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MOX FUEL FABRICATION FACILITY
SITE GEOTECHNICAL REPORT

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1. EXCUTIVE SUMMARY

This report presents the results of the initial geotechnical assessment for the Mixed Oxide Fuel Fabrication Facility (MFFF) site. The results of exploration boring, cone penetration testing (CPT) and laboratory classification testing program for of soils at the MFFF site are presented in this report. Additional static and dynamic laboratory testing of soils, engineering analysis, and establishment of final static and dynamic geotechnical design criteria and site preparation requirements are ongoing activities to be completed, therefore, the results are not included in the report at this time.

The field exploration program and initial laboratory test results indicate that subsurface conditions encountered at the MFFF site are consistent with subsurface conditions reported in previous geotechnical investigations for the F-Area. Conditions described for the Savannah River Site (SRS) in WSRC (2000a) are also applicable to the MFFF site. No unusual subsurface or conditions were encountered at the MFFF site. The geologic, groundwater and seismic conditions described in SRS reports for F-Area are applicable for the MFFF site.

A preliminary assessment of the subsurface conditions encountered at the MFFF site indicates that the site is considered suitable to support the proposed structures. It is anticipated that site preparation and foundation preparation and treatment will be required to properly control settlement of the structures and to provide adequate bearing capacity for static and seismic loading conditions. Analysis is being performed to define specific treatment and preparation requirements that will be required for any facility foundation system. Presently, anticipated foundation preparation and treatment will not have any adverse affect to the existing groundwater conditions at the site.

Some isolated soft zones were identified at depth on the MFFF site and are consistent with soft zones encountered in previous investigations in the F-Area. The exploration borings and CPT holes were used to define approximate limits of any substantial soft zones encountered. Critical structures, such as the MOX Fuel Fabrication Building and the Emergency Diesel Generator Building, have been located so that they are not directly over any identified thicker soft zone units. Both static and dynamic analysis will be performed to evaluate the affect of any soft zones that may be located near or beneath any of these critical structures.

The site geological conditions encountered at the MFFF site indicate that the seismic response spectra developed for SRS will be applicable for use at the MFFF site.

2. INTRODUCTION

The Mixed Oxide Fuel Fabrication Facility (MFFF) site is located adjacent to the F-Area, in the Separations Area of the Department of Energy's (DOE) Savannah River Site (SRS) in South Carolina. The MFFF site geotechnical program was performed on an land area set aside for the MFFF. DOE assigned this site for the MFFF after an evaluation of five sites in the vicinity of the F-Area. This Geotechnical Report presents the initial results of the geotechnical investigation performed at the MFFF site location.

The detailed field exploration program for the MFFF site has been completed. A total of thirteen (13) exploration borings and sixty-three (63) cone penetration test (CPT) holes were used to define subsurface conditions at the MFFF site. Laboratory classification testing for representative soil samples has been completed and additional static and dynamic testing is being completed and reviewed at this time. Additional site geotechnical programs, previously performed by others adjacent to and on this site, were also used to evaluate site subsurface geologic and groundwater conditions. Exploration boring logs, CPT logs and initial soil classification test results are presented in this report. The locations of exploration borings and CPT holes used to evaluated the MFFF site are shown on Figure 1.

The results of the geotechnical program have been used to establish a baseline database to compare with previous investigations performed at SRS and the F-Area and to define relevant data that can be utilized for the MFFF investigation. Further analysis is ongoing to develop the geotechnical design criteria for the MFFF site.

The Geotechnical Exploration and Testing Program was performed under the engineering oversight of the Duke Cogema Stone & Webster (DCS) Lead Geotechnical Engineer and geotechnical staff.

1.1 PURPOSE AND SCOPE

The purpose of the Geotechnical and Exploration and Testing Program was to obtain geotechnical information to characterize subsurface conditions at the MFFF site and to compare these results with subsurface conditions reported in and around the adjacent F-Area. Specific objectives include:

- Define geologic stratigraphy and compare the continuity, thickness and relative elevation to stratigraphic units defined across the F-Area and at SRS;
- Define the index properties of each stratigraphic layer and make a comparison to geotechnical properties determined for the F-Area stratigraphy;
- Evaluate the subsurface conditions to define relative geotechnical conditions and suitability to support the proposed MFFF foundations systems;
- Define any subsurface conditions that may be detrimental to support the proposed MFFF foundation systems; and
- Develop geotechnical design criteria for the MFFF site

2. GEOTECHNICAL EXPLORATION AND TESTING PROGRAM

2.1 APPROACH

The Geotechnical Exploration and Testing Program for the MFFF site was developed utilizing existing subsurface information that was available for the F-Area and the MFFF site. The topography for the MFFF site and the results of previous geotechnical investigations at and near the MFFF were used to define tentative critical structure locations for the MFFF (MOX Fuel Fabrication Building and Emergency Diesel Generator Building). A detailed exploration program, consisting of exploration borings with standard penetration tests (SPT) and cone penetration test soundings (CPT), was developed to define subsurface conditions at and in the vicinity of proposed MFFF building locations. Major emphasis of the exploration program was to adequately define subsurface conditions at the location of critical structures. Figure 1 presents the location of previous site exploration test holes and the exploration program completed in 2000 for the MFFF site. The MOX and Emergency Diesel Generator buildings have been located to avoid being directly located over extensive soft zones, as shown on Figure 1.

The original exploration program consisted of thirteen (13) exploration borings and thirty-seven (37) CPT soundings. The CPT program was extended to sixty-three (63) soundings after soft zones were encountered at the original building locations and critical structures had to be relocated to avoid soft zones. The original soil boring locations were adjusted to the revised site layout and still remained at a total of 13. Five dilatometer test holes (DMT holes) were performed at representative locations near CPT soundings and exploration borings to evaluate insitu stress conditions and to collect insitu data for correlation with the CPT, exploration boring and laboratory test results.

The primary purpose of the exploration borings was to obtain SPT results for correlation with CPT results and to collect representative soil samples for laboratory testing. The exploration borings were also drilled to a depth adequate to define the contact between the upper soil units at the site and the Congree Formation. The Congree Formation is an established geologic marker bed in the F-Area and at the SRS. The exploration borings were located to provide representative subsurface soil sampling across the MFFF site and to provide a positive definition of the geologic contact with the Congree Formation.

CPTs were located to establish a continuous and representative profile of the upper soil stratigraphy and to collect insitu information for engineering evaluation of the site. CPTs have been used extensively and successfully at SRS and the F-Area in recent years to define subsurface conditions for engineering and groundwater evaluations. The extensive use of the CPT at SRS provides an extensive database for correlation with the MFFF site program.

All CPTs at the MFFF site measured tip resistance, pore water pressure, and sleeve resistance. Fourteen (14) of the CPT's were seismic cones and included measurement of compression (P) and shear (S) wave velocities at depth intervals of 5 feet. Seventeen (17) of the CPTs included measurement of electrical resistivity for the full depth pushed. Pore water pressure dissipation testing was performed at selected locations to define the groundwater conditions. The CPT holes

within the MFFF-Area were pushed to cone refusal, which occurred at some locations before reaching the Congree Formation.

The CPT soundings were located to provide representative coverage across the MFFF site and to provide detailed subsurface information at the location of critical structures. Isolated soft zones at depth are known to be present in the F-Area from previous investigations, therefore, the CPT soundings for the MFFF site were spaced closer at critical structure locations than generally used for standard geotechnical programs. The CPT spacing was tightened to define the extent any soft zones or loose zones identified in the vicinity of critical structures. The management of the field geotechnical program included adding additional CPT or exploration holes, when soft zones were encountered so that their limits could be mapped. The CPT thin wall sampler was also utilized to obtain soil samples in identified softer layers at depth, when directed by the DCS Field Engineer.

All exploration borings and CPT and DMT soundings were drilled and grouted in compliance with established SRS procedures to prevent cross flow or contamination from the upper site aquifer system to the Congree aquifer system. All holes were grouted after completion to seal any penetration into the Congree aquifer system as required by SRS procedures.

The soil laboratory testing program was developed to establish a representative database for classification, static and dynamic testing of the soils engineering units defined at the MFFF site. The testing program was designed to provide adequate classification of engineering units encountered at the MFFF site for correlation with available test data for the F-Area and other relevant stratigraphic units at SRS. The laboratory testing program was designed to be adequate for correlation with CPT and SPT results and for establishing geotechnical design criteria that is required for the analysis of MFFF structures.

Samples of cuttings from exploration borings and all soil samples were tested by WSRC Health Physics to verify whether radiological contamination was present at the site. For this extensive exploration and sampling program across the MFFF site, no radiological contamination was identified in any samples tested. No samples were removed from SRS until cleared by WSRC Health Physics.

2.2 METHODOLOGY

The Geotechnical Exploration and Testing Program was conducted in accordance with MOX Project Procedure PP 9-19 Rev. 0, Geotechnical Exploration and Testing (DCS 2000a). All field exploration programs were conducted under the engineering oversight of DCS Field Engineers, as outlined in DCS (2000a). The DCS Field Engineer performed engineering oversight and field documentation for all test boring and sampling activities, including preparation of the Log of Borings, selection of soil sampling type and location, and sample handling, packaging, storage and shipment. The DCS Field Engineer also performed engineering oversight and field documentation for field activities associated with conducting the CPT soundings and DMT testing.

The DCS Field Engineer also coordinated with WSRC Health Physics for radiological testing of cuttings from exploration borings and samples collected for laboratory testing. No samples were removed from SRS until cleared of radiological contamination by WSRC Health Physics.

Miller Drilling Company, Inc. (Miller) performed the exploration borings and soil sampling in accordance with Specification for Geotechnical Test Borings and Sampling, DCS01-WRS-DS-SPE-G-00002-A (DCS 2000b). All Quality related technical field activities for soil exploration and sampling were performed by the DCS Field Engineer, in accordance with DCS (2000a). The drop hammer weight for SPT testing was certified under the DCS Quality Program.

The CPT program was performed by Applied Research Associates, Inc. (ARA) in accordance with Specification for Cone Penetration Testing of Soil, DCS01-WRS-DS-SPE-G-00001-A (2000c). ARA implemented their Quality Assurance Program requirements for all work performed per this specification. The DCS Field Engineer provided engineering oversight of the CPT program in accordance with DCS (2000a).

The soil testing program was performed by Law Engineering and Environmental Services, Inc. (LAW) in accordance with Specification for Laboratory Testing of Soils, DCS01-WRS-DS-SPE-G-00003-A (DCS 2000d). Selection of samples for laboratory testing and definition of the soils testing program was prepared by DCS geotechnical engineers, under the supervision of the DCS Lead Geotechnical Engineer in accordance with DCS (2000a).

2.3 GEOTECHNICAL EXPLORATION PROGRAM

Both the soil exploration and CPT programs were started on June 6, 2000 at the MFFF site. The exploration program was completed on July 22, 2000 and the CPT program was completed on July 24, 2000. A total of thirteen (13) exploration borings and sixty-three (63) cone penetration test (CPT) holes were used to define subsurface conditions at the MFFF site. Additional site geotechnical programs previously performed by others adjacent to and on this site were also used to evaluate site subsurface geologic and groundwater conditions. The location of exploration borings and CPT holes used to investigate the MFFF site are shown on Figure 1.

The CPT holes extended from approximately 64 feet to 140 feet below present site grade. Each CPT hole provided a continuous profile of the soil conditions encountered at each test location. Some soft soil zones were identified at depth during the initial MFFF site exploration program at CPT. Additional CPT holes were performed, as required, to delineate boundaries for these soft zones. The soft zones encountered were typical to those that have been described in previous F-Area investigations. Heavily loaded structures, such as the MOX and the Emergency Diesel Generator buildings, were adjusted on the MFFF site to minimize the potential impact of the underlying soft zones. The present location of facilities at the MFFF site is shown on Figure 1.

The soil exploration borings extend from approximately 131 feet to 181 feet below the present site grade. The exploration borings were used for correlation with the CPT holes and to obtain soil samples for laboratory testing. Three cased holes (exploration borings BH-2, BH-5, and

BH-10) from the exploration program were cased for downhole seismic testing. The results for the downhole testing are not available for presentation in the report at this time.

Laboratory testing started at the completion of the site exploration program. Classification testing has been completed and the results are presented on the Log of Borings. Static and dynamic testing for the MFFF site soils has been completed, however, evaluation of these test results is ongoing and not available for presentation in the report at this time.

The detailed Log of Borings prepared for the MFFF site geotechnical exploration program are presented in Attachment 1. The detailed results of the CPT program are presented in Attachment 2.

2.4 SUBSURFACE SOIL CONDITIONS

The subsurface soil conditions at the MFFF site were characterized utilizing information obtained from the field geotechnical exploration program. This information was compared to published subsurface data from the adjacent Actinide Packaging and Storage Facility (APSF) and Northeast Expansion area geotechnical investigations (WSRC 1996, 1999; Geomatrix 1997). Material characterization included field logging and extensive laboratory index property testing. Groundwater conditions were estimated from CPT pore pressure dissipation test results.

Four subsurface cross sections were developed to show the site stratigraphy to a depth of approximately 130 to 150 feet below natural grade. The location of the subsurface cross sections is shown on Figure 2. The cross sections are shown in Figures 3 through 6. Also shown is cross section 4-4 (Figure 7) from the WSRC F-Area Northeast Expansion Report (WSRC 1999a), conducted as part of the F-Area Northeast Expansion site characterization. This cross section passes along the southern portion of the MFFF site, and is presented for comparison purposes.

2.4.1 Engineering Stratigraphy Units

The subsurface stratigraphy units were mainly developed from CPT measurements including tip resistance, sleeve friction, pore pressure and shear wave velocity. This information was correlated with data from adjacent geotechnical borings, where available. The basis for the stratigraphic subdivisions described in the following sections was developed by WSRC (1996, 1999). WSRC developed an "engineering stratigraphy" to distinguish these layers from the geologic formations in which they lie. To maintain consistency with previously published SRS data, the alphanumeric system used by WSRC to describe the engineering stratigraphy units is maintained in this report. The correlation presently being used at SRS for an engineering stratigraphy unit with its respective geologic unit is presented on Table 1. A detailed discussion of the geologic units is presented in Section 3.5.1.

In general, the subsurface stratigraphy of the MFFF site is consistent with the conditions found at the APSF site, located immediately south of the MFFF site, and the F-Area Northeast Expansion Area, located about 150 yards southeast. In addition, the average material properties for each of the stratigraphic layers discussed below correlate quite well with those averages found at the

APSF and F-Area Northeast Expansion sites. A summary of the material properties for the MFFF subsurface soils, along with comparisons to published averages for the APSF and F-Area Northeast Expansion soils, is shown in Table 2. Table 2 shows that index properties for the subsurface units at the MFFF site are consistent with those found at APSF and the Northeast Expansion studies performed in the F-Area.

2.4.1.1 TR1 and TR1A

The TR1 and TR1A layers are considered to be part of the Altamaha Formation (sometimes referred to as the "Upland Unit"). In general, these soils consist of red, purple and brown poorly sorted sands, clayey sands and silty sands in a medium dense to dense state. The TR1 layer is typically found at El 260 or higher at the SRS, often contains some fine gravel, and is less fine-grained than the underlying TR1A. Moderate CPT tip resistances and moderate to high friction ratios characterizes the TR1/TR1A layers. TR1 ranges in thickness from about 10 feet in the western portion of the site, tapering to zero thickness in the eastern third. TR1A ranges in thickness from about 10 to 20 feet. The top of TR1 ranges in elevation from approximately El 265 to El 280. The top of TR1A ranges from about El 260 to El 278.

2.4.1.2 TR2A and TR2B

The TR2A and TR2B layers are used to differentiate the Tabacco Road Formation. In general, TR2A and TR2B consist of purple, red, and brown, medium dense to dense, poorly sorted sands and clayey sands. The boundary between TR1A and TR2A is often identified by an increase in CPT tip resistance and notably lower sleeve friction values, resulting in substantially lower friction ratios. Although TR2A and TR2B have very similar material properties, TR2B is typically identified by an increase in CPT tip resistance. TR2A ranges in thickness from a maximum of approximately 30 feet near the center of the site, to about five feet near the eastern edge of the site. The thickness of TR2B ranges from about 32 feet near the center of the site to around 15 feet at the eastern edge of the site. The top of TR2A ranges in elevation from approximately El 249 to El 265. The top of TR2B ranges from about El 226 to El 245.

2.4.1.3 TR3/4 and DB1/3

The TR3/4 and DB1/3 layers are part of the Dry Branch geologic formation. The TR3/4 layer consists primarily of stiff sandy clay and loose to medium dense clayey sands and sandy silts. The fine-grained fraction (minus No. 200 sieve) of the TR3/4 soils are highly plastic. The upper boundary of the TR3/4 layer is defined by a significant decrease in CPT tip resistance and an increase in both friction ratio and pore pressure, relative to the TR2B layer. The TR3/4 layer appears to be present across the MFFF site and ranges in thickness from about three to 10 feet. The top of the layer ranges in elevation from about El 200 to El 230.

The DB1/3 layer corresponds to the Irwinton Sand member, and consists mainly of silty sands and poorly graded sands, with widely interspersed thin sandy clay and clayey sand layers. The sands are generally medium dense, with widely interspersed pockets of loose and dense to very dense material. DB1/3 is a layer of variable, but generally high CPT tip resistance and low

friction ratios. The DB1/3 layer at the site ranges in thickness from about 18 to 30 feet, with the top elevation ranging from about El 190 to El 215.

2.4.1.4 DB4/5, ST1 and ST2

The DB4/5, ST1 and ST2 layers are part of the highly variable Tinker/Santee Formation. CPT tip resistances and friction ratios in this formation characteristically exhibit a pronounced sawtooth profile, with large variations over small vertical intervals. This pattern is consistent with lenses of clayey and silty sands interfingered with resistant silica-cemented sediments and less resistant, calcareous sediments.

DB4/5 consists mainly of medium dense, medium to highly plastic clayey and silty sands. In general, this layer is more clayey and silty than either the overlying DB1/3 or underlying ST1 layers. The DB4/5 layer typically exhibits moderate to low CPT tip resistances and moderate friction ratios, along with a notable increase in pore pressure. Several "soft zones" (defined at SRS as zones having a CPT tip resistance of 15 tsf or less, or an SPT N-value of 5 or less) were encountered within the DB4/5 layer at the APSF site. At the MFFF site, the DB4/5 layer at the site ranges in thickness from about five to 13 feet, with the top elevation ranging from about El 169 to El 191.

The ST1 and ST2 layers mainly consist of silty sands and poorly sorted sands. In general, the ST1 layer is dense to very dense, while the underlying ST2 layer is loose to medium dense. The ST1 is characterized by markedly higher CPT tip resistances and sleeve friction than either the DB4/5 or ST2 layers. At the MFFF site, the ST1 layer ranges in thickness from about 15 to 21 feet, with the top elevation ranging from about El 143 to El 184. The ST2 layer ranges in thickness from about 5 to 15 feet, with the top elevation ranging from about El 135 to El 165.

2.4.1.5 GC

The "green clay" is an informal name used at SRS for the medium dense to dense green, brown and gray clayey sands, silty sands, sandy silts and sandy clays that mark the Warley Hill Formation at the base of the Tinker/Santee Formation. The GC layer locally continuous across F-Area, and has been used by WSRC to define the lower boundary of the shallow stratigraphy. Only a few of the CPTs at the MFFF site fully penetrated the GC layer due to its depth. All of the exploration borings penetrated the GC layer. Based on this limited information, the GC layer at the site ranges in thickness from about three to 10 feet, with a top elevation ranging from about El 135 to El 145. The GC layer is considered to be continuous across the MFFF site.

2.4.2 Soft Zones

Soft zones at the MFFF site are presently being defined based on criteria presented by WSCR (1999a and 1999b). Soft zones are defined by SPT N-values ≤ 5 or CPT tip resistance of ≤ 15 tsf. Soft zones were generally restricted to the lower Dry Branch Formation and the Tinker/Santee Formation at the MFFF site. Limited isolated soft zones were also defined in

other horizons on the MFFF site. The definition for soft zones will be refined, if required, for the MFFF site after planned FLAC analysis is completed critical structures.

Using the above definitions, soft zones encountered during the site exploration program were immediately characterized and their limits defined by adding additional CPT holes and borings to determine their lateral extent. The location of soft zones encountered on the eastern portion of the MFFF site resulted in a major relocation for the MOX and Emergency Diesel Generator buildings. These structures were relocated within the MFFF site boundary so that these critical structures are not directly over any significant soft zones. Soft zones in the vicinity of the new structure footprints were mapped to the extent possible during this investigation so that the influence of the soft zone to the structure can be evaluated by analysis. This analysis is ongoing and the results are not available for presentation in this report.

Soft zones identified during the MFFF site exploration program are characteristic of soft zones identified during the APSF and F-Area Northeast Expansion geotechnical investigations (Geomatrix 1997 and WSRC 1999a). The soft zones encountered at the MFFF site are also consistent with the description of soft zones presented in WSRC (1999b). No unusual soft zone conditions were encountered at the MFFF site. The soft zones identified on the MFFF site are at depth, isolated and have a limited lateral definition. The majority of the soft zones are located in the Tinker/Santee Formations. Table 3 lists the depth and thicknesses of soft zones identified in CPTs and borings, in accordance with the SRS soft zone criteria listed above.

2.4.3 Groundwater Conditions

Section 1.4.2 of WSRC (2000a) provides a detailed discussion for the groundwater hydrology at SRS and the F-Area. This section presents a summary of groundwater hydrology for the MFFF site.

2.4.3.1 Groundwater Aquifers

The groundwater conditions at the MFFF site have the same characteristics as the F-Area. Groundwater in the shallow, intermediate, and deep aquifers at the MFFF site flows in different directions, depending on the depths of the streams that cut the aquifers. The Upper Three Runs Aquifer Unit is the shallow groundwater, unconfined aquifer at the MFFF site and discharges into Upper Three Runs Creek to the north. The Upper Three Runs Aquifer Unit occurs between the groundwater table and the Gorden Confining Unit (Warley Hill Formation and GC) and includes all strata above. The Gorden aquifer underlies the Three Runs aquifer at the MFFF Site and flows horizontally toward the Savannah River. Underlying deeper aquifer units at the MFFF site flow southeast toward the coast (WSRC 2000a).

Groundwater flow at the MFFF site area is vertical and lateral. In the Upper Three Runs and Gorden aquifers, flow moves downward until its movement is obstructed by impermeable material. This was illustrated in CPTs located near the existing sedimentation basins at the south portion of the site. Water held in the sediment basins infiltrates into the Upper Three Runs aquifer, causing local groundwater mounding at these locations. The GC layer provides a

confining layer between the Upper Three Runs and Gorden Aquifers. Groundwater in the Upper Three Runs aquifer flows laterally to the north across the MFFF site.

Operating under a different set of physical conditions, groundwater in the intermediate and deep aquifers flows mostly horizontally. At the F-Area and MFFF site, flow from deeper aquifers moves upward due to higher water pressure below the confining unit between the upper and lower aquifer systems. This upward movement helps to protect the lower aquifers from any contaminants that might be present in the F-Area in the shallow Upper Three Runs aquifer.

The depth to groundwater at the MFFF site area varies from approximately elevation 200-feet to 210 feet and is found at a depth of over 60 feet below existing ground level. The groundwater levels shown on Cross Sections 1, 2, 3 and 4 (Figures 3 through 6) were developed based on pore dissipation tests performed in the respective CPTs. These groundwarter levels support groundwater contours presented for the Upper Three Runs aquifer in WSRC (2000a and 2000b). At the time of the field exploration program, SRS had been experiencing drought conditions. Long term groundwater monitoring in the F-Area indicates that the groundwater level can fluctuate as much a 10 feet seasonally (WSRC 1999a).

2.4.3.2 Groundwater Quality

Groundwater quality in F-Area and MFFF site is not significantly different from that for SRS as a whole. It is abundant, usually soft, slightly acidic, and low in dissolved solids. High dissolved iron concentrations occur in some aquifers.

WSRC (2000b) provides a comprehensive discussion of groundwater contamination plumes in the F-Area and covers the MFFF site. Also WSRC (1995) for the Old F-Area Seepage Basin defines the soil and groundwater contamination from past disposal practice into the seepage basin. The Old F-Area Seepage Basin is located just northwest of the MFFF site area, as shown on Figures 1 and 2. The contaminated soil zone within the Old F-Area Seepage Basin was remediated in 2000. These two reports indicate that there is no known soil or groundwater contamination on the MFFF site area. This was confirmed with the recent comprehensive geotechnical investigations conducted during 2000 at the MFFF site. Radiological testing was performed for drill cuttings and all samples. No radioactive contamination was encountered during this program in the Upper Three Runs or Gorden Aquifers, which are the upper aquifers at the MFFF site. WSRC (1995 and 2000a) also indicate that the identified groundwater contamination plumes in the F-Area will not pass beneath the MFFF site, since it is up gradient of the direction of known plume migrations.

The anticipated construction, site preparation, and development for the MFFF facilities will be confined within the geologic units that comprise the Upper Three Runs Aquifer units. The planned construction activities will not have any adverse affects to the existing aquifer systems beneath the MFFF site area.

2.4.4 Stability of Subsurface Materials

2.4.4.1 Liquefaction Susceptibility

The liquefaction susceptibility of the subsurface materials at the MFFF site will be evaluated using qualitative and quantitative approaches. The site specific investigations did indicate some loose, isolated soil materials at depth which need to be evaluated. The depth to groundwater exceeds 60 foot depth at the MFFF site. Field and laboratory testing programs have been completed to characterize site conditions. The liquefaction analysis is ongoing, therefore, results are not available for presentation in the report at this time. At the present time it is anticipated that the affect on critical structures, from any potential and isolated liquefaction condition, can be remediated by design or structure relocation.

2.4.4.2 Soft Zone Settlement

Soft zone conditions identified at the MFFF site are discussed in Section 2.4.2. Any soft zones identified within the influence of critical structure foundation systems will be evaluated for both static and dynamic loading conditions. This analysis has not been completed, therefore, results are not available for presentation in the report at this time. At the present time is anticipated that the affect on critical structures, from any nearby soft zones, can be remediated by a combination of foundation preparation and treatment and design or by structure relocation.

2.4.4.3 Faulting

Studies at SRS have indicated that identified faults at or near SRS are not capable, therefore, faults do not present a subsurface stability problem for the MFFF site. Refer to Section 2.5.2 for more detail.

2.5 GEOLOGY

2.5.1 Regional Geology

The following discussion on the regional and MFFF site geology is based on detailed discussions presented in section 1.4.3 of WSRC (2000a). The area of interest evaluated includes a radius of about 200 miles from the SRS and MFFF site. The information also provides the basis for understanding the regional and SRS geology as applied to subsurface encountered at the MFFF site.

Many SRS investigations and an extensive literature review reach the conclusion that there are no geologic threats affecting the MFFF site, except the Charleston Seismic Zone and the minor random Piedmont earthquakes. The Pen Branch fault has been regarded as the primary structural feature at SRS that has the characteristics necessary to pose a potential seismic risk. Studies have indicated that, despite this potential, the fault is not capable.

2.5.1.1 Atlantic Coastal Plain Stratigraphy

The SRS is located on the sediments of the Upper Atlantic Coastal Plain in South Carolina. The Coastal Plain are stratified sand, clay, limestone, and gravel that dip gently seaward and range in age from Late Cretaceous to Recent. The sedimentary sequence thickens from essentially zero at the Fall Line to more than 1,219 meters (4,000 feet) at the coast. Regional dip is to the southeast, although beds dip and thicken locally in other directions because of locally variable depositional regimes and differential subsidence of basement features such as the Cape Fear Arch and the South Georgia Embayment. A map depicting these regional features and the study area discussed in the following sections is presented in Figure 8.

The Coastal Plain sedimentary sequence near the center of the region (i.e., SRS) consists of about 213 meters (700 feet) of Late Cretaceous quartz sand, pebbly sand, and kaolinitic clay, overlain by about 18 meters (60 feet) of Paleocene clayey and silty quartz sand, glauconitic sand, and silt. The Paleocene beds are in turn overlain by about 107 meters (350 feet) of Eocene quartz sand, glauconitic quartz sand, clay, and limestone grading into calcareous sand, silt, and clay. The calcareous strata are common in the upper part of the Eocene section in downdip parts of the study area. In places, especially at higher elevations, deposits of pebbly, clayey sand, conglomerate, and clay of Miocene or Oligocene age cap the sequence. Lateral and vertical facies changes are characteristic of most of the Coastal Plain sequence, and the lithologic descriptions below are therefore generalized. The stratigraphic section, which delineates the coastal plain lithology (see Figure 9), is divided into several formations and groups, based principally on age and lithology.

The following sections describe regional stratigraphy and lithologies of the Coastal Plain sediments, with emphasis on variations near the SRS. The data presented are based upon direct observations of surface outcrops; geologic core obtained during drilling of bore holes; microfossil age dating; and borehole geophysical logs. Several key boring locations within the SRS boundaries and in the adjacent regions (see Figure 10) are referenced throughout the following discussions.

2.5.1.1.1 Upper Cretaceous Sediments

Upper Cretaceous sediments overlie Paleozoic crystalline rocks or lower Mesozoic sedimentary rocks throughout most of the study area. The Upper Cretaceous sequence includes the basal Cape Fear Formation and the overlying Lumbee Group, which is divided into three formations (see Figure 9). The sediments in this region consist predominantly of poorly consolidated, clay-rich, fine- to medium-grained, micaceous sand, sandy clay, and gravel, and is about 213 meters (700 feet) thick near the center of the study area. Thin clay layers are common. In parts of the section, clay beds and lenses up to 21 meters (70 feet) thick are present. Depositional environments were fluvial to prodeltaic.

2.5.1.1.2 Tertiary Sediments

Tertiary sediments range in age from Early Paleocene to Miocene and were deposited in fluvial to marine shelf environments. The Tertiary sequence of sand, silt, and clay generally grades into highly permeable platform carbonates in the southern part of the study area and these continue southward to the coast. The Tertiary sequence is divided into three groups, the Black Mingo Group, Orangeburg Group, and Barnwell Group, which are further subdivided into formations and members (see Figure 9). The ubiquitous Upland unit overlies these groups.

2.5.1.1.2.1 Black Mingo Group

The Black Mingo Group underlies SRS and the MFFF site and consists of quartz sand, silty clay, and clay that suggest upper and lower delta plain environments of deposition generally under marine influences. In the southern part of the study area, massive clay beds, often more than 50 feet (15 meters) thick, predominate.

Basal Black Mingo sediments were deposited on the regional "Cretaceous-Tertiary" unconformity of Aadland that defines the base of Sequence Stratigraphic unit I. There is no apparent structural control of this unconformity. Above the unconformity, the clay and clayey sand beds of the Black Mingo Group thin and often pinch out along the traces of the Pen Branch and Crackerneck Faults. This suggests that coarser-grained materials were deposited preferentially along the fault traces, perhaps due to shoaling of the depositional surface. This, in turn, suggests movement (reactivation) along the faults. This reactivation would have occurred during Black Mingo deposition, that is, in Paleocene and lower Eocene time.

2.5.1.1.2.2 Orangeburg Group

The Orangeburg Group underlies SRS and the MFFF site and consists of the lower middle Eocene Congaree Formation (Tallahatta equivalent) and the upper middle Eocene Warley Hill Formation and Santee Limestone (see Figure 9). Over most of the study area, these post-Paleocene units are more marine in character than the underlying Cretaceous and Paleocene units; they consist of alternating layers of sand, limestone, marl, and clay.

The group crops out at lower elevations in many places within and near SRS. The sediments thicken from about 26 meters (85 feet) at well P-30 near the northwestern SRS boundary to 61 meters (200 feet) at well C-10 (see Figure 10) in the south. Dip of the upper surface is 2 m/km (12 ft/mile) to the southeast.

In the central part of the study area the group includes, in ascending order, the Congaree, Warley Hill, and Tinker/Santee Formations (see Figure 9). The units consist of alternating layers of sand, limestone, marl, and clay that are indicative of deposition in shoreline to shallow shelf environments. From the base upward, the Orangeburg Group passes from clean shoreline sand characteristic of the Congaree Formation to shelf marl, clay, sand, and limestone typical of the Warley Hill and Santee Limestone. Near the center of the study area, the Santee sediments

consist of up to 30 % carbonate. The sequence is transgressive, with the middle Eocene Sea reaching its most northerly position during Tinker/Santee deposition.

Toward the south, near wells P-21, ALL-324, and C-10 (see Figure 10), the carbonate content of all three formations increases dramatically. The shoreline sand of the Congaree undergoes a facies change to interbedded glauconitic sand and shale, grading to glauconitic argillaceous, fossiliferous, sandy limestone. Downdip, the fine-grained, glauconitic sand, and clay of the Warley Hill become increasingly calcareous and grades imperceptibly into carbonate-rich facies comparable to both the overlying and underlying units. Carbonate content in the glauconitic marl, calcareous sand, and sandy limestone of the Santee increases towards the south. Carbonate sediments constitute the vast majority of the Santee from well P-21 southward.

2.5.1.1.2.2.1 Congaree Formation

The early middle Eocene Congaree Formation has been traced from the Congaree valley in east central South Carolina into the study area. It has been paleontologically correlated with the early and middle Eocene Tallahatta Formation in neighboring southeastern Georgia.

The Congaree is about 9 meters (30 feet) thick near the center of the SRS study area and consists of yellow, orange, tan, gray, green, and greenish gray, well-sorted, fine to coarse quartz sand, with granule and small pebble zones common. Thin clay laminae occur throughout the section. The quartz grains tend to be better rounded than those in the rest of the stratigraphic column are. The sand is glauconitic in places suggesting deposition in shoreline or shallow shelf environments. To the south, near well ALL-324 (see Figure 10), the Congaree Formation consists of interbedded glauconitic sand and shale, grading to glauconitic, argillaceous, fossiliferous sandy limestone suggestive of shallow to deeper shelf environments of deposition. Farther south, beyond well C-10, the Congaree grades into platform carbonate facies of the lower Santee Limestone.

2.5.1.1.2.2.2 Warley Hill Formation

Unconformably overlying the Congaree Formation are 3 meters (10 feet) to 6 meters (20 feet) of fine-grained, often glauconitic sand and green clay beds that have been referred to respectively as the Warley Hill and Caw Members of the Santee Limestone. The green sand and clay beds are referred to informally as the "green clay" in previous SRS reports. Both the glauconitic sand and the clay at the top of the Congaree are assigned to the Warley Hill Formation. In the updip parts of the study area, the Warley Hill apparently is missing or very thin, and the overlying Tinker/Santee Formation rests unconformably on the Congaree Formation.

The Warley Hill Formation (GC) is present at the MFFF site and averages 1.5 meters (5 feet) in thickness.

The Warley Hill sediments indicate shallow to deeper clastic shelf environments of deposition in the study area, representing deeper water than the underlying Congaree Formation. This suggests a continuation of a transgressive pulse during upper middle Eocene time. To the south,

beyond well P-21, the green silty sand, and clay of the Warley Hill undergo a facies change to the clayey micritic limestone and limey clay typical of the overlying Santee Limestone. The Warley Hill blends imperceptibly into a thick clayey micritic limestone that divides the Floridan Aquifer System south of the study area. In the SRS study area, the thickness of the Warley Hill Formation is generally less than 6 meters (20 feet).

2.5.1.1.2.2.3 Tinker/Santee Formation

The Tinker/Santee (Utley) interval is about 21 meters (70 feet) thick near the center of SRS. Sediments of the Tinker/Santee indicate deposition in shallow marine environments. Often found within the Tinker/Santee sediments, particularly in the upper third of the interval, are weak zones interspersed in stronger carbonate-rich matrix materials. The weak zones, which vary in apparent thickness and lateral extent, were noted where rod drops and/or lost circulation occurred during drilling, low blow counts occurred during SPT pushes, etc. These weak zones have variously been termed in SRS reference documents as "soft zones", the "critical layer", "underconsolidated zones", "bad ground", and "void".

The Tinker/Santee Formation is present at the MFFF Site and is about 12 meters (40 feet) thick. Soft zones, typical to this formation, were also encountered at the MFFF site.

2.5.1.1.2.3 Barnwell Group

Upper Eocene sediments of the Barnwell Group (see Figure 9) represent the Upper Coastal Plain of western South Carolina and eastern Georgia. Sediments of the Barnwell Group are present at the MFFF site and overlie the Tinker/Santee Formation and consist mostly of shallow marine quartz sand containing sporadic clay layers. The group is about 21 meters (70 feet) thick near the northwestern boundary of SRS and 52 meters (170 feet) near its southeastern boundary. The regionally significant Santee Unconformity that defines of boundary between Sequence Stratigtraphic units II and III (Figure 9) separates the Clinchfield Formation from the overlying Dry Branch Formation. The Santee Unconformity is a pronounced erosional surface observable throughout the SRS region (Figures 9).

2.5.1.1.2.3.1 Clinchfield Formation

The basal late Eocene Clinchfield Formation consists of light colored quartz sand and glauconitic, biomoldic limestone, calcareous sand, and clay. Sand beds of the formation constitute the Riggins Mill Member of the Clinchfield Formation and are composed of medium to coarse, poorly to well sorted, loose and slightly indurated, tan, clay, and green quartz. The sand is difficult to identify unless it occurs between the overlying carbonate layers of the Griffins Landing Member and the underlying carbonate layers of the Santee Limestone. The Clinchfield is about 8 meters (25 feet) thick in the southeastern part of SRS and pinches out or becomes unrecognizable at the center of the site, at the MFFF site location.

The Clinchfield Formation is not present at the MFFF site.

2.5.1.1.2.3.2 Dry Branch Formation

The late Eocene Dry Branch Formation is divided into the Irwinton Sand Member, the Twiggs Clay Member, and the Griffins Landing Member. The unit is about 18 meters (60 feet) thick near the center of the study area. The Dry Branch sediments overlying the Tinker/Santee (Utley) interval in the central portion of SRS were deposited in shoreline/lagoonal/tidal marsh environments. The shoreline retreated from its position in northern SRS during Tinker/Santee (Utley) time to the central part of SRS in Dry Branch time. Progradation of the shoreline environments to the south resulted in the sands and muddy sands of the Dry Branch being deposited over the shelf carbonates and clastics of the Tinker/Santee (Utley) sequence.

The Dry Branch Formation is present at the MFFF site and is about 9 meters (30 feet) thick.

2.5.1.1.2.3.3 Tobacco Road Formation

The Late Eocene Tobacco Road Formation consists of moderately to poorly sorted, red, brown, tan, purple, and orange, fine to coarse, clayey quartz sand. Pebble layers are common, as are clay laminae and beds. Ophiomorpha burrows are abundant in parts of the formation. Sediments have the characteristics of lower Delta plain to shallow marine deposits. The top of the Tobacco Road is characterized by the change from a comparatively well-sorted sand to the more poorly sorted sand, pebbly sand, and clay of the "Upland unit." Contact between the units constitutes the "Upland" unconformity. The unconformity is very irregular due to fluvial incision that accompanied deposition of the overlying "Upland unit" and later erosion.

The Tobacco Road Formation is found at the MFFF site and is about 13 meters (43 feet) thick. The Tobacco Road Formation is overlain by the "Upland Unit" at the MFFF site.

2.5.1.1.2.3.4 "Upland Unit"/Hawthorn/Chandler Bridge Formations

Deposits of poorly sorted silty, clayey sand, pebbly sand, and conglomerate of the "Upland unit" cap many of the hills at higher elevations over much of the study area. Weathered feldspar is abundant in places. The color is variable, and facies changes are abrupt. The "Upland unit", is generally considered toto be Miocene age. The unit is up to 18 meters (60 feet) thick. The environment of deposition appears to be fluvial, and the thickness changes abruptly owing to channeling of the underlying Tobacco Road Formation during "Upland" deposition and subsequent erosion of the "Upland" unit itself. This erosion formed the "Upland" unconformity. The unit is up to 18 meters (60 feet) thick at SRS.

The "Upland Unit" is the upper soil unit at the MFFF site. The thickness of the unit is about 9 meters (30 feet).

2.5.2 Faulting

Faulting affecting the MFFF site is controlled by faulting at SRS. Faulting is discussed in detail in Section 1.4.3.2 of WSRC (2000a). Many SRS investigations and an extensive literature review reach the conclusion that there are no geologic threats affecting the SRS or the MFFF site, except the Charleston Seismic Zone and the minor random Piedmont earthquakes. The Pen Branch fault has been regarded as the primary structural feature at SRS that has the characteristics necessary to pose a potential seismic risk. Studies have indicated that, despite this potential, the fault is not capable.

2.6 CONCLUSIONS

The MFFF Site Geotechnical Program and initial analyses performed indicate that this site is suitable for design and construction of the MFFF. The subsurface conditions encountered at the MFFF site demonstrate consistency with subsurface conditions found throughout the adjacent F-Area. No unusual subsurface conditions have been identified. All soft zones and loose soil deposits identified at depth are consistent with those identified in area adjacent F-Area. All of the soft zones and loose soil zones identified at the MFFF site appear to be deep, isolated and have a limited lateral extent.

Presently, the exploration and testing program performed for the site is considered adequate to define subsurface conditions and establish geotechnical design criteria required for the MFFF. Further site investigations and laboratory testing are not anticipated unless further analyses indicate that soft zones or liquefication conditions may require additional site specific information.

All subsurface conditions identified during this geotechnical program indicate that the underlying geology at the MFFF site is consistent with conditions described in WSRC 2000a. The regional and SRS specific hydrogolgy, geology and seismology descriptions presented in Sections 1.4.2, 1.4.4, and 1.4.4 of WSRC (2000a), respectively, are applicable for use at the MFFF site.

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TABLE 1

CORRELATION OF ENGINEERING AND GEOLOGIC STRATIGRAPHY UNITS FOR MFFF SITE

Engineering Unit	Geologic Unit
TR1 and TR1A	"Upland Unit" Formation
TR2A and TR2B	Tabacco Road Formation
TR3/4 and DB1/3	Dry Branch Formation
DB4/5. ST1 and ST2	Tinker/Santee Formation
GC Layer	Warley Hill Formation
CG Layer	Congree Formation

TABLE 2
AVERAGE SOIL INDEX PROPERTIES FOR MFFF, APSF, AND F-AREA NORTHEAST EXPANSION

	LAYER	AVE. THICK.* (ft)	AVE TOP EL.* (MSL)	AVE SPT N VALUE	AVE PI (%)	LIQUID LIMIT (%)	WATER CONT. (%)	AVE - NO. 200 (%)
NE Exp.	TR1	11.7	291	31	23	48	18	34
APSF		19.0		33	11	30	16	25
MOX FFF		19.0	276	14	-	-	-	-
NE Exp.	TR1A	16.9	278	31	20	35	19	30
APSF		20.0		27	22	46	20	37
MOX FFF		9.7	267	19	16	39	14	29
NE Exp.	TR2A	25.3	262	37	9	28	21	14
APSF		26.0		34	10	33	17	16
MOX FFF		19.5	255	22	25	50	16	17
NE Exp.	TR2B	23.1	236	39	12	24	18	10
APSF		19.0		38	NP	NP	24	11
MOX FFF		23.1	235	30	-	-	17	11
NE Exp.	TR3/4	7.2	213	27	19	54	34	36
APSF		7.0		19	19	54	42	34
MOX FFF		7.5	212	18	47	83	37	35
NE Exp.	DB1/3	27.7	206	37	16	11	25	11
APSF		28.0		50	NP	NP	27	9
MOX FFF		22.0	205	27	36	67	29	13
NE Exp.	DB4/5	6.4	178	29	11	45	36	20
APSF		7.0		21	11	45	38	21
MOX FFF		10.2	184	19	35	68	38	27
NE Exp.	ST1	18.2	172	43	14	23	30	19
APSF		26.0		46	25	49	30	18
MOX FFF		18.0	174	48	12	43	27	10
NE Exp.	ST2	11.2	152					
APSF								
MOX FFF		11.2	157	20	26	53	33	32
NE Exp.	GC	6.7	141	39	27	42	32	33
APSF		9.0		49	30	57	28	52
MOX FFF		5.3	146	32	32	58	31	51
NE Exp.	CG		134					
APSF								
MOX FFF			141	92	-	-	26	17

*NE Expansion values include APSF data.

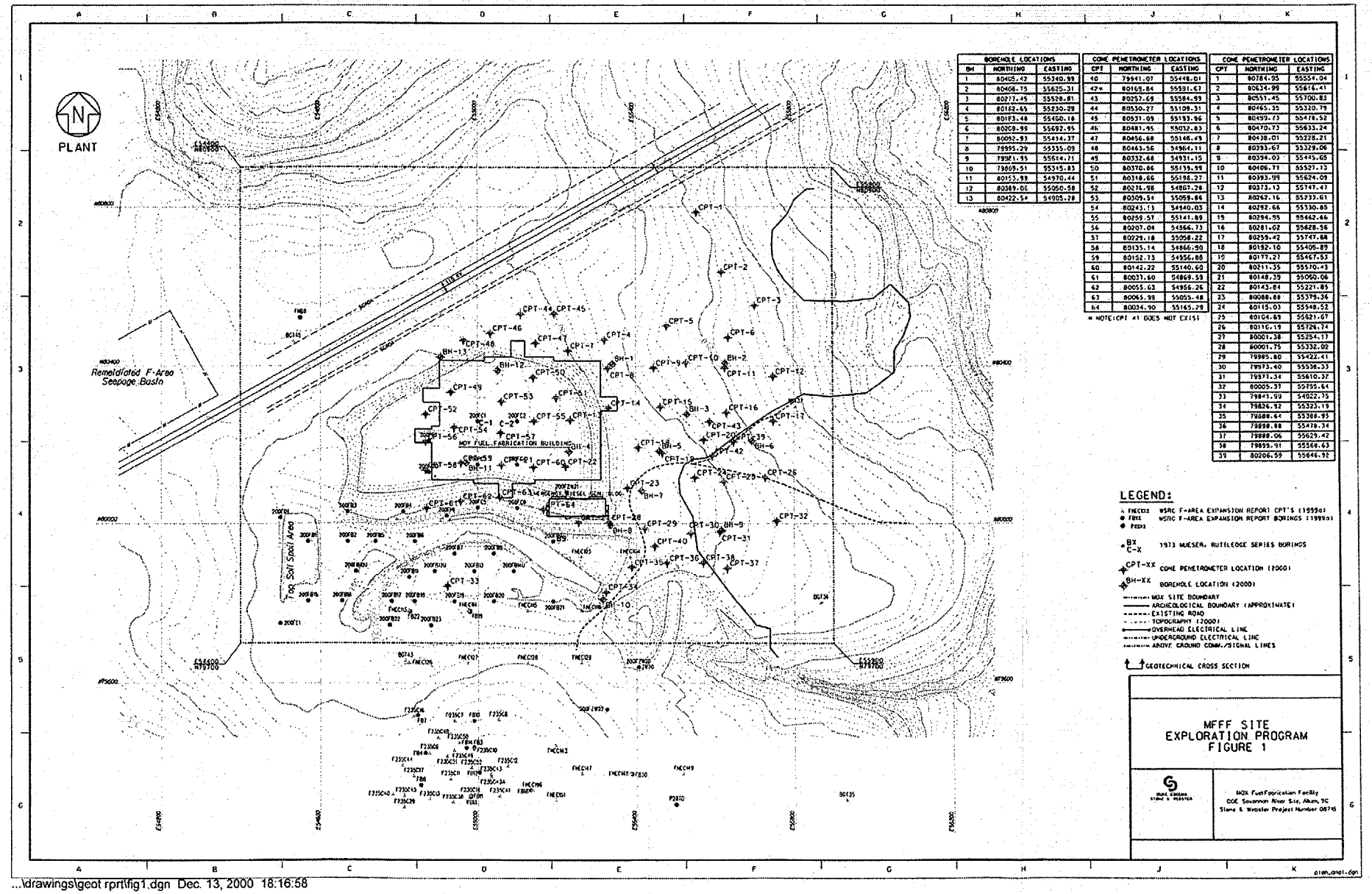
TABLE 3
SUMMARY OF SOFT ZONE INTERVALS

CPT No.	Top Elev.	Bottom Elev.	Approx. Thick. (ft)
2	166.3	159.5	6.8
26	152.7	150	2.7
30	150.9	146.2	4.7
32	184.4	180.8	3.6
37	157.5	152.9	4.6
38	182.2	177.3	4.9
45	205.8	204	1.8
	187.2	182.1	5.1
	132.6	129.5	3.1
46	155.9	149.2	6.7
46	145.8	142.1	3.7
50	183	180.8	2.2
54	198	195.9	2.1
55	190.1	186.3	3.8
61	185.3	175.7	9.6

Boring No.	Top Elev.	Bottom Elev.	Approx. Thick. (ft)
BH-3	156	153.5	2.5
BH-5	193	191	2
	183	181	2
BH-6	184	182	2
	161	157	4
BH-11	213	211	2
	143	139	4
BH-12	186.5	184.5	2
BH-13	212	209	3
	182	178	4

SOFT ZONE THICKNESS CRITERIA:

1. In CPT soundings, a soft zone is defined as a zone with a CPT corrected tip stress of 15 tsf or less over a continuous interval of at least two feet.
2. In boreholes, a soft zone is defined as a zone with SPT N-value of 5 or less, or a Shelby Tube push pressure of 250 psi or less over a continuous interval of at least two feet.
3. In CPTs where two or more soft zones are closely spaced, i.e., four feet or less, professional judgement was used to determine whether or not to combine them into one zone for engineering purposes.



BOREHOLE LOCATIONS		
BH	NORTHING	EASTING
1	80405.42	55340.99
2	80406.75	55625.31
3	80277.45	55528.81
4	80162.65	55230.29
5	80193.48	55460.18
6	80209.99	55692.95
7	80092.93	55434.37
8	79995.29	55335.09
9	79981.15	55614.71
10	79859.51	55315.83
11	80153.98	54970.44
12	80349.05	55050.58
13	80422.54	54905.28

CONE PENETROMETER LOCATIONS		
CPT	NORTHING	EASTING
40	79941.07	55448.01
42*	80169.84	55591.67
43	80257.69	55584.99
44	80530.27	55109.31
45	80531.09	55193.96
46	80481.95	55032.83
47	80456.68	55148.49
48	80463.56	54961.11
49	80332.64	54931.15
50	80370.86	55139.99
51	80318.66	55198.27
52	80276.98	54867.28
53	80309.54	55058.86
54	80243.13	54940.03
55	80259.57	55141.89
56	80207.04	54866.73
57	80229.18	55058.22
58	80135.14	54866.50
59	80152.73	54956.88
60	80142.22	55140.60
61	80037.60	54869.59
62	80055.63	54956.26
63	80065.98	55055.48
64	80034.90	55145.29

* NOTE: CPT 41 DOES NOT EXIST

CONE PENETROMETER LOCATIONS		
CPT	NORTHING	EASTING
1	80784.95	55554.04
2	80634.98	55616.41
3	80557.45	55700.83
4	80465.35	55320.79
5	80459.73	55478.52
6	80470.73	55633.24
7	80438.01	55228.21
8	80393.67	55329.06
9	80394.03	55445.65
10	80406.79	55527.13
11	80393.99	55624.09
12	80373.13	55747.47
13	80262.16	55733.61
14	80292.66	55330.85
15	80294.95	55462.66
16	80281.02	55628.56
17	80259.42	55747.88
18	80192.10	55405.89
19	80177.27	55467.53
20	80211.35	55570.43
21	80148.39	55060.06
22	80143.84	55221.85
23	80088.69	55379.36
24	80115.03	55548.52
25	80104.69	55621.67
26	80116.19	55726.74
27	80001.38	55254.17
28	80001.75	55332.02
29	79985.80	55422.41
30	79973.40	55538.33
31	79971.34	55610.37
32	80005.31	55755.64
33	79841.99	54022.75
34	79826.92	55323.19
35	79688.64	55368.95
36	79898.88	55419.34
37	79888.06	55629.42
38	79899.91	55568.63
39	80206.59	55646.92

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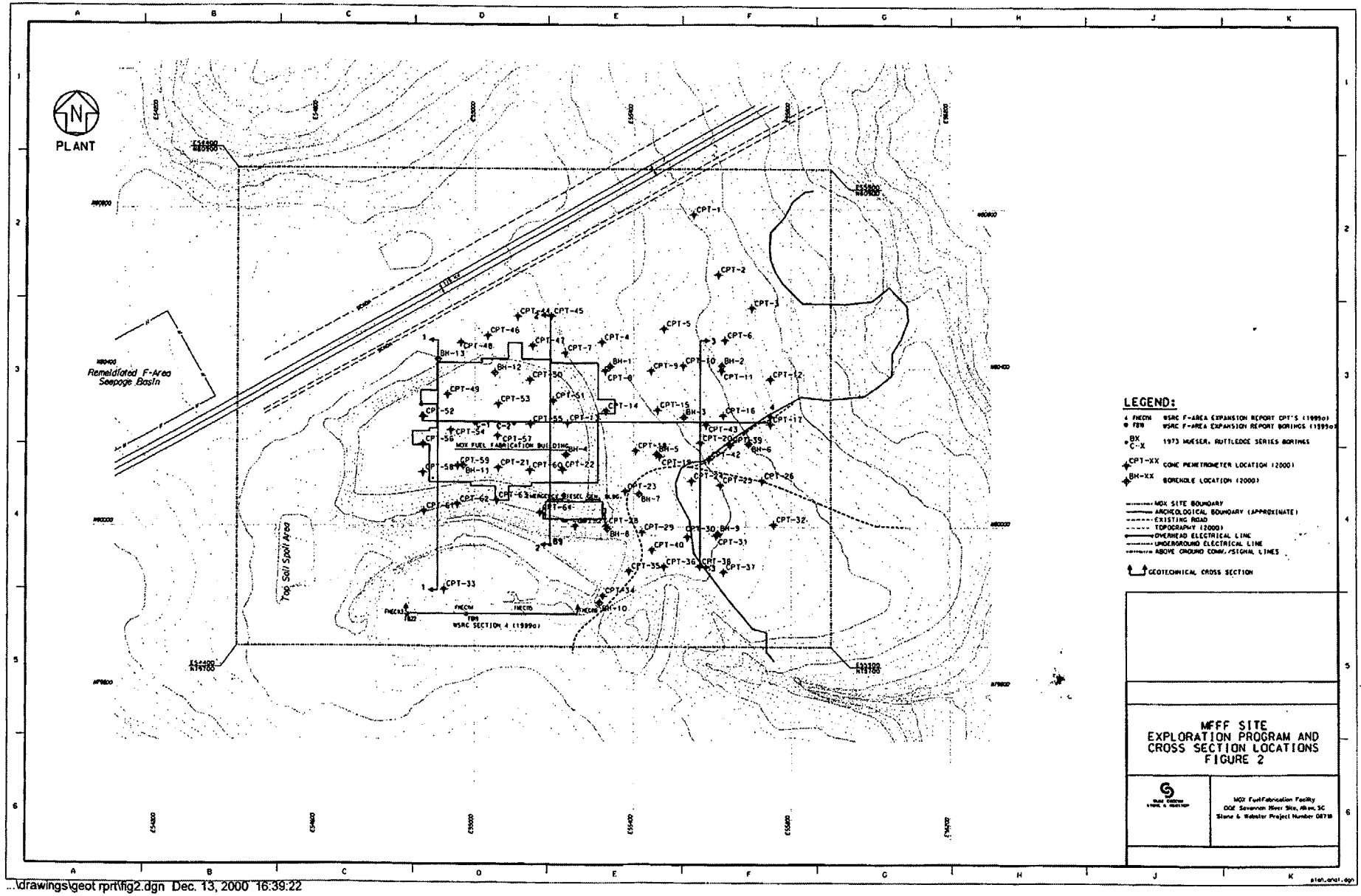

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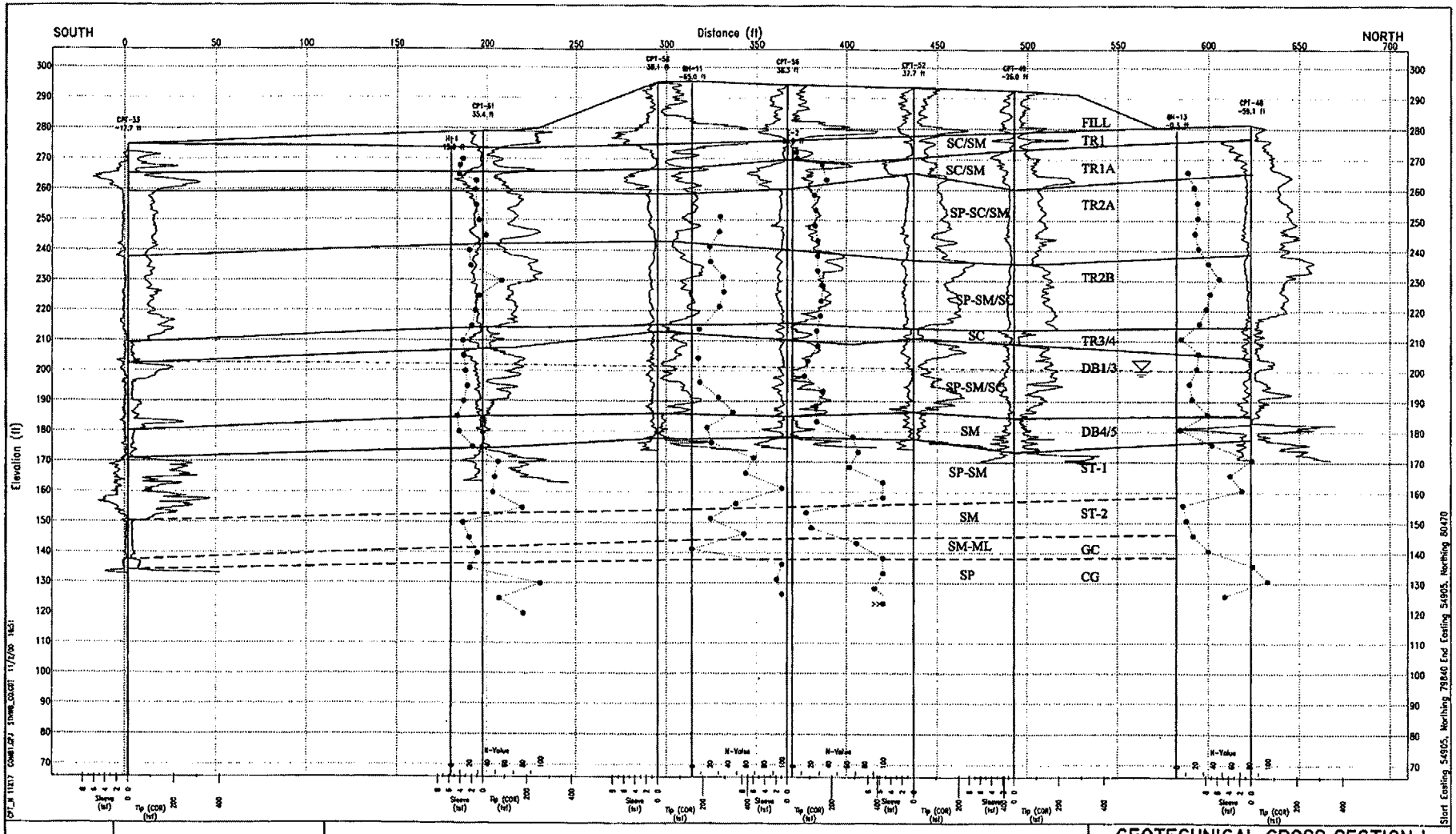


DUKE COGEMA STONE & WEBSTER

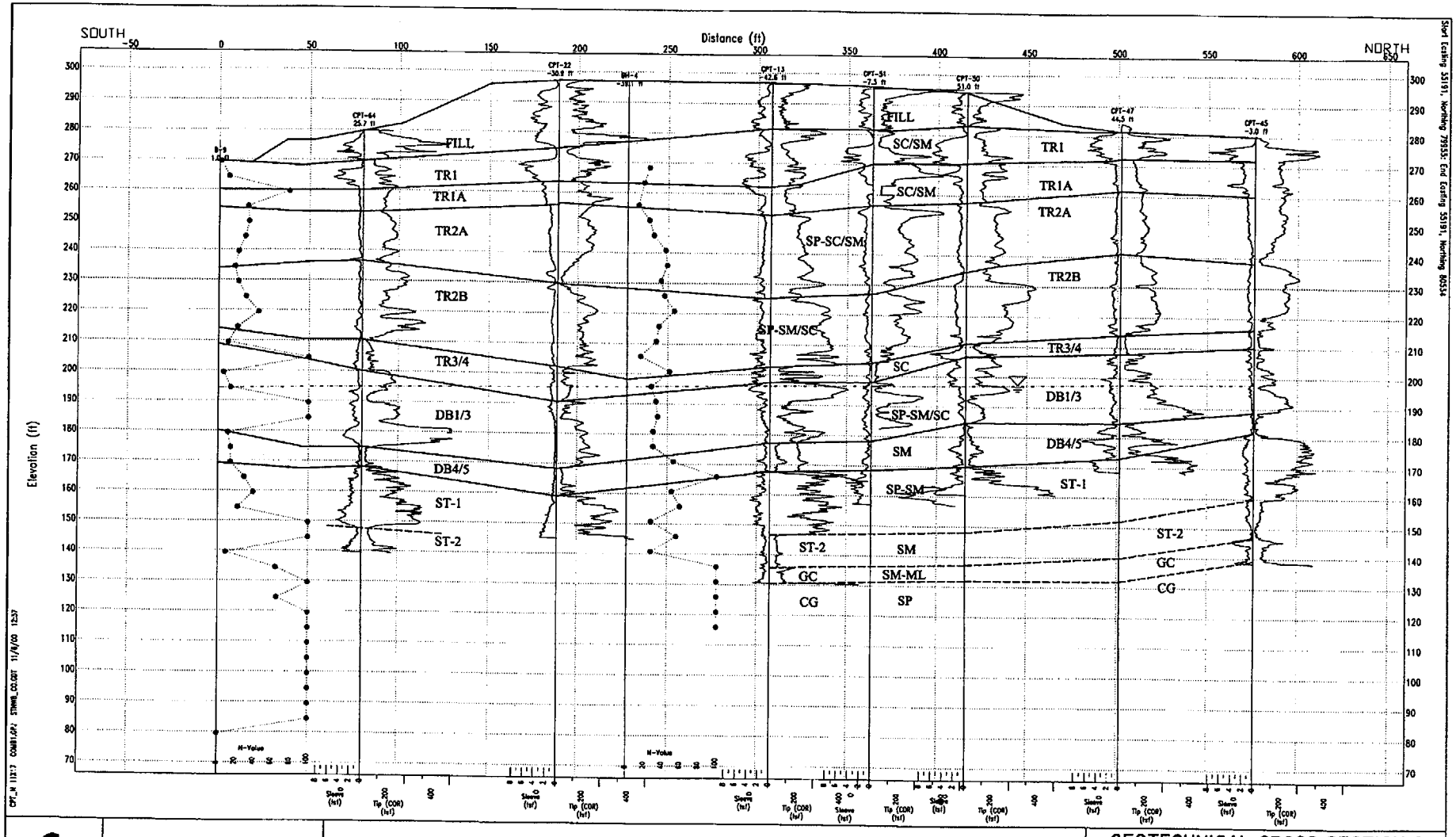
MOX FUEL FABRICATION FACILITY
DOE SAVANNAH RIVER SITE
JOB # 08716

NOTES:
1. Subsurface stratigraphy shown represents a reasonable judgement of the conditions expected based on the data shown. Some variation from these conditions must be expected.
2. The water table elevation shown represents approximate conditions at the time of the site investigation (June/July 2000).
3. Some borings and CPT soundings used to develop this cross section are not shown to maintain clarity.
4. "B- and C-" series borings from 1973 Foundation Investigation for Delta Program, Mueser, Rutledge Consulting Engineers.

GEOTECHNICAL CROSS SECTION I

NOT TO SCALE

FIGURE 3



DUKE COGEMA STONE & WEBSTER

MOX FUEL FABRICATION FACILITY
DOE SAVANNAH RIVER SITE
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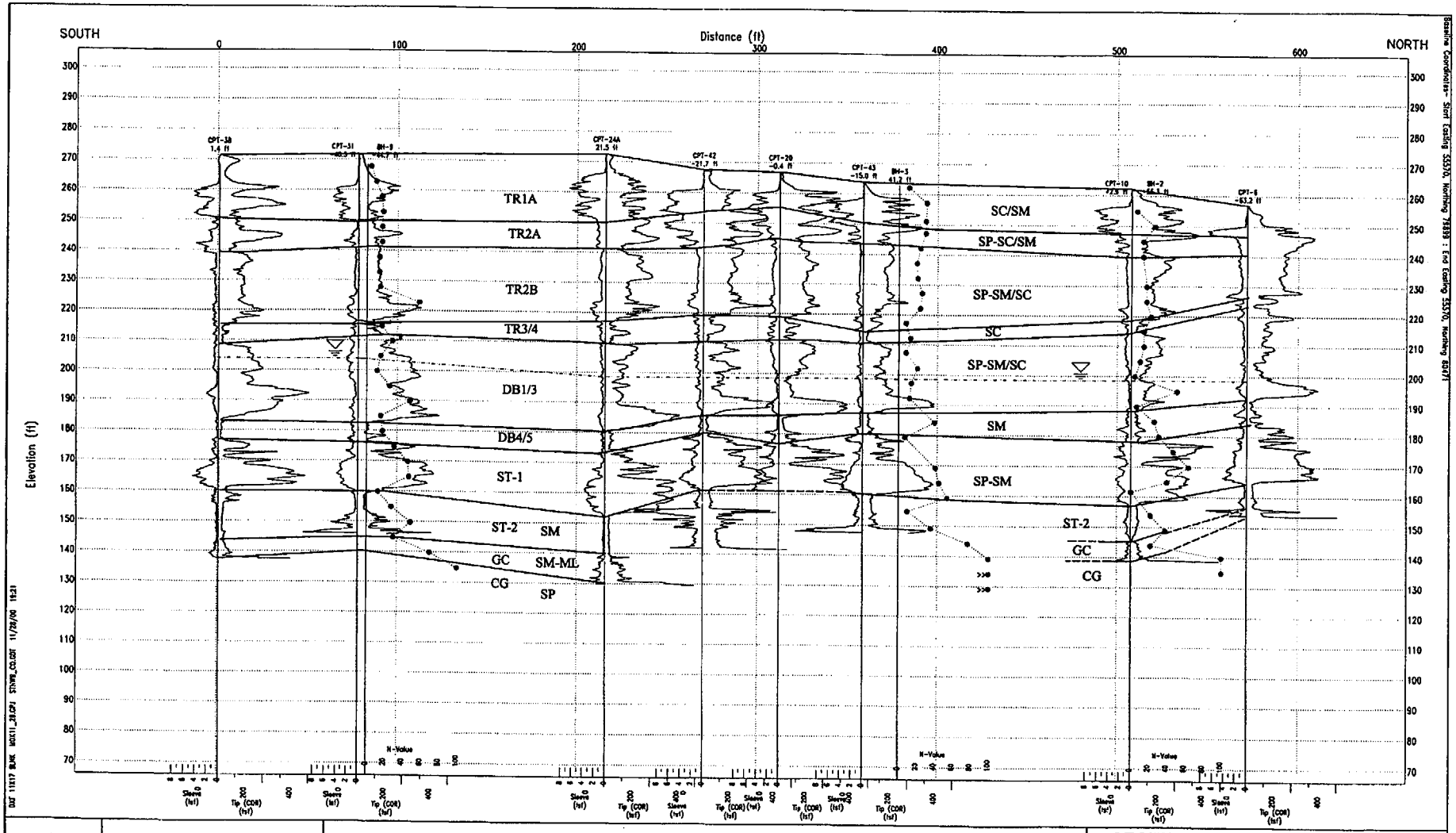
4. "B-" and C-" series borings from 1973 Foundation Investigation for Delta Program, Mueser, Rutledge Consulting Engineers.

GEOTECHNICAL CROSS SECTION 2

NOT TO SCALE

FIGURE 4



DUKE COGEMA STONE & WEBSTER

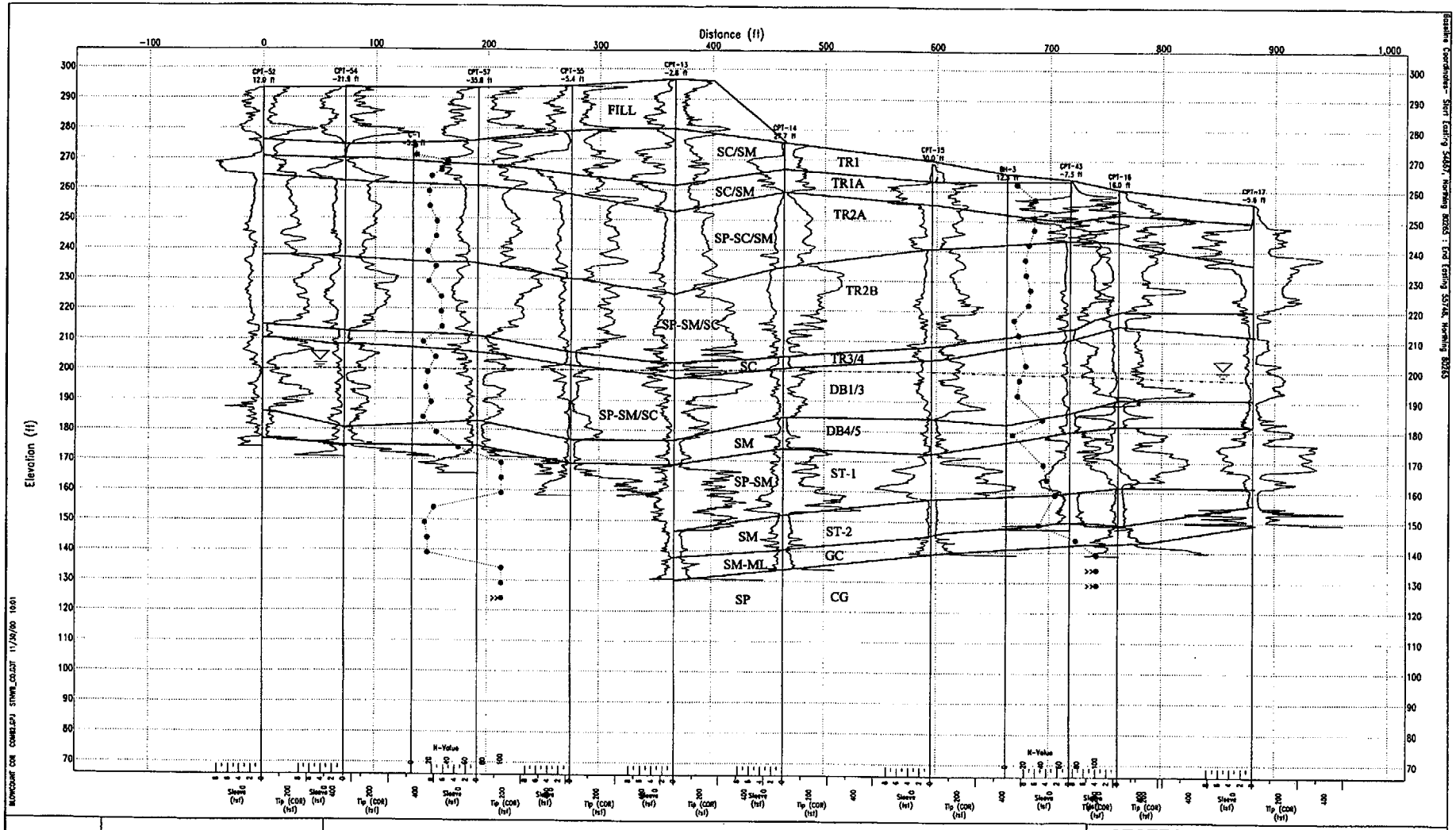
MOX FUEL FABRICATION FACILITY
DOE SAVANNAH RIVER SITE
JOB # 08716

NOTES:
1. Subsurface stratigraphy shown represents a reasonable judgement of the conditions expected based on the data shown. Some variation from these conditions must be expected.
2. The water table elevation shown represents approximate conditions at the time of the site investigation (June/July 2000).
3. Some borings and CPT soundings used to develop this cross section are not shown to maintain clarity.
4. "B-" and C-" series borings from 1973 Foundation Investigation for Delta Program, Mueser, Rutledge Consulting Engineers.

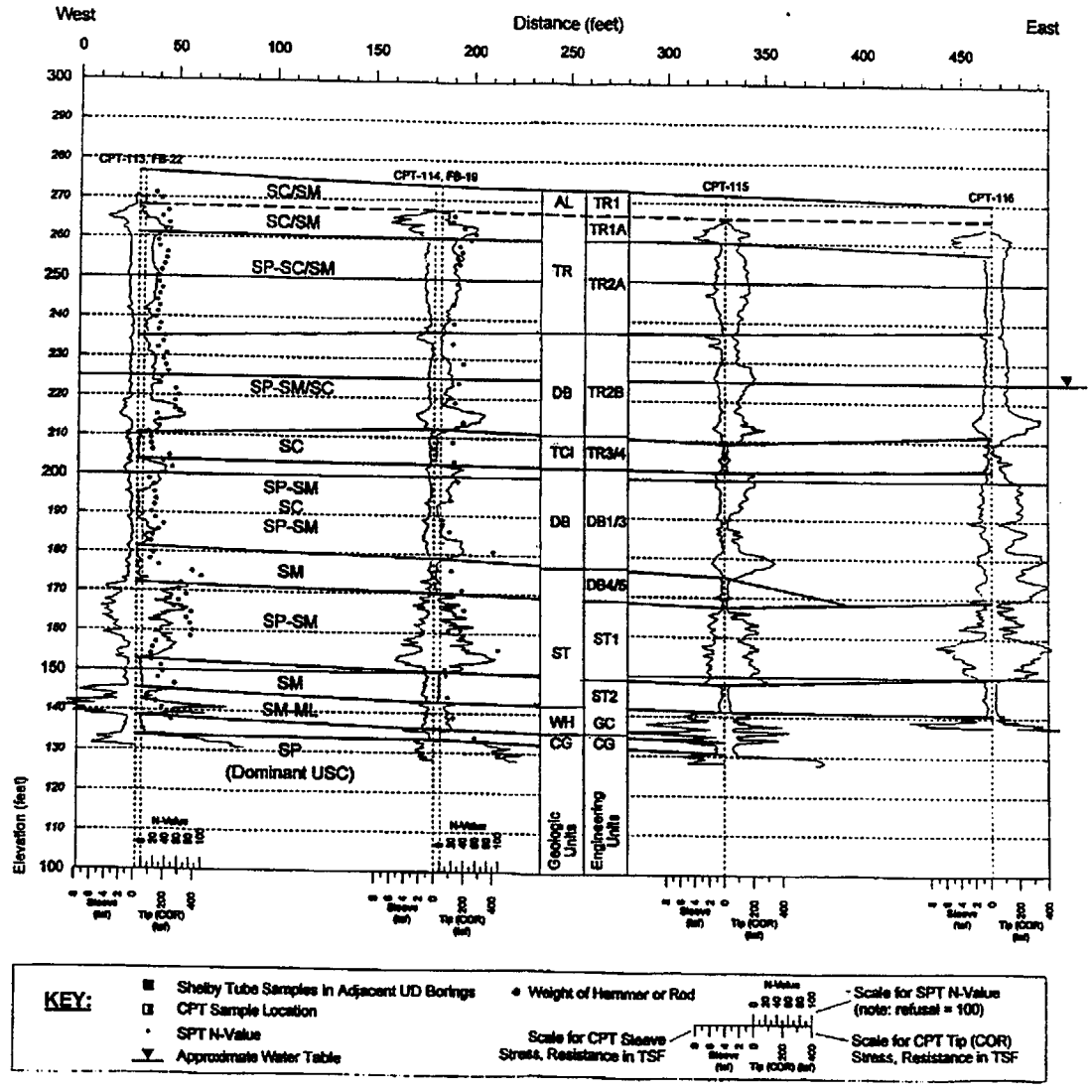
GEOTECHNICAL CROSS SECTION 3

NOT TO SCALE

FIGURE 5



DUKE COGEMA STONE & WEBSTER	MOX FUEL FABRICATION FACILITY DOE SAVANNAH RIVER SITE JOB # 08716	NOTES: 1. Subsurface stratigraphy shown represents a reasonable judgement of the conditions expected based on the data shown. Some variation from these conditions must be expected. 2. The water table elevation shown represents approximate conditions at the time of the site investigation (June/July 2000). 3. Some borings and CPT soundings used to develop this cross section are not shown to maintain clarity. 4. "B-" and C-" series borings from 1973 Foundation Investigation for Delta Program, Mueser, Rutledge Consulting Engineers.	GEOTECHNICAL CROSS SECTION 4 NOT TO SCALE FIGURE 6



Geotechnical Cross Section Line 4
Figure 7
(From WSRC 1999a, Figure 3.0-4)

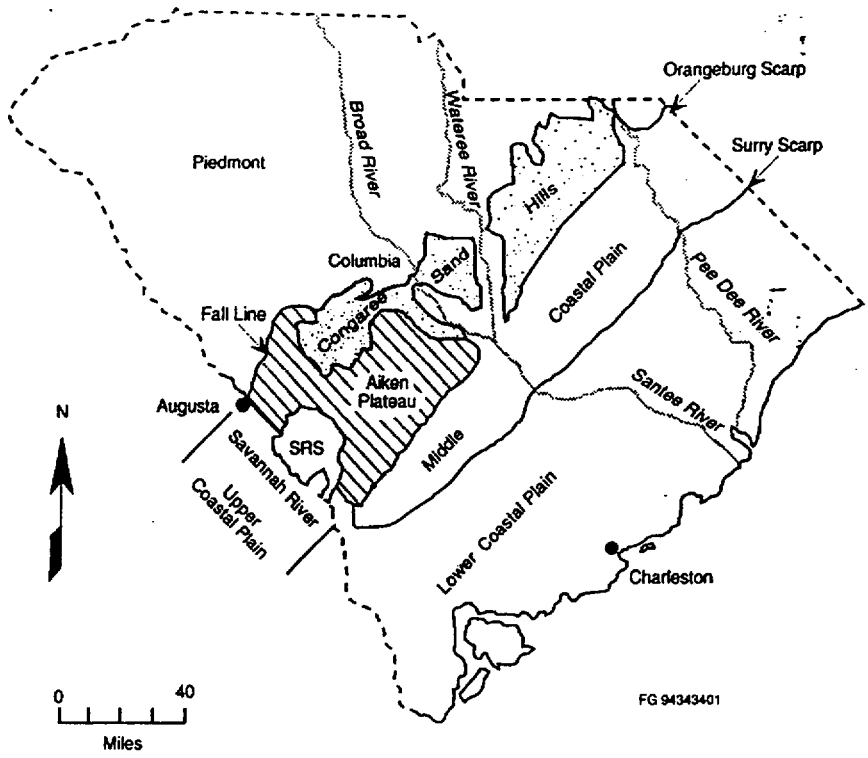


FIGURE 8 Physiography of the SRS Area

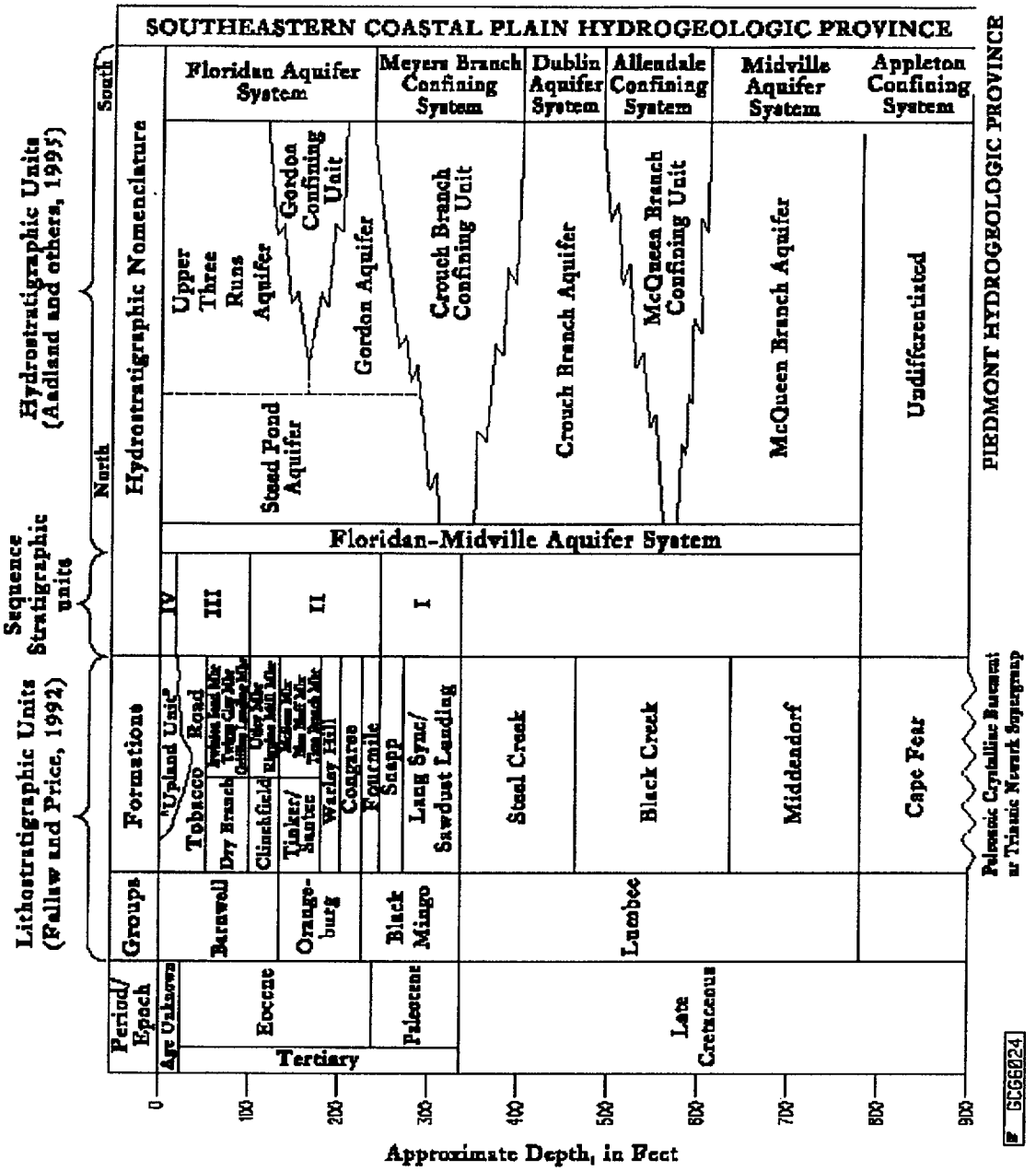


FIGURE 9. Comparison of Chronostratigraphic, Lithostratigraphic, and Hydrostratigraphic Units in the SRS Region.

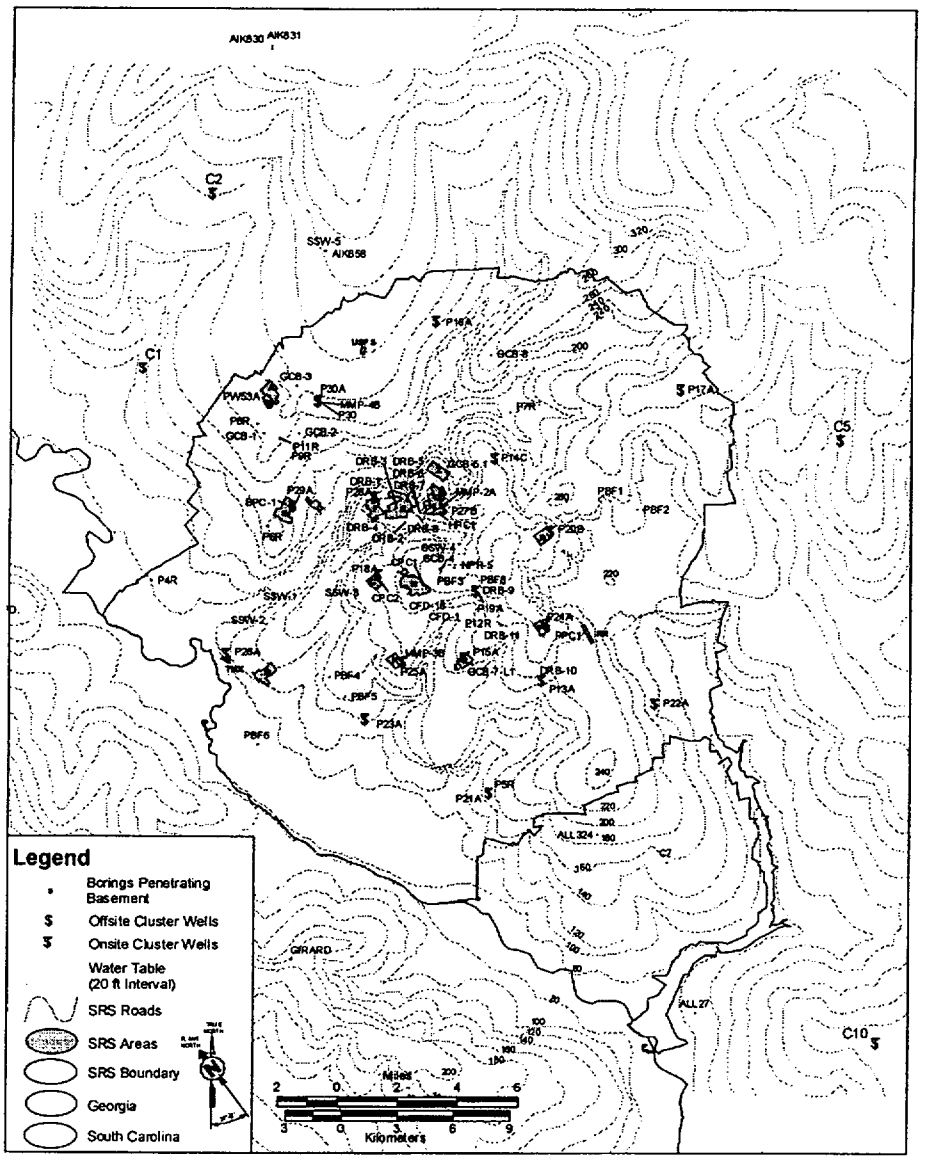


FIGURE 10 Location of Type and Reference Wells for Geologic Units at SRS

QUALITY LEVEL QL-1, IROFS

Total Pages 89

ATTACHMENT NUMBER 1

LOG OF BORINGS
DECEMBER 2000

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-1

Project Name: MOX Fuel Fabrica ion Facility
Location: DOE Savannah River Site
Job Number: 08716

Boring Location:
Northing: 80,405.4
Easting: 55,341.0
Surface Elevation: 272.0
Datum: MSL

Date Started: 7/13/00
Date Completed: 7/14/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0	272														
2	270														
4	268	Yellow-tan poorly graded SAND, some silt, fine- to medium-grained, loose, moist.	SP		SS	1	2 2 4	6	33						
6	266														
8	264	Mottled reddish-brown/tan CLAY, some fine-grained sand, medium dense, moist.	CL		SS	2	5 7 11	18	83				39	23	16
10	262														
12	260														
14	258	Mottled reddish-brown/tan silty SAND, trace clay, fine- to medium-grained, interbedded thin clayey stringers, medium dense, moist.	SM		SS	3	5 9 10	19	94						
16	256														
18	254	Mottled reddish-brown/tan and white clayey SAND, trace clay, fine- to medium-grained, medium dense, moist. Visible layering.	SC		SS	4	6 8 10	18	72				38	21	17
20	252														
22	250														
24	248	Similar to above material	SM		SS	5	9 10 12	22							

Completion Depth: 149.5
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole grouted immediately upon completion. Ave. grout density = 13.3 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-1

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,405.4
Easting: 55,341.0
Surface Elevation: 272.0
Datum: MSL

Date Started: 7/13/00
Date Completed: 7/14/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
26	246														
28	244	Yellow-tan to reddish-brown clayey SAND, fine- to medium-grained, moist, medium dense.	SC												
		Layered brown-orange, tan, pink, red poorly graded SAND, fine- to coarse-grained, medium dense, moist.	SP		SS	6	5 7 9	16	56						
30	242														
32	240														
34	238	Yellow-orange clayey SAND, fine- to medium-grained, with thinly laminated clay layers, medium dense, moist.	SC		SS	7A	3 6 6	12	56	22.5		81.9	18.1	44	23	21
36	236				ST	7B	750/1		0							
38	234	Yellow-orange poorly graded SAND, trace silt, fine- to medium-grained, medium dense, moist.	SP		SS	8	5 6 7	13	44				NV	NP	NF
40	232														
42	230														
44	228	Reddish-brown/purple poorly graded SAND, trace silt, fine- to medium-grained, medium dense, moist.	SP		SS	9	7 11 12	23	44						
46	226														
48	224	Yellow-orange poorly graded SAND, some silt, trace clay, fine- to medium-grained, medium dense, moist	SP		SS	10	9 13 13	26							
50	222														

Completion Depth: 149.5
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole grouted immediately upon completion. Ave. grout density = 13.3 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-1

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

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Surface Elevation: 272.0
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Date Started: 7/13/00
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Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
50	222														
52	220														
54	218	Reddish-brown poorly graded SAND, trace silt, trace fine gravel, fine- to coarse-grained, medium dense, moist, with occasional thin laminae of white fat clay.	SP		SS	11	7 12 13	25	50						
56	216														
58	214	similar to above, becomes yellow-orange.	SP		SS	12A	9 17 12	29	50						
60	212	Becomes reddish-brown.													
62	210	Brown clayey SAND, with silt, fine- to medium-grained, medium dense, moist.	SC		ST	12B	150/12 250/6 450/3	104	27.0		75.5	24.5	43	20	2
64	208														
66	206														
68	204	Top 1" layered purple, white and tan silty CLAY to clayey SILT, very stiff, moist.	CL ML		SS	13	13 17	32	61						
		Layered reddish-brown, tan and white silty SAND, dense, moist.	SM				15								
70	202														
72	200														
74	198	Tan silty SAND, trace clay, fine- to medium-grained, loose to medium dense, moist.	SM		SS	14	3 4 6	10	28.5		86.2	13.8			

Completion Depth: 149.5
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole grouted immediately upon completion. Ave. grout density = 13.3 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-1

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
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Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
76	196														
78	194	Gray-tan poorly graded SAND, some silt, fine- to medium-grained, dense, wet.	SP		SS	15	14 17 17 34	94							
80	192														
82	190														
84	188	Disturbed material, cuttings/caved material.			SS	16		0							
86	186														
88	184	Greenish-gray clayey SAND, fine- to medium-grained, dense, moist, interbedded with thin layers of greenish-gray silt.	SC SM		SS	17A	9 14 17 31	100	36.1		65.7	34.3			
90	182														
92	180	Tan-brown silty SAND, trace clay, fine- to coarse-grained, trace fine-grained gravel, dense, wet.	SM		ST	17B	250/15 450/9	100	51.5	1.2	82.4	16.4	86	52	3
94	178	Gray-green clayey SAND, fine-grained, loose, moist.	SC		SS	18	WH 2 7 9	100	34.0		73.6	26.4	42	22	2
96	176														
98	174	Light brownish-orange poorly graded SAND, trace silt, fine- to coarse-grained, dense, wet.	SP		SS	19	17 24 24 48								
100	172														

Completion Depth: 149.5
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole grouted immediately upon completion. Ave. grout density = 13.3 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-1

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,405.4
Easting: 55,341.0
Surface Elevation: 272.0
Datum: MSL

Date Started: 7/13/00
Date Completed: 7/14/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
100	172														
102	170														
104	168	Yellow-orange poorly graded SAND with silt, fine-grained, dense, wet with very thin clay and lignite laminae.	SP		SS	20	16 21 23	44	50						
106	166														
108	164	Layered yellow-orange, tan, pink poorly graded SAND, trace silt, dense to very dense, wet.	SP		SS	21	16 19 31	50	56						
110	162														
112	160														
114	158	Light brown/yellow-orange poorly graded SAND, trace silt, fine- to medium-grained, very dense, wet.	SP		SS	22	18 27 33	60	56						
116	156														
118	154	Reddish-tan clayey SAND, trace shell fragments, very fine-grained, loose to medium dense, wet.	SC		SS	23A	WH 4 6	10	100	33.0		78.4	21.6	53	27	2
120	152				ST	23B	WR/3 50/3 350/6		0						
122	150														
124	148	Yellow-orange poorly graded SAND, some silt, fine-grained, dense, wet.	SP		SS	24	14 25 20	45	61						

Completion Depth: 149.5
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole grouted immediately upon completion. Ave. grout density = 13.3 lb/gal.

LOG OF BORING BH-1

DUKE COGEMA
STONE & WEBSTER

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site
Job Number: 08716

Boring Location:
Northing: 80,405.4
Easting: 55,341.0
Surface Elevation: 272.0
Datum: MSL

Date Started: 7/13/00
Date Completed: 7/14/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
126	146														
128	144	Tan silty SAND, fine-grained, trace medium-grained, loose, wet.	SM		SS	25	WR 1 7	8	100	32.8		56.5	43.5	35	28	7
130	142														
132	140														
134	138	Yellow-brown poorly graded to silty SAND, trace clay, fine- to medium-grained, very dense, wet.	SP SM		SS	26	9 16 40	56	100						
136	136														
138	134	Yellow-brown poorly graded quartz SAND, trace silt, fine- to coarse-grained, very dense, wet.	SP		SS	27	28 38 33	71	44						
140	132														
142	130														
144	128	Similar to above.	SP		SS	28	32/6" 10/0"	>100	0						
146	125														
148	124														
150	122	Dark gray poorly graded SAND, trace silt, fine- to medium-grained, very dense, moist. Completed boring at 149.5.	SP		SS	29	21 38 52	90							

Completion Depth: 149.5
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole grouted immediately upon completion. Ave. grout density = 13.3 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-1

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,405.4
Easting: 55,341.0
Surface Elevation: 272.0
Datum: MSL

Date Started: 7/13/00
Date Completed: 7/14/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
150	122	Completed boring at 149.5'.													
152	120														
154	118														
156	116														
158	114														
160	112														
162	110														
164	108														
166	106														
168	104														
170	102														
172	100														
174	98														

Completion Depth: 149.5
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole grouted immediately upon completion. Ave. grout density = 13.3 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-2

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:

Northing: 80,406.7

Easting: 55,625.3

Surface Elevation: 258.6

Datum: MSL

Date Started: 7/1/00

Date Completed: 7/7/00

Drill Method: 8" auger to 25'/ 8" mud rota

Logged By: JJT/JKM

Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0	258														
2	256														
4	254	Yellow-orange poorly graded SAND, trace silt, fine- to medium-grained, loose, dry to slightly moist.	SP		SS	1	1 2 4	6	78	6.9					
6	252														
8	250	Red-orange poorly graded SAND, trace silt, fine-grained, medium dense, slightly moist.	SP		SS	2	10 12 14	26	100						
10	248														
12	246														
14	244	Yellow-orange poorly graded SAND, with silt, fine- to medium-grained, medium dense, slightly moist.	SP SM		SS	3	6 7 6	13	89	6.9	0.3	90.6	9.1		
16	242														
18	240	Similar to above.	SP SM		SS	4	6 7 6	13	0						
20	238														
22	236														
24	234														

Completion Depth: 138

Drilling Rig: CME-75

Weather: Sunny, high 90's F

Remarks: Hole cased to 137.35' with 6" dia. PVC pipe capped at bottom. Annulus between hole and casing grouted to top of hole.

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 08:57

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-2

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,406.7
Easting: 55,625.3
Surface Elevation: 258.6
Datum: MSL

Date Started: 7/1/00
Date Completed: 7/7/00
Drill Method: 8" auger to 25'/ 8" mud rot
Logged By: JJT/JKM
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
26	232				ST	5B									
28	230	Yellow-orange poorly graded SAND, with silt, fine- to medium-grained, medium dense, slightly moist.	SP SM		SS	5A	7 7 10 — 17	83		2.5	82.5	11			
30	228														
32	226														
34	224	Yellow poorly graded SAND, with silt, fine- to medium-grained, medium dense, slightly moist.	SP SM		SS	6	6 7 10 — 17	94	67.0		89.9	11.1			
36	222														
38	220	Yellow-orange poorly graded SAND, some silt, fine- to medium-grained, medium dense, moist.	SP SM		SS	7	7 10 12 — 22	78							
40	218														
42	216														
44	214	Yellow-orange silty SAND, fine-grained, medium- to coarse-grained, medium dense, moist	SM		SS	8	5 6 8 — 14	56			87.5	12.5			
46	212														
48	210	Yellow-orange poorly graded SAND, some silt, fine- to medium-grained, medium dense	SP SM		SS	9	4 5 9 — 14	67							
50															

Completion Depth: 138
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole cased to 137.35' with 6" dia. PVC pipe capped at bottom. Annulus between hole and casing grouted to top of hole.

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 08:57

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-2

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:

Northing: 80,406.7

Easting: 55,625.3

Surface Elevation: 258.6

Datum: MSL

Date Started: 7/1/00

Date Completed: 7/7/00

Drill Method: 8" auger to 25'/ 8" mud rota

Logged By: JJT/JKM

Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
50	208														
52	206														
54	204	Yellow-orange silty SAND, fine- to medium-grained, loose to medium dense, moist.	SM		SS	10	4 5 5	10	100						
56	202				ST	11	200/12 150/12 500/3		63						
58	200	Yellow-orange poorly graded SAND, with silt, fine- to medium-grained, trace coarse grained, very loose to loose, moist.	SP		SS	12	1 2 2	4	78	24.3		92	8		
60	198														
62	196														
64	194	Light yellow-brown to yellow-orange poorly graded SAND, trace silt, fine- to medium-grained, very dense, moist.	SP		SS	13	13 23 28	51	100						
66	192														
68	190	Yellow-orange silty SAND, trace clay, fine- to medium-grained, grades with thin seams (<1" silt and clay), loose, wet.	SM		SS	14	0 2 4	6	111	35.7		84.2	15.8	32	25	7
70	188	Tan brown clayey SAND, fine- to medium-grained, trace coarse-grained, wet.	SC		ST	15	250/12 540/12		115	35.3		81.5	18.5	89	31	58
72	186														
74	184	Light brown-brown silty SAND, fine- to medium-grained, trace coarse-grained, medium dense, wet.	SM		SS	16	7 10 16	26	100			79.3 73.0	20.7 27.0			

Completion Depth: 138

Drilling Rig: CME-75

Weather: Sunny, high 90's F

Remarks: Hole cased to 137.35' with 6" dia. PVC pipe capped at bottom. Annulus between hole and casing grouted to top of hole.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-2

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,406.7
Easting: 55,625.3
Surface Elevation: 258.6
Datum: MSL

Date Started: 7/1/00
Date Completed: 7/7/00
Drill Method: 8" auger to 25'/ 8" mud rot
Logged By: JJT/JKM
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
76	182														
78	180	Yellow-brown to brown-orange silty SAND, fine-grained, dense, moist.	SM		SS	17	8 14 17 31	83							
80	178														
82	176														
84	174	Yellow-brown to brown-orange poorly graded SAND, with silt, fine-grained, dense, moist.	SP SM		SS	18	8 22 25 47	111			94.0	6.0			
86	172														
88	170	Grades less silt.	SP		SS	19	19 29 35 64	89							
90	168														
92	166														
94	164	Yellow-brown to orange-brown poorly graded SAND, with silt, fine-grained, dense, moist.	SP SM		SS	20	17 20 20 40	81			93.2	6.8			
96	162														
98	160	Tan clayey SAND, with silt, fine grained, trace medium- to coarse-grained, wet.	SC		ST	21	200/18 500/6	115	34.9		77.1	22.9	59	29	3
100															

Completion Depth: 138
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole cased to 137.35' with 6" dia. PVC pipe capped at bottom. Annulus between hole and casing grouted to top of hole.

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 08:57

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-2

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

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Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
100	158	Harder drilling at 100'.													
102	156	Grades harder drilling at 102'.													
104	154	Yellow-brown clayey SAND, with silt, fine-grained, trace medium-grained, medium dense, damp.	SC SM		SS	22	7 10 12 — 22	133	31.4		57.5	42.5	49	24	25
106	152	Harder drilling with chatter 105.5'-107'.													
108	150														
110	148	Mottled yellow-brown to green-grey silty CLAY, with fine sand, hard, moist.	CL		SS	23	5 10 28 — 38	150							
112	146														
114	144	Mottled yellow-brown to green-grey silty CLAY, with sandier layers containing larger quartz grains, very stiff, moist.	CL		SS	24	8 10 12 — 22	133							
116	142														
118	140	Light brown to yellow-orange well graded SAND, with silt, trace fine-grained gravel, fine- to coarse-grained, very dense, moist.	SW SM		SS	25	45 50/5 — >100			1.5	90.7	7.8			
120	138														
122	136														
124	134	Dark grey poony graded SAND, fine- to coarse-grained, very dense, moist.	SP		SS	26	34 50/5.5 — >100								

Completion Depth: 138
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole cased to 137.35' with 6" dia. PVC pipe capped at bottom. Annulus between hole and casing grouted to top of hole.

LOG OF BORING BH-2

DUKE COGEMA
STONE & WEBSTER

Project Name: MOX Fuel Fabricat on Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,406.7
Easting: 55,625.3
Surface Elevation: 258.6
Datum: MSL

Date Started: 7/1/00
Date Completed: 7/7/00
Drill Method: 8" auger to 25'/ 8" mud rota
Logged By: JJT/JKM
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
126	132	Dark grey poorly graded SAND, fine- to coarse-grained, very dense, moist.	SP												
128	130														
130	128														
132	126														
134	124														
136	122														
138	120	Completed boring at 138'.													
140	118														
142	116														
144	114														
146	112														
148	110														
150															

Completion Depth: 138
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole cased to 137.35' with 6" dia. PVC pipe capped at bottom. Annulus between hole and casing grouted to top of hole.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-3

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,277.5
Easting: 55,528.8
Surface Elevation: 265.9
Datum: MSL

Date Started: 6/24/00
Date Completed: 6/27/00
Drill Method: 8" auger to 25'/ 6" mud rota
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0														
2	264													
4	262	Tan-brown poorly graded SAND, fine- to medium-grained, medium dense, slightly moist.	SP		SS	1	4 4 7	11	100					
6	260													
8	258	Reddish-brown silty SAND, trace clay, fine- to medium-grained, dense, damp. Very thin white clay/silt laminae throughout.	SM		SS	2	10 14 17	31	100	12.8				
10	256													
12	254													
14	252	Reddish-brown silty SAND, some clay, fine- to medium-grained, dense, damp. Very thin white clay/silt laminae throughout.	SM		SS	3	15 13 17	30	100		79.6	20.4		
16	250													
18	248	Similar to above.	SM		SS	4	11 15 15	30	100					
20	246													
22	244													
24	242	Reddish-brown silty SAND, fine- to medium-grained, medium dense, damp.	SP		SS	5	8 10 14	24	100		77.1	22.9		

Completion Depth: 137.5
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole grouted immediately upon completion. Ave. grout density = 13.5 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-3

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,277.5
Easting: 55,528.8
Surface Elevation: 265.9
Datum: MSL

Date Started: 6/24/00
Date Completed: 6/27/00
Drill Method: 8" auger to 25'/ 6" mud r
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit
26	240													
28	238	Orange-brown poorly graded SAND, trace silt, fine- to medium-grained, medium dense, damp.	SP		SS	6A	6 8 12	20	40					
30	236				ST	6B	100/18		75					
32	234													
34	232	Grading fine-grained.	SP		SS	7	6 10 11	21						
36	230	Grading coarser.												
38	228	Similar to above, grading fine-grained.	SP		SS	8	7 12 14	26	40					
40	226													
42	224													
44	222	Yellow-orange poorly graded SAND, with silt, fine- to medium-grained, medium dense, moist.	SP SM		SS	9	11 12 12	24	40		93.8	6.2		
46	220													
48	218	Yellow-orange clayey SAND, fine- to medium-grained, loose, moist. Grading more clay with depth	SC		SS	10A	4 4 4	8	40	28.3	82.1	17.9	33	18
50	216													

Completion Depth: 137.5
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole grouted immediately upon completion. Ave. grout density = 13.5 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-3

Project Name: MOX Fuel Fabricat.on Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,277.5
Easting: 55,528.8
Surface Elevation: 265.9
Datum: MSL

Date Started: 6/24/00
Date Completed: 6/27/00
Drill Method: 8" auger to 25'/ 6" mud rotar
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
50		Tan CLAY, highly plastic, trace fine sand, wet.	CH		ST	10B	150/24 375/6	125	66.3 44.1	10.3 88.0	89.7 22.0	175 148	82 47	93 101
52	214	Tan SILT, highly plastic, trace fine sand, wet.	MH											
54	212	Yellow-orange clayey SAND to poorly graded SAND with clay, medium dense, fine- to medium-grained, moist. Thinly bedded with black carbonaceous layers.	SC/ SP SC		SS	11	5 6 7	60	34.9	70.8 89.8	29.2 10.2	59 84	29 24	30 60
56	210													
58	208	Yellow-orange mottled black and white, silty SAND, trace clay, fine-to medium-grained, loose, wet.	SM		SS	12	WH WH 9	60		79.8	20.2			
60	206													
62	204													
64	202	Yellow-orange poorly graded SAND, with silt, trace clay, fine- to medium-grained, medium dense, wet.	SP SM		SS	13	10 10 11	60		91.9	8.1			
66	200													
68	198	Yellow-orange with mottled black poorly graded SAND, with clay, fine-grained, medium dense, wet.	SP SC		SS	14	3 4 10	100	25.7	92.1	7.9	39	25	14
70	196													
72	194													
74	192	Similar to above.	SP SC		SS	15A	4 5 7	12						

Completion Depth: 137.5
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole grouted immediately upon completion. Ave. grout density = 13.5 lb/gal.

LOG OF BORING LETTER SIZE COMB2 GPJ STNWB_CO GDT 12/11/00 12:37

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-3

Project Name: MOX Fuel Fabrica ion Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,277.5
Easting: 55,528.8
Surface Elevation: 265.9
Datum: MSL

Date Started: 6/24/00
Date Completed: 6/27/00
Drill Method: 8" auger to 25'/ 6" mud rota
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
76	190	Tan poorly graded SAND, with clay, fine- to coarse-grained, medium dense, moist.	SP SC		ST	15B	>1500	75	24.4	90.9	9.1	101	26	75
78	188													
80	186													
82	184	Yellow-tan poorly graded SAND, trace silt, trace clay, fine- to medium-grained, dense, saturated.	SP		SS	16	23 25 15	40	30		95.3	4.7		
84	182													
86	180	Mottled light brown black and white interbedded SANDS, SILTS and CLAYS, fine-grained, loose, soft. Bedding planes clearly visible. Carbonaceous.	SC		SS	17A	WH 2 5	7		37.7	72.1	27.9	59	24	35
88	178													
90	176	Brown silty SAND, with clay, fine- to medium-grained.	SM		ST	17B	400/12 750/12			29.3	79.4	20.6	43	31	12
92	174													
94	172													
96	170	Yellow-orange poorly graded SAND, fine- to medium-grained, dense, saturated. Interbedded with thin (1-2mm) white clay laminae.	SP		SS	18	18 21 20	41	30					
98	168													
100	166													

Completion Depth: 137.5
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole grouted immediately upon completion. Ave. grout density = 13.5 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-3

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,277.5
Easting: 55,528.8
Surface Elevation: 265.9
Datum: MSL

Date Started: 6/24/00
Date Completed: 6/27/00
Drill Method: 8" auger to 25'/ 6" mud rotar
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
100														
102	164	Yellow-orange silty SAND, fine-grained, dense, wet.	SM		SS	19	17 21 24	45	45					
104	162													
106	160	Similar to above, very dense, very moist.	SM		SS	20	21 27 27	54	100					
108	158													
110	156													
112	154	Yellow-orange silty SAND, fine-grained, loose, moist. Shell fragments visible throughout.	SM		SS	21	WH WH 5		100	33.5	80.8	19.2	44	28	16
114	152				ST		300/24 500/6		0					
116	150	Yellow-orange clayey SAND, trace limestone fragments, fine-grained, dense, moist.	SC		SS	22	22 18 18	36	65					
118	148													
120	146													
122	144	Yellow-orange SILT, with fine-grained sand, trace clay, very dense, moist.	ML		SS	23	28 38 39	77	30					
124	142													

Completion Depth: 137.5
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole grouted immediately upon completion. Ave. grout density = 13.5 lb/gal.

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 12:37

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-3

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,277.5
Easting: 55,528.8
Surface Elevation: 265.9
Datum: MSL

Date Started: 6/24/00
Date Completed: 6/27/00
Drill Method: 8" auger to 25'/ 6" mud rot
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
126	140				SS	24	23 50 50	100	0					
128	138	Very hard drilling with softer layers between 126 and 128.5 feet.												
130	136													
132	134	Yellow-orange poorly graded SAND, some silt, trace clay, fine- to coarse-grained, very dense, saturated.	SP		SS	25	28 53 54	107						
134	132													
136	130	Light-brown poorly graded SAND, some silt, fine- to medium-grained, very dense, wet.	SP		SS	26	29 48 54	102						
138	128	Completed boring at 137.5'.												
140	126													
142	124													
144	122													
146	120													
148	118													
150	116													

Completion Depth: 137.5
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Hole grouted immediately upon completion. Ave. grout density = 13.5 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-4

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,182.6
Easting: 55,230.1
Surface Elevation: 297.1
Datum: MSL

Date Started: 6/13/00
Date Completed: 6/15/00
Drill Method: 8" auger to 40'/ 6" mud rota
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0	296	Reddish-brown silty SAND, fine- to medium-grained, dry to moist. No sampling in the first 25'.	SM											
2	294													
4	292													
6	290													
8	288													
10	286													
12	284													
14	282													
16	280													
18	278													
20	276													
22	274													
24														

Completion Depth: 181
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Head pressure grouting through drill rods. Average grout density was 13.2 lb/gallon. Observed good flow of mud.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-4

Project Name: MOX Fuel Fabrication Facility
Location: DOE Savannah River Site
Job Number: 08716

Boring Location:
Northing: 80,182.6
Easting: 55,230.1
Surface Elevation: 297.1
Datum: MSL

Date Started: 6/13/00
Date Completed: 6/15/00
Drill Method: 8" auger to 40'/ 6" mud rotar
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
26	272	Reddish-brown silty SAND, fine- to medium-grained, dry to moist.	SM											
28	270	Reddish-brown clayey SAND, fine-grained, damp (FILL).	SC		SS	1	9 11 13 24	90						
30	268	Brown clayey SAND, with roots, damp. (original ground)	SC											
32	266													
34	264	Mottled pink-orange silty SAND, fine-grained, medium dense, dry to damp. Interbedded with thinly laminated light grey-purple clay.	SM		SS	2	7 8 10 18	70						
36	262													
38	260													
40	258				ST	3	400/24	100						
42	256	Reddish brown and tan silty SAND, fine- to medium-grained, medium dense, damp. Clay stringers throughout.	SM		SS	4	2 4 8 12	40	9.5	78.4	21.6			
44	254													
46	252	Yellow-tan mottled with pink and white silty SAND, fine- to medium-grained, medium dense, moist. Interspersed clay nodules.	SM		SS	5	12 12 12 24	90	22	81.4	18.6			
48	250													
50	248													

Completion Depth: 181
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Head pressure grouting through drill rods. Average grout density was 13.2 lb/gallon. Observed good flow of mud.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-4

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,182.6
Easting: 55,230.1
Surface Elevation: 297.1
Datum: MSL

Date Started: 6/13/00
Date Completed: 6/15/00
Drill Method: 8" auger to 40'/ 6" mud rota
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
50	246	Yellow-tan silty SAND, fine-grained, medium dense, moist, thin white clay laminae throughout.	SM		SS	6	12 13 16	29	50						
52	244														
54	242														
56	240	Similar to above, reddish-brown mottled with tan, grading fine- to medium-grained, dense.	SM		SS	7	18 19 23	42		17.7	86.0	14.0			
58	238														
60	236	Yellow-tan to pink silty SAND, fine- to medium-grained, dense, moist.	SM		SS	8	14 19 25	44	50						
62	234														
64	232														
66	230	Yellow-tan silty/clayey SAND, fine- to medium-grained, dense, moist.	SC SM		SS	9	14 17 20	37	80						
68	228														
70	226	Yellow-tan poorly graded SAND, with silt, fine- to medium-grained, dense, moist.	SP SM		SS	10	18 21 20	41	45		93.8	6.2			
72	224														
74															

Completion Depth: 181
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Head pressure grouting through drill rods. Average grout density was 13.2 lb/gallon. Observed good flow of mud.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-4

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,182.6
Easting: 55,230.1
Surface Elevation: 297.1
Datum: MSL

Date Started: 6/13/00
Date Completed: 6/15/00
Drill Method: 8" auger to 40'/ 6" mud rot
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
76	222	Yellow-tan poorly graded SAND, trace silt, trace clay, fine- to medium-grained, very dense, moist.	SP		SS	11	21 25 27	52	40					
78	220													
80	218													
82	216	Yellow-tan poorly graded SAND, with silt, trace clay, fine- to medium-grained, dense, moist to wet.	SP SM		SS	12	16 17 18	35	40	89.9	10.1			
84	214													
86	212	Similar to above, with pink medium plastic clay stringers, wet.	SP SM		SS	13	17 15 17	32	33					
88	210													
90	208	Brown clayey SAND, fine- to medium-grained, medium dense, moist.	SC		SS	14	3 4 15	15		26.3	78.6	21.4	94	36	5
92	206	Brown-orange poorly graded SAND, trace clay, fine- to coarse-grained, medium dense, moist.	SP				11								
94	204													
96	202	Grey-green sandy SILT, dense, moist with thin lenses of orange fine-grained sand and lignite <1mm thick.	MH		SS	15	15 21 26	47		67	43.3	56.7	80	62	1
98	200													
100	198													

Completion Depth: 181
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Head pressure grouting through drill rods. Average grout density was 13.2 lb/gallon. Observed good flow of mud.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-4

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,182.6
Easting: 55,230.1
Surface Elevation: 297.1
Datum: MSL

Date Started: 6/13/00
Date Completed: 6/15/00
Drill Method: 8" auger to 40'/ 6" mud rota
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
100														
	196	Grey silty SAND, trace clay, fine-grained, medium dense, very moist. Layering visible. Becoming tan.	SM		SS	16	9 12 15 — 27	100						
102														
	194													
104														
	192													
106		Orange-brown silty SAND, medium-grained, dense, very moist to saturated.	SM		SS	17	17 16 16 — 32	70						
	190													
108														
	188													
110														
	186	Yellow-tan poorly graded SAND, with silt, fine- to medium-grained, dense, wet.	SP SM		SS	18	14 17 17 — 34	75		91.2	8.8			
112														
	184													
114														
	182													
116		Yellow-orange poorly graded SAND, some clay, fine- to medium-grained, medium dense, saturated.	SP		SS	19	11 14 15 — 29	95						
	180													
118														
	178													
120														
	176	Mottled orange/tan/black clayey SAND, fine- to medium-grained, medium dense, moist.	SC		SS	20	12 14 15 — 29	100	34.4	60.0	40.0	74	22	52
122														
	174													
124														

Completion Depth: 181
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Head pressure grouting through drill rods. Average grout density was 13.2 lb/gallon. Observed good flow of mud.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-4

Project Name: MOX Fuel Fabrication Facility
Location: DOE Savannah River Site
Job Number: 08716

Boring Location:
Northing: 80,182.6
Easting: 55,230.1
Surface Elevation: 297.1
Datum: MSL

Date Started: 6/13/00
Date Completed: 6/15/00
Drill Method: 8" auger to 40'/ 6" mud rota
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
126	172	Yellow-tan poorly graded SAND, with silt, fine- to medium-grained, very dense, wet. Brown interbedded silt layers.	SP		SS	21	28 25 27 — 52	100						
128	170													
130	168													
132	166	Yellow-tan interbedded silty SAND, fine- to medium-grained, very dense, very moist. Interbedded with white clay laminae 1-3mm thick.	SM		SS	22	17 20 80 — 100	100						
134	164													
136	162	Orange-yellow poorly graded SAND, with silt, very fine- to fine-grained, dense to very dense, moist. Interbedded with thin clay laminae and lignite.	SP SM		SS	23	25 27 23 — 50	75						
138	160													
140	158													
142	156	Grey-brown silty SAND, fine- to coarse-grained, dense to very dense, wet.	SM											
144	154	Orange-yellow poorly graded SAND, some silt, trace clay, fine-grained, very dense.	SP		SS	24	19 23 36 — 59	75						
146	152													
148	150	Orange-brown silty SAND, very fine-grained, medium dense, moist. White clay stringers throughout.	SM		SS	25	13 13 14 — 27	75						
150	148													

Completion Depth: 181
Drilling Rig: CME-75
Weather: Sunny, high 90's F

Remarks: Head pressure grouting through drill rods. Average grout density was 13.2 lb/gallon. Observed good flow of mud.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-4

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:

Northing: 80,182.6

Easting: 55,230.1

Surface Elevation: 297.1

Datum: MSL

Date Started: 6/13/00

Date Completed: 6/15/00

Drill Method: 8" auger to 40'/ 6" mud rota

Logged By: JJT

Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
150														
	146	Orange-yellow silty SAND, trace clay, fine-grained, very dense, moist. Widely spaced thin clay laminae.	SM		SS	26	25 25 30	55	100					
152														
	144													
154														
	142													
156		Yellow/yellow-orange clayey SILT, some fine- to medium-grained SAND, medium dense, moist	ML		SS	27	2 13 14	27						
	140	Yellow-brown clayey SAND, fine- to medium-grained, medium dense, moist.	SC											
158														
	138													
160														
	136	Orange-brown poorly graded SAND, with silt, fine- to coarse-grained, very dense, moist. Thin clay stringers throughout.	SP SM		SS	28	25 100/8	>100		88.4	11.6			
162														
	134													
164														
	132													
166		Yellow-orange poorly graded SAND, trace silt, fine- to coarse-grained, very dense, moist.	SP		SS	29	32 40 50/5	>100						
	130													
168														
	128													
170														
	126	Dark grey to black silty SAND, fine- to coarse-grained, very dense, damp.	SM		SS	30	24 40 50/5	>100						
172														
	124													
174														

Completion Depth: 181

Drilling Rig: CME-75

Weather: Sunny, high 90's F

Remarks: Head pressure grouting through drill rods. Average grout density was 13.2 lb/gallon. Observed good flow of mud.

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 08:58

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-4

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:		Date Started:	6/13/00
Northing:	80,182.6	Date Completed:	6/15/00
Easting:	55,230.1	Drill Method:	8" auger to 40'/ 6" mud ro
Surface Elevation:	297.1	Logged By:	JJT
Datum:	MSL	Reviewed By:	FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit
176	122	Tan poorly graded SAND, trace silt, very dense, wet.	SP		SS	31	50/5 >100						
178	120												
180	118												
182	116	Tan silty SAND, fine-grained, very dense, wet.	SM		SS	32	33 40 50/4 >100						
184	114	Completed boring at 182'.											
186	112												
188	110												
190	108												
192	106												
194	104												
196	102												
198	100												
200	98												

Completion Depth: 181

Drilling Rig: CME-75

Weather: Sunny, high 90's F

Remarks: Head pressure grouting through drill rods. Average grout density was 13.2 lb/gallon. Observed good flow of mud.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-5

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,183.5
Easting: 55,460.2
Surface Elevation: 275.3
Datum: MSL

Date Started: 7/8/00
Date Completed: 7/10/00
Drill Method: 8" mud rotary
Logged By: JKM
Reviewed By: FJW/JJT

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0	274														
2															
4	272	Light-orange/brown poorly graded SAND, with silt, fine-grained, medium dense, dry.	SP SM		SS	1	1 4 7	11	78						
6	270														
8	268														
10	266	Red-orange silty CLAY, with fine-grained sand, dense, wet.	CL		SS	2	9 14 27	41	89						
12	264														
14	262	Mottled red-orange to yellow-orange silty SAND, fine- to medium-grained, medium dense, damp. Grades with calcite stringers.	SM		SS	3	5 9 10	19	78	13.6		76.2	23.8		
16	260														
18	258														
20	256	Similar to above, grades with more sand, stiff.	SM		SS	4	4 5 9	14	78						
22	254														
24	252	Red-brown and tan clayey SAND, fine- to medium-grained, medium dense, damp with more calcite stringers.	SC		SS	5	4 5 9	14	67	15.4		80.4	19.6	37	20	17

Completion Depth: 158
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole cased with 6" PVC casing from ground surface to 153'. Annulus between casing and wall of boring grouted with lean cement grount (~13.5 lb/gal).

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LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 08:58

LOG OF BORING BH-5

DUKE COGEMA
STONE & WEBSTER

Project Name: MOX Fuel Fabrica ion Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,183.5
Easting: 55,460.2
Surface Elevation: 275.3
Datum: MSL

Date Started: 7/8/00
Date Completed: 7/10/00
Drill Method: 8" mud rotary
Logged By: JKM
Reviewed By: FJW/JJT

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
26	250														
28	248	Similar to above, grades with more white stringers and more fine sand, very stiff.	SC		SS	6A	4 7 9	83							
30	246	Yellow-tan silty SAND, fine- to coarse-grained, medium dense.	SM		ST	6B	100/12 200/6 300/3	0							
32	244	Tan brown silty SAND, fine- to medium-grained, trace coarse-grained, medium dense. With white stringers at 33.5'.	SM		SS	7	4 8 10	72			79.7	20.3			
34	242														
36	240														
38	238	Yellowish-tan silty SAND, with clay, fine- to coarse-grained, trace fine-grained gravel, medium dense, moist.	SM		ST	8	250/12 500/12 1000/2	108	21.8	0.4	78.3	21.3	112	48	64
40	236														
42	234														
44	232	Red-brown poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, medium dense, moist.	SP SM		SS	9	6 9 11	61			94.3	5.7			
46	230														
48	228	Red-brown poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, dense, moist.	SP SM		SS	10	9 15 15	72			92.9	7.1			
50	226														

Completion Depth: 158
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole cased with 6" PVC casing from ground surface to 153'. Annulus between casing and wall of boring grouted with lean cement grount (~13.5 lb/gal).

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-5

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,183.5
Easting: 55,460.2
Surface Elevation: 275.3
Datum: MSL

Date Started: 7/8/00
Date Completed: 7/10/00
Drill Method: 8" mud rotary
Logged By: JKM
Reviewed By: FJW/JJT

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
50															
	224														
52															
	222	Mottled red-brown to yellow-brown poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, dense, moist.	SP SM		SS	11	10 15 16	31	67						
54															
	220														
56															
	218														
58		Similar to above, medium dense to dense.	SP SM		SS	12	10 14 15	29	78		92.5	7.5			
	216														
60															
	214														
62															
	212	Mottled yellow-orange to red-orange sandy CLAY, stiff, wet, with thin sand lenses.	CH		SS	13	5 4 5	9	100	41.4	33.3	66.7	92	28	64
64															
	210	Red-brown sandy CLAY, soft, wet.	CH		ST	14	250/12 300/6 400/6		100	46.0	31.6	68.4	78	25	53
66															
	208														
68		Light yellow-brown sandy CLAY, with silt, trace medium-grained, stiff, wet. Grades with black organic streaks and fine sand.	CH		SS	15	2 5 6	11	128	42.5	49.0	51.0			
	206														
70															
	204														
72															
	202	Light yellow-brown poorly graded SAND, with silt, fine- to medium-grained, dense, moist.	SP SM		SS	16	11 17 16	33			91.2	8.8			
74															

Completion Depth: 158
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole cased with 6" PVC casing from ground surface to 153'. Annulus between casing and wall of boring grouted with lean cement grount (~13.5 lb/gal).

LOG OF BORING BH-5

DUKE COGEMA
STONE & WEBSTER

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,183.5
Easting: 55,460.2
Surface Elevation: 275.3
Datum: MSL

Date Started: 7/8/00
Date Completed: 7/10/00
Drill Method: 8" mud rotary
Logged By: JKM
Reviewed By: FJW/JJT

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
76	200	Attempted shelby tube sample at 75'. Pushed 6" at 1,000 psi, no recovery.													
78	198	Light brown poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, dense, moist.	SP SM		SS	17	17 17 27	44	94						
80	196														
82	194														
84	192	Similar to above, loose. Becoming medium dense at 84.5'-85'.	SP SM		SS	18	WH WH 1	1	133	29.5		91.4	8.6		
86	190														
88	188	Light-brown poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, very dense, moist.	SP SM		SS	19	16 26 35	61	89			95.0	5.0		
90	186	Harder drilling at 90'.													
92	184														
94	182	Yellow-brown clayey SAND, fine- to medium-grained, loose, wet, with shell fragments.	SC		SS	20	WH 2 3	5	144	31.2		83.7	16.3	60	27	3
96	180														
98	178	Grading more clayey, medium dense.	SC		SS	21	5 10 16	26	122						
100	176														

Completion Depth: 158
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole cased with 6" PVC casing from ground surface to 153'. Annulus between casing and wall of boring grouted with lean cement grount (~13.5 lb/gal).

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-5

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,183.5
Easting: 55,460.2
Surface Elevation: 275.3
Datum: MSL

Date Started: 7/8/00
Date Completed: 7/10/00
Drill Method: 8" mud rotary
Logged By: JKM
Reviewed By: FJW/JJT

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
100															
	174	Yellow-brown tan clayey SAND, fine- to medium-grained, medium dense, wet.	SC		ST	22	250/12 400/8 500/4	100	47.1		75.9	24.1	67	32	35
102															
	172	Similar to above, medium dense.			SS	23	3 8 19	27	111						
104		Yellow-brown silty SAND, fine- to coarse-grained, medium dense, moist.	SM												
	170														
106															
	168														
108			SP				3								
	166	Mottled yellow-orange/yellow-brown poorly graded SAND, with silt, fine-grained, medium dense to dense. Grading to fine silty SAND, last 6" grading with hard brittle clay lenses.	SM		SS	24	10 19	29	122		89.4	10.6			
110															
	164														
112															
	162		SP				19								
		Similar to above, dense, with thin silt lenses througout.	SM		SS	25	21 24	45	106						
114															
	160														
116															
	158														
118			SP				23								
		Similar to above, very dense	SM		SS	26	28 30	58	94						
120															
	154														
122															
	152						WH								
		Mottled yellow-brown to yellow-orange clayey SAND, fine-grained, loose, wet. Numerous white stringers (calcite) and shell fragments.	SC		SS	27	1 7	8	133	34.6	75.0	25.0	61	30	31
124															

Completion Depth: 158
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole cased with 6" PVC casing from ground surface to 153'. Annulus between casing and wall of boring grouted with lean cement grount (~13.5 lb/gal).

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-5

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,183.5
Easting: 55,460.2
Surface Elevation: 275.3
Datum: MSL

Date Started: 7/8/00
Date Completed: 7/10/00
Drill Method: 8" mud rotary
Logged By: JKM
Reviewed By: FJW/JJT

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
126	150															
	148															
128		Similar to above, loose. Grades with less white stringers and shells.	SC		SS	28	WH WH 7	7	144							
	146															
130		Tan sandy CLAY, highly plastic, medium stiff, wet.	CH		ST	29	WR/12 50/8 250/8		100	39.3		42.0	58.0	61	25	3
132	144															
	142	Mottled brown and yellow-brown clayey SAND, fine-grained, dense.	SC		SS	30	7 14 16	30	122	32.0		65.0	35.0			
134																
	140															
136																
	138															
138		Yellow-brown poorly graded SAND, with silt, fine- to coarse-grained, very dense.	SP SM		SS	31	22 42 50	92	94							
140	136															
	134															
142																
	132	Similar to above, very dense.	SP		SS	32	50/5	>100	39							
144																
	130															
146																
	128															
148		Light brown poorly graded SAND, some silt, fine- to medium-grained, very dense.	SP		SS	33	25/1	>100	28							
	126															
150																

Completion Depth: 158
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole cased with 6" PVC casing from ground surface to 153'. Annulus between casing and wall of boring grouted with lean cement grount (~13.5 lb/gal).

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-5

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,183.5
Easting: 55,460.2
Surface Elevation: 275.3
Datum: MSL

Date Started: 7/8/00
Date Completed: 7/10/00
Drill Method: 8" mud rotary
Logged By: JKM
Reviewed By: FJW/JJT

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit
150	124	Hard drilling 150'-151.5'.												
152	122													
154	120													
156	118	Harder drilling 156.5'-158.0'.												
158	116	Completed boring at 158'.												
160	114													
162	112													
164	110													
166	108													
168	106													
170	104													
172	102													
174														

Completion Depth: 158
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole cased with 6" PVC casing from ground surface to 153'. Annulus between casing and wall of boring grouted with lean cement grount (~13.5 lb/gal).

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-6

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,210.0
Easting: 55,692.9
Surface Elevation: 259.4
Datum: MSL

Date Started: 6/20/00
Date Completed: 6/22/00
Drill Method: 8" auger to 25'/ 6" mud rot
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0	258	Yellow-orange poorly graded SAND, fine-grained, very loose, slightly moist.	SP		SS	1	2 1 2	3	75						
2															
4	256														
6	254														
8	252	Mottled red and tan SILT, some fine-grained sand, medium dense, moist. Interbedded with thin clay and sand layers.	ML		SS	2	9 13 14	27							
10	250														
12	248														
14	246	Mottled red and tan silty SAND, fine- to medium-grained, dense, moist.	SM		SS	3	9 17 17	34	13.5		67.9	32.1			
16	244														
18	242														
20	240	Red-orange silty SAND, trace clay, fine- to medium-grained, trace coarse-grained, medium dense, moist.	SM		SS	4	6 9 19	28	13.6		68.9	31.1			
22	238														
24	236														

Completion Depth: 131
Drilling Rig: CME-75
Weather: Sunny, mid 90's F

Remarks: Hole grouted immediately upon completion.

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 08:59

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-6

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,210.0
Easting: 55,692.9
Surface Elevation: 259.4
Datum: MSL

Date Started: 6/20/00
Date Completed: 6/22/00
Drill Method: 8" auger to 25'/ 6" mud rot
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
26	234	Light brown poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, medium dense, moist.	SP SM		SS	5	11 11 12	23	35						
28	232														
30	230														
32	228	Yellow-tan poorly graded SAND, with silt, fine- to medium-grained, medium dense, moist.	SP SM		SS	6	8 10 12	22	50		92.2	7.8			
34	226														
36	224														
38	222														
40	220														
42	218														
44	216	Mottled tan and gray silty SAND, fine- to medium-grained, moist.	SM		ST	7A	500/23		96						
46	214	Tan silty SAND, trace clay, fine- to medium-grained, trace coarse-grained, medium dense, moist. Black clayey stringers throughout.	SM		SS	7B	8 7 7	14	75		87.1	12.9			
48	212														
50	210														

Completion Depth: 131
Drilling Rig: CME-75
Weather: Sunny, mid 90's F

Remarks: Hole grouted immediately upon completion.

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 08:59

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-6

Project Name: MOX Fuel Fabrica ion Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,210.0
Easting: 55,692.9
Surface Elevation: 259.4
Datum: MSL

Date Started: 6/20/00
Date Completed: 6/22/00
Drill Method: 8" auger to 25'/ 6" mud rota
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
50															
52	208	Yellow-tan silty SAND, fine- to medium-grained, medium dense, moist. Interspersed with clay nodules.	SM		SS	8	7 7 8 15	80							
54	206														
56	204	Mottled black yellow-tan clayey SAND, with silt, fine- to medium-grained, trace coarse-grained, loose to medium dense, wet. Black carbonaceous nodules throughout.	SC		SS	9	3 3 7 10	100	36.3		71.1	28.9			
58	202														
60	200														
62	198	Yellow-tan poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, medium dense, moist. White clay stringers throughout.	SP SM		SS	10	8 8 10 18	100			90.1	9.9			
64	196														
66	194	Yellow-tan interbedded silty SAND and poorly graded SAND, fine- to coarse-grained, medium dense, wet.	SP SM		SS	11	13 13 16 29	75							
68	192														
70	190														
72	188	Yellow-tan poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, medium dense, saturated.	SP SM		SS	12	17 14 15 29	40			93.9	6.1			
74	186														

Completion Depth: 131
Drilling Rig: CME-75
Weather: Sunny, mid 90's F

Remarks: Hole grouted immediately upon completion.

LOG OF BORING BH-6

DUKE COGEMA STONE & WEBSTER

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:

Northing: 80,210.0

Easting: 55,692.9

Surface Elevation: 259.4

Datum: MSL

Date Started: 6/20/00

Date Completed: 6/22/00

Drill Method: 8" auger to 25'/ 6" mud rot

Logged By: JJT

Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
76	184	Olive-tan silty SAND, trace gravel, fine- to medium-grained, trace coarse-grained, loose, wet with black carbonaceous stringers.	SM		SS	13A	2 3 2	5	100	37.6	0.2	75.2	24.6	36	27	9
78	182	Tan-brown clayey SAND, fine-grained, trace medium- to coarse-grained, wet.	SC		ST	13B	900/18		100	37.0		74.2	25.8	58	26	3
80	180															
82	178	Yellow-tan poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, dense, saturated.	SP SM		SS	14	16 17 14	31	40			92.9	7.1			
84	176															
86	174	Similar to above, grading fine-grained, more dense.	SP SM		SS	15	18 20 20	40	40							
88	172															
90	170															
92	168	Yellow-tan poorly graded SAND, with silt, very fine-grained, dense, saturated. Interbedded with silty SAND, very fine-grained.	SP SM		SS	16	9 17 19	36	45							
94	166															
96	164	Yellow-tan silty SAND, trace clay, fine-grained, trace medium-grained, loose, wet, with shell fragments.	SP SM		SS	17A	0 0 9	9	100	35.2		74.5	25.5			
98	162						250/24									
100	160	Tan poorly graded SAND, with clay, fine- to medium-grained, wet.	SP SC		ST	17B			100	18.9		88.8	11.2	51	23	2

Completion Depth: 131

Drilling Rig: CME-75

Weather: Sunny, mid 90's F

Remarks: Hole grouted immediately upon completion.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-6

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,210.0
Easting: 55,692.9
Surface Elevation: 259.4
Datum: MSL

Date Started: 6/20/00
Date Completed: 6/22/00
Drill Method: 8" auger to 25'/ 6" mud rot
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
100															
	158						WR								
102		Yellow-tan clayey SAND, fine-grained, trace medium-grained, very loose, wet.	SC		SS	18A	WR		39.7		66.6	33.4	49	25	24
							WR	100							
	156	Tan clayey SAND, fine-grained, trace medium-grained, wet.	SC				300/24								
104					ST	18B			38.2		51.4	48.6	57	22	31
	154														
106							6								
		Yellow-brown sandy CLAY, fine- to medium-grained, hard, wet.	CH		SS	19	10	35	34.6		33.4	66.6	58	30	28
	152						25	100							
108		Very hard seam at 108.5' (possibly limestone).													
	150														
110															
	148						10								
112		Grading from brown, rust, black and grey-green mottled to yellow-tan silty SAND, with clay, fine-grained, trace medium-grained, medium dense, wet.	SM		SS	20	10	27	32		61.4	38.6			
							17	100							
	146														
114															
	144	Possible limestone seam at 115.5'.													
116							26								
		Yellow-tan clayey SAND, fine- to coarse-grained, very dense, wet.	SC		SS	21	44	>100	50						
	142	Light tan-grey poorly graded SAND, fine- to medium-grained, very dense, saturated.	SP				42/4								
118															
	140														
120															
	138		SP				41								
122		Light yellow-tan poorly graded SAND, fine-grained, very dense, saturated. Grading light orange-brown SAND, with silt.	SM		SS	22	34/4	>100	50						
							10/0								
	136														
124															

Completion Depth: 131
Drilling Rig: CME-75
Weather: Sunny, mid 90's F

Remarks: Hole grouted immediately upon completion.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-6

Project Name: MOX Fuel Fabricat.on Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,210.0
Easting: 55,692.9
Surface Elevation: 259.4
Datum: MSL

Date Started: 6/20/00
Date Completed: 6/22/00
Drill Method: 8" auger to 25'/ 6" mud rotar
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
126	134	Yellow-tan grading brown and grey poorly graded SAND, fine- to medium-grained, very dense, wet.	SP		SS	23	42 47 50/4	>100								
128	132															
130	130															
132	128	Completed boring at 131'.														
134	126															
136	124															
138	122															
140	120															
142	118															
144	116															
146	114															
148	112															
150	110															

Completion Depth: 131
Drilling Rig: CME-75
Weather: Sunny, mid 90's F

Remarks: Hole grouted immediately upon completion.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-7

Project Name: MOX Fuel Fabrication Facility
Location: DOE Savannah River Site
Job Number: 08716

Boring Location:
Northing: 80,082.9
Easting: 55,414.4
Surface Elevation: 277.4
Datum: MSL

Date Started: 7/11/00
Date Completed: 7/12/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0	276	Pinkish-tan poorly graded SAND, some silt, fine-grained, loose, moist.	SP		SS	1	1 2 2 — 4	56							
2	274														
4	272	Mottled red and tan sandy CLAY/SILT, fine-grained, very stiff, slightly moist.	CL ML		SS	2	10 10 10 — 20	100							
6	270														
8	268														
10	266	Reddish brown silty SAND, with silt, fine- to medium-grained, medium dense, damp.	SM		SS	3	3 6 7 — 13	67	20.3		59.1	40.9			
12	264														
14	262														
16	260	Yellow-orange silty SAND, fine-grained, medium dense, moist. Thin white clay/silt laminae throughout.	SM		SS	4	5 7 8 — 15	72							
18	258														
20	256														
22	254	Yellow-orange silty SAND, fine- to medium-grained, trace coarse-grained, medium dense, damp.	SM		SS	5	5 6 7 — 13	72			81.2	18.8			
24															

Completion Depth: 153
Drilling Rig: CME-75
Weather: Sunny, low 80's F

Remarks: Hole grouted immediately upon completion.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-7

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,082.9
Easting: 55,414.4
Surface Elevation: 277.4
Datum: MSL

Date Started: 7/11/00
Date Completed: 7/12/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
26	252															
28	250	Similar to above, with more white clayey laminae.	SM		SS	6A	5 7 8	15	78							
30	248	Tan clayey SAND, some silt, fine- to coarse-grained, gravel, moist.	SC		ST	6B	250/4 750/2		71	20.1	7.7	78.2	14.1	31	20	1
32	246															
34	244	Yellow-orange silty SAND, fine- to medium-grained, medium dense, moist.	SM		SS	7	7 9 13	22	72							
36	242															
38	240	Red-brown tan silty SAND, fine- to medium-grained, trace coarse-grained, medium dense, moist. Thin clayey laminae throughout.	SM		SS	8A	7 10 10	20				83.2	16.8			
40	238	Tan clayey SAND, some silt, fine- to coarse-grained with fine-grained gravel, moist.	SC		ST	8B	250/6 450/2 800/7		63	26.2	8.0	74.7	17.3	36	19	1
42	236															
44	234	Yellow-orange mottled with rust clayey SAND, fine- to medium-grained, medium dense, moist. Thin white clay/silt laminae throughout.	SC		SS	9	6 7 9	16	83			74.4	25.6			
46	232															
48	230	Brown poorly graded SAND, with silt, fine- to medium-grained trace coarse-grained, medium dense, moist.	SP SM		SS	10	8 13 15	28				93.2	6.8			
50	228															

Completion Depth: 153
Drilling Rig: CME-75
Weather: Sunny, low 80's F

Remarks: Hole grouted immediately upon completion.

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DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-7

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,082.9
Easting: 55,414.4
Surface Elevation: 277.4
Datum: MSL

Date Started: 7/11/00
Date Completed: 7/12/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
50	226														
52															
54	224	Tan with lavender hue poorly graded SAND, with silt, trace clay, fine- to medium-grained, trace coarse-grained, medium dense, saturated.	SP SM		SS	11	7 12 14	26	72		93.0	7.0			
56	222														
58	220														
60	218	Yellow-orange poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, medium dense, moist.	SP SM		SS	12	8 12 13	25	72		91.6	8.4			
62	216														
64	214	Yellow-orange poorly graded SAND, with silt, fine- to coarse-grained, trace fine-grained gravel, medium dense, saturated.	SP SM		SS	13	8 13 11	24	72						
66	212														
68	210	Yellow-orange silty SAND, trace clay, fine-grained, medium dense, saturated.	SM		SS	14A	4 8 9	17	67						
70	208														
72	206	Tan silty SAND, fine- to coarse-grained, saturated.	SM		ST	14B	350/6 750/3 1000/3		54	45.9	54.4	45.6	109	68	
74	204	Yellow-orange interbedded poorly graded SAND and silty SAND, fine- to coarse-grained, dense, moist.	SP SM		SS	15	9 18 25	43	100						

Completion Depth: 153
Drilling Rig: CME-75
Weather: Sunny, low 80's F

Remarks: Hole grouted immediately upon completion.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-7

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,082.9
Easting: 55,414.4
Surface Elevation: 277.4
Datum: MSL

Date Started: 7/11/00
Date Completed: 7/12/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
76	202														
78	200														
		Tan silty SAND, fine- to medium-grained, medium dense, moist.	SM		SS	16A	5 10 12	22			82.5	17.5			
80	198	Grading to greenish-grey poorly graded SAND, with thin silt laminae, fine- to medium-grained, medium dense, moist.	SP SM												
82	196				ST	16B	250/7 500/13 800/4	0							
84	194	Greyish-tan mottled with black clayey SAND, trace silt, fine- to medium-grained, trace coarse-grained, medium dense, wet.	SC		SS	17	2 4 8	12	89	32.5	83.3	16.7	62	28	34
86	192														
88	190	Yellow-orange SAND, with silt, fine- to medium-grained, loose to medium dense, wet.	SP SM		SS	18	3 4 6	10	100	33.0	89.3	10.7			
90	188														
92	186														
94	184	Tan poorly graded SAND, with silt, fine- to coarse-grained, dense, saturated.	SP SM		SS	19	3 14 29	43	83		93.6	6.4			
96	182														
98	180														
100	178	Alternating layers yellow-orange silty/clayey SAND, fine- to medium-grained loose to medium dense, wet. Thinly laminated silt layers visible	SC SM		SS	20A	6 5 5	10	72						

Completion Depth: 153
Drilling Rig: CME-75
Weather: Sunny, low 80's F

Remarks: Hole grouted immediately upon completion.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-7

Project Name: MOX Fuel Fabrication Facility
Location: DOE Savannah River Site
Job Number: 08716

Boring Location:
Northing: 80,082.9
Easting: 55,414.4
Surface Elevation: 277.4
Datum: MSL

Date Started: 7/11/00
Date Completed: 7/12/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
100	176	Tan sandy SILT, with clay, wet.	MH		ST	20B	50/9 100/6 400/9		100	54.5		30.9	69.1	93	43	5
102	174	Brownish-tan clayey SAND, with silt, fine- to medium-grained, medium dense, wet. Grading less fine-grained with depth. Very thin white/black layers visible. Carbonaceous particles also visible.	SC		SS	21	WH 7 11	18	128	30.1		71.9	18.1	74	31	4
104	172															
106	170															
108	168	As above. Light brown-orange poorly graded SAND, with silt, fine- to medium-grained, medium dense, moist.	SC SP SM		SS	22	4 8 10	18	100							
110	166															
112	164	Brown-tan mottled rust/black poorly graded SAND, with silt, trace clay, fine- to medium-grained, medium dense, wet. Small carbonaceous particles visible.	SP SM		SS	23	4 5 8	13	111	35.3		88.1	11.9			
114	162															
116	160															
118	158	Brown-tan poorly graded SAND, very fine-grained, very dense, moist.	SP		SS	24	22 28 24	52	100							
120	156															
122	154	Brown-tan silty SAND, fine-grained, very dense, moist.	SM		SS	25	18 34 38	72	78			87.4	12.6			
124																

Completion Depth: 153
Drilling Rig: CME-75
Weather: Sunny, low 80's F

Remarks: Hole grouted immediately upon completion.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-7

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,082.9
Easting: 55,414.4
Surface Elevation: 277.4
Datum: MSL

Date Started: 7/11/00
Date Completed: 7/12/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
126	152														
		Rust-brown clayey SAND, trace silt, fine-grained, trace medium-grained, medium dense, moist. Grey-green thin silt laminae throughout (<0.5mm).	SC		SS	26	9 13 15	28	83			75.0	25.0		
128	150														
130	148														
132	146														
134	144	Yellow-brown silty SAND, fine-grained, trace medium-grained, medium dense, moist. Grey-green thin silt laminae throughout.	SM		SS	27	WH 5 9	14	133	32.6		62.6	37.4		
136	142														
138	140	Yellow-orange SILT, with fine-grained sand, medium dense, moist. Grading rust-light brown, clayey, trace fine sand, dense, moist.	ML		SS	28	WH 1 17	18	133						
140	138														
142	136														
144	134	Yellowish-orange silty SAND, trace clay, fine- to coarse-grained, dense to very dense, saturated. Grading coarser with depth.	SM		SS	29	18 24 28	52	89						
146	132														
148	130														
150	128	Similar to above, very dense.	SM		SS	30	24/1	>100	0						

Completion Depth: 153
Drilling Rig: CME-75
Weather: Sunny, low 80's F

Remarks: Hole grouted immediately upon completion.

46

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 12:38

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-7

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,082.9
Easting: 55,414.4
Surface Elevation: 277.4
Datum: MSL

Date Started: 7/11/00
Date Completed: 7/12/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
150	126	As above.	SM		SS	31	18/1 >100								
152	124	Black fine-grained clayey SAND observed in recirculated drill mud at 153'. Completed boring at 153'.													
154	122														
156	120														
158	118														
160	116														
162	114														
164	112														
166	110														
168	108														
170	106														
172	104														
174															

Completion Depth: 153
Drilling Rig: CME-75
Weather: Sunny, low 80's F

Remarks: Hole grouted immediately upon completion.

47

LOG OF BORING LETTER SIZE COM82.GPJ STNWB_CO.GDT 12/11/00 12:38

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-8

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,995.3
Easting: 55,335.1
Surface Elevation: 279.4
Datum: MSL

Date Started: 6/6/00
Date Completed: 6/9/00
Drill Method: 8" auger to 25'/ 6" mud rota
Logged By: JJT/FJW
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0	278	Reddish-brown silty SAND, fine- to medium-grained, dense, moist.	SM		SS	1	12 19 27	46	100						
2	276														
4	274														
6	272	Yellow-tan grading to reddish brown mottled yellow clayey SAND, fine- to medium-grained, medium dense, moist.	SC		SS	2	3 5 9	14	100						
8	270														
10	268	Red-brown silty SAND, fine-grained, trace medium-grained, medium dense, moist.	SM		SS	3	3 8 9	17	100	14.9	59.9	40.1			
12	266														
14	264	Red-brown SILT, trace sand, trace clay, medium dense, moist.	ML												
16	262	Red-tan poorly graded SAND, with silt, fine- to medium-grained, medium dense, moist.	SP SM		SS	4	4 6 7	13	100						
18	260														
20	258														
22	256	Tan silty SAND, fine- to medium-grained, medium dense, moist.	SM		SS	5	5 5 7	12	100		85.8	14.2			
24															

Completion Depth: 152.5
Drilling Rig: CME-75
Weather: Sunny, mid 80's F

Remarks: Hole grouted immediately upon completion.

DUKE COGEMA STONE & WEBSTER

LOG OF BORING BH-8

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,995.3
Easting: 55,335.1
Surface Elevation: 279.4
Datum: MSL

Date Started: 6/6/00
Date Completed: 6/9/00
Drill Method: 8" auger to 25'/ 6" mud rot
Logged By: JJT/FJW
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
26	254														
28	252														
30	250														
32	248	Yellow-tan mottled red-brown silty SAND, trace clay, fine- medium-grained, medium dense, moist.	SM		SS	6	9 11 13	24	100						
34	246														
36	244														
38	242	Mottled yellow/white/brown silty SAND, fine- to medium-grained, medium dense, moist.	SM		SS	7	10 11 13	24	100		80.9	19.1			
40	240														
42	238	Yellow-tan silty SAND, trace clay, fine- to medium-grained, medium dense, moist.	SM		SS	8	9 11 16	27	50						
44	236														
46	234	Mottled yellow/red-grey/tan poorly graded SAND, with silt, fine- to medium-grained, dense, moist.	SP SM		SS	9	13 16 19	35	40	19.0	90.1	9.9			
48	232														
50	230														

Completion Depth: 152.5
Drilling Rig: CME-75
Weather: Sunny, mid 80's F

Remarks: Hole grouted immediately upon completion.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-8

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,995.3
Easting: 55,335.1
Surface Elevation: 279.4
Datum: MSL

Date Started: 6/6/00
Date Completed: 6/9/00
Drill Method: 8" auger to 25'/ 6" mud rot.
Logged By: JJT/FJW
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
50															
52	228	Red-brown mottled red-yellow/tan silty SAND, with clay, fine- to medium-grained, dense, moist.	SM		SS	10	13 15 18	33	40						
54	226														
56	224	Yellow-tan silty SAND, some clay, medium dense to dense, moist.	SM		SS	11	11 14 15	29	35						
58	222														
60	220														
62	218	Yellow-tan to red-brown poorly graded SAND, with silt, fine- to medium-grained, very dense, moist. Grades silter with depth.	SP SM		SS	12	19 37 47	84	40		93.7	6.3			
64	216														
66	214	Yellow-tan poorly graded SAND, with silt, fine- to medium-grained, dense, moist.	SP SM		SS	13	15 19 20	39	60						
68	212														
70	210														
72	208	Yellow-orange silty SAND, trace clay, fine- to coarse-grained, medium dense, moist.	SM		SS	14	9 8 12	20	100						
74	206														

Completion Depth: 152.5
Drilling Rig: CME-75
Weather: Sunny, mid 80's F

Remarks: Hole grouted immediately upon completion.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-8

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,995.3
Easting: 55,335.1
Surface Elevation: 279.4
Datum: MSL

Date Started: 6/6/00
Date Completed: 6/9/00
Drill Method: 8" auger to 25'/ 6" mud rota
Logged By: JJT/FJW
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
76	204														
		Yellow-orange CLAY, some silt, medium stiff, moist.	CL				8								
78	202	Grades to yellow-orange silty SAND, fine- to medium-grained, some clay, medium dense, moist.	SM		SS	15	8 12	20	100						
80	200														
82	198	Yellow-orange silty SAND, fine- to medium-grained, medium dense to dense, moist. Thin black carbonaceous layers throughout.	SM		SS	16	12 14 15	29	80	31.5	85.0	15.0			
84	196														
86	194														
		Yellow-orange mottled white poorly graded SAND, with silt, medium dense, moist.	SP SM		SS	17	21 15 13	28	70						
88	192														
90	190														
92	188	Yellow-orange mottled silty SAND, trace clay, fine- to medium-grained, dense, wet.	SM		SS	18	15 16 19	35	100	35.1	87.2	12.8			
94	186														
96	184														
		Yellow-tan mottled black well graded SAND, with silt, fine- to coarse-grained, very dense, wet.	SW		SS	19	14 26 39	65	75						
98	182	Yellow-orange poorly graded SAND, with silt, very dense, wet, with clay stringers	SP												
100	180														

Completion Depth: 152.5
Drilling Rig: CME-75
Weather: Sunny, mid 80's F

Remarks: Hole grouted immediately upon completion.

51

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 12:38

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-8

Project Name: MOX Fuel Fabrication Facility
Location: DOE Savannah River Site
Job Number: 08716

Boring Location:
Northing: 79,995.3
Easting: 55,335.1
Surface Elevation: 279.4
Datum: MSL

Date Started: 6/6/00
Date Completed: 6/9/00
Drill Method: 8" auger to 25'/ 6" mud rota
Logged By: JJT/FJW
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
100															
102	178	Yellow-orange silty SAND, fine- to medium-grained, trace coarse-grained, medium dense, wet.	SM		SS	20	7 8 9	17	100		86.9	13.1			
104	176														
106	174	Mottled yellow/tan clayey SAND, with silt, fine- to medium-grained, medium dense, wet.	SC		SS	21	6 7 9	16	100	37.3	61.0	39.0	102	32	70
108	172														
110	170														
112	168	Dark orange silty SAND, fine-grained, medium dense, moist. Grading less silt.	SM		SS	22	11 11 17	28	75						
114	166														
116	164	Dark orange poorly graded SAND, with silt, fine-grained, dense, moist to wet.	SP SM		SS	23	14 15 24	39	100						
118	162														
120	160														
122	158	Tan poorly graded SAND, with silt, fine-grained, trace medium-grained, dense, wet. Clay stringers in top 6" of sample.	SP SM		SS	24	20 22 20	42	60	26.3	88.7	11.3			
124	156														

Completion Depth: 152.5
Drilling Rig: CME-75
Weather: Sunny, mid 80's F

Remarks: Hole grouted immediately upon completion.

52

LOG OF BORING LETTER SIZE COMB2 GPJ STNWB_CO GDT 12/11/00 12:38

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-8

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,995.3
Easting: 55,335.1
Surface Elevation: 279.4
Datum: MSL

Date Started: 6/6/00
Date Completed: 6/9/00
Drill Method: 8" auger to 25'/ 6" mud rot
Logged By: JJT/FJW
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
126	154	As above, grade moist to wet with depth, very dense.	SP SM		SS	25	27 26 28	54	100						
128	152														
130	150														
132	148	Orange silty SAND, fine-grained, trace medium-grained, medium dense, moist, with shell fragments.	SM		SS	26	9 10 11	21	100		75.8	24.2			
134	146														
136	144														
138	142	Orange mottled black silty SAND, with clay, fine-grained, trace medium-grained, loose, moist.	SM		SS	27	WR WR 10	10	100	35.4	58.6	41.4			
		Hard drilling 138'-140'.													
140	140														
142	138	Light grey/white clayey SILT, interbedded with thin layers of orange mottled poorly graded SAND, fine- to medium-grained, medium dense, moist. Thin layer of green CLAY, with silt and fine- to coarse-grained sand at bottom of sample, very stiff.	ML		SS	28	10 9 15	24	100						
144	136														
146	134	Yellow-orange well graded SAND, fine- to coarse-grained, very dense, wet.	SW		SS	29	42 49 43	92	85						
148	132														
150	130														

Completion Depth: 152.5
Drilling Rig: CME-75
Weather: Sunny, mid 80's F

Remarks: Hole grouted immediately upon completion.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-8

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,995.3
Easting: 55,335.1
Surface Elevation: 279.4
Datum: MSL

Date Started: 6/6/00
Date Completed: 6/9/00
Drill Method: 8" auger to 25'/ 6" mud rot
Logged By: JJT/FJW
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
150	128	Harder drilling.													
152		Yellow-orange poorly graded SAND, medium- to coarse-grained, very dense, wet.	SP		SS	30	75 25/1	>100							
	126	Completed boring at 152.5'.													
154															
	124														
156															
	122														
158															
	120														
160															
	118														
162															
	116														
164															
	114														
166															
	112														
168															
	110														
170															
	108														
172															
	106														
174															

Completion Depth: 152.5
Drilling Rig: CME-75
Weather: Sunny, mid 80's F

Remarks: Hole grouted immediately upon completion.

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 12:38

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-9

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,981.9
Easting: 55,614.7
Surface Elevation: 271.5
Datum: MSL

Date Started: 6/9/00
Date Completed: 6/12/00
Drill Method: 8" auger to 25'/6" mud rota
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0	270															
2	268	Tan poorly graded SAND, trace silt, fine-grained, loose, dry.	SP		SS	1	2 2 2	4	100							
4	266															
6	264															
8	262	Similar to above, pinkish-tan medium dense.	SP		SS	2	3 4 6	10	70							
10	260															
12	258	Reddish-brown silty SAND, fine- to medium-grained, trace coarse-grained, medium dense, moist.	SM		SS	3	5 7 10	17	100	15.2		68.4	31.6			
14	256															
16	254															
18	252	Similar to above.	SM		SS	4	4 8 10	18	100							
20	250															
22	248															
24		Reddish-brown silty SAND, fine- to medium-grained, trace coarse-grained, medium dense, damp.	SM		SS	5	7 6 11	17	50	8.0		81.9	18.1			

Completion Depth: 136
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole grouted, average fluid density 14 lb/gal.

55

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 12:38

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-9

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,981.9
Easting: 55,614.7
Surface Elevation: 271.5
Datum: MSL

Date Started: 6/9/00
Date Completed: 6/12/00
Drill Method: 8" auger to 25'/6" mud rotar
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
26	246															
28	244	Same as above.	SM		SS	6	7 7 10	17	100							
30	242															
32	240															
34	238	Tan poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, medium dense, damp.	SP SM		SS	7	6 6 8	14	50	5.1		94.2	5.8			
36	236															
38	234	Yellow-tan silty SAND, fine-grained, medium dense, damp.	SM		SS	8	6 7 7	14	95							
40	232															
42	230															
44	228	Grading less silt, medium-grained.	SM		SS	9	5 7 8	15	90							
46	226															
48	224	Yellow-tan poorly graded SAND with silt, fine-grained, very dense, damp.	SP SM		SS	10	18 25 33	58	50							
50	222															

Completion Depth: 136
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole grouted, average fluid density 14 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-9

Project Name: MOX Fuel Fabrica ion Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,981.9
Easting: 55,614.7
Surface Elevation: 271.5
Datum: MSL

Date Started: 6/9/00
Date Completed: 6/12/00
Drill Method: 8" auger to 25'/6" mud ro
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit
50															
	220														
52															
	218														
54															
	216	Yellow-brown clayey SAND, fine- to medium-grained, medium dense, moist.	SC												
56		Yellow-tan sandy CLAY, very stiff, moist.	CH		SS	11	3 7 10	17	100						
	214														
58															
	212														
60															
	210	Yellow-orange poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, medium dense, moist.	SP SM		SS	12	16 15 14	29	75			94.5	5.5		
62															
	208														
64															
	206														
66		Yellow-orange poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, medium dense, wet.	SP SM		SS	13	8 6 10	16	80	24.3		89.4	10.6		
	204														
68															
	202														
70															
	200	Yellow-orange silty SAND, trace clay, fine-grained, trace medium-grained, medium dense, moist. Very thin laminae of carbonaceous material throughout.	SM		SS	14	4 4 8	12	90	29.2		82.3	17.7	52	30
72															
	198														
74															

Completion Depth: 136
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole grouted, average fluid density 14 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-9

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,981.9
Easting: 55,614.7
Surface Elevation: 271.5
Datum: MSL

Date Started: 6/9/00
Date Completed: 6/12/00
Drill Method: 8" auger to 25'/6" mud rota
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
76	196	Yellow-orange poorly graded SAND, some silt, fine- to medium-grained, medium dense, saturated.	SP SM		SS	15	12 12 14	26	90							
78	194															
80	192															
82	190	Yellow-orange mottled black and white silty SAND, fine- to coarse-grained, dense, wet. Interbedded with thin silty clay layers.	SM		SS	16	18 23 25	48	30							
84	188															
86	186	Orange-brown silty SAND, fine- to medium-grained, trace coarse-grained, medium dense, wet.	SM		SS	17	10 8 8	16	80			86.6	13.4			
88	184															
90	182															
92	180	Yellow-orange mottled tan and black clayey SAND, fine-grained, medium dense, moist.	SC		SS	18	8 7 11	18	100							
94	178															
96	176	Yellow-orange poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, dense, moist.	SP SM		SS	19	17 15 16	31	75			92.5	7.5			
98	174															
100	172															

Completion Depth: 136
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole grouted, average fluid density 14 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-9

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,981.9
Easting: 55,614.7
Surface Elevation: 271.5
Datum: MSL

Date Started: 6/9/00
Date Completed: 6/12/00
Drill Method: 8" auger to 25'/6" mud rota
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
100																
102	170	Similar to above, grading siltier, fine-grained, dense.	SP SM		SS	20	20 22 24	46	40							
104	168															
106	166	Greyish-orange poorly graded SAND, medium- to coarse-grained, dense, saturated.	SP		SS	21	23 22 25	47	50							
108	164	Grading orange with silt, fine-grained, with shells.														
110	162															
112	160	Tan silty SAND, fine- to coarse-grained, medium dense, wet. Grading orange-yellow mottled with black, fine-grained.	SM		SS	22	4 6 7	13	60							
114	158															
116	156	Orange silty clayey SAND, fine-grained, medium dense, moist. Interbedded mottled yellow/white clays.	SC SM		SS	23	7 12 16	28	100							
118	154															
120	152															
122	150	Yellowish-orange sandy SILT, dense, moist. 1" limestone layer in sample.	ML		SS	24	16 19 30	49	90		4.5	42.4	53.1			
124	148															

Completion Depth: 136
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole grouted, average fluid density 14 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-9

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,981.9
Easting: 55,614.7
Surface Elevation: 271.5
Datum: MSL

Date Started: 6/9/00
Date Completed: 6/12/00
Drill Method: 8" auger to 25'/6" mud rota
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
126	146	Reddish-brown clayey SAND, fine- to medium-grained, trace coarse-grained, trace fine-grained gravel, medium dense to dense, moist. Grey-green thin interbeds of silt/clay throughout.	SC		SS	25	12 14 16	30			0.2	61.1	38.7			
128	144															
130	142															
132	140	Tan mottled grey-green and dark grey silty SAND, fine- to coarse-grained, loose to medium dense, moist (slough). Yellowish-orange/grey silty SAND, fine- to medium-grained, very dense, saturated.	SP SM		SS	26	WR 20 50	70	100							
134	138															
136	136	Grey-orange poorly graded SAND, trace silt, medium- to coarse-grained, very dense, moist.	SP		SS	27	100/6	>100	30							
138	134	Completed boring at 137.5'.														
140	132															
142	130															
144	128															
146	126															
148	124															
150	122															

Completion Depth: 136
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole grouted, average fluid density 14 lb/gal.

60

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 12:39

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-10

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,809.5
Easting: 55,315.8
Surface Elevation: 273.1
Datum: MSL

Date Started: 6/27/00
Date Completed: 6/30/00
Drill Method: 8" Auger to 24'/8" mud rota
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0	272	Reddish-brown silty SAND, trace clay, fine- to medium-grained, medium dense, moist.	SM		SS	1A	9 12 17	29	75						
2	270						750/20								
4	268				ST	1B		83							
6	266														
8	264	Similar to above.	SM		SS	2	9 10 13	23	75	14.4		75.6	24.4		
10	262														
12	260														
14	258	Similar to above, but grades to yellow-orange at 19'.	SM		SS	3	8 10 11	21	100						
16	256														
18	254														
20	252														
22	250	Similar to above, less silty, moist.	SM		SS	4	4 5 5	10	75						
24															

Completion Depth: 153
Drilling Rig: CME-75
Weather: Sunny/rainy, 70 F

Remarks: 6" PVC casing installed entire depth of boring. Annulus between casing and boring wall grouted with 13.4 lb/gal cement grout.

61

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 12:35

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-10

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,809.5
Easting: 55,315.8
Surface Elevation: 273.1
Datum: MSL

Date Started: 6/27/00
Date Completed: 6/30/00
Drill Method: 8" Auger to 24'/8" mud rot.
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
26	248														
28	246														
30	244	Yellow-orange silty SAND, fine- to medium-grained, trace coarse-grained, medium dense, moist.	SM		SS	5	4 7 8 15	50	18.5		80.7	16.3			
32	242														
34	240	Yellow-orange to orange-brown poorly graded SAND, with silt, fine- to medium-grained, medium dense, very moist.	SP SM		SS	6A	7 9 11 20	40							
36	238				ST	6B	250/20 400/4	100							
38	236	Yellow-orange, layered red and yellow-orange poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, medium dense, moist.	SP SM		SS	7	5 9 13 22	40			90.9	9.1			
40	234														
42	232														
44	230	Reddish-brown to lavender-brown silty SAND, fine- to medium-grained, medium dense, moist.	SM		SS	8	8 13 15 28	56							
46	228														
48	226														
50	224	Reddish-brown silty SAND, fine-grained, trace medium-grained, medium dense to dense, moist. White very thin layers of clay (>0.5mm).	SM		SS	9	9 13 17 30	56			87.3	12.7			

Completion Depth: 153
Drilling Rig: CME-75
Weather: Sunny/rainy, 70 F

Remarks: 6" PVC casing installed entire depth of boring. Annulus between casing and boring wall grouted with 13.4 lb/gal cement grout.

62

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 12:35

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-10

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,809.5
Easting: 55,315.8
Surface Elevation: 273.1
Datum: MSL

Date Started: 6/27/00
Date Completed: 6/30/00
Drill Method: 8" Auger to 24'/8" mud rot
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
50	222														
52	220	Reddish-brown poorly graded SAND, with silt, trace fine-gravel, fine- to medium-grained, trace coarse-grained, dense, moist.	SP SM		SS	10	11 16 18	34	44	23.0	1.1	91.4	7.5			
54	218														
56	216														
58	214	Yellow-orange poorly graded SAND, with silt, trace fine-grained gravel, fine- to coarse-grained, dense, moist.	SP SM		SS	11	12 17 17	34	61						
60	212														
62	210	Reddish-brown with black interbedded silty SAND, silty CLAY and SILT, medium dense, very stiff, moist.	SM		SS	12	6 9 9	18	39						
64	208														
66	206														
68	204	Brownish-red silty SAND, trace clay, fine- to medium-grained, trace coarse-grained, medium dense, moist.	SM		SS	13	7 12 13	25	50			86.9	13.1		
70	202														
72	200	Orange-tan to reddish-brown poorly graded SAND, with silt, fine- to medium-grained, dense, wet. Layering visible.	SP SM		SS	14A	17 15 16	31	56			92.7	7.3		
74							200/8 450/3								

Completion Depth: 153
Drilling Rig: CME-75
Weather: Sunny/rainy, 70 F

Remarks: 6" PVC casing installed entire depth of boring. Annulus between casing and boring wall grouted with 13.4 lb/gal cement grout.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-10

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,809.5
Easting: 55,315.8
Surface Elevation: 273.1
Datum: MSL

Date Started: 6/27/00
Date Completed: 6/30/00
Drill Method: 8" Auger to 24'/8" mud rota
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
76	198	Reddish-brown poorly graded SAND and silty SAND, fine- to coarse-grained, medium dense, moist.	SP SM		ST	14B	650/12	100							
78	196	Layered yellow-orange, reddish brown poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, medium dense, moist to wet.	SP SM		SS	15	8 9 18	27	56		94.0	6.0			
80	194														
82	192														
84	190	Whitish-pink poorly graded SAND, with silt, fine-grained, dense, wet. Layering visible.	SP SM		SS	16	12 18 19	37	89						
86	188														
88	186	White, black, yellow-orange well graded SAND, with silt, fine- to medium-grained, trace coarse-grained, very dense, moist. Layering visible.	SW SM		SS	17	19 25 26	51	56	16.3	93.6	6.4			
90	184														
92	182														
94	180	Brown, yellow, white, black interbedded silty and clayey SAND, fine- to medium-grained, very dense, wet.	SC SM		SS	18	21 39 42	81	83						
96	178														
98	176														
100	174	Pinkish tan mottled with black (carbonaceous material) interbedded clayey SILT/clayey SAND, fine- to medium-grained, medium dense, moist to wet.	SC		SS	19	9 11 15	26	117	28.5	62.0	38.0			

Completion Depth: 153
Drilling Rig: CME-75
Weather: Sunny/rainy, 70 F

Remarks: 6" PVC casing installed entire depth of boring. Annulus between casing and boring wall grouted with 13.4 lb/gal cement grout.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-10

Project Name: MOX Fuel Fabrica ion Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,809.5
Easting: 55,315.8
Surface Elevation: 273.1
Datum: MSL

Date Started: 6/27/00
Date Completed: 6/30/00
Drill Method: 8" Auger to 24'/8" mud rota
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
100	172														
102	170														
104	168	Yellow-orange poorly graded SAND, trace clay, very fine- to fine-grained, dense, saturated.	SP		SS	20	11 17 14	31	94						
106	166	Yellow-orange mottled black silty SAND, fine- grained, trace medium-grained, very dense, wet.	SM		SS	21A	17 34 40	74	78	23.2		85.1	14.9		
108	164	Reddish-brown poorly graded SAND, fine- to medium-grained, dense, wet. Becoming yellow-tan at 109'.	SP		ST	21B	500/12 1250/8		92						
110	162														
112	160	Yellow-orange mottled black/white poorly graded SAND, very fine- to fine-grained, very dense, wet.	SP		SS	22	17 30 41	71	56						
114	158														
116	156														
118	154	Tan-brown sandy SILT, medium dense, moist, interbedded grey-green silt, light brown silty sand and black lignite stringers. Shell fragments.	ML		SS	23	5 9 12	21	133						
120	152														
122	150														
124		Tan silty SAND, fine-grained, trace medium-grained, medium dense, wet.	SM		SS	24	4 7 9	16		32.8		82.4	17.6	43	28	1

Completion Depth: 153
Drilling Rig: CME-75
Weather: Sunny/rainy, 70 F

Remarks: 6" PVC casing installed entire depth of boring. Annulus between casing and boring wall grouted with 13.4 lb/gal cement grout.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-10

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,809.5
Easting: 55,315.8
Surface Elevation: 273.1
Datum: MSL

Date Started: 6/27/00
Date Completed: 6/30/00
Drill Method: 8" Auger to 24'/8" mud rotar
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
126	148														
128	146														
130	144	Similar to above, grading with clay, medium dense to dense.	SM		SS	25	11 13 16	29	89						
132	142														
134	140	Similar to above.	SM		SS	26A	7 7 11	18	128						
136	138	Brown silty SAND, fine- to medium-grained, saturated.	SC		ST	26B	400/12 750/6		75	18		84.6	15.4	45	22	23
138	136														
140	134	Yellow-orange poorly graded SAND, trace silt, trace fine-grained gravel, fine- to coarse-grained, very dense, saturated.	SP SM		SS	27	27 38 42	80	61						
142	132														
144	130	Yellow-brown poorly graded SAND, trace silt, trace clay, very dense, moist.	SP		SS	28	43 50/5	>100	67						
146	128														
148	126	Gray-black poorly graded SAND, with silt, fine- to medium-grained, medium dense, wet.	SM		SS	29	11 14 37	51	51	22.6		93.5	6.4		
150	124														

Completion Depth: 153
Drilling Rig: CME-75
Weather: Sunny/rainy, 70 F

Remarks: 6" PVC casing installed entire depth of boring. Annulus between casing and boring wall grouted with 13.4 lb/gal cement grout.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-10

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 79,809.5
Easting: 55,315.8
Surface Elevation: 273.1
Datum: MSL

Date Started: 6/27/00
Date Completed: 6/30/00
Drill Method: 8" Auger to 24'/8" mud rot
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
150	122														
152	120	Completed boring at 153'.													
154	118														
156	116														
158	114														
160	112														
162	110														
164	108														
166	106														
168	104														
170	102														
172	100														
174															

Completion Depth: 153
Drilling Rig: CME-75
Weather: Sunny/rainy, 70 F

Remarks: 6" PVC casing installed entire depth of boring. Annulus between casing and boring wall grouted with 13.4 lb/gal cement grout.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-11

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,154.0
Easting: 54,970.0
Surface Elevation: 295
Datum: MSL

Date Started: 7/17/00
Date Completed: 7/19/00
Drill Method: 8" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0	294	Fill. No samples collected.													
2	292														
4	290														
6	288														
8	286														
10	284														
12	282														
14	280														
16	278														
18	276														
20	274	Assumed original ground.													
22	272														
24	270														

Completion Depth: 169.5
Drilling Rig: CME-75
Weather: Sunny, mid 90's F

Remarks: Hole grouted immediately upon completion. Average fluid weight 13.7 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-11

Project Name: MOX Fuel Fabrica ion Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,154.0
Easting: 54,970.0
Surface Elevation: 295
Datum: MSL

Date Started: 7/17/00
Date Completed: 7/19/00
Drill Method: 8" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
26	270														
28	268														
30	266														
32	264														
34	262														
36	260														
38	258														
40	256														
42	254														
44	252	Yellow-tan silty SAND, trace clay, fine- to medium-grained, dense, moist. Thin green-grey thin silt/clay laminae (<0.5mm) throughout.	SM		SS	1	10 14 18	32	72	11.3		85.1	14.9		
46	250														
48	248														
50	246	Similar to above.	SM		SS	2	10 14 17	31	61						

Completion Depth: 169.5
Drilling Rig: CME-75
Weather: Sunny, mid 90's F

Remarks: Hole grouted immediately upon completion. Average fluid weight 13.7 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-11

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,154.0
Easting: 54,970.0
Surface Elevation: 295
Datum: MSL

Date Started: 7/17/00
Date Completed: 7/19/00
Drill Method: 8" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
50	244														
52	242														
54	240	Red-light brown poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, medium dense, moist.	SP SM		SS	3	8 10 10	20	44	16.2		93.7	6.3			
56	238														
58	236	Red-brown silty SAND, trace clay, fine- to medium-grained, medium dense, wet.	SM		SS	4	8 9 12	21	56						
60	234														
62	232														
64	230	Yellow-orange well graded SAND, with silt, trace clay, fine- to medium-grained, dense, moist. Clayey stringers.	SW SM		SS	5	7 14 21	35	61	13.5		93.1	6.9			
66	228														
68	226	Yellow-orange poorly graded SAND, with silt, fine- to coarse-grained, dense, very moist.	SP SM		SS	6	12 17 19	36	50						
70	224														
72	222														
74	220	Yellow-orange poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, dense, moist.	SP SM		SS	7A	10 14 17 150/1	31		20.2		90.4	9.6			

Completion Depth: 169.5
Drilling Rig: CME-75
Weather: Sunny, mid 90's F

Remarks: Hole grouted immediately upon completion. Average fluid weight 13.7 lb/gal.

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LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 12:36

LOG OF BORING BH-11

DUKE COGEMA
STONE & WEBSTER

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,154.0
Easting: 54,970.0
Surface Elevation: 295
Datum: MSL

Date Started: 7/17/00
Date Completed: 7/19/00
Drill Method: 8" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
76	220	Light brown clayey SAND, fine- to coarse-grained, wet.	SC		ST	7B	300/2 700/5		26.8	3.6	81.8	14.6	59	23	3
78	218														
80	216														
82	214	Yellow-orange clayey SAND, trace silt, medium- to coarse-grained, loose, saturated.	SC		SS	8A	2 3 5	50							
84	212	Light brown clayey SAND, fine- to medium-grained.	SC		ST	8B	100/10.5 150/12.5 400/1.5		28.9	1.2	71.6	27.2	54	20	3
									27.7		66.9	33.1	118	38	8
86	210														
88	208														
90	206	Yellow-orange silty SAND, trace fine-grained gravel, fine- to coarse-grained, loose, saturated.	SP SM		SS	9A	2 4 3	111		4.5	83.4	12.1			
92	204	Attempted shelby tube sample, no recovery.			ST	9B	750/12	0							
94	202														
96	200														
98	198	Yellow-orange clayey SAND, trace silt, trace fine-grained gravel, fine- to medium-grained, trace coarse-grained, loose to medium dense, wet.	SC		SS	10	1 2 7	9	37.6		72.6	27.4	86	34	5
100	196														

Completion Depth: 169.5
Drilling Rig: CME-75
Weather: Sunny, mid 90's F

Remarks: Hole grouted immediately upon completion. Average fluid weight 13.7 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-11

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,154.0
Easting: 54,970.0
Surface Elevation: 295
Datum: MSL

Date Started: 7/17/00
Date Completed: 7/19/00
Drill Method: 8" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
100	194														
102	192														
104	190	Poorly graded SAND, with clay, trace silt, fine- to medium-grained, dense, wet. Clayey stringers throughout.	SP SC		SS	11	7 13 17	30	44						
106	188														
108	186	Light brown-orange, yellow-tan, black innerbedded silty/clayey SAND, SILT and CLAY, trace carbonaceous material, dense/hard, moist.	SM		SS	12	11 23 23	46	100						
110	184														
112	182	Greenish-brown mottled light grey silty SAND, trace clay, fine- to medium-grained, medium dense, wet.	SM		SS	13	7 9 8	17	111	27.8		77.1	22.9		
114	180														
116	178														
118	176	Orange, yellow-orange, yellow-tan poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, medium dense, wet.	SP SM		SS	14	6 5 17	22	100	30.8	1.5	88.9	9.6		
120	174														
122	172														
124	170	Yellow-orange poorly graded SAND, with silt, fine-grained, trace medium- to coarse-grained, very dense, saturated. Thin clay laminae and carbonaceous particles visible.	SP SM		SS	15	23 23 46	69	78	22.3		94.5	5.5		

Completion Depth: 169.5
Drilling Rig: CME-75
Weather: Sunny, mid 90's F

Remarks: Hole grouted immediately upon completion. Average fluid weight 13.7 lb/gal.

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LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 12:36

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-11

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,154.0
Easting: 54,970.0
Surface Elevation: 295
Datum: MSL

Date Started: 7/17/00
Date Completed: 7/19/00
Drill Method: 8" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
126	170															
128	168	Similar to above.	SP SM		SS	16	26 30 30	60	50							
130	166															
132	164															
134	162	Similar to above grading with carbonaceous material, fine- to medium-grained, saturated.	SP SM		SS	17	26 50/5	>100	61	24.1		93.9	6.1			
136	160															
138	158	Similar to above with grading with silt nodules, dense. Light brown, black, tan clay laminae observed.	SP SM		SS	18	20 25 24	49	56							
140	156															
142	154															
144	152	Yellow-orange clayey SAND, fine-grained, trace medium-grained, medium dense, wet. Trace shell fragments.	SC		SS	19	6 10 11	21	111	31.7		77.6	22.4	51	27	24
146	150															
148	148															
150	146	Yellow-orange silty SAND, very fine-grained, very dense, moist.	SM		SS	20	29 31 27	58	61							

Completion Depth: 169.5
Drilling Rig: CME-75
Weather: Sunny, mid 90's F

Remarks: Hole grouted immediately upon completion. Average fluid weight 13.7 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-11

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,154.0
Easting: 54,970.0
Surface Elevation: 295
Datum: MSL

Date Started: 7/17/00
Date Completed: 7/19/00
Drill Method: 8" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
150	144														
152	142						WH								
154		Yellow-orange sandy SILT, loose, wet. Light green and light brown-orange clay laminae throughout, soft, moist.	ML		SS	21A	WH 108/21 500/3	133	32.7		34.9	65.1	39	28	11
140		Tan fat CLAY with fine-grained sand, wet.	CH		ST	21B		100	36.6		23.7	76.3	83	27	56
156	138														
158	136	Yellow-orange poorly graded SAND, trace clay, fine- to coarse-grained, very dense, moist.	SP		SS	22	22 30/5	>100	100						
160	134														
162	132														
164		Yellow-orange poorly graded SAND, trace silt, medium- to coarse-grained, very dense, saturated.	SP		SS	23	28 44 50	94	94						
166	130														
168	128														
170	126	Completed boring at 169.5'			SS	24	10/.1	>100	0						
172	124														
174	122														
	120														

Completion Depth: 169.5
Drilling Rig: CME-75
Weather: Sunny, mid 90's F

Remarks: Hole grouted immediately upon completion. Average fluid weight 13.7 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-12

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,389.1
Easting: 55,050.6
Surface Elevation: 291.2
Datum: MSL

Date Started: 7/15/00
Date Completed: 7/17/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0	290	Fill.														
2	288															
4	286															
6	284															
8	282	Approximate onginal ground.														
10	280															
12	278															
14	276															
16	274															
18	272															
20	270															
22	268															
24																

Completion Depth: 154
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole grouted immediately upon completion. Ave fluid weight is 13.4 lb/gal.

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DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-12

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,389.1
Easting: 55,050.6
Surface Elevation: 291.2
Datum: MSL

Date Started: 7/15/00
Date Completed: 7/17/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
26	266														
28	264														
30	262														
32	260														
34	258														
36	256														
38	254														
40	252														
42	250														
44	248	Yellow-orange silty SAND, trace clay, fine- to medium-grained, medium dense, moist. Thin white clay/silt laminae throughout.	SM		SS	1	7 10 11	21	83						
46	246														
48	244														
50	242	Light brown-orange interbedded silty/clayey SAND, fine- to medium-grained, medium dense, moist. Lavender and light brown-red clay seams (3-4mm)	SC SM		SS	2	6 9 11	20	67	17.6		81.3	18.7		

Completion Depth: 154
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole grouted immediately upon completion. Ave fluid weight is 13.4 lb/gal.

LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 12:36

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-12

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,389.1
Easting: 55,050.6
Surface Elevation: 291.2
Datum: MSL

Date Started: 7/15/00
Date Completed: 7/17/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
50	240														
52	238	Red clayey SAND, fine- to medium-grained, trace coarse-grained, medium dense, moist. Thin clay laminae throughout.	SC		SS	3	9 7 17	24	67	18.0		80.8	19.2			
54	236														
56	234														
58	232	Dark yellow-orange poorly graded SAND, with silt, dense, wet. Bottom 4" yellow-orange/red interbedded.	SP SM		SS	4	11 16 20	36	50						
60	230														
62	228	Red to yellow-orange silty SAND, fine- to medium-grained, trace coarse-grained, dense, moist.	SM		SS	5	11 17 21	38	67	19.9		87.5	12.5		
64	226														
66	224														
68	222	Similar to above, grades less silt, trace fine-grained gravel.	SP SM		SS	6	15 22 24	46	61						
70	220														
72	218														
74		Reddish-brown poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, dense, wet	SP SM		SS	7	7 12 14	26		19.2	0.3	89.9	9.8		

Completion Depth: 154
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole grouted immediately upon completion. Ave fluid weight is 13.4 lb/gal.

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LOG OF BORING LETTER SIZE COMB2.GPJ STNWB_CO.GDT 12/11/00 12:36

LOG OF BORING BH-12

DUKE COGEMA
STONE & WEBSTER

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,389.1
Easting: 55,050.6
Surface Elevation: 291.2
Datum: MSL

Date Started: 7/15/00
Date Completed: 7/17/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
76	216															
78	214	Red-brown mottled greenish-grey silty/clayey SAND, fine- to coarse-grained, medium dense, moist. Thin layering visible.	SC SM		SS	8	6 7 10	17	67							
80	212															
82	210															
84	208	Brown poorly graded SAND, with silt, fine- to medium-grained, medium dense, moist.	SC SM		SS	9	11 10 17	27	56	23.2		90.0	10.0			
86	206															
88	204	Yellow-orange silty SAND, fine-grained, trace medium-grained, loose, moist.	SM		SS	10A	6 4 5	9	111	36.4		77.6	22.4			
90	202	Brown silty SAND, trace clay, fine-grained, trace medium- to coarse-grained.	SM		ST	10B	150/2.5 250/2.5 500/8.5		71	30.3		85.2	14.8	41	29	1
92	200															
94	198															
96	196															
98	194	Yellow-orange poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, medium dense, moist.	SP SM		SS	11	8 11 12	23	100	23.1		94.1	5.9			
100	192															

Completion Depth: 154
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole grouted immediately upon completion. Ave fluid weight is 13.4 lb/gal.

78

LOG OF BORING LETTER SIZE COMB2 GPJ STNWB_CO GDT 12/11/00 12:36

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-12

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,389.1
Easting: 55,050.6
Surface Elevation: 291.2
Datum: MSL

Date Started: 7/15/00
Date Completed: 7/17/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
100	190														
102	188						5								
104		Green-grey silty SAND, with clay, trace carbonaceous material, fine- to medium-grained, loose, wet.	SM		SS	12A	2 4	6	128	39.5		76.7	23.3	109	67	42
106	186	Light yellow-tan clayey SAND, fine- to medium-grained, loose to medium dense, wet.	SM		ST	12B	50/19 250/4 500/1		117	36.9		81.4	18.6	59	28	31
108	184	Grey-green silty SAND, with clay, fine- to medium-grained, trace coarse-grained, dense, wet.	SM		SS	13	15 14 18	32	94	31.0		79.0	21.0	62	35	27
110	182															
112	180															
114	178	Interbedded light greyish-green mottled with white/black flecks sandy CLAY, sand is fine- to medium-grained, stiff, wet. Horizontal layering visible.	CH		SS	14	3 5 9	14	133	45.3		47.2	52.8	79	26	53
116	176															
118	174	Light brown-orange poorly graded SAND, with silt, fine- to medium-grained, very dense, wet.	SP SM		SS	15	22 30 37	67	78							
120	172															
122	170															
124	168	Similar to above, grading fine-grained.	SP SM		SS	16	23 34 50	84	78	22.6		93.4	6.6			

Completion Depth: 154
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole grouted immediately upon completion. Ave fluid weight is 13.4 lb/gal.

LOG OF BORING BH-12

DUKE COGEMA STONE & WEBSTER

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:

Northing: 80,389.1

Easting: 55,050.6

Surface Elevation: 291.2

Datum: MSL

Date Started: 7/15/00

Date Completed: 7/17/00

Drill Method: 6" mud rotary

Logged By: JJT

Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
126	166														
	164														
128		Light brown-orange poorly graded SAND, trace silt, dense, very moist to wet.	SP		SS	17	20 25 28	53	33						
	162														
130															
	160														
132															
	158		SP SM		SS	18	7 12 8	20	111	25.3		90.6	9.4			
134		Light orange-brown poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, medium dense, wet. Interbedded with thin clayey layers.													
	156														
136															
	154														
138							100/20 450/4								
	152	Yellow-orange clayey SAND, fine-grained, trace medium- to coarse-grained, wet.	SC		ST	19			113	31.4		82.0	18.0	44	26	1
140															
	150														
142															
	148						7								
144		Yellow-orange sandy CLAY, with silt, fine-grained, trace medium-grained, very stiff, moist. Sandy zone of 1"-2" at 143.2' is saturated.	CH		SS	20	8 8	16	83	34.8		40.4	59.6	57	27	3
	146														
146															
	144														
148							7								
	142	Olive-grey silty SAND, with clay, fine-grained, trace medium- to coarse-grained, medium dense, moist. Grading silttier	SM		SS	21	10 12	22	117	27.5		66.1	33.9			
150															

Completion Depth: 154

Drilling Rig: CME-75

Weather: Sunny, low 90's F

Remarks: Hole grouted immediately upon completion. Ave fluid weight is 13.4 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-12

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,389.1
Easting: 55,050.6
Surface Elevation: 291.2
Datum: MSL

Date Started: 7/15/00
Date Completed: 7/17/00
Drill Method: 6" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
150	140	Light yellow-orange poorly graded SAND, trace silt, trace fine-grained gravel, fine- to coarse-grained, very dense, saturated. completed boring at 154'.	SP		SS	22	43 55/5 >100	56							
152	138														
154	136														
156	134														
158	132														
160	130														
162	128														
164	126														
166	124														
168	122														
170	120														
172	118														
174															

Completion Depth: 154
Drilling Rig: CME-75
Weather: Sunny, low 90's F

Remarks: Hole grouted immediately upon completion. Ave fluid weight is 13.4 lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-13

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,422.5
Easting: 54,905.3
Surface Elevation: 279.5
Datum: MSL

Date Started: 7/20/00
Date Completed: 7/21/00
Drill Method: 8" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0	279	No samples collected in upper 13'.													
2	278														
4	276														
6	274														
8	272														
10	270														
12	268														
14	266	Yellow-orange, pink, orange, lavender-grey SILT, trace clay, medium dense, damp.	ML		SS	1	2 5 7	12	67						
16	264														
18	262	Yellow-orange silty SAND, fine- to medium-grained, medium dense, damp. Thin white clayey laminae (1-3mm) throughout, more with depth. Horizontal layering visible.	SM		SS	2	5 8 11	19	83	14.8		82.8	17.2		
20	260														
22	258														
24	256	Similar to above	SM		SS	3	7 11 12	23	100						

Completion Depth: 154.5
Drilling Rig: CME-75
Weather: Sunny, high 80's F

Remarks: Hole grouted immediately upon completion. Average fluid density 13.4lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-13

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,422.5
Easting: 54,905.3
Surface Elevation: 279.5
Datum: MSL

Date Started: 7/20/00
Date Completed: 7/21/00
Drill Method: 8" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
26	254														
28	252	As above, fine- to medium-grained, trace coarse-grained, moist.	SM		SS	4	7 11 12	23	89	13.1		83.1	16.9		
30	250														
32	248														
34	246	As above.	SM		SS	5A	5 9 11	20	78						
36	244				ST	5B	100/1.5 350/1.5 600/6		54						
38	242	As above, grading less silt, moist.	SM		SS	6	7 11 13	24	72	14.8		85.2	14.8		
40	240														
42	238														
44	236	As above, with thin white laminae, dense, moist.	SM		SS	7	10 17 18	35	56						
46	234														
48	232	Red-brown poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, dense, moist.	SP SM		SS	8	15 22 25	47	61	12.9		94.0	6.0		
50	230														

Completion Depth: 154.5
Drilling Rig: CME-75
Weather: Sunny, high 80's F

Remarks: Hole grouted immediately upon completion. Average fluid density 13.4lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-13

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,422.5
Easting: 54,905.3
Surface Elevation: 279.5
Datum: MSL

Date Started: 7/20/00
Date Completed: 7/21/00
Drill Method: 8" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
50	228														
52															
54	226	As above.	SP SM		SS	9	10 16 21	37	50						
56	224														
58	222														
60	220	As above, reddish-brown, trace fine-grained gravel.	SP SM		SS	10	10 14 19	33	56	14.9	0.6	92.5	6.9		
62	218														
64	216	Pinkish and yellow-orange silty SAND, fine- to coarse-grained, medium dense, moist.	SP SM		SS	11	8 10 15	25	56						
66	214														
68	212														
70	210	Interbedded purple-grey, yellow-orange, light brown, pink and black clayey SAND, trace silt, fine- to medium-grained, trace coarse-grained, loose, wet.	SC		SS	12A	3 2 3	5	133	28.7		74.4	25.6		
72	208	Tan clayey SAND with silt, fine- to medium-grained, trace coarse-grained, wet.	SC		ST	12B	100/4 275/6 600/8		63	20.2		74.3	25.7	39	23
74	206	Reddish-brown silty SAND, fine-grained, medium dense, moist.	SM		SS	13	8 10 14	24	67						

Completion Depth: 154.5
Drilling Rig: CME-75
Weather: Sunny, high 80's F

Remarks: Hole grouted immediately upon completion. Average fluid density 13.4lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-13

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,422.5
Easting: 54,905.3
Surface Elevation: 279.5
Datum: MSL

Date Started: 7/20/00
Date Completed: 7/21/00
Drill Method: 8" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in	N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
76	204															
78	202															
		Yellow-orange silty SAND, fine- to medium-grained, trace coarse-grained, medium dense, wet. Tan fine-grained sand at bottom of sample.	SM		SS	14	5 9 13	22		26.7		86.2	13.8			
80	200															
82	198															
84	196	Greenish-tan silty SAND, with clay, fine- to medium-grained, trace coarse-grained, medium dense, moist.	SM		SS	15A	4 5 9	14				60.9	39.1	94	52	4
86	194	Tan poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, wet.	SP SM		ST	15B	100/5 150/7 450/5.5		100	21.8		90.6	9.4	52	31	2
88	192															
		Yellow-orange mottled black silty SAND, trace clay, fine- to coarse-grained, medium dense, moist.	SM		SS	16	4 7 10	17	100							
90	190															
92	188															
94	186	Greenish-grey mottled light brown orange and black silty SAND, fine- to medium-grained, trace coarse-grained dense, wet.	SM		SS	17	8 13 21	34	117	34.4		79.2	20.8			
96	184															
98	182															
		Hard white layer (calcite?) at 98.4'. Light greenish-grey speckled black motteled yellow-orange SILT, trace fine-grained sand, loose, wet to moist.	ML		SS	18A	3 2 2	4	100							
100	180															

Completion Depth: 154.5
Drilling Rig: CME-75
Weather: Sunny, high 80's F

Remarks: Hole grouted immediately upon completion. Average fluid density 13.4lb/gal.

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LOG OF BORING LETTER SIZE COMB2.GPJ STNWB.CO.GDT 12/11/00 08:57

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-13

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,422.5
Easting: 54,905.3
Surface Elevation: 279.5
Datum: MSL

Date Started: 7/20/00
Date Completed: 7/21/00
Drill Method: 8" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
100		Yellow-brown clayey SAND, fine- to medium-grained, trace fine-grained gravel, moist.	SC		ST	18B	100/15 200/2 800/2	79	28.0	3.7	79.4	16.9	50	27	2
102	178														
104	176	Yellow-orange to milky-white/clear interbedded poorly graded SAND and silty SAND, fine- to coarse-grained, dense, wet. Grey-green 1" silt layer between sand layers.	SP SM		SS	19	10 13 26	39							
106	174														
108	172	Tan-grey poorly graded SAND, with silt, fine-grained, trace coarse-grained, very dense, saturated. Becomes orange-yellow.	SP SM		SS	20	31 41 42	83	23.2		93.7	6.3			
110	170														
112	168														
114	166	Orange-yellow poorly graded SAND, with silt, fine-grained, very dense, saturated.	SP SM		SS	21	23 28 31	59							
116	164														
118	162	Dark yellow-orange poorly graded SAND, with silt, fine-grained, very dense, saturated.	SP SM		SS	22	23 34 38	72	78						
120	160														
122	158														
124	156	Dark yellow-orange/light brown-orange clayey SAND, fine-grained, trace medium-grained, loose, wet. Trace spiral shell fragments.	SC		SS	23A	WH 1 6	7	35.5		75.5	24.5	55	26	2

Completion Depth: 154.5
Drilling Rig: CME-75
Weather: Sunny, high 80's F

Remarks: Hole grouted immediately upon completion. Average fluid density 13.4lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-13

Project Name: MOX Fuel Fabrication Facility
Location: DOE Savannah River Site
Job Number: 08716

Boring Location:
Northing: 80,422.5
Easting: 54,905.3
Surface Elevation: 279.5
Datum: MSL

Date Started: 7/20/00
Date Completed: 7/21/00
Drill Method: 8" mud rotary
Logged By: JJT
Reviewed By: FJW/JKM

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
126	154	Yellow-tan clayey SAND, fine-grained, wet.	SC		ST	23B					75.0	25.0	62	26	36
128	152	As above, but with thin greenish silt/clay laminae, medium dense.	SC		SS	24	WR 6 5	11	133						
130	150														
132	148														
134	146	Brown sandy CLAY, with silt, fine- to medium-grained, trace coarse-grained, very stiff, wet.	CH		SS	25	6 8 10	18	133	27.1	42.3	57.7	52	23	29
136	144														
138	142	Light brown-orange silty SAND, trace clay, trace fine-grained gravel, fine- to coarse-grained, dense, moist.	SM		SS	26	6 10 25	35	133						
140	140														
142	138														
144	136	Yellow-orange poorly graded SAND, with silt, fine- to medium-grained, very dense, wet to saturated.	SP SM		SS	27	31 34 50	84	72						
146	134														
148	132														
150	130	Yellow-orange to dark orange poorly graded SAND, with silt, with clayey stringers, fine- to coarse-grained, very dense, wet to saturated.	SP SM		SS	28	42 50/3	>100	56						

Completion Depth: 154.5
Drilling Rig: CME-75
Weather: Sunny, high 80's F

Remarks: Hole grouted immediately upon completion. Average fluid density 13.4lb/gal.

DUKE COGEMA
STONE & WEBSTER

LOG OF BORING BH-13

Project Name: MOX Fuel Fabrication Facility

Location: DOE Savannah River Site

Job Number: 08716

Boring Location:
Northing: 80,422.5
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Date Started: 7/20/00
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Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	USCS Classification	Graphic Log	Sample Type	Sample/Run No.	Blows/6" Press./Int. psi/in N Value (uncorrected)	Recovery (%)	Water Content (%)	% Gravel	% Sand	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
150	128	Black silty poorly graded SAND, with silt, fine- to medium-grained, trace coarse-grained, very dense, wet.	SP SM		SS	29	9 22 31	53	133	25.9		92.1	7.9			
152	126	Completed boring at 154.5'.													
154	124														
156	122														
158	120														
160	118														
162	116														
164	114														
166	112														
168	110														
170	108														
172	106														
174															

Completion Depth: 154.5
Drilling Rig: CME-75
Weather: Sunny, high 80's F

Remarks: Hole grouted immediately upon completion. Average fluid density 13.4lb/gal.

QUALITY LEVEL QL-1, IROFS

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ATTACHMENT NUMBER 2

CONE PENETRATION TESTING AT THE MIXED OXIDE FUEL FABRICATION FACILITY (MFFF) FINAL REPORT OCTOBER 17, 2000

CONE PENETRATION TESTING AT THE MIXED OXIDE FUEL FABRICATION FACILITY (MFFF) SAVANNAH RIVER SITE AIKEN, SOUTH CAROLINA

Final Report

Copy 5

Prepared for:

Duke Cogema Stone & Webster, LLC
400 South Tryon Street
Charlotte, NC 28202

Prepared by:

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New England Division
415 Waterman Road
South Royalton, Vermont 05068

ARA Report No. 0198

October 17, 2000

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LIST OF TABLES

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