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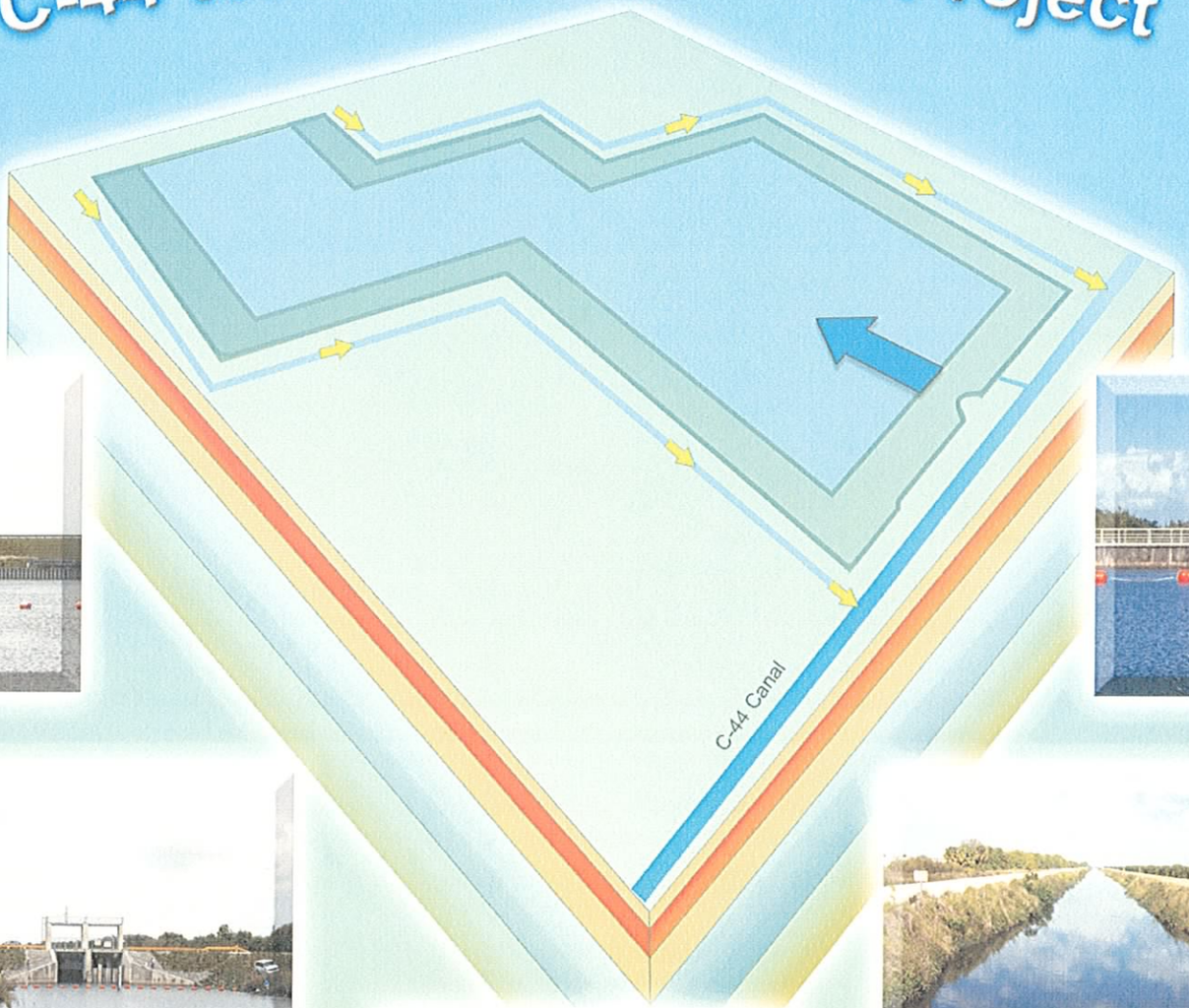
Preliminary Geotechnical Engineering Evaluation for the C-44 Water Management Project

Aquacalma



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Appendices

APPENDIX B

Subsurface Exploration and Preliminary Geotechnical Engineering Evaluation

Reservoir and Stormwater Treatment Area Project

Indiantown, Florida

By

Ardaman & Associates, Inc.

SUBSURFACE EXPLORATION AND PRELIMINARY
GEOTECHNICAL ENGINEERING EVALUATION
TROUP-INDIANTOWN WATER CONTROL DISTRICT
RESERVOIR AND STORMWATER TREATMENT
AREA PROJECT
INDIANTOWN, MARTIN COUNTY, FLORIDA

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Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

File No. 03-2197
January 8, 2004

LBFH, Inc.
3550 Southwest Corporate Parkway
Palm City, Florida 34990

Attention: Mr. Lennart J. Lindahl, P.E.

SUBSURFACE EXPLORATION AND PRELIMINARY GEOTECHNICAL ENGINEERING EVALUATION TROUP-INDIANTOWN WATER CONTROL DISTRICT RESERVOIR AND STORMWATER TREATMENT AREA PROJECT INDIANTOWN, MARTIN COUNTY, FLORIDA

1.0 INTRODUCTION

In accordance with your request and authorization, Ardaman & Associates, Inc. (AAI) has completed a preliminary subsurface exploration and geotechnical engineering program for the above captioned project site. We explored the general subsurface conditions in order to evaluate their suitability for supporting future levee construction and water distribution structures for a proposed reservoir and stormwater treatment area (RSTA), to obtain a measure of pertinent engineering properties of subsurface materials, and to provide general recommendations for site preparation, levee design and construction, and foundation design. This report describes our explorations and tests, reports their findings, and summarizes our conclusions and recommendations.

Our report has been prepared specifically for this project. It is intended for the exclusive use of LBFH, Inc. (LBFH), Troup-Indiantown Water Control District (Troup), Consolidated Citrus Limited Partnership, Hodgson Grove (Consolidated), their subsidiaries, and their representatives. Our work has used methods and procedures consistent with local foundation and soil engineering practices. No other warranty, expressed or implied, is made. We do not guarantee project performance in any respect, only that our work meets normal standards of professional care.

2.0 PERTINENT SITE INFORMATION

2.1 SITE LOCATION

The proposed Troup-Indiantown Water Control District Reservoir and STA (RSTA) site is located in Sections 2, 3, 4, 5, 8, 9, 10, 11, 13, 14, 15, 16, 17, 22, 23, 24, 25, 26, 27, 34, 35, and 36, Township 39 South, Range 39 East in Martin County, Florida. More specifically, the site is located approximately 3 miles northeast of Indiantown, north of County Road 726 and east of County Road 609 in Martin County, Florida. A site vicinity map is presented as our Figure 1.

2.2 SITE DESCRIPTION

The site encompasses approximately 12,000 acres of active citrus groves. The site is mainly occupied by citrus trees, in addition to various drainage ditches and unpaved roadways found throughout the site. A maintenance compound is located near the center of the site. The site is bounded by County Road 726 and then the C-44 Canal (a.k.a. the St. Lucie Canal) to the south, by citrus groves and pasture land to the east, and by undeveloped pasture land to the north and west.

2.3 SITE TOPOGRAPHY

Based on our review of the U.S. Geological Survey, 7.5 Minute Series Topographic Quadrangle map of "Indiantown, Florida" from 1953 (photorevised 1983), the subject site appears to be relatively level with ground surface elevations ranging from approximately 26 to 28 feet with respect to the National Geodetic Vertical Datum (NGVD) of 1929.

2.4 USDA SOIL SURVEY

The Soil Survey of Martin County, Florida, which was issued by the U.S. Department of Agriculture, Soil Conservation Service in 1981, states that the predominant surficial soil types in the area where the site is located are as follows:

(16) Oldsmar fine sand which consists of very poorly drained sandy soil that is in broad areas in the flatwoods. The slopes are smooth and range from 0 to 2 percent. The available water capacity is very low in the surface and subsurface layers and medium in the subsoil. Permeability is rapid in the surface and subsurface layers. It is moderately rapid to moderately low in the upper sandy part of the subsoil and slow to very slow in the lower loamy part. The water table is within 10 inches of the surface during the rainy season. It is at a depth of 10 to 40 inches for 6 months or more and recedes to greater depths during extended dry periods.

(17) Wabasso sand which consists of poorly drained sandy soil that is in broad open land areas in the flatwoods. The slopes are smooth and range from 0 to 2 percent. The available water capacity is very low in the surface and subsurface layers, medium in the subsoil, and low in the substratum. Permeability is rapid in the surface and subsurface layers, moderate in the sandy part of the subsoil and slow to very slow in the lower loamy part. The water table is within 10 inches of the surface during the rainy season. It is at a depth of 10 to 40 inches for 6 months or more and recedes to greater depths during extended dry periods.

(19) Winder sand which consists of poorly drained sandy soil that is in long, low depressions in the flatwoods. The slopes are smooth to concave and are less than 2 percent. The available water capacity is low in the surface and subsurface layers and medium in the subsoil. Permeability is rapid in the surface and subsurface layers. It is moderately rapid to moderately low in the upper sandy part of the subsoil and slow to very slow in the lower loamy part. This soil is ponded for 6 to 9 months of the year and the water table is at a depth of less than 40 inches the rest of the time.

(20) Riviera fine sand which consists of poorly drained sandy soil that is in broad, low flats and in drainageways. The slopes are smooth to concave and range from 0 to 2 percent. The available water capacity is low in the surface and subsurface layers and medium in the subsoil. Permeability is rapid in the surface and subsurface layers and slow to very slow in the subsoil. The water table is at a depth of less than 10 inches for 2 to 4 months and at a depth of 20 to 30 inches the rest of the time.

(21) Pineda sand which consists of poorly drained sandy soil that is in low grassy flats. The slopes are smooth and dominantly less than 1 percent but range from 0 to 2 percent. The available water capacity is very low in the surface and subsurface layers and substratum and medium in the subsoil. Permeability is rapid, except it is slow to very slow in the lower part of the subsoil. The water table is within 10 inches for 2 to 6 months during wet seasons and at a depth of 10 to 40 inches most of the remaining time. Some areas are covered in places with shallow water for 1 to 2 months.

(27) Arents, organic stratum which consists of poorly drained fill material that was excavated and spread over organic soils. The slopes are smooth and range from 0 to 2 percent. The available water capacity is variable but generally low in the mineral soil layers and high in organic layers. Permeability is mainly rapid. The water table is at a depth of 20 to 40 inches during most of the year.

(36) Arents, which consists of poorly to well drained fill material that was excavated and spread over surface of wet mineral soils. The slopes are smooth and range from 0 to 2 percent. The available water capacity is variable but generally low. Permeability is variable but generally is rapid. The water table is below a depth of 30 inches during most of the year.

(38) Floridana fine sand, depressional which consists of nearly level, very poorly drained soil. It is in the wet sloughs and depressions. The slopes are smooth to concave and range from 0 to 2 percent. The available water capacity is medium in the surface layer and the subsoil and low in the subsurface layers. Permeability is rapid in the surface and subsurface layers and slow to very slow in the subsoil. This soil is ponded for more than 6 months of the year and the water table is at a depth of less than 10 inches the rest of the time.

(42) Hallandale sand which consists of poorly drained sandy soil that is in broad, low flats and along the edges of drainageways. The slopes are smooth and are 1 percent or less. The available water capacity is low. Permeability is rapid. This soil is periodically covered with shallow water for few days to a month. Generally, the water table is at a depth of less than 10 inches during wet seasons and a depth of 10 to 30 inches for the rest of the year.

(44) Boca fine sand which consists of poorly drained sandy soil in areas of flatwoods. Slopes are less than 2 percent. The available water capacity is low in the surface layer, very low in the subsurface layer, and medium in the subsoil. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The water table is at a depth of less than 10 inches for 2 to 4 months during wet seasons and below 60 inches during the dry season.

(45) Hilolo fine sand which consists of poorly drained sandy soil in hammocks and along borders of depressions and sloughs. Slopes are smooth to convex and range from 0 to 2 percent. The available water capacity is low to medium in the surface layer and medium in the subsoil and substratum. Permeability is rapid in the surface layer, moderate to moderately slow in the subsoil, and slow to very slow below the subsoil. The water table is at a depth of less than 10 inches for 2 to 4 months during wet seasons and at a depth of 10 to 40 inches for 6 to 9 months and below 40 inches during the dry season.

(47) Pinellas fine sand which consists of poorly drained sandy soil in flatwoods and hammock areas bordering sloughs and depressions. Slopes are smooth and range from 0 to 2 percent. The available water capacity is very low in the surface layer and medium in the subsurface layer and the subsoil. Permeability is rapid in the surface and subsurface layer and moderate in the subsoil. The water table is within a depth of 10 inches for less than 3 months and a depth of 10 to 40 inches for 4 to 6 months during most years. The water table can recede to a depth of more than 40 inches during extended dry periods.

(48) Jupiter sand which consists of poorly drained sandy soil in areas of low flats and hammocks along the fringes of broad, marshy drainageways. Slopes are smooth to convex and are dominantly 1 percent or less. The available water capacity is low to medium in the surface layer. Permeability is rapid in the sandy surface layer and moderate to rapid in the substratum. Some areas of this soil are covered with water for brief periods in the wet season. The water table is at a depth of less than 10 inches for 2 to 4 months in the wet season and 10 to 40 inches in drier seasons.

(49) Riviera fine sand, depressional which consists of poorly drained sandy soil in areas of depression. The slopes are smooth to concave and range from 0 to 2 percent. The available water capacity is low in the surface and subsurface layers, medium in the upper 10 inches of the subsoil and low below this. Permeability is rapid in the sandy surface and subsurface layers, slow or very slow in the upper part of the subsoil, and rapid below this. This soil is ponded for more than 6 months of the year and the water table is at a depth of 10 to 40 inches the rest of the time.

(54) Oldsmar fine sand, depressional which consists of poorly drained sandy soil in areas of wet depressions in the flatwoods. The slopes are smooth to concave and range from 0 to 2 percent. The available water capacity is very low in the surface and subsurface layers and medium in the subsoil. Permeability is rapid in the surface and subsurface layers. It is rapid to moderately slow in the upper sandy part of the subsoil and slow to very slow in the loamy part. This soil is ponded for more than 6 months of the year and the water table is within 10 inches of the surface the rest of the time.

(57) Chobee loamy sand which consists of very poorly drained sandy soils in areas of small to large depressions and poorly defined drainageways and on broad, low flats. The slopes are smooth to concave and range from 0 to 2 percent. The available water capacity is medium. Permeability is moderately rapid in the surface layer and slow or very slow in the subsoil and substratum. The water table is above the surface or within a depth of 10 inches for 6 to 9 months and at a depth of 10 to 30 inches for short periods during dry seasons.

(58) Gator muck which consists of very poorly drained soils in areas of wet depressions and broad marsh areas. The slopes are 1 percent or less. The available water capacity is high in organic layers, medium in loamy layers, and low in the underlying sandy material. Permeability is rapid in the organic layer and moderate in the loamy layer. In the natural condition, this soil is covered with water, or the water table is within a depth of 10 inches except in extended dry seasons.

(60) Tequesta Variant Muck which consists of very poorly drained soil in areas of depressions and marshy areas. The slopes are smooth to concave and range from 0 to 2 percent. The available water capacity is very high in organic surface layer, low in the sandy layers below the organics material, and medium in the subsoil. Permeability is rapid in the organic surface and sandy surface and moderate slow or slow in the subsoil. The water table is above the surface or within a depth of 10 inches for 6 to 9 months or more.

(64) EauGallie fine sand which consists of poorly drained sandy soil that is in broad areas in the flatwoods. The slopes are smooth and range from 0 to 2 percent. The available water capacity is very low in the surface and subsurface layers, low to medium in the subsoil, and low in the substratum. Permeability is rapid in the surface and subsurface layers and moderate to moderately rapid in the subsoil and substratum. Generally, the water table is at a depth of less than 10 inches during wet seasons and within a depth of 40 inches for more than 6 months.

Complete descriptions of these soil types and the soil series to which they belong are presented in Appendix 1.

3.0 PROJECT DESCRIPTION

It is our understanding that the Troup-Indiantown Water Control District RSTA project will consist of constructing a number of interconnected ponds to treat runoff pumped from the adjacent C-44 canal.

Based on our experience with similar projects, we have assumed that the water level in the RSTA will be relatively shallow, say less than 5 feet, and that several internal levees will be constructed to reduce wave action and to promote sedimentation of nutrients. The anticipated maximum height of levees is 10 to 20 feet and we expect that a number of interior weir structures and a few pump stations will be required for the project. We further understand that although the anticipated location of the perimeter/exterior levees (i.e. the site boundary) has been determined with some certainty, at this point in time there are no specific plans for the actual design or location of the interior levees, or any pump structures or weir systems. Thus, the main purpose of our field exploration program and geotechnical studies is to obtain general subsurface soil information so that preliminary recommendations can be provided for geotechnical and hydrogeological aspects of the project.

Additional explorations will have to be performed at a later date to provide specific information for the design of levee cross-sections, seepage analyses, and foundations for various structures needed to control the water levels and circulate the water within the RSTA.

4.0 FIELD EXPLORATION

4.1 SUBSURFACE PROFILE - HYDROLOGY

Eight (8) Standard Penetration Test (SPT) borings (B-1 through B-8) were performed at various locations across the RSTA to determine the subsurface profile to depths of 100 feet and to establish the nature of soils and rock underlying the site to determine if there are potential aquicludes or aquitards that might affect the rate of infiltration of ponded water into the ground. The findings of these borings were used to establish the depth at which borehole permeability tests would have to be performed, and the depth at which groundwater quality monitoring wells would be installed. The borings were performed at the locations shown on the Boring Location Plan, Figure 2 in accordance with the procedures recommended in ASTM D-1586. The boring logs and a description of our drilling and testing procedures are included in Appendix 2.

4.2 SUBSURFACE PROFILE - BORROW

A total of sixty-eight (68) solid-stem auger borings (A-1 through A-68) were performed in a grid pattern across the site to determine if suitable borrow materials are present within the interior of the site for use in the construction of the levees, and if there will be difficulties in excavating due to the presence of shallow rock layer and/or a high groundwater table. The auger borings were performed at the locations shown on the Boring Location Plan, Figure 2 in accordance with the procedures recommended in ASTM D-1452. The boring logs and a description of our drilling and testing procedures are included in Appendix 2.

4.3 SUBSURFACE PROFILE - BORROW AND HYDROLOGY

To complement the auger borings and more accurately determine the density of the encountered soils, and to provide additional information for the determination of shallow aquicludes or aquitards that might affect the rate of infiltration of ponded water into the ground, a total of thirty-three (33) SPT borings (B-9 through B-41) were performed to depths of about 45 feet below the existing grade. These borings were performed at the locations shown on the Boring Location Plan, Figure 2 in accordance with the procedures recommended in ASTM D-1586. The boring logs and a description of our drilling and testing procedures are included in Appendix 2.

4.4 GENERAL

The desired arrangement of the borings was discussed with representatives of LBFH and Consolidated prior to commencement of the field work, and the boring locations shown on our Boring Location Plan, Figure 2 were then laid out by our AAI staff using hand-held Global Positioning System (GPS) devices and land coordinates provided by LBFH. Representatives of Consolidated were consulted periodically as needed as it related to the sequence of the boring locations such that our field work minimized disturbance of grove operations. In addition, some boring locations were relocated in the field to avoid conflicts with existing infrastructure and on-going grove operations. In general, the borings were performed within existing roadways or by the end of drainage ditches. We estimate that the actual boring locations are within about 100 feet of the locations shown in Figure 2.

The soil samples recovered from our explorations will be kept in our laboratory for 60 days, then discarded unless you request otherwise.

4.4.1 Description of Soil Borings

Our borings describe subsurface conditions only at the locations drilled and at the time drilled. They provide no information about subsurface conditions below the bottom of the boreholes. At locations not explored, surface conditions that differ from those observed in the borings may exist and should be anticipated.

The information reported on our boring logs is based on our drillers' logs and on visual examination in our laboratory of disturbed soil samples recovered from the borings. The distinction shown on the logs between soil types is approximate only. The actual transition from one soil to another may be gradual and indistinct.

The groundwater depth shown on our boring logs is the water level the driller observed in the borehole when it was drilled. These water levels may have been influenced by the drilling procedures, especially in borings made by rotary drilling with bentonitic drilling mud. An accurate determination of groundwater level requires long-term observation of suitable monitoring wells. Fluctuations in groundwater levels throughout the year should be anticipated.

The absence of a groundwater level on certain logs indicates that no groundwater data is available or was recorded. It does not mean that no groundwater will be encountered at that boring location.

4.4.2 Standard Penetration Test Borings

The Standard Penetration Test is a widely accepted method of testing foundation soils in place. The N-Value obtained from the test has been correlated empirically with various soil properties. These empirical correlations allow satisfactory estimates to be made of how the soil is likely to behave when subjected to foundation loads. Tests are usually performed in the boreholes at intervals of five feet. In addition, our Firm performs tests continuously in the interval directly below the expected foundation bearing grade where the soil will be most highly stressed.

Boreholes where Standard Penetration Tests will be performed are drilled with a truck- or all-terrain vehicle-mounted CME 45 drill rig or a CME 55 drill rig. The boreholes are advanced by rotary drilling with a winged bit that makes a hole about three inches in diameter. A bentonitic drilling mud is recirculated in order to remove the cuttings and support the walls of the borehole. The drag bit is specially modified to direct the mud upward and reduce disturbance of the soil ahead of the bit. If access is not available for our truck-mounted drilling equipment, portable tripod drilling equipment can be used instead.

Occasionally, running or squeezing ground is encountered that cannot be stabilized by the drilling mud alone. In addition, drilling mud may be lost into the soil or rock strata that are unusually pervious. In such cases, flush-coupled steel casing with an outside diameter of about 3.5 inches is driven as a liner for the borehole.

After the borehole has been advanced to the depth where a Standard Penetration Test will be performed, the soil sampler used to run the test is attached to the end of the drill rods and lowered to the bottom of the borehole. The testing procedure used conforms closely to the methods recommended in ASTM D-1586. The sampler used has a split-barrel 24 inches long and an outside diameter of 2.0 inches. It is driven into the ground below the bottom of the borehole using a hammer that weighs 140 pounds and falls 30 inches. The driller records the number of hammer blows needed to advance the sampler in successive increments of six inches. The total number of blows required to advance the sampler the second and third six-inch increments constitutes the test result; that is, the N-value at the depth. The test is completed after the sampler has been driven not more than 24 inches or when refusal is encountered, whichever occurs first. Refusal occurs when 50 hammer blows advance the sampler six inches or less. After the test is completed, the sampler is removed from the borehole and opened.

The driller examines and classifies the soil recovered by the sampler. He places representative soil specimens from each test in closed glass jars or plastic bags and takes them to our laboratory. In the laboratory, additional evaluations and tests are performed, if needed. The driller's classifications may be adjusted, if necessary, to conform more closely with the United Soil Classification System (USCS).

After completion of a test boring, the water level in the borehole may or may not be recorded.

4.4.3 Solid-Stem Auger Borings

Solid-stem auger borings are used when a relatively large, continuous sampling of soil strata close to the ground surface is desired. The testing procedure used conforms closely to the methods recommended in ASTM D-1452. A 4-inch diameter continuous flight, helical auger with a cutting head at its end is screwed into the ground in 5 foot sections. It is powered by the rotary drill rig. The samples are recovered by withdrawing the auger out of the ground without rotating it. The soil samples so obtained, are described and representative samples put in jars or bags and returned to the laboratory for further classification and testing, if necessary.

4.5 WELL INSTALLATIONS AND FIELD PERMEABILITY TESTS

In order to estimate the hydraulic conductivity of the levee foundation soils and deeper strata, a total of sixteen (16) permanent 2-inch diameter monitoring wells were installed in clusters at 5 selected locations throughout the site. The wells were installed by a well contractor licensed by the South Florida Water Management District (SFWMD) using rotary-mud drilling. The wells were constructed of 2-inch diameter schedule 40 PVC with 0.010 slot screens at predetermined depths. The wells were sand packed with 20/30 grade sand to a depth of two feet above the screens, after which they were bentonite sealed for 10 feet and then backfilled with cuttings. Steel man holes were installed at the ground surface, set in 2 foot by 2 foot concrete pads.

The depth of the wells and their screened intervals is summarized in Appendix 3. Following the well installations, field permeability tests (constant head and falling head) were performed in the installed wells. The results of these tests are also attached in Appendix 3.

Finally, groundwater samples were collected from various well locations and the samples submitted to a laboratory for analytical testing to determine basic physical characteristics, and other constituents as required by the project participants. The sampling procedures and the test results are discussed in detail in Section 8.4. Groundwater sampling logs for each well are attached in Appendix 4, and a copy of the laboratory reports can be found in Appendix 5.

5.0 GENERAL SUBSURFACE CONDITIONS

The boring logs and soil profiles shown in Appendix 2 present a detailed description of the soils encountered at the locations and the depths explored. The soil stratification shown on the boring logs is based on examination of recovered soil samples, interpretation of the driller's field logs, and the results of our laboratory testing program. It indicates only the approximate boundaries between soil types. The actual transitions between adjacent soil strata may be gradual and indistinct.

In very general terms the soils throughout the site consist generally of alternating layers of fine sand and slightly clayey to clayey fine sand from the existing ground surface to depths of approximately 15 to 20 feet, followed by fine sand and slightly silty fine sand with varying amounts of shell and cemented fragments reaching the termination depths of our deepest borings at 100 feet.

Several exceptions to the above described subsurface conditions were observed throughout the site as follows: (1) Borings A-19, A-20, A-46, A-51, B-10, B-21 and B-32, performed along the southern perimeter of the site along the C-44 Canal, encountered a layer of soft gray silt approximately 1 to 2 feet in thickness and starting at depths ranging from 3.5 to 7.5 feet below the ground surface, possibly a dredge deposit. (2) Boring B-41, performed at the south end of "Section A" (refer to Figure 2), encountered a layer of dark brown fibrous organics approximately 1.5 feet in thickness and starting at a depth of about 5 feet. (3) Boring B-56, performed within the southern one-third of "Section E", encountered a layer of dark brown fibrous organics approximately 5 feet in thickness and starting at a depth of about 4 feet. (4) Our borings B-7, B-

18, B-19, B-22, B-26, B-30, B-32 and B-33 encountered a layer of sandy fragmented limestone. The thickness and depth of the encountered limestone stratum varies widely throughout the site. (5) Boring B-2, performed within the northwestern section of the site, encountered a layer of soft gray clay at depths between 64 and 69 feet, followed by a layer of stiff slightly sandy silt reaching a depth of about 75 feet.

Overall, given the number of borings performed and the size of the project, these variations are considered to have little impact on the RSTA project, however, some consideration should be given to further explore the areas where buried organics were encountered. This is discussed further.

6.0 GROUNDWATER CONDITIONS

The groundwater was observed in the boreholes at the time of drilling and was generally encountered at relatively shallow depths. Due to the inherent inaccuracy of measuring the groundwater table at the time of drilling these readings are not recorded on the boring logs and consequently, more reliable groundwater readings were obtained from the installed wells, with the observed groundwater depths ranging from 5 to 8 feet below grade.

Fluctuations in groundwater level on this site should be anticipated throughout the year due to a variety of factors, the most important of which is recharge from rainfall. We expect that groundwater conditions are controlled by rainfall events and to a degree by a combination of the level of water in the on-site drainage ditches, and for the very southern portion of the site the level of water in the nearby C-44 canal. Groundwater levels somewhat above the present levels should be expected after periods of heavy rains.

6.1 TYPICAL SEASONAL HIGH WATER TABLE

The typical seasonal high water table each year is the level in the August-September period at the end of the rainy season. The water table elevations associated with a 100-year flood level would be much higher than the seasonal high water table elevations. The normal high water levels would more approximate the seasonal high water table elevations.

The seasonal high water table is affected by a number of factors. The drainage characteristics of the soils, the land surface, relief points such as lakes, rivers, swamp areas, etc. and distance to relief points are some of the more important factors influencing the seasonal high water table elevation.

Based on our interpretation of the site conditions using our site observations boring logs, we estimate the seasonal high water table at this site to be two to three feet below the existing ground surface. However, without the benefit of the existing drainage ditches, the groundwater should be expected to rise to higher levels.

7.0 LABORATORY TESTING - MECHANICAL PROPERTIES

All recovered soil samples were transported to our West Palm Beach soils laboratory where they were examined by a geotechnical engineer to determine their engineering classification. The visual classification of the samples was performed in accordance with the Unified Soil Classification System, USCS. Representative samples were selected for additional testing including Moisture Content, Organic Content, Percent Fines Content, Atterberg limits, Direct Shear tests, Consolidation tests, and Permeability testing (remolded samples), the latter in triaxial cells. All laboratory tests were performed in accordance with their respective ASTM standards. The soil classifications and other pertinent data obtained from our explorations and laboratory examinations and tests are reported on the boring logs in Appendix 2. The results are furthermore summarized in Appendix 6 along with other laboratory test results which will be prudent in the design phase of the project.

8.0 PRELIMINARY ENGINEERING EVALUATION

8.1 BORROW MATERIALS AND LEVEE CONSTRUCTION

In general, based on the findings of our site exploration, laboratory testing program, and preliminary engineering analyses, it is our opinion that the soils at the site are suitable to support the anticipated levees and the various pump stations and weir structures. The encountered subsurface materials consist mostly of sands or slightly clayey to clayey sands with varying amounts of shell. These materials can tolerate stresses from such embankments and structures with minimum settlements. Soils directly beneath the structures would have to be compacted with vibratory rollers or tampers.

The vast majority of our borings encountered relatively shallow slightly clayey to clayey materials with individual layers ranging in thickness from a few feet to more than 7 feet. These clayey soils were overlain by mostly clean fine sands. Depending on the final design of the RSTA basins and the anticipated depth of water to be retained it may prove prudent to utilize these clayey soils to form an impervious core (or upstream blanket) in the levees to increase their stability and minimize lateral seepage loss. The upper sandy soils would then be placed next to the clayey soils to form the shell of the levees. The clayey materials could be obtained from excavations parallel to the levees to create seepage collection ditches, if needed, or from designated excavation sites in the interior of the RSTA. In any event, we did not encounter any shallow, hard cemented materials in any of our borings and consequently, we do not anticipate the need for heavy-duty excavation equipment to obtain these soils. However, some dewatering measures may be necessary.

With the exception of a few of our borings, we did not encounter any surficial organic or soft silt deposits which would require a staged levee construction sequence, or possibly the removal and replacement of the organics/silts. However, should levees (or structures) fall in the areas in which we did encounter shallow organic or silty soils (e.g. borings B-10, B-21, B-32, A-19, A-20, A46, A51, and A-56), additional test pits or borings should be performed to delineate these soils and to more accurately determine the extent and properties of the soils. Consideration should be given during the design phase to attempt to avoid locating levees or structures in these areas but, these soils appear to be thin enough that their replacement from levee alignments would not be too costly.

The geometry of the levees will be controlled by the need to withstand runup during periods of heavy storms. Thus, wind forces may cause the ponded water to rise five to ten feet above the static maximum pond level depending upon the depth of the ponded water, the width of the pond, and the intensity of the wind. It is our preliminary opinion that levee side slopes of 3 horizontally to 1 vertically likely can be used safely in the construction of the levees. The crest should have a minimum width of 15 feet. Settlements under the middle of 10 to 20 feet high levees are not anticipated to exceed 1 to 1½ inches and would mostly occur during construction. Post-construction settlements should de minimal. An analysis should be made of the potential for high wave action under the design storm so as to determine the necessary height of the perimeter embankments and the need for interior dikes. Slope stability analyses, settlement computations, and seepage analyses would then be performed to verify that the chosen design can be constructed safely and without excessive surface settlements and seepage losses. Note that it may be necessary to install a clayey soil "key" below the impervious section of the embankment to curtail seepage under the levees. The analyses would determine the steepness of the various levee side slopes in addition to determining the maximum weight and resulting contact pressure of the equipment operating on the surface of the levees during and after construction. The stability analyses should consider the various construction stages of the levees under worst-case steady-state seepage conditions.

Based on the above considerations, levee construction for the vast majority of the site, would start with the clearing, grubbing and stripping of all surface vegetation and topsoil along the levee alignments. If a seepage cut-off key is required, an excavation is to be made along the alignment of the key to the desired depth which may not have to be as deep as to the top of the underlying clayey soil strata; the excavation is then to be filled with clayey soils, placed and compacted in 12-inch lifts. Once the key is completed, the rest of the cleared areas would be proofrolled with a heavy vibratory roller. Sufficient passes should be made during the proofrolling operations to produce dry densities not less than 95 percent of the modified Proctor (ASTM D-1557) maximum dry density of the compacted material to depths of 2 feet below the compacted surface. The levees can then be constructed with the zoned levee materials placed in individually compacted lifts of 12 inches (clayey soils) to as much as 18 inches (sands) in thickness with no special consideration to wait time between lifts. The intent is to allow the use of the more pervious materials (clean sands) in the construction of the levees since they are shallower and easier to handle. The clayey soils would be placed in a thin strip along the middle of the alignment with sandy soils on both sides, or in a thin upstream blanket, with sandy soils in the center and downstream sections. The impervious core or upstream blanket need only rise to a height of 6 inches above the maximum design static pond water level.

The fill material should be relatively dry (within 3% of the optimum moisture content) at the time of placement. Furthermore, the levee lifts should be graded so that rainfall would tend to run off their surface. Each lift should be allowed to dry as needed to approach the optimum moisture content of the material prior to compaction. For compaction of the clayey levee materials we recommend using a sheepsfoot or similar type of non-smooth roller, although a heavy rubber tired roller may have to be used to complement the other rollers. A heavy smooth-wheeled vibratory roller can be used for the sandy soils. Soils in the impervious sections should have more than 15% fines; they should be compacted to 98% of their modified Proctor maximum dry density. Sands for the rest of the levees should have less than 15% fines and can be compacted to 95% of their modified Proctor maximum dry density. The levee fill materials should be free of organics and other deleterious materials.

The results of our borings and the results of our laboratory testing program (see Appendix 2 and Appendix 6) should be used in the design phase of the project for the above mentioned analyses. We remain available for consultations in these matters.

8.2 STRUCTURES

We anticipate that a few larger pump stations would be constructed and typically the excavations for these structures will reach relatively deep elevations with respect to the existing ground surface. Thus, dewatering will likely be required to facilitate the excavation and the proper compaction of the bottom of the excavation. We preliminarily anticipate that the dewatering system will consist of one or more wellpoint arrays at the perimeter of the excavation, maintaining the groundwater level at least 2 feet below the bottom of the excavation. Once final designs and locations of these structures are available, dewatering systems can be designed using the field permeability tests results included in Appendix 3.

No need for special digging equipment is anticipated to excavate the encountered loose to moderately dense clean to clayey sands. We recommend that the bottom of any proposed pump station excavation be overexcavated by six inches and then backfilled with well-compacted washed gravel to the elevation of the bottom of the mat foundation in order to facilitate creating a firm uniform bearing layer. The bearing layer should be compacted with a vibratory roller until a firm surface is produced. Materials compacted as recommended should withstand contact pressures of up to 2,500 pounds per square foot [psf] with a minimum factor of safety in excess of four against bearing capacity failure. Furthermore, with the site prepared and the foundations designed property, we anticipate total settlements of one-inch or less. Because of the nature of the subsurface soils, the majority of the settlements should occur during construction; post-construction settlement should be minimal.

The various anticipated lightly-loaded weir structures/water control structures which will regulate the water flow between the internal RSTA cells can more than likely be constructed on shallow foundations as described above.

The design of any pump station should consider the nature of the soils on which it will be supported on, in addition to the length of the structure versus that of the levee, to determine whether piping of soils could be produced by the flow of water under the structure. In other words, the structure could form an artificial "roof" over the seepage path, so that an open channel would be maintained. Vertical barriers such as poured-in-place concrete keyways or sheet pile walls would reduce the possibility of the development of this phenomenon. An advantage of these structural additions is that they help resist lateral displacement. The effective seepage path length can be computed using the empirical coefficient called the weighted creep ratio, R_c which can be calculated using the following formula:

$$R_c = [\frac{1}{3}H + V] / h$$

Where: H is the length of the horizontal contacts ($\leq 45°$)

V is the length of the vertical contacts ($> 45°$)

h is the differential head across the structure.

The above considerations apply for any pipeline or spillway that crosses an embankment and may require a seepage shield. We remain available for consultations in these matters once pump stations design near their completion.

The backfill directly around pump structure(s) and possibly around water control or weir structures can consist of sandy fill with not more than 10 percent by dry weight passing the U.S. #200 sieve and no particles larger than 2 inches in diameter. It should be placed in level lifts twelve inches or less in thickness, individually compacted with a walk-behind type vibratory compactor so as to attain dry densities of at least 95% of the modified Proctor (ASTM D-1557) maximum dry density of the compacted material. Depending on the chosen locations of the pump stations, engineering properties of the soils for use in lateral earth pressure computations at those specific locations can be determined using a combination of the soil borings in Appendix 2, the laboratory test results in Appendix 6, and empirical correlations.

8.3 SEEPAGE/HYDROLOGY

Due to the presence of a low-permeability confining layer (i.e. an aquiclude/aquitard) consisting of clayey fine sands starting at depths as shallow as 5 feet below the existing ground surface in addition to a shallow ambient groundwater table, vertical seepage loss is expected to be nil, following an initial saturation period. Lateral seepage through the surficial aquifer may occur assuming that the levees are constructed of soils which have a similar or lower permeability as compared to the in-situ soils, which is anticipated. This must be analyzed further through a large scale flow net analyses once a layout of the RSTA is available.

Also, additional seepage analyses should be performed for critical sections of the levees using the proposed maximum water depths and the chosen levee geometry and soil structure. The results of our laboratory permeability tests were very consistent and yielded an average coefficient of permeability of the encountered clayey soils of about 4 to 5 x 10^{-6} cm/s and as such, it is not anticipated that levees constructed with these materials (or possibly with a core or an upstream blanket of clayey soils) and retaining less than 5 feet of water would yield significant lateral seepage losses through the levees. In any event, it is typically recommended that minor seepage collection ditches be constructed along the outside of the levees to allow collecting the seepage at various sumps and returning it back to the reservoir. Again, a cutoff trench may have to be excavated below the impervious section of the embankment and filled with well compacted clayey soils to curtail seepage under the levees.

8.4 CONSTRUCTION QUALITY CONTROL

We recommend establishing a comprehensive quality assurance program to verify that all site preparation, levee construction, excavation, bedding (pump station) and backfilling is conducted in accordance with the appropriate plans and specifications. Materials testing and inspection services should be provided by Ardaman & Associates, Inc.

As a minimum, an on-site engineering technician should monitor all stripping and grubbing to verify that all deleterious materials have been removed with special attention in areas where surficial (Gator muck) or buried (Tequesta organics) could be present. The technician should observe the compaction rolling operation to ensure that the appropriate number of passes are applied to the levee foundation soils and to the individual fill lifts. In-situ density tests should be conducted during backfilling activities and below all footings to verify that the required densities have been achieved. In-situ density values should be compared to laboratory Proctor moisture-density results for each of the different natural and fill soils encountered.

Finally, we recommend inspecting and testing the construction materials for the pump station foundations and other structural components such as for the various WCS.

In South Florida, earthwork testing is typically performed on an on-call basis when the contractor has completed a portion of the work. The test result from a specific location is only representative of a larger area if the contractor has used consistent means and methods and the soils are practically uniform throughout. The frequency of testing can be increased and full-time construction inspection can be provided to account for variations. We recommend that the following minimum testing frequencies be utilized.

Natural ground under levee segments should be tested at 300-foot intervals.

Levee fill material should be tested at a minimum frequency of one in-place density test for each 12- to 18-inch lift for each 200 lineal feet levee alignment.

Additional tests should be performed in backfill around pump stations and water control structures.

Representative samples of the various natural ground/fill soils should be obtained and transported to our laboratory for Proctor compaction tests. These tests will determine the maximum dry density and optimum moisture content for the materials tested and will be used in conjunction with the results of the In-place density tests to determine the degree of compaction achieved.

We recommend that Ardaman & Associates, Inc. inspect the levee conditions and performance during construction, immediately after the filling of the pond, and then periodically thereafter.

8.5 GROUNDWATER QUALITY

On November 18 and 19, 2003, Ardaman representatives collected groundwater samples from six groundwater monitoring wells (W-1B, W-2B, W-3A, W-3B, W-4B, and W-5B) on the site. A total of ten wells were to initially be sampled, however, one of the wells was dry (W-4A) and the other three wells purged dry (W-1A, W-2A, and W-5A) and therefore a groundwater sample could not be collected. The groundwater samples were collected under the guidance of the Florida Department of Environmental Protection (FDEP) Standard Operating Procedures (SOP) dated January, 2002. The FDEP's Groundwater Sampling Logs for each well are located in Appendix 4.

All the groundwater samples were submitted to Jupiter Environmental Laboratories, a National Environmental Laboratory Accreditation Conference (NELAC) certified Laboratory, for analyses of arsenic, cadmium, copper, iron, lead, manganese, and zinc by ICP-MS, chloride by SM4500B,

mercury by Cold Vapor AA, total phosphorous by phosphate-ortho and dissolved(ortho) phosphorous by phosphate-ortho diss, nitrite and nitrate by EPA methods 353.2 and 354.1 respectively, hardness as CaCo3 by EPA Method 130.2, ammonia by EPA Method 130.2, and total kjeldahl nitrogen by TKN.

The Guidance Concentration for Groundwater Cleanup Target Levels (GCTL) Criteria Chapter 62-777, Florida Administrative Code (FAC) as listed in Table 1 of this section were referenced to place the analytical results in a regulatory framework. Table 1 also references the Primary and Secondary Drinking Water Standards Chapter 62-550, FAC for some of the compounds. The secondary standards are intended to be used for community water systems. All of the analytical results for iron, a secondary standard, were above the GCTL. All the analytical results for manganese, a secondary standard, except for W-1B were above the GCTL. The analytical results for nitrate, a primary standard, in W-1B, W-3A, and W-5B were above the GCTL. None of the other parameters exceeded the GCTL. See Table 1 for the laboratory analytical results and Table 2 for the parameters measured in the field and total dissolved solids. A copy of the laboratory reports can be found in Appendix 5.

Table I - Laboratory Analytical Results

Constituent	W-1B (mg/L)	W-2B (mg/L)	W-3A (mg/L)	W-3B (mg/L)	W-4B (mg/L)	W-5B (mg/L)	GCTL (mg/L)
Ammonia	0.210	0.230	0.360	0.380	0.130	0.620	28
Arsenic	U	U	0.007	U	U	U	0.05*
Cadmium	U	U	U	U	U	U	0.005*
Chloride	84	73	21	30	60	46	250**
Copper	0.002	U	0.003	0.002	0.002	0.002	1**
Hardness as CaCo3	580	530	600	390	510	370	NA
Lead	U	U	U	U	U	U	0.015*
Iron	5.02	6.38	4.27	5.60	10.9	2.71	0.3**
Manganese	0.023	0.158	0.218	0.158	0.406	0.065	0.05**
Mercury	U	U	U	U	U	U	0.002*
Nitrate	***65***	U	***71***	U	U	***64***	10*
Nitrite	U	U	U	U	U	U	1*
Total Phosphorous	0.067	0.067	0.079	0.027	0.130	0.026	NA
Total Dissolved Phosphorous	U	U	U	U	U	U	NA
Total Kjeldahl Nitrogen	1.90	1.60	2.40	1.80	2.10	1.70	NA
Zinc	0.005	U	0.008	0.003	0.002	0.006	5*

U = Below Detection Limit

* = Primary Standard, as per Chapter 62-550, FAC

** = Secondary Standard, as per Chapter 62-550, FAC

NA = Not Applicable

Items in ***BOLD ITALICS*** exceed primary standards.

Table 2 - Field Parameters

Constituent	W-1B	W-2B	W-3A	W-3B	W-4B	W-5B	Standards
Color	70	15	100	70	48	15	15** color units
Conductivity (ms/cm)	1.07	1.198	1.36	0.77	1.414	0.809	NA
Dissolved Oxygen (mg/L)	2.44	0.52	1.74	0.04	2.05	0.02	NA
pH	6.78	6.76	6.78	6.94	6.66	6.94	6.5 - 8.5**
Odor	Sulfur	Sulfur	Sulfur	Sulfur	Sulfur	Sulfur	NA
Temperature (degrees Celsius)	25.19	25.40	26.71	25.18	26.66	25.31	NA
Total Dissolved Solids (mg/L)	698	772	883	503	919	525	500** (mg/L)
Turbidity (NTU)	4.98	12.6	195	8.61	19.8	19.9	NA

* = Primary Standard, as per Chapter 62-550, FAC

** = Secondary Standard, as per Chapter 62-550, FAC

High concentrations of iron and manganese can cause unpleasant tastes and odors in drinking water. They may encrust well screens and clog pipes, and may cause aesthetic problems such as staining of laundry and plumbing fixtures. Based on the EPA's US Map for Risk of Groundwater Nitrate Contamination this site is located in a moderate risk zone. The measure of total dissolved solids (TDS) is a good indicator of the mineralized character of the water. Groundwater having less than 500 mg/L of TDS is generally satisfactory for domestic and industrial use while groundwater having greater than 1000 mg/L of TDS is generally unsatisfactory.

9.0 CLOSURE

The analyses and recommendations submitted herein are based upon the data obtained from the soil borings and our analyses presented in the Appendices. This report does not reflect any variations which may occur adjacent to or between the borings. The nature and extent of the variations between the borings may not become evident until additional subsurface explorations have been completed. It is recommended in this report that additional explorations be performed at a later date to complement the preliminary findings in this report and to provide specific information for the design of levee cross-sections, seepage analyses, and foundations for various structures needed to control the water levels and circulate the water within the RSTA.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices. In the event any changes occur in the design, nature, or location of the proposed improvements, we should review the applicability of conclusions and recommendations contained in this report. We also recommend a general review of final design and specifications by our office to make sure that the preliminary earthwork and foundation recommendations are properly interpreted and implemented in the design specifications. Ardaman and Associates should attend pre-bid and preconstruction meetings to ensure that the bidders/contractor understand the recommendations contained in this report.

It has been a pleasure to assist you on this phase of your project. Please contact us whenever we may be of service to you, and please call if you have any questions concerning this report.

Best regards,

ARDAMAN & ASSOCIATES, INC.

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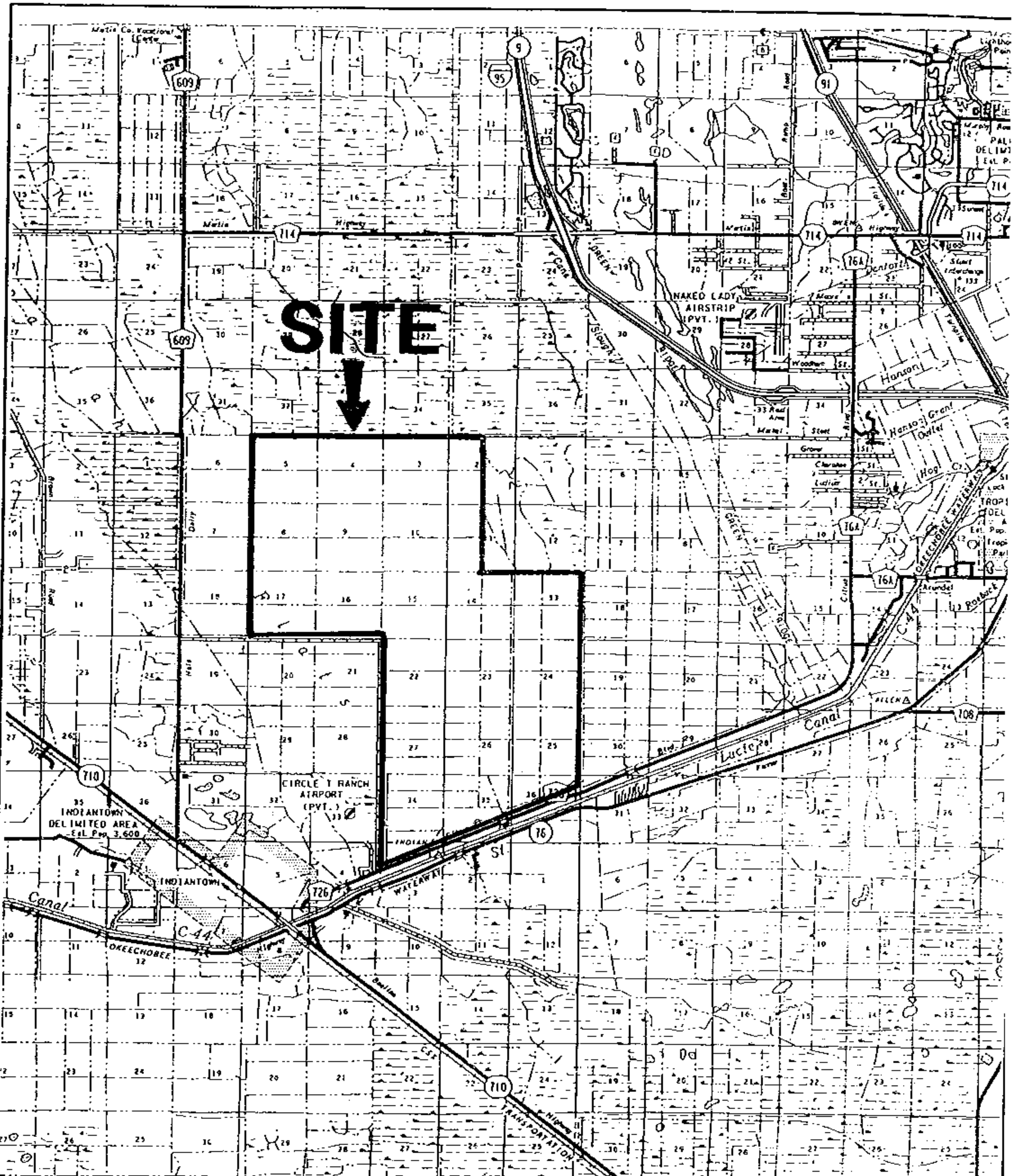
RF/PGA/REB:pa/aw



N.T.S.

SITE VICINITY MAP

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

TROUP-INDIANTOWN WATER CONTROL DISTRICT
RESERVOIR AND STA
MARTIN COUNTY, FLORIDA

DRAWN BY: RF	CHECKED BY: PGA	DATE: 01/07/04
FILE NO.	APPROVED BY:	FIGURE:

Arents

Arents in this survey area are somewhat poorly drained to excessively drained soils consisting of variable textured fill material that has been reworked by earthmoving equipment and deposited over undisturbed natural soils, mostly in the low lying areas. This fill material contains fragments of former subsoils or organic soils. It has been excavated from soils having sandy, loamy, or clayey subsoils or consisting of organic material. Shell or limestone fragments are in some places. The material was excavated nearby, or it was transported from distant areas. Most areas have been smoothed or shaped to suit the desired use. Thickness of the material varies from a few feet to many feet. Slopes range from 0 to 35 percent. The water table ranges from a depth of about 20 to 72 inches or more.

Arents are closely associated with many of the soils in the survey area. They differ from the associated soils in not having an orderly sequence of soil horizons.

Reference pedon of Arents, 0 to 2 percent slopes, on the edge of the St. Lucie River; about 0.25 mile north of the mouth of Bessie Creek, NW1/4NW1/4NW1/4 sec. 6, T. 38 S., R. 41 E.

C—0 to 30 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; few fine roots; numerous small to large lumps of dark grayish brown (10YR 4/2) sandy loam and sandy clay loam; few to common black (10YR 2/1) and dark reddish brown (5YR 2/2) weakly cemented spodic horizon fragments; neutral; clear wavy boundary.

IIA1b—30 to 36 inches; black (10YR 2/1) mucky fine sand; weak fine granular structure; very friable; many medium and coarse roots; common pockets of very dark gray (10YR 3/1) and dark gray (10YR 4/1) fine sand; neutral; clear wavy boundary.

IIA2b—36 to 60 inches; dark grayish brown (10YR 4/2) fine sand; single grained; loose; few lenses of very dark gray (10YR 3/1) fine sand; few pockets of dark gray (10YR 4/1) and light gray (10YR 7/1) fine sand; neutral.

Reaction ranges from very strongly acid to moderately acid. Thickness of the mixed material ranges from about 20 to 50 inches in numerous small areas but is many feet thick in areas that make up spoil banks and dikes. In some pedons, the mixed material overlies organic material that ranges in thickness from 6 to 50 inches or more. In other pedons, the overburden rests on sand or fine sand or sand overlying loamy material. The mixed surface layer material is dominantly fine sand or sand ranging to loamy fine sand with few to common fragments or lumps of finer textured material, Bh fragments, organic matter, or shell fragments. Matrix colors are dominantly in shades of gray and brown.

The buried surface layer of the underlying natural soil may be thin or thick sand or fine sand, in hue of 10YR, value of 2 to 6, and chroma of 2 or less. Below this layer is dark to light colored, dominantly sandy material.

The range of characteristics used in describing this unit is broad and reflects the general nature of the unit. For the objectives of this survey, it was important to recognize the heterogeneity of the overburden material because characteristics of the material vary too much to make accurate interpretations. It was not important to separate these soils into texture, color, and thickness of horizons. Map units have been separated to identify areas where the land has been filled over and smoothed, areas where the mixed material overlies organic material, and areas of better drained spoil banks and constructed dikes.

36—Arents, 0 to 2 percent slopes. This nearly level soil is somewhat poorly drained to moderately well drained. It consists of fill material that was excavated and spread over the surface of wet mineral soils, then smoothed to suit the desired use. The mixed fill material was spread to a depth of about 20 to 50 inches. Areas are irregular in shape and range from about 5 to 50 acres.

The texture and thickness of the layers of this soil are highly variable from place to place. A common profile has a surface layer of light brownish gray fine sand about 30 inches thick. It has numerous small to large lumps of dark grayish brown sandy loam and sandy clay loam and few to common, firm, black and dark reddish brown fragments. Below this is the natural undisturbed soil in which the upper 6 inches is black, mucky fine sand that has a few small pockets of dark gray and very dark gray fine sand and black organic matter. Below a depth of 36 inches is dark grayish brown fine sand that has a few lenses of very dark gray fine sand and pockets of dark gray and light gray fine sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils that are similar to this Arents soil, but have less than 20 inches or more than 50 inches of mixed overburden material and small areas of soils underlain by organic material. Also included are a few areas where garbage and other refuse has been deposited and covered by a layer of mixed soil material. These areas are labeled Sanitary Landfill on the maps where they occur. Total inclusions in any area are less than 25 percent.

The water table is below a depth of 30 inches during most of the year. Permeability is variable but generally is rapid. The available water capacity is variable but generally is low. Natural fertility and the content of organic matter are low.

This soil is not used as cropland. It consists of mixed soil material used to fill low areas to make them suitable for building sites or other urban uses. Even though it was constructed for such uses, the potential of this soil is variable for urban development because of the wide range in soil properties. Soil strength is likely to be variable because of differences in thickness, texture, and degree of compaction. Onsite investigation is needed for each use.

This soil is not assigned to a capability subclass.

Taken from USDA Soil Survey of Martin County, Florida, 1981 Edition.

27—Arents, organic substratum, 0 to 2 percent slopes. This nearly level soil is somewhat poorly drained. It consists of fill material that was excavated and spread over organic soils, then shaped or smoothed to suit the desired use. The mixed fill material was spread over the surface of the natural organic soil to a depth of about 20 to 50 inches. The areas are irregular in shape and range from about 2 to 50 acres.

The texture and thickness of the layers of this soil are highly variable from place to place. A common profile has a surface layer about 36 inches thick. The surface layer is mixed dark gray and dark brown fine sand and has a few lumps of gray fine sandy loam and small pockets of black muck. Next is 10 inches of dark gray and grayish brown fine sand that has some black and very dark gray fine sand mixed into the upper part. Below this, the upper 20 inches is undisturbed dark reddish brown muck that has few to common, gray fine sand pockets. Below this is dark grayish brown and grayish brown fine sand to a depth of 70 inches. The upper part of this fine sand has a few pockets and tongues of black muck.

Included with this soil in mapping are a few areas of soil in which the organic layer is over thin to thick layers of calcareous or saline silty clay loam. Also included are small areas that have less than 20 inches of fill material overlying the natural soil, a few areas that have material mixed with shell fragments in the surface layer or below the muck layer, and a few spots of more poorly drained soil. Total inclusions in any area are less than 25 percent.

The water table is at a depth of 20 to 40 inches during most of the year. Permeability is mainly rapid. The available water capacity is variable but is generally low in the mineral soil layers and high in the organic layer. Natural fertility is low.

Most areas of this soil are used for urban development. Some small areas are used for citrus where low, wet organic soils are covered so that continuous, uniform bedding can be established.

This soil is poorly suited to citrus trees. The weight of the overburden in the beds compresses the underlying organic material and allows the beds to sag. Also, the compression reduces permeability and in places causes a thin seal to form at the surface of the organic material. In these places the water table remains high, trees grow poorly, and the drainage furrows hold water and become boggy.

The potential is variable for most urban uses because of a wide range in soil properties. Low soil strength and wetness are the major limitations. This soil has high potential for playgrounds. Onsite investigation is necessary to determine the limitations and suitability of each site.

This soil is not assigned to a capability subclass.

Boca series

Soils of Boca series are loamy, siliceous, hyperthermic Arenic Ochraqualfs. They are poorly drained, moderately permeable soils that formed in moderately thick beds of sandy and loamy marine sediment overlying a hard limestone ledge that has numerous fractures and solution holes. These nearly level soils are in the flatwoods. The water table is within a depth of 10 inches for 2 to 4 months during the rainy season in most years. Slopes range from 0 to 2 percent.

Boca soils are geographically closely associated with Hallandale, Pineda, Pinellas, Riviera, and Wabasso soils. Hallandale soils do not have an argillic horizon and have limestone at a depth of less than 20 inches. Pineda soils have a Bir horizon and do not have limestone. Pinellas soils have an Aca horizon and do not have limestone. Riviera and Wabasso soils have an argillic horizon that does not rest on limestone. In addition, Wabasso soils have a Bh horizon.

Typical pedon of Boca fine sand in an area in natural vegetation; about 0.9 mile south of Clements Road, 1.1 miles southwest of Florida Highway 710, and about 300 feet north of small graded road. NW1/4SW1/4SE1/4 sec. 11, T. 39 S., R. 37 E.

A11—0 to 4 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; slightly acid; gradual wavy boundary.

A12—4 to 8 inches; dark gray (10YR 4/1) fine sand; weak fine granular structure; very friable; common medium splotches of gray (10YR 6/1); neutral; clear wavy boundary.

A21—8 to 16 inches; light gray (10YR 7/2) fine sand; common coarse distinct pale brown (10YR 6/3) mottles; single grained; loose; neutral; gradual wavy boundary.

A22—16 to 25 inches; pale brown (10YR 6/3) fine sand; single grained; loose; mildly alkaline; abrupt wavy boundary.

B2tg—25 to 32 inches; light gray (5Y 7/1 and 2.5Y 7/2) fine sandy loam; many medium distinct light olive brown (2.5Y 5/6) mottles; weak coarse subangular blocky structure; friable; sand grains coated and bridged with clay; few to common pockets of light gray (10YR 7/2) fine sand; mildly alkaline; abrupt wavy to irregular boundary.

IIR—32 to 40 inches; hard limestone containing fractures and solution holes; calcareous; abrupt wavy boundary.

IIIC1—40 to 45 inches; light gray (10YR 7/1) fine sand; few medium to coarse dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) mottles; single grained; loose; mildly alkaline; clear wavy boundary.

IIIC2—45 to 50 inches; greenish gray (5GY 5/1) loamy fine sand; few fine to coarse distinct olive brown 2.5Y 4/4) mottles; single grained; loose; moderately alkaline; noncalcareous; clear wavy boundary.

IVC3—50 to 60 inches; light gray (5Y 7/1) fine sand and white shell fragments; single grained; loose; few small unbroken shells; moderately alkaline; calcareous.

Thickness of the solum and depth to limestone within the dominant part of a pedon ranges from 24 to 40 inches, but in solution holes and fractures, the depth to limestone ranges to 50 inches or more. Depth to the argillic horizon ranges from 20 to 36 inches in more than half of the pedons. In the rest of the pedons, the argillic horizon ranges to a depth of 40 inches or more.

The A1 horizon has hue of 10YR, value of 2, and chroma of 1; or value of 3 or 4 and chroma of 2 or less. It is 3 to 9 inches thick. The A1 or Ap horizon having value of less than 3.5 is less than 6 inches thick. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or less; or value of 7 and chroma of 4 or less. The A horizon is sand or fine sand. Reaction ranges from strongly acid to slightly acid.

Some pedons have a discontinuous B1 horizon that has hue of 10YR, value of 3 or 4, and chroma of 2 or 3; or value of 5 to 7 and chroma of 3 or more, with or without mottles of gray, yellow, or brown. The B1 horizon is sand or fine sand that has at least 3 percent increase in clay content from the horizon above, or, in places, it is loamy fine sand. It ranges from 0 to 14 inches in thickness. Reaction ranges from strongly acid to mildly alkaline.

The Btg horizon has hue of 10YR to 5Y, value of 5 to 7, and chroma of 2 or less, with mottles of gray, yellow, brown, or olive. It is sandy loam, fine sandy loam, or sandy clay loam. Reaction ranges from neutral to moderately alkaline. In some pedons, it is calcareous. The Btg horizon ranges from 4 to 20 inches in thickness

In some pedons a layer of mixed decomposed fragments of rock, marl, sand, or fine sand ranges from 1 inch to 5 inches in thickness. This layer has pockets of finer material between the Btg horizon and the limestone strata. It is variable in color, or it is highly mottled.

The layer of hard limestone has many fractures and solution holes, or it is made up of large flat boulders with solution holes. The rock ranges from 6 to 18 inches thick. Layers of sand to sandy loam, some of which have a variable content of shell fragments, are below the rock.

44—Boca fine sand. This nearly level soil is poorly drained. It is in areas of flatwoods. Slopes are less than 2 percent.

Typically, the surface layer is fine sand to a depth of about 8 inches. The upper 4 inches of the surface layer is very dark gray, and the lower 4 inches is dark gray. The subsurface layer is fine sand about 17 inches thick. The upper 8 inches of the subsurface layer is light gray, and the lower 9 inches is pale brown. The subsoil is light gray fine sandy loam about 7 inches thick. Below this is hard limestone about 8 inches thick. Underlying the limestone are layers of light gray fine sand, greenish gray loamy fine sand, and light gray fine sand mixed with shell fragments to a depth of 60 inches or more.

Included with this soil in mapping are soils that are similar to this Boca soil but have black, organic matter enriched layers or have soft carbonate accumlation in place of or overlying the hard limestone. Also included are small areas of Hallandale, Pineda, Pinellas, Riviera, and Wabasso soils. Total inclusions in any area are about 20 percent.

The water table is at a depth of less than 10 inches for 2 to 4 months in most years. In drier seasons, the depth to the water table coincides with the depth of the limestone layer. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is low in the surface layer, very low in the subsurface layer, and medium in the subsoil. Natural fertility and the content of organic matter are low.

Many areas of this soil are in open forest. The natural vegetation is slash pine and cabbage palm and an understory of sawpalmetto, waxmyrtle, gallberry, fetterbush, blue maidencane, pineland threeawn, bluestems, and other native grasses.

Under natural conditions, this soil has severe limitations for cultivated crops because of the wetness and shallow depth to rock. The variety of adapted crops is limited unless intensive water control and soil improving measures are used. However, if a good water control system removes the excess water in wet seasons and provides water through subsurface irrigation in dry seasons, this soil is suitable for adapted vegetable crops. Seedbed preparation needs to include bedding of the rows. Row crops need to be rotated with close growing, soil improving crops, and these crops should be in the cropping system two-thirds of the time. Fertilizer and lime should be added according to the need of the crop.

This soil is suited to citrus only after a carefully designed water control system has been installed. The water control system should maintain the water table below a depth of 4 feet. Planting the trees on beds lowers the effective depth of the water table. A cover crop should be maintained between the rows of trees. Regular applications of fertilizer and lime are needed.

Improved pasture grasses are well suited to this soil. Pangolagrass, improved bahiagrasses, and white clover grow well if well managed. A simple drainage system is needed to remove the excess surface water after heavy rains. Regular applications of fertilizer and lime are needed. Grazing should be controlled to maintain vigorous plants for highest yields and good ground cover.

The potential is high for pine trees on this soil. A simple drainage system is needed to remove excess water in the wet season. Plant competition and seedling mortality are management concerns. South Florida slash pine is better suited to this soil than other trees.

This soil is in capability subclass IIIw.

Chobee series

Soils of the Chobee series are fine-loamy, siliceous hyperthermic Typic Argiaquolls. They are very poorly drained, slowly to very slowly permeable soils that formed in thick beds of moderately fine marine sediment (fig. 12). These nearly level soils are in small to large depressional areas, in poorly defined drainageways, and on broad, low flats. They are saturated during the rainy season and after periods of heavy rainfall. Slopes are generally less than 1 percent, but range to 2 percent in places.

Chobee soils are geographically closely associated with Floridana, Gator, Riviera, Tequesta Variant, and Winder soils. Floridana soils have an argillic horizon between a depth of 20 and 40 inches. Gator soils are organic. Riviera and Winder soils do not have a mollic epipedon. Tequesta Variant soils have a histic epipedon.

Typical pedon of Chobee loamy sand in improved pasture; 2.75 miles west of Florida Highway 609, 1.2 miles south of Florida Highway 714, and about 1 mile southwest of ranch headquarters:

Oap—3 inches to 0; black (10YR 2/1) muck; less than 5 percent fiber rubbed; weak fine and medium granular structure; very friable; many fine roots; up to 50 percent uncoated sand grains; medium acid; clear smooth boundary.

A—0 to 6 inches; black (10YR 2/1) loamy sand; weak fine granular structure; friable; common fine roots; many uncoated sand grains; neutral; clear wavy boundary.

B21t&A—6 to 19 inches; black (10YR 2/1) sandy loam; weak coarse subangular blocky structure; firm to friable; common fine roots; sand grains coated and bridged with clay; many fine and medium pockets of dark grayish brown (10YR 4/2) loamy sand; moderately alkaline; clear wavy boundary.

B22t—19 to 24 inches; black (10YR 2/1) sandy clay loam; weak coarse subangular blocky structure; sticky and plastic; common fine roots; sand grains coated and bridged with clay; common fine pockets of dark grayish brown (10YR 4/2) loamy sand; mildly alkaline; abrupt irregular boundary.

B23tca—24 to 42 inches; gray (10YR 5/1) sandy clay loam; weak coarse subangular blocky structure; slightly sticky and plastic; common fine and medium roots; few white shell fragments; sand grains coated and bridged with clay and calcium carbonate; mildly alkaline; calcareous; clear wavy boundary.

IIC1—42 to 49 inches; grayish brown (2.5Y 5/2) sandy loam mixed with many fine and medium shell fragments; massive; slightly sticky; moderately alkaline; calcareous; clear wavy boundary.

IIC2—49 to 58 inches; light olive gray (5Y 6/2) clay loam; massive; slightly sticky and plastic; many white shell fragments and soft carbonate nodules; moderately alkaline; calcareous; clear wavy boundary.

IIC3—58 to 80 inches; greenish gray (5GY 5/1) sandy clay loam; massive; sticky and plastic; many white shell fragments and soft carbonate nodules; common pockets of loamy sand; moderately alkaline; calcareous.

Thickness of the solum is more than 40 inches. A thin Oa or Oap horizon is on the surface of most pedons. It has hue of 10YR or 5YR, value of 2, and chroma of 1 or 2. It is well decomposed organic material and is 0 to 5 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Reaction ranges from slightly acid to moderately alkaline. Thickness ranges from 4 to 18 inches.

The Bt and Btca horizons have hue of 10YR or they are neutral, value of 2 to 5, and chroma of 1 or less; or hue of 5YR, value of 4 to 6, and chroma of 1 or 2, with or without mottles of gray or brown; or hue of 2.5Y, value of 4 or 5, and chroma of 2, with mottles. These horizons are sandy loam or sandy clay loam. Clay content in the upper 20 inches of the argillic horizon ranges from 18 to 35 percent. Reaction ranges from neutral to moderately alkaline. The Btca horizon is calcareous.

The IIC horizon has hue of 10YR, value of 5 to 7, and chroma of 1; hue of 2.5Y, value of 5 to 7, and chroma of 2; hue of 5Y, value of 5 to 7, and chroma of 1 or 2; or hue of 5GY, value of 5 or 6, and chroma of 1, with or without mottles. The IIC horizon ranges from loamy sand or loamy fine sand to clay loam. Reaction ranges from neutral to moderately alkaline and calcareous. Shell fragments are absent in some pedons.

57--Chobee loamy sand. This nearly level soil is very poorly drained. It is in small to large depressions and poorly defined drainageways and on broad, low flats. Areas range from as little as 5 to 10 acres in isolated depressions to 3,000 acres or more in the broad Allapattah Flats. Slopes are smooth to concave and range from 0 to 2 percent.

Typically, this soil has a 3-inch layer of black muck on the surface. The surface mineral layer is black loamy sand about 6 inches thick. The subsoil is sandy loam and sandy clay loam about 36 inches thick. The upper part of the subsoil is black, and the lower part is gray. Below this is the calcareous substratum to a depth of 80 inches or more. The upper 7 inches of the substratum is grayish brown sandy loam, the next 9 inches is light olive gray clay loam, and the lower 22 inches is greenish gray sandy clay loam that has pockets of loamy sand.

Included with this soil in mapping are small areas of Floridana, Gator, Riviera, Tequesta Variant, and Winder soils. Also included are small areas of soils that are similar to this Chobee soil but have 6 to 16 inches of organic material on the surface and a few areas of soils that have a surface texture of loamy fine sand or sandy loam. Total inclusions in any area are less than 20 percent.

The water table is above the surface or within a depth of 10 inches for 6 to 9 months or more in most years. It is at a depth of 10 to 30 inches for short periods during dry seasons. The available water capacity is medium in all layers. Permeability is moderately rapid in the surface layer and slow or very slow in the subsoil and substratum. The natural fertility is medium.

A large acreage of this soil is used for improved pasture, and a small acreage is planted in citrus. The natural vegetation in swampy areas is red maple, water oak, and cabbage palm and an understory of ferns and water tolerant grasses. Vegetation in the open marsh areas and depressions is maidencane, pickerelweed, smartweed, and patches of sawgrass.

In the natural state, this soil is too wet for cultivated crops. If water control is adequate, it is well suited to many adapted vegetable crops. A well designed and maintained water control system should rapidly remove the excess surface water. Other management practices needed are good seedbed preparation, bedding, and rotating row crops with soil improving crops. All crop residue and soil improving crops should be used to protect the soil from erosion. Regular applications of fertilizers are needed.

Under natural conditions, this soil is not suited to citrus. However, if a well designed water control system is installed, citrus can be grown. The system should be designed to maintain the water table at a depth of about 4 feet. Trees need to be planted on beds, and a close growing cover crop should be maintained between the tree rows to prevent soil blowing or washing. Regular applications of fertilizers are needed.

This soil is well suited to improved pasture grasses. A water control system is needed to rapidly remove the excess surface water. High yields of pangolagrass, bahiagrass, and white clover can be obtained if they are adequately fertilized. Grazing should be controlled to maintain plant vigor.

If a water control system is used to remove the excess surface water, the potential is high on this soil for pine trees. Equipment limitations, seedling mortality, and plant competition are the major management concerns.

This soil is in capability subclass IIIw.

EauGallie series

Soils of the EauGallie series are sandy, siliceous, hyperthermic Alfic Haplaquods. They are poorly drained, moderate to moderately rapidly permeable soils that formed in thick beds of sandy and loamy marine sediment. These nearly level soils are in broad areas of flatwoods. A water table is within a depth of 10 inches for 2 to 4 months in wet seasons and within a depth of 40 inches for more than 6 months in most years. Slopes range from 0 to 2 percent.

EauGallie soils are geographically closely associated with Waveland, Lawnwood, Oldsmar, and Wabasso soils. Waveland soils are deeper to the Bh horizon than EauGallie soils and do not have a Bt horizon. Lawnwood soils do not have a Bt horizon. Oldsmar soils have a Bh horizon at a greater depth than EauGallie soils. Wabasso soils have a Bt horizon at a shallower depth.

Typical pedon of EauGallie fine sand in an area of native range; about 3.5 miles north of Florida Highway 708, and 1.25 miles west-southwest of U.S. Highway 1 and Poinciana Gardens in the Gomez Grant:

A1—0 to 5 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; many fine and few medium roots; mixture of light gray sand grains and black organic matter granules; very strongly acid; gradual wavy boundary.

A21—5 to 12 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; few fine and medium roots; very strongly acid; gradual wavy boundary.

A22—12 to 28 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; few fine and medium roots; few medium distinct grayish brown (10YR 5/2) mottles; very strongly acid; abrupt wavy boundary.

B2h—28 to 42 inches; black (5YR 2/1) fine sand; massive in place, crushes to moderate medium granular structure; firm sand grains coated with organic matter; few fine and medium roots; very strongly acid; clear wavy boundary.

Btg—42 to 50 inches; grayish brown (2.5Y 5/2) sand clay loam; moderate medium subangular blocky structure; firm and slightly sticky; few fine and medium roots; sand grains coated and bridged with clay; slightly acid; gradual wavy boundary.

C—50 to 65 inches; mixed lenses and pockets of grayish brown (10YR 5/2) fine sand, loamy fine sand, and fine sandy loam; massive; friable; few pockets of grayish brown (2.5Y 5/2) sandy clay loam; slightly acid.

Thickness of the solum is more than 46 inches. Thickness of the A horizon is less than 30 inches. The Btg horizon is below a depth of 40 inches. The A and Bh horizons are sand or fine sand.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1. It ranges from 3 to 9 inches in thickness. The A2 horizon has hue of 10YR, value of 5 to 8, and chroma of 2 or less. The A horizon is very strongly acid or strongly acid.

The B2h horizon is neutral and value is 2; or it has hue of 10YR or 5YR, value of 2, and chroma of 1 or 2; hues of 5YR and 7.5YR, value of 3, and chroma of 2; or hue of 5YR, value of 3, and chroma of 3. The sand grains are coated with organic matter. Reaction ranges from very strongly acid to slightly acid. A B3 horizon that has hue of 10YR, value of 3 to 6, and chroma of 3 commonly is below the Bh horizon. It is sand or fine sand. In some pedons there is an A'2 horizon in hue of 10YR, value 4 or 5, and chroma of 1; or hues of 10YR and 2.5Y, value of 5 or 6, and chroma of 2.

The B2tg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or less, with or without mottles in shades of brown, yellow, or gray. It is sandy loam or sandy clay loam and has pockets of sand or loamy sand. Reaction is medium acid to mildly alkaline.

The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or less, with or without mottles in shades of yellow or brown. It is fine sand, loamy fine sand, or sandy loam and has pockets of finer material. Reaction is slightly acid to mildly alkaline.

Taken from USDA Soil Survey of Martin County, Florida, 1981 Edition.

64—EauGallie fine sand. This nearly level soil is poorly drained. It is in broad areas of flatwoods. Areas range from 20 to 200 acres. Slopes are smooth and range from 0 to 2 percent.

Typically, the surface layer is very dark gray fine sand. The subsurface layer is grayish brown and light brownish gray fine sand to a depth of about 28 inches. The upper part of the subsoil is black fine sand coated with organic matter, and the lower part is grayish brown sandy clay loam. The substratum is mixed grayish brown fine sand, loamy fine sand, and fine sandy loam.

Included with this soil in mapping are small areas of Lawnwood, Waveland, Oldsmar, and Wabasso soils and scattered wet depressions. Also included are soils that are similar to this EauGallie soil but have yellowish or brownish colors in the subsurface layer. Total inclusions in any one delineation are less than 20 percent.

In most years, the water table is at a depth of less than 10 inches for 2 to 4 months during wet seasons and within a depth of 40 inches for more than 6 months. Permeability is rapid in the surface and subsurface layers and moderate to moderately rapid in the subsoil and substratum. The available water capacity is very low in the surface and subsurface layers, low to medium in the subsoil, and low in the substratum. Natural fertility and the content of organic matter are low.

Some areas of this soil are used for improved pasture, but most areas are in open forest. The natural vegetation is slash pine, sawpalmetto, waxmyrtle, gallberry, pineland threeawn, and species of bluestem, panicum, and other grasses.

This soil has very severe limitations for cultivated crops because of wetness and sandy texture in the root zone. The number of adapted crops is limited unless management is very intensive. If water control is good and soil improving measures are used, this soil is well suited to a number of vegetable crops. A water control system is needed to remove the excess water in wet seasons and to provide water through subsurface irrigation in dry seasons. Row crops need to be rotated with close growing, soil improving crops. Crop residue and soil improving crops should be used to protect the soil from erosion. Seedbed preparation needs to include bedding of the rows. Fertilizer and lime should be added according to the need of the crop.

Unless management is very intensive, this soil is poorly suited to citrus. It is suitable for citrus only after installation of a water control system that is carefully designed to maintain the water table below a depth of 4 feet. Planting the trees on beds helps to lower the effective depth of the water table. A cover crop should be maintained between the tree rows. Regular applications of fertilizers and lime are needed.

This soil is well suited to pasture. Pangolagrass, improved bahiagrasses, and white clover grow well if well managed. Water control measures are needed to remove the excess surface water after heavy rains. Regular applications of fertilizers and lime are needed, and grazing should be controlled to prevent overgrazing and weakening of the plants.

The potential for pine trees on this soil is medium. Equipment limitations, seedling mortality, and plant competition are the main management concerns. Slash pine is preferred for planting.

This soil is in capability subclass IVw.

Gator series

Soils of the Gator series are loamy, siliceous, euic, hyperthermic Terric Medisaprists. They are very poorly drained, moderately permeable soils that formed in moderately thick deposits of decomposed organic material and underlying loamy material. These nearly level soils are in marshes and wet depressional areas. They are saturated or covered with water except during extended dry periods. Slopes are less than 1 percent.

Gator soils are closely associated with Chobee, Floridana, Jupiter, and Winder soils. All of these soils are mineral. An argillic horizon is within a depth of 20 inches in the Chobee and Winder soils and between a depth of 20 and 40 inches in the Floridana soils. Jupiter soils have limestone within a depth of 20 inches.

Typical pedon of Gator muck in an area of improved pasture; about 8 miles north-northwest of Indiantown; 2 miles south of Florida Highway 714 and 1 mile west of Florida Highway 609, NE1/4NE1/4NE1/4 sec. 35, T. 32 S., R. 38 E.

Oap—0 to 11 inches; black (10YR 2/1) muck; about 15 percent fiber unrubbed, less than 10 percent rubbed; moderate medium granular structure in upper part, grading to coarse subangular blocky structure in lower part; friable; many fine, few medium and coarse roots; about 35 percent mineral material; dark yellowish brown (10YR 3/4) sodium pyrophosphate extract; extremely acid (pH 4.3 in 0.01 molar calcium chloride solution); clear wavy boundary.

Oa2—11 to 24 inches; dark reddish brown (5YR 2/2) muck; about 30 percent fiber unrubbed, less than 15 percent rubbed; massive in place, crushes to weak medium and coarse subangular blocky structure; friable; common fine and medium roots; estimated 40 percent mineral material; very dark brown (10YR 2/2) sodium pyrophosphate extract; very strongly acid (pH 4.7 in 0.01 molar calcium chloride solution); gradual wavy boundary.

IIC1—24 to 48 inches; very dark gray (10YR 3/1) fine sandy loam; massive in places, crushes to weak coarse subangular blocky structure; sticky and plastic; many fine roots; sand grains coated and bridged with clay; neutral; clear wavy boundary.

IIC2—48 to 56 inches; gray (N 5/0) and grayish brown (2.5Y 5/2) sand; single grained; loose; few pockets of light brownish gray (10YR 6/2); common white shell fragments; mildly alkaline; calcareous.

The Oa horizon dominantly has pH value of more th 4.5 in 0.01 molar calcium chloride solution, but pH of less than 4.5 in the upper part of the horizon in some places. Reaction of the IIC horizon ranges from slightly acid to moderately alkaline and calcareous.

The Oa horizon has hue of 10YR, value of 2, and chroma of 1; hue of 7.5YR, value of 3, and chroma of 2; hue of 5YR, value of 2 or 3, and chroma of 1 through 3; or it is neutral and value is 3. The fiber content after rubbing is less than 15 percent of the soil volume. Mineral content ranges from about 10 to 40 percent.

The IIC1 horizon has hue of 10YR, value of 2 through 4, and chroma of 2 or less; hue of 2.5Y, value of 2 through 4, and chroma of 2; or it is neutral and value is 2 through 5, with or without mottles of brown, olive, or gray. It ranges from sandy loam to sandy clay. Pockets or tongues of dark grayish brown, grayish brown, or light brownish gray sand, loamy sand, or fine sandy loam are in this horizon in places. The IIC1 horizon is more than 20 inches thick and extends below a depth of 40 inches.

The IIIC2 horizon has hue of 2.5Y, value of 4 through 6, and chroma of 2; hue of 5Y, value of 5 or 6, and chroma of 1; or it is neutral and value is 5 or 6, with or without brown, olive, or gray mottles. It is sand or loamy sand. Few to many white shell fragments are in this horizon in places. The IIIC2 horizon is absent in some pedons.

58—Gator muck. This nearly level soil is very poorly drained. It is in wet depressions and broad marsh areas. Areas range from 5 to 10 acres to about 1,000 acres. Slopes are 1 percent or less.

Typically, the surface layer is muck about 24 inches thick. The upper 11 inches of the muck is black, and the lower 13 inches is dark reddish brown. Next is very dark gray fine sandy loam about 24 inches thick. Below this is gray and brownish gray sand and common shell fragments to a depth of 56 inches or more.

Included with this soil in mapping are small areas of Chobee, Tequesta Variant, and Floridana soils. Also included are areas of soils that have sandy layers between the organic layer and loamy substratum. Total inclusions in any area are less than about 20 percent.

In the natural condition, this soil is covered with water, or the water table is within a depth of 10 inches except in extended dry seasons. The available water capacity is very high in the organic layer, medium in the loamy layer, and low in the underlying sandy material. Permeability is rapid in the organic layer and moderate in the loamy layer. The natural fertility is medium to high.

A few large areas of this soil are used for improved pasture. Other areas have natural vegetation consisting of willows, red maple, sawgrass, pickerelweed, sedges, ferns, maidencane, and water tolerant grasses (fig. 9).

This soil is not suitable for cultivated crops unless the water is controlled. However, if adequate water control is provided, it is well suited to most vegetable crops and sugarcane. A well designed and maintained water control system should remove the excess water when crops are growing on the soil and needs to keep the soils saturated with water at all other times. Water tolerant cover crops need to be on the soils when they are not being row cropped. All crop residue and cover crops should be used to protect the soil from erosion.

Most improved grasses and clovers grow well on this soil if the water is properly controlled. Pangolagrass, bahiagrass, and white clover grow well. The water control system should maintain the water table near the surface to prevent excessive oxidation of the organic horizons. Grazing should be controlled to permit maximum yields.

This soil is not suitable for citrus trees or pine trees. This soil is in capability subclass IIIw.

Hallandale Series

The Hallandale series consists of nearly level, poorly drained, sandy soils in broad flats east of the Everglades and west of the Atlantic Coastal Ridge. These soils formed in sandy marine sediment over limestone. Under natural conditions ponding may occur after heavy rains. In most years the water table is at a depth of 10 inches or less for 4 to 6 months and between depths of 10 and 20 inches for 6 months or more. During very dry periods water remains briefly in solution holes in the limestone. Near large drainage canals the water table fluctuates with the water level in the canals, and much of the time it is below a depth of 20 inches.

Typically, the surface layer is black fine sand about 4 inches thick. The subsurface layer is light brownish gray fine sand about 6 inches thick. The subsoil is brown fine sand about 4 inches thick over 2 inches of yellowish brown fine sand that contains decomposed limestone fragments. Limestone is at a depth of 16 inches.

Permeability is moderate to moderately rapid throughout. Available water capacity is low in the surface layer and the layer above the limestone and very low between depths of 4 and 14 inches. Content of organic matter and natural fertility are low.

Hallandale soils are suited to improved pasture, but because of excessive wetness and shallowness to limestone, they are not suited to cultivated crops or citrus.

Typical pedon of Hallandale fine sand about 0.5 mile north of Stirling Road and 0.2 mile east of Hunter Lane and Holatee Trail Junction, NE1/4NW1/4SW1/4 sec. 34, T. 50 S., R. 40 E.:

A1—0 to 4 inches; black (10YR 2/1) fine sand; weak fine granular structure; very friable; many medium and fine roots; strongly acid; clear smooth boundary.

A2—4 to 10 inches; light brownish gray (10YR 6/2) fine sand; few fine faint very dark gray mottles and streaks along root channels; single grained; loose; few fine roots; cyclic thickness of 2 to 8 inches; medium acid; gradual wavy boundary.

B1—10 to 14 inches; brown (10YR 5/3) fine sand; few faint very dark grayish brown mottles; single grained; loose; many uncoated, few well coated, and some thinly coated or partly coated sand grains; cyclic thickness of 1 to 20 inches; medium acid; gradual wavy boundary.

B2—14 to 16 inches; yellowish brown (10YR 5/4) fine sand and very pale brown (10YR 8/4) decomposed limestone fragments; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; single grained; loose; slight increase in clay content; common clean sand grains; discontinuous; cyclic thickness of 0 to 8 inches; neutral; abrupt irregular boundary.

IIR—16 inches; hard, fractured limestone that can be excavated using power equipment.

Thickness of the solum and depth to limestone are commonly 7 to 20 inches, but solution holes as deep as 50 inches or more are within the profile.

The A1 horizon is black, very dark gray, dark gray, or gray. The A2 horizon is light brownish gray, gray, or grayish brown. The A horizon ranges from 4 to 14 inches in thickness and from strongly acid to slightly acid in reaction.

The B1 horizon is brown, pale brown, dark brown, or grayish brown. Reaction ranges from medium acid to mildly alkaline. In some profiles the B1 horizon is absent, but, where present, it ranges from 1 to 20 inches in thickness. The B2 horizon is yellowish brown, dark yellowish brown, or brown fine sand 0 to 8 inches thick. This horizon has an average of about 1 to 3 percent more clay than the B1 horizon. Sandy clay loam or sandy loam is discontinuous where the B2 horizon contacts the limestone. Grayish marly material containing small fragments of weathered rock or carbonatic material is also present at the surface of the limestone. Reaction in the B2 horizon is neutral to moderately alkaline.

The IIR horizon is hard, fractured limestone that has many solution holes. These holes range from about 4 inches to 3 feet in diameter and are at intervals of 1 to 6 feet. They are filled with gray (10YR 5/1), light brownish gray (10YR 6/2), pale brown (10YR 6/3), or very pale brown (10YR 7/4) fine sand. Solution holes are 50 inches or more in depth.

Hallandale soils are associated with Boca, Dania, Margate, and Plantation soils. They differ from Boca, Margate, and Plantation soils by having limestone at a depth of 20 inches or less. Also, they do not have the loamy B horizon of Boca soils. Hallandale soils do not have the layers of muck or organic matter of Dania and Plantation soils.

Ha—Hallandale fine sand. This nearly level, poorly drained, sandy soil is underlain by limestone at a depth of 7 to 20 inches. It is in broad flats east of the Everglades and west of the Atlantic Coastal Ridge. This soil has the profile described as typical of the series.

Included with this soil in mapping are small areas of Margate fine sand, Dania muck, and Plantation muck. In some areas a thin layer, 4 inches thick or less, of organic material is on the surface.

Most of the acreage of this soil is in natural vegetation or improved pasture. The natural vegetation consists of scattered slash pine and sawpalmetto, pineland threeawn, paspalum, bluejoint panicum, blue maidencane, and bluestem.

This soil is poorly suited to cultivated crops or citrus. Good pasture of improved grasses or grass and clover can be produced under intensive management. Some water control and fertilization with trace elements are needed.

This soil is in capability subclass IVw.

Hilolo series

Soils of the Hilolo series are fine-loamy, siliceous, hyperthermic Mollic Ochraqualfs. They are poorly drained, slowly to very slowly permeable soils that formed in beds of sandy and loamy marine sediment that is influenced by the underlying alkaline material. These nearly level soils are on low palm hammocks and along the borders of depressional areas and sloughs. Slopes are dominantly less than 1 percent but range to 2 percent.

Hilolo soils are geographically closely associated with Boca, Chobee, Hallandale, Jupiter, Pinellas, and Riviera soils. Boca soils have limestone below the argillic horizon. Chobee soils have a mollic epipedon and are more poorly drained than Hilolo soils. Hallandale and Jupiter soils have limestone at a depth of less than 20 inches. Pinellas and Riviera soils have an argillic horizon between a depth of 20 and 40 inches, and, in addition, Pinellas soils have a calcareous A2 horizon.

Typical pedon of Hilolo fine sand in a palm hammock; 2.5 miles south of Florida Highway 714, and slightly more than 0.5 mile east of Florida Highway 609, SW1/4SW1/4NE1/4 sec. 31, T. 38 S., R. 39 E.

A11—0 to 3 inches; black (10YR 2/1) fine sand; weak fine granular structure; very friable; many fine roots, few medium and coarse roots; many uncoated sand grains; neutral; clear wavy boundary.

A12—3 to 8 inches; very dark brown (10YR 2/2) fine sand; weak fine granular structure; very friable; many medium and few coarse roots; few medium grayish brown (10YR 5/2) pockets of sand coated with carbonates; mildly alkaline; clear wavy boundary.

B21tgca—8 to 18 inches; gray (10YR 5/1) sandy clay loam; few fine faint olive mottles; weak medium subangular blocky structure; friable; few medium roots; sand grains bridged and coated with clay; common streaks and nodules of carbonate accumulations; moderately alkaline; calcareous; clear wavy boundary.

B22tgca—18 to 40 inches; gray (10YR 6/1) sandy clay loam; common fine distinct yellowish brown (10YR 5/8), brownish yellow (10YR 6/6), and yellow (10YR 7/6) mottles, common medium faint very pale brown (10YR 8/4) mottles; moderate coarse subangular blocky structure; slightly sticky and slightly plastic; sand grains coated and bridged with clay; common white nodules of carbonate accumulations; moderately alkaline; calcareous; gradual wavy boundary.

B23tgca—40 to 56 inches; white (10YR 8/1) sandy clay loam; many coarse distinct very pale brown (10YR 7/4) and few fine and medium prominent yellowish brown mottles; moderate coarse subangular blocky structure; very sticky and plastic; common medium to coarse black streaks in old root channels; sand grains coated and bridged with clay; moderately alkaline; calcareous; gradual wavy boundary.

Cg—56 to 66 inches; light gray (10YR 6/1) fine sandy loam; massive; slightly sticky; moderately alkaline; calcareous.

Thickness of the solum ranges from 40 to 60 inches. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is neutral to moderately alkaline. A horizon ranges from 6 to 10 inches in thickness. In some pedons, a thin horizon of calcareous fine sand or loamy fine sand is between the A and Btg horizons.

The Btgca horizon has hue of 10YR, value of 4 to 8, and chroma of 1; or value of 5 to 8 and chroma of 2; or hue of 2.5Y, value of 5 to 7, and chroma of 1 or 2, with mottles in shades of brown, yellow, and olive. It is sandy loam, fine sandy loam, or sandy clay loam. Average clay content of the upper 20 inches of the control section ranges from 18 to 35 percent. The Btgca horizon is mildly alkaline or moderately alkaline and is calcareous.

In some pedons, a B3g horizon is between the B2tgca and the Cg horizons. If present, it is similar in color to the B2tgca horizon except that mottles are fewer or absent. The B3g horizon is loamy sand, loamy fine sand, sandy loam, or fine sandy loam. It is mildly alkaline or moderately alkaline and is calcareous.

The Cg horizon has hue of 10YR, 2.5Y, 5Y, or 5GY, value of 5 to 7; and chroma or 2 or less. It ranges from sand to fine sandy loam. In some pedons shell fragments are in this horizon. Reaction ranges from mildly alkaline to strongly alkaline.

45—Hilolo fine sand. This nearly level soil is poorly drained. It is in hammocks and along borders of depressions and sloughs. Areas range from about 5 to 50 acres. Slopes are smooth to convex and range from 0 to 2 percent.

Typically, the surface layer is fine sand to a depth of 8 inches. The upper 3 inches of the surface layer is black, and the lower 5 inches is very dark brown. The subsoil is calcareous sandy clay loam to a depth of 56 inches. The upper 32 inches of the subsoil is gray, and the lower 16 inches is white. Below this is light gray fine sandy loam to a depth of 66 inches or more.

Included with this soil in mapping are small areas of soils that are similar to this Hilolo soil but have limestone below the subsoil, soils that have a dark surface layer more than 10 inches thick, and soils that have a sandy surface layer slightly more than 20 inches thick. Also included are small spots of Chobee, Jupiter, and Pinellas soils. Total inclusions in any area are less than 25 percent.

The water table is at a depth of less than 10 inches for 2 to 4 months in most years. It is at a depth of 10 to 40 inches for 6 to 9 months and below 40 inches in dry seasons. The available water capacity is low to medium in the surface layer and medium in the subsoil and substratum. Permeability is rapid in the surface layer, moderate to moderately slow in the subsoil, and slow to very slow below the subsoil. Natural fertility and the content of organic matter are medium.

Most areas of this soil are used for citrus. The rest is in natural vegetation of cabbage palm, South Florida slash pine, live oak, water oak, scattered sawpalmetto, wild coffee, ferns, American beautyberry, and species of bluestem and a few other grasses.

This soil has severe limitations for cultivated crops because of wetness. If a complete water control system is installed and maintained, this soil is suitable for many adapted vegetable crops. The water control system should be designed to remove excess surface water rapidly and provide a means for subsurface irrigation. Good management includes crop rotations that keep close growing cover crops in the cropping system two-thirds of the time, use of cover crops and all crop residue to protect the soil from erosion, bedding, and applications of fertilizers according to the need of the crop.

Citrus crops are well suited to this soil. A well designed water control system that will maintain good drainage to a depth of about 4 feet is needed. The trees need to be planted on beds. A good close growing cover crop should be maintained between the tree rows to prevent soil blowing in dry weather and eroding in rainy seasons. Regular applications of fertilizers are needed, but lime is already present in adequate amounts.

This soil is excellent for improved pasture grasses. It is well suited to pangolagrass, bahiagrass, and white clover. A simple surface drainage system is needed. For maximum yields, regular applications of fertilizers are needed and grazing should be controlled.

The potential is medium for pine trees. A simple drainage system is needed to remove the excess surface water. Seedling mortality, plant competition, and occasional equipment limitations are the major management concerns.

This soil is in capability subclass IIIw.

Jupiter series

Soils of the Jupiter series are sandy, siliceous, hyperthermic Typic Haplaquolls. They are poorly drained, rapidly permeable soils that formed in thin beds of sandy marine sediment overlying hard, fractured limestone. These nearly level soils are on low flats and hammocks. They are saturated in the wet season. Slopes are dominantly less than 1 percent, but along the edges of some areas there is an abrupt drop of 1 foot to 2 feet to adjacent soils.

Jupiter soils are geographically closely associated with Chobee, Floridana, Gator, Hallandale, and Hilolo soils. Chobee, Floridana, and Hilolo soils have an argillic horizon. Gator soils are organic. Hallandale soils do not have a mollic epipedon.

Typical pedon of Jupiter sand in a pasture; about 8 miles north-northwest of Indiantown, 1.85 miles south of Florida Highway 714, and slightly more than 1 mile west of Florida Highway 609, SE1/4SE1/4SE1/4 sec. 26, T. 38 S., R. 38 E.

Ap—0 to 4 inches; black (10YR 2/1) sand; weak fine granular structure; very friable; many fine roots; neutral; clear wavy boundary.

A12—4 to 10 inches; very dark grayish brown (10YR 3/2) sand, many fine and medium distinct dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) mottles; weak fine granular structure; very friable; many fine roots; thin root mat on underlying rock; moderately alkaline; abrupt wavy boundary.

IIR—10 to 22 inches; hard, fractured limestone; fractures 1 inch to 4 inches wide and filled with A12 material mixed with carbonatic material in places; very hard rock in upper 6 to 8 inches, softer rock in lower part; rock surface smooth to wavy; moderately alkaline; calcareous; clear irregular boundary.

IIIC1—22 to 32 inches; light brownish gray (10YR 6/2) sandy clay loam; many fine faint grayish brown and light gray mottles; few fine distinct brownish yellow (10YR 6/8) mottles; weak medium granular structure; friable; common small soft to hard carbonate nodules; moderately alkaline; calcareous; gradual wavy boundary.

IIIC2—32 to 48 inches; light gray (10YR 7/2) sandy loam; common medium distinct brownish yellow (10YR 6/8) and yellowish brown (10YR 5/8) mottles; weak medium granular structure; friable; common small soft white carbonate nodules; moderately alkaline; calcareous; clear wavy boundary.

IIIC3—48 to 72 inches; olive gray (5Y 5/2) fine sandy loam; few fine distinct yellowish brown (10YR 5/8) mottles; weak medium granular structure; common small light gray and white carbonate nodules and streaks; moderately alkaline; calcareous; clear wavy boundary.

IIIC4—72 to 84 inches; greenish gray (5GY 6/1) loamy sand mixed with white shell fragments; single grained; loose; moderately alkaline; calcareous

Depth to limestone ranges from 6 to 20 inches in the main part of each pedon but is more than 20 inches where fractures occur. Reaction ranges from slightly acid to moderately alkaline throughout the pedon.

The Ap or A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2; or it is neutral and value is 2 or 3. It commonly ranges from 10 to 20 inches in thickness but is thinner where limestone is at a depth of less than 10 inches.

In some pedons, a C horizon is between the A horizon and the limestone. It has hue of 10YR, value of 4 to 7 and chroma of 1 or 2; or hue of 2.5Y, value of 4 to 6, and chroma of 2. It is sand or fine sand. The C horizon ranges from 0 to 6 inches in thickness. In some pedons, a thin, discontinuous layer of soft weathered limestone is on the surface of the rock.

The IIR horizon is discontinuous hard limestone that has many fractures and a few solution holes. The limestone ranges from 6 to 24 inches or more in thickness.

The IIIC horizon has hue of 10YR, 2.5Y, and 5Y, value of 5 to 7, and chroma of 2 or less; or hue of 5GY, value of 5 to 7, and chroma of 1, with or without mottles in shades of brown, yellow, and olive. It ranges from sand or fine sand to sandy clay loam. Some pedons do not have carbonate nodules or shell fragments.

48—Jupiter sand. This nearly level, shallow soil is poorly drained. It is in low flats and hammocks along the fringes of broad, marshy drainageways. Areas range from 5 to about 150 acres. Slopes are smooth to convex and are dominantly 1 percent or less.

Typically, the surface layer is sand about 10 inches thick. The upper 4 inches of the surface layer is black, and the lower 6 inches is very dark grayish brown. Below this is hard, fractured limestone about 12 inches thick. The substratum is calcareous loamy sand. The upper 10 inches of the substratum is light brownish gray, the next 16 inches is light gray, the next 24 inches is olive gray, and the lower part is greenish gray and is mixed with white shell fragments to a depth of 84 inches or more.

Included with this soil in mapping are small areas of soils that are similar to this Jupiter soil but have a thin layer of loamy material over the limestone, soils that have less than 6 inches of sandy material over the limestone, and scattered spots of exposed limestone. Also included are small areas of Canova Variant, Chobee, Floridana, Hallandale, and Hilolo soils. Total inclusions in any area are less than 25 percent.

Some areas of this soil are covered with water for brief periods in the wet season. The water table is at a depth of less than 10 inches for 2 to 4 months in the wet season during most years. It is at a depth of 10 to 40 inches in drier seasons. Permeability is rapid in the sandy surface layer above the rock. The hard limestone is impermeable but has sufficient fractures and solution holes to permit water movement. Permeability is moderate to rapid in the substratum. The available water capacity is low to medium in the surface layer. Natural fertility and the content of organic matter are medium.

A few areas of this soil are used for citrus and improved pasture grasses. Most areas are in natural vegetation of water oak, cabbage palm, red maple, strangler fig, marlberry, wild coffee, greenbriar, ferns, and a few sprigs of grasses.

Under natural conditions, this soil has very severe limitations for cultivated crops because of the wetness and shallow root zone. The shallow depth to rock and the high water table severely restrict root development. If water control is adequate, this soil is suitable for adapted vegetable crops. The water control system must be designed to remove excess surface water in wet seasons. However, the shallow depth to rock makes such a system difficult to construct. Row crops need to be placed on beds and should be rotated with soil improving crops. All crop residue and soil improving crops should be used to protect the soil from erosion. Fertilizers should be applied according to the need of the crop.

This soil is poorly suited to citrus if the excess water is not controlled. Citrus can be grown if water control and intensive management are provided. The water control system should be designed and constructed to maintain the water table at a depth of 4 feet. Trees need to be planted on beds, and a cover crop should be maintained between tree rows. Regular applications of fertilizers are needed.

Pasture is well suited to this soil. Pangolagrass, improved bahiagrasses, and white clover grow well if well managed. A water control system is needed to remove the excess surface water after heavy rains. Regular applications of fertilizers are needed, and grazing should be controlled to prevent overgrazing and weakening of the plants.

The potential is low for pine tree production, even if a water control system removes the excess surface water. Windthrow hazard and seedling mortality are the main management concerns.

This soil is in capability subclass IVw.

Oldsmar series

Soils of the Oldsmar series are sandy, siliceous, hyperthermic Alfic Arenic Haplaquods. They are poorly drained, slowly to very slowly permeable soils that formed in sandy and loamy marine sediment. These nearly level soils are in broad areas of flatwoods and in wet depressional areas. Slopes range from 0 to 2 percent. These soils are saturated for long periods during the wet season. Depressions are ponded for 6 to 9 months in most years.

Oldsmar soils are geographically associated with Basinger, Floridana, Holopaw, Malabar, Nettles, Pineda, Riviera, Wabasso, and Waveland soils. Basinger soils do not have a spodic or an argillic horizon. Floridana soils have a mollic epipedon and do not have a spodic horizon. Holopaw and Malabar soils do not have a spodic horizon. In addition, Malabar soils have a Bir horizon. Nettles soils have an ortstein. Pineda and Riviera soils do not have a spodic horizon and have an argillic horizon within a depth of 20 to 40 inches. Wabasso soils have an argillic horizon within a depth of 40 inches. Waveland soils do not have an argillic horizon and have an ortstein.

Typical pedon of Oldsmar fine sand in an area of native rangeland; about 2 miles south of Florida Highway 714, 0.5 mile west of Loop Road, and 200 feet south of Woodham Road, NE1/4NE1/4NW1/4 sec. 34, T. 38 S., R. 40 E.

A1—0 to 5 inches; black (10YR 2/1) fine sand rubbed; weak fine granular structure; very friable; many fine roots; very strongly acid; clear smooth boundary.

A21—5 to 14 inches; gray (10YR 5/1) fine sand; single grained; loose; common fine and medium roots; few very dark grayish brown (10YR 3/2) streaks in old root channels; very strongly acid; gradual wavy boundary.

A22—14 to 35 inches; light gray (10YR 7/2) fine sand; single grained; loose; few fine and medium roots; very strongly acid; abrupt wavy boundary.

B21h—35 to 40 inches; black (10YR 2/1) fine sand; massive; friable; noncemented; common fine and medium roots; sand grains well coated with organic matter; very strongly acid; clear wavy boundary.

B22—40 to 46 inches; brown (10YR 4/3) fine sand; single grained; loose; few fine and medium roots; few black (5YR 2/1) streaks and pockets; very strongly acid; abrupt wavy boundary.

B23t—46 to 60 inches; grayish brown (10YR 5/2) fine sandy loam; common fine and medium distinct mottles of brownish yellow (10YR 6/6) and dark grayish brown (10YR 4/2); massive in place, parts to weak medium subangular blocky structure; slightly sticky and slightly plastic; few fine and medium roots; sand grains coated and bridged with clay; medium acid.

Thickness of the solum is more than 44 inches.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1; or it is neutral and value is 2 to 4. It is 4 to 8 inches thick. The A2 horizon has hue of 10YR, value of 5 to 8, and chroma of 2 or less; or it is neutral and value is 5 to 8. In some pedons this horizon has brown mottles. Reaction ranges from very strongly acid to slightly acid. Total thickness of the A horizon ranges from 30 to 50 inches. A darker transitional horizon is at the base of the A horizon in some pedons.

The B21h horizon has hue of 10YR and 5YR, value of 2, and chroma of 1 or 2; hue of 7.5YR, value of 3, and chroma of 2; or hue of 5YR, value of 3, and chroma of 2 or 3. It is fine sand or loamy fine sand. The B21h horizon may be weakly cemented in less than 50 percent of each pedon. Reaction ranges from very strongly acid to slightly acid.

The B22 horizon has hue of 10YR, value of 3, and chroma of 3; or value of 4 and chroma of 4; or hue of 5YR, value of 3, and chroma of 4. It is fine sand or loamy fine sand. Reaction ranges from very strongly acid to neutral. In some pedons, the B22 horizon is absent. In other pedons, there is a B22&Bh horizon that has matrix colors similar to the B22 horizon and darker, weakly cemented Bh fragments.

The B23t horizon has hue of 10YR and 2.5Y, value of 4 to 7, and chroma of 2 or less; or hue of 5Y, value of 5 or 6, and chroma of 2 or less. In most pedons this horizon has mottles of gray, brown, yellow, or red. This horizon is fine sandy loam, sandy loam, or sandy clay loam. Reaction ranges from strongly acid to moderately alkaline. Depth to the Btg horizon ranges from 40 to 70 inches. In some pedons the Btg horizon extends to a depth of more than 80 inches, and in other pedons, it is underlain by a sandy C horizon at a depth of about 50 inches.

16—Oldsmar fine sand. This nearly level soil is poorly drained. It is in broad areas in the flatwoods. Areas are generally large, ranging to 1,000 acres or more. Slopes are smooth and range from 0 to 2 percent.

Typically, the surface layer is black fine sand about 5 inches thick. The subsurface layer is fine sand to a depth of 35 inches. The upper 9 inches of the subsurface layer is gray, and the lower 21 inches is light gray. The upper 11 inches of the subsoil is black and brown fine sand and has organic matter coatings on the sand grains. The lower part of the subsoil is grayish brown fine sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils in which the dark colored, sandy part of the subsoil is above a depth of 30 inches or slightly deeper than 50 inches and in some small areas is less well developed than in the typical profile. Some areas of included soils have a thicker dark surface layer, a surface layer of sand, or a subsurface layer with more color. Also included are small areas of Basinger, Boca, Holopaw, Malabar, Nettles, Pinellas, and Wabasso soils. Total inclusions in any area are less than 20 percent.

The water table is at a depth of less than 10 inches for 1 to 3 months during wet seasons in most years. It is at a depth of 10 to 40 inches for 6 months or more, and recedes to a greater depth during extended dry periods Permeability is rapid in the surface and subsurface layers. It is moderately rapid to moderately slow in the upper sandy part of the subsoil and slow to very slow in the lower loamy part. The available water capacity is very low in the surface and subsurface layers and medium in the subsoil. Natural fertility and the content of organic matter are low.

Some large areas of this soil are used for citrus or improved pasture grasses. Most areas remain in natural vegetation consisting of South Florida slash pine, scattered cabbage palm, sawpalmetto, waxmyrtle, gallberry, fetterbush, running oak, dwarf huckleberry, pineland threeawn, blue maidencane, and species of bluestem.

This soil has very severe limitations for cultivated crops because of wetness. The number of adapted crops is limited unless intensive water control measures are used. If a water control system is designed to remove the excess water in wet seasons and to provide for subsurface irrigation in dry seasons, this soil is suited to many kinds of flower and vegetable crops. Good management includes close growing, soil improving crops in the crop rotation, use of crop residue and cover crops to protect the soil from erosion, and applications of lime and fertilizers according to the need of the crop.

Under natural conditions, this soil is poorly suited to citrus trees because of wetness. If a well designed drainage system is used to remove the excess water to a depth of about 4 feet, this soil is suitable for citrus crops. Good management includes planting the trees on beds to lower the effective depth of the water table, use of a close growing cover crop between tree rows to protect the soil from blowing when dry and washing during heavy rains, and regular applications of fertilizers and lime as needed. Supplemental irrigation is needed in dry seasons for maximum yields.

This soil is well suited to pasture and hay crops. Pangolagrass, bahiagrass, and white clover grow well if well managed. A simple drainage system that removes the excess surface water in times of high rainfall is needed. Regular applications of fertilizers and lime are also needed. Grazing should be controlled to maintain healthy plants for best yields.

The potential is medium for pine trees. The major management concerns are plant competition, equipment mobility, and seedling mortality. South Florida slash pine is preferred for planting. A simple drainage system to remove excess surface water should be installed.

This soil is in capability subclass IVw.

54—Oldsmar fine sand, depressional. This nearly level soil is poorly drained. It is in wet depressions in the flatwoods. Areas generally range from about 5 to 50 acres. Slopes are smooth to concave and range from 0 to 2 percent.

Typically, the surface layer is fine sand about 12 inches thick. The upper 5 inches of the surface layer is very dark gray, and the lower 7 inches is dark grayish brown. The subsurface layer is light gray fine sand about 21 inches thick. The upper part of the subsoil is black, dark reddish brown, and brown fine sand that has coatings of organic matter, and the lower part of the subsoil is dark grayish brown sandy clay loam about 8 inches thick. The substratum is light olive gray sandy loam to a depth of 68 inches or more.

Included with this soil in mapping are small areas of soils that are similar to this Oldsmar soil but have a thicker, dark colored surface layer, a few small areas of soils that have a thin layer of muck on the surface, and areas of soils that have a sand texture. Some small areas of this soil have a less well developed, lighter colored sandy subsoil, rather than the typical black color. Also included are small areas of Basinger, Floridana, Holopaw, Riviera, and Wabasso soils. Total inclusions in any area are less than 25 percent.

This soil is ponded for 6 to 9 months or more in most years, and the water table is within 10 inches of the surface most of the rest of the time. The available water capacity is very low in the surface and subsurface layers and medium in the subsoil. Permeability is rapid in the surface and subsurface layers, rapid to moderately slow in the upper sandy part of the subsoil, and slow to very slow in the lower loamy part. Natural fertility and the content of organic matter are low.

Most areas of this soil remain in natural vegetation consisting of St. Johnswort, needlerush, pipewort, queensdelight, ferns, sedges, blue maidencane, and various grasses.

Under natural conditions, this soil is not suited to cultivated crops because of ponding. However, if very intensive management, soil improving measures, and a good water control system are used, this soil is suitable for vegetable crops. A water control system is needed to remove the excess water in wet seasons and provide for subsurface irrigation in dry seasons. Row crops should be rotated with close growing, soil improving crops. The rotation needs to include soil improving crops three-fourths of the time. Crop residue and soil improving crops should be used to protect the soil from erosion. Seedbed preparation needs to include bedding of the rows. Fertilizer and lime should be added according to the need of the crop.

This soil is not suited to citrus trees in the natural state and is poorly suited even if management is intensive and water control is adequate.

Under natural conditions, this soil is not suited to pasture. However, if very intensive management, soil improving measures, and a good water control system are used, this soil is moderately suited to improved pasture grasses. Pangolagrass, improved bahiagrasses and white clover grow well if well managed. Water control measures are needed to remove the excess surface water after heavy rains. Regular applications of fertilizer and lime are needed. Grazing should be controlled to prevent overgrazing and weakening of plants.

The potential is low on this soil for pine trees. Severe equipment limitations and seedling mortality are the main management concerns. A good water control system that removes the excess surface water is necessary before trees can be planted and the potential productivity realized. Slash pine is better than other species to plant.

Pineda series

Soils of the Pineda series are loamy, siliceous, hyperthermic Arenic Glossaqualfs. They are poorly drained, slowly to very slowly permeable soils that formed in thick beds of sandy and loamy marine sediments. These nearly level soils are on broad lowlands. A water table is within a depth of 10 inches for 1 month to 6 months in most years. Slopes are dominantly less than 1 percent but range to 2 percent.

Pineda soils are geographically associated with EauGallie, Malabar, Oldsmar, Pinellas, Riviera, Wabasso, and Winder soils. EauGallie, Oldsmar, and Wabasso soils have a spodic horizon. Malabar soils have an argillic horizon below a depth of 40 inches. Pinellas soils have calcium carbonate accumulations in the horizons above the argillic horizon. Riviera soils do not have a Bir horizon. Winder soils do not have a Bir horizon and have an argillic horizon within 20 inches of the surface.

Typical pedon of Pineda sand in an area of natural vegetation; about 10 miles south of Stuart, 300 feet west of the intersection of Florida Highways 76 and 708, 50 feet south of Florida Highway 76, NW1/4NE1/4NE1/4 sec. 26, T. 39 S., R. 40 E.

A11—0 to 5 inches; dark gray (10YR 4/1) sand; weak fine granular structure; very friable; many fine and medium, few coarse roots; black organic matter segregated into fine and medium granules; strongly acid; clear smooth boundary.

A12—5 to 8 inches; dark grayish brown (10YR 4/2) sand; few medium faint brown (10YR 5/3) mottles; single grained; loose; common fine and medium, few coarse roots; strongly acid; clear wavy boundary.

A2—8 to 15 inches; brown (10YR 5/3) sand, many fine faint yellow and brownish yellow mottles; single grained; loose; few fine roots; medium acid; clear wavy boundary.

B2ir—15 to 22 inches; brownish yellow (10YR 6/8) sand; few medium distinct very pale brown (10YR 7/3) and common medium distinct yellowish brown (10YR 5/8) mottles; weak fine granular structure; very friable; slightly acid; clear wavy boundary.

B3ir—22 to 36 inches; very pale brown (10YR 7/4) sand, common fine distinct brownish yellow (10YR 6/6) mottles; single grained; loose; few tongues of yellowish brown (10YR 5/8) extend into horizon, moderately alkaline; abrupt irregular boundary.

B2tg—36 to 44 inches; gray (5Y 5/1) fine sandy loam, common coarse distinct olive brown (2.5Y 4/4) mottles; weak medium and coarse subangular blocky structure; few old roots; sand grains coated and bridged with clay; few large pale brown (10YR 6/3) and gray (5Y 5/1) fine sand tongues and pockets; matrix of upper few inches is dark grayish brown (10YR 4/2); very strongly acid; clear wavy boundary.

B3g—44 to 60 inches; greenish gray (5G 5/1) and dark grayish brown (2.5Y 4/2) fine sandy loam; weak fine granular structure; friable; common coarse pockets of brown (10YR 4/3, 5/3) fine sand; medium acid; clear wavy boundary.

IIC—60 to 72 inches; mixture of greenish gray (5G 5/1) fine sand and white shell fragments; moderately alkaline; calcareous.

Thickness of the solum is 40 to 80 inches or more. Combined thickness of the A and Bir horizon is 20 to 40 inches. Reaction ranges from strongly acid to neutral in the A and Bir horizons and from neutral to moderately alkaline in the Btg and C horizons.

The A1 horizon is neutral and value is 3 or 4; or it has hue of 10YR, value of 2 or 3, and chroma of 1; or value of 4 and chroma of 1 or 2. Where value is 2 or 3, thickness of the horizon is less than 6 inches. The A2 horizon has hue of 10YR, value of 5, and chroma of 1 to 3; or value of 6 and chroma of 1 or 2; or value of 7 or 8 and chroma of 1 to 4. In some pedons the A2 horizon is absent.

The B2ir horizon has hue of 10YR, value of 6, and chroma of 3; or value of 5 or 6 and chroma of 6 or 8; or hue of 7.5YR, value of 5, and chroma of 6 or 8. The B3ir horizon has hue of 10YR, value of 6 to 8, and chroma of 3 or 4. In some pedons, a thin discontinuous dark brown Bh horizon is at the base of the Bir horizon.

The B2tg horizon matrix is sandy loam, fine sandy loam, or sandy clay loam. Tongues of coarser material extend into this horizon from the horizons above. The B2tg horizon matrix has hue of 10YR, value of 4 to 7, and chroma of 2 or less; hue of 5Y, value of 5 or 6, and chroma of 1; hue of 2.5Y, value of 4 to 7, and chroma of 2; or is neutral and has value of 4 to 6. In most pedons this horizon is mottled in shades of yellow or brown. Tongues of sand, fine sand, or loamy sand are generally lighter colored than the matrix. In some pedons a loamy sand or sandy loam B1tg horizon is above the B2tg horizon. The B3g horizon, where present, is loamy sand or sandy loam. It is similar in color to the B2tg horizon and, in addition, it has hue of 5G, value of 5 or 6, and chroma of 1.

The Cg or IIC horizon has hue of 10YR and 2.5Y, value of 5 or 6, and chroma of 2 or less; or hue of 5Y 5G, and 5GY, value of 5 to 7, and chroma of 1. It is sand, fine sand, loamy sand, or sandy loam and has few to many fine shell fragments. In some pedons this horizon is absent.

21—Pineda sand. This nearly level soil is poorly drained. It is in low grassy flats in most parts of the county. Areas vary considerably in size, ranging from 5 to 1,000 acres. Slopes are smooth and dominantly less than 1 percent but range from 0 to 2 percent.

Typically, the surface layer is dark gray and dark grayish brown sand. The subsurface layer is brown fine sand and has yellow and brownish yellow mottles. The upper part of the subsoil is brownish yellow and very pale brown fine sand that is coated with iron oxides. The lower part of the subsoil is mottled, gray fine sandy loam. Below this is grayish fine sandy loam. The substratum is a mixture of gray sand and white shell fragments to a depth of 72 inches or more.

Included with this soil in mapping are small areas of Boca, Malabar, Oldsmar, Pinellas, Riviera, Wabasso, and Winder soils. Also included are areas of soils that have organic stained layers or a thin, discontinuous Bh horizon above the loamy subsoil and areas of soils that have a thicker, dark colored surface layer. Total inclusions in any area are less than 20 percent.

The water table is within a depth of 10 inches for 2 to 6 months during wet seasons in most years and at a depth of 10 to 40 inches most of the remaining time. Some areas are covered in places with shallow water for 1 to 2 months. Permeability is rapid, except it is slow to very slow in the lower part of the subsoil. The available water capacity is very low in the surface and subsurface layers and substratum and medium in the subsoil. Natural fertility and the content of organic matter are low.

Some large areas of this soil are used for citrus crops and improved pasture. Most areas remain in natural vegetation of slash pine, cabbage palm, waxmyrtle, gallberry, fetterbush, blue maidencane, broomsedge bluestem, chalky bluestem, low panicums, pineland threeawn, and numerous grasses.

This soil has severe limitations for cultivated crops. If a water control system is established to remove excess water and provide a means of applying subsurface irrigation, this soil is well suited to vegetable crops. Good management includes crop rotations that keep close growing cover crops in the cropping system at least two-thirds of the time. The cover crops and all other crop residue should be used to protect the soil from erosion. Seedbed preparation needs to include bedding. Fertilizers should be applied according to the need of the crop.

Under natural conditions this soil is poorly suited to citrus trees, but if water control is adequate, it is well suited to citrus. Water control systems that maintain good drainage to a depth of about 4 feet are needed. Planting the trees on beds lowers the effective depth of the water table. A close growing cover crop is needed between the tree rows to protect the soil from blowing when the trees are young. The trees require regular applications of fertilizer.

This soil is well suited to improved pasture, especially to pangolagrass, bahiagrass, and clovers. Excellent pasture of grass alone or grass-clover mixtures can be grown if management is good. Pasture requires regular applications of fertilizers and controlled grazing for highest yields.

The potential is medium for pine trees, but a water control system is needed if the potential productivity is to be realized. Equipment limitations and seedling mortality are the main management concerns. Slash pine is better suited than other species.

This soil is in capability subclass IIIw.

Pinellas series

Soils of the Pinellas series are loamy, mixed, hyperthermic Arenic Ochraqualfs. They are poorly drained, moderately permeable soils that formed in sandy and loamy marine sediment. These nearly level soils border sloughs and depressions in the flatwoods areas. They are periodically saturated during the rainy season and following heavy rainfall in other seasons. Slopes are dominantly less than 1 percent but range to 2 percent at the edges of some depressions.

Pinellas soils are geographically closely associated with Boca, Hallandale, Pineda, Riviera, Wabasso, and Winder soils. Boca soils have limestone below the argillic horizon. Hallandale soils do not have an argillic horizon and have limestone within a depth of 20 inches. Pineda and Riviera soils do not have a calcareous A2 horizon, and Pineda soils have a Bir horizon. Wabasso soils have a spodic horizon. Winder soils do not have a calcareous A2 horizon and have an argillic horizon within a depth of 20 inches.

Typical pedon of Pinellas fine sand in an undisturbed flatwoods area; 1.1 miles west of Florida Highway 710, about 400 feet east of end of Clements Road, and about 100 feet south of road, NW1/4NW1/4NW1/4 sec. 7, T. 39 S., R. 37 E.

A1—0 to 5 inches; black (10YR 2/1) fine sand; weak fine granular structure; very friable; mixture of organic matter and uncoated sand grains; many fine roots; medium acid; clear wavy boundary.

A21—5 to 11 inches; grayish brown (10YR 5/2) fine sand; many fine faint light gray and dark grayish brown mottles; single grained; loose; few fine and coarse roots; slightly acid; gradual wavy boundary.

A22ca—11 to 13 inches; dark grayish brown (10YR 4/2) fine sand; few fine distinct yellowish brown mottles; single grained; loose; few coarse roots; moderately alkaline; calcareous; gradual wavy boundary.

A23ca—13 to 16 inches; light gray (10YR 7/2) fine sand; many fine distinct brownish yellow (10YR 6/6) mottles; weak fine granular structure; very friable; secondary carbonates in interstices between sand grains; few coarse roots; strong bluish gray streaks in old root channels; moderately alkaline; calcareous; gradual wavy boundary.

A24ca—16 to 26 inches; white (10YR 8/2) fine sand; weak coarse subangular blocky structure; very friable; secondary carbonates in interstices between sand grains; strongly alkaline; calcareous; abrupt wavy boundary.

B2tg—26 to 38 inches; light olive gray (5Y 6/2) fine sandy loam; few coarse faint greenish gray (5GY 6/1) and few fine distinct olive brown mottles; weak coarse subangular blocky structure; slightly sticky, slightly plastic; sand grains coated and bridged with clay; common pockets of light gray fine sand; secondary carbonates in some old root channels; strongly alkaline; clear irregular boundary.

Cg—38 to 52 inches; light olive gray (5Y 6/2) fine sand; single grained; loose; few pockets of loamy fine sand; moderately alkaline; calcareous; gradual wavy boundary.

IIC—52 to 60 inches; light gray (5Y 7/1) fine sand mixed with white shell fragments; single grained; loose; many small unbroken shells; moderately alkaline; calcareous.

Thickness of the solum is less than 60 inches. Reaction of the A1 horizon and upper part of the A2 horizon ranges from medium acid to mildly alkaline. The lower part of the A2 horizon is mildly alkaline to strongly alkaline and is calcareous. Thickness of the A horizon ranges from 20 to 40 inches.

The A1 horizon has hue of 10YR or it is neutral, value of 2 to 4, and chroma of 1 or less. Where the A1 horizon has value of 3.5 or less, it is less than 6 inches thick. The A2 horizon has hue of 10YR, value of 4, and chroma of 2; or value of 5 to 8 and chroma of 1 to 3, or hue of 2.5Y, value of 5 to 7, and chroma of 2, with or without mottles in shades of gray, brown, or yellow. Subhorizons of the A2 horizon that have secondary carbonate accumulations have firm to loose consistence.

The B2tg horizon has hue of 10YR or 5Y, value of 5 to 8, and chroma of 1, with or without mottles; or chroma of 2, with mottles in shades of brown, yellow, olive, and gray. It is fine sandy loam, sandy loam, or sandy clay loam. The B2tg horizon is neutral to strongly alkaline and is calcareous.

The C and IIC horizons are similar in color to the B2tg horizon. The C horizon does not have shell fragments. The C and IIC horizons are fine sand or sand. Either of these horizons may be absent.

47—Pinellas fine sand. This nearly level soil is poorly drained. It is in flatwoods and hammock areas bordering sloughs and depressions. Areas range from about 5 to 50 acres. Slopes are smooth and range from 0 to 2 percent.

Typically, the surface layer is black fine sand about 5 inches thick. The subsurface layer is fine sand to a depth of about 26 inches. The upper 6 inches of the subsurface layer is grayish brown. The lower part of the subsurface layer has carbonate accumulations and is calcareous. It is dark grayish brown in the upper 2 inches, light gray in the next 3 inches, and white in the lower 10 inches. The subsoil is light olive gray fine sandy loam about 12 inches thick. Below this is about 14 inches of light olive gray fine sand over light gray fine sand and shell fragments to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils that are similar to this Pinellas soil but have a subsoil slightly deeper than 40 inches or have a dark colored surface layer more than 6 inches thick. Small areas of soils have a yellowish horizon above the subsoil. Limestone boulders are below the subsoil in some pedons. Also included are small areas of Boca, Ft. Drum, Hallandale, Hilolo, Pineda, Riviera, and Tuscawilla soils. Total inclusions in any area are less than 25 percent.

The water table is within a depth of 10 inches for less than 3 months and at a depth of 10 to 40 inches for 4 to 6 months during most years. The water table can recede to a depth of more than 40 inches during extended dry periods. Permeability is rapid in the surface and subsurface layer and moderate in the subsoil. The available water capacity is very low in the surface layer and medium in the subsurface layer and subsoil. Natural fertility and the content of organic matter are low.

Some areas of this soil are used for citrus. Most area remain in natural vegetation. The natural vegetation is South Florida slash pine, cabbage palm, sawpalmetto, waxmyrtle, and gallberry. It also includes grasses, such as broomsedge and chalky bluestems, blue maidencane lopsided indiangrass, sand cordgrass, and pineland threeawn.

Under natural conditions, this soil has severe limitations for cultivated crops. Wetness resulting from a high water table is the major limiting factor. This soil is well suited to many vegetable crops if a complete water control system is used to remove the excess surface water and provide a means for applying subsurface irrigation. Good management practices include crop rotations that keep close growing cover crops on the soil between cropping seasons, use of cover crops and all crop residue to protect the soil from erosion, good seedbed preparation, bedding, and applications of fertilizers according to the need of the crop.

Citrus trees are suited to this soil if a water control system is designed to maintain the water table below a depth of 4 feet. Planting the trees on beds helps provide good surface drainage. A good close growing cover crop is needed between tree rows to protect the soil from blowing. Regular applications of fertilizers are needed

This soil is well suited to pasture and hay crops. Pangolagrass, improved bahiagrasses, and clovers g well. Management practices include regular applicatic of fertilizers and controlled grazing.

The potential is medium for pine trees. The major concerns in management are seedling mortality, windthrow hazard, and plant competition. Slash pine is better suited than other species.

This soil is in capability subclass IIIw.

Riviera series

Soils of the Riviera series are loamy, siliceous, hyperthermic Arenic Glossaqualfs. They are nearly level, poorly drained, slowly to very slowly permeable soils that formed in beds of sandy and loamy marine sediments (fig. 13). These soils are on broad, low flats and in depressional areas. The water table is within a depth of 10 inches for 2 to 4 months in most years and between a depth of 10 and 30 inches for most of the rest of the year. Depressions are ponded for 6 to 12 months in most years. Slopes are less than 2 percent.

Riviera soils are geographically closely associated with Chobee, Floridana, Holopaw, Pineda, Wabasso, and Winder soils. Chobee and Floridana soils have a mollic epipedon. Holopaw soils have an argillic horizon below a depth of 40 inches. Pineda soils have a Bir horizon above the argillic horizon, and Wabasso soils have a spodic horizon above the argillic horizon. Winder soils have an argillic horizon at a depth of less than 20 inches.

Typical pedon of Riviera fine sand in an area of grassy sloughland; about 100 feet east of Florida Highway 710, 1.1 miles south of Florida Highway 714, and about 0.4 mile north of a railroad crossing on Florida Highway 710, NW1/4NE1/4 sec. 29, T. 38 S., R. 37 E.

A1—0 to 4 inches; dark gray (10YR 4/1) fine sand; weak fine granular structure; very friable; many fine and few coarse roots; neutral; gradual wavy boundary.

A21—4 to 17 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; neutral; clear wavy boundary.

A22—17 to 31 inches; light gray (10YR 7/2) fine sand; single grained; loose; common coarse mottles or pockets of very pale brown (10YR 7/3); neutral; clear wavy boundary.

A23—31 to 36 inches; discontinuous, horizontal bands of light gray (10YR 7/2) and brown (10YR 5/3) fine sand; single grained; loose; few medium distinct yellowish brown (10YR 5/8) streaks along old root channels; neutral; abrupt irregular boundary.

B2tg&A—36 to 42 inches; olive gray (5Y 5/2) fine sandy loam; few fine distinct strong brown (7.5YR 5/8) and olive brown (2.5Y 4/4) mottles; few fine tongues and pockets of light gray (10YR 7/2) material from the A2 horizon; weak coarse subangular blocky structure; friable, slightly sticky; sand grains coated and bridged with clay; many fine darker colored old root channels throughout; strongly acid; gradual wavy boundary.

C1g—42 to 56 inches; light gray (2.5Y 7/2) fine sand with common coarse distinct yellowish brown (10YR 5/8) and brownish yellow (10YR 6/6) mottles; weak medium granular structure; very friable; few large pockets of olive gray (5Y 5/2) fine sand; mildly alkaline; gradual wavy boundary.

IIC—56 to 80 inches; light gray (10YR 7/1) fine sand mixed with many white shell fragments and few white shells; single grained; loose; moderately alkaline; calcareous.

The A1 horizon has hue of 10YR, value of 2 to 5, and chroma of 1. Where value is 3.5 or less, the horizon is less than 6 inches thick. The A2 horizon has hue of 10YR, value of 5 to 8, chroma of 1 or 2, with or without mottles or pockets in shades of brown, yellow, or gray. The A horizon is sand or fine sand. It is strongly acid to slightly acid and ranges from 20 to 40 inches in thickness.

The B2tg part of the B2tg&A horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2; hue of 2.5Y, value of 5 or 6, and chroma of 2; or hue of 5Y, value of 5 or 6, and chroma of 1 or 2 with mottles in shades of brown and yellow. It is sandy loam, fine sandy loan, or sandy clay loam and has tongues or vertical inclusions from the A2 horizon. Reaction ranges from slightly acid to moderately alkaline. However, in some places, this horizon contains small bodies of pyrites. If this soil is drained, sulfates are released in these places and the reaction in localized spots becomes extremely acid.

The C1g horizon has hue of 10YR and 5Y, value of 5 to 7, and chroma of 1 or 2; or hue of 2.5Y, value of 5 to 7 and chroma of 2, with or without mottles of brown, yellow, or olive. This horizon ranges from sand to fine sandy loam and is slightly acid to moderately alkaline. It is absent in some pedons.

The IIC horizon generally is at a depth of more than 40 inches. It has hue of 10YR, 5Y, and 5GY, value of 5 to 7, and chroma of 1. This horizon is a mixture of sandy material and a varying amount of shell fragments. It is mildly alkaline or moderately alkaline and is calcareous

20--Riviera fine sand. This nearly level soil is poorly drained. It is on broad, low flats and in drainageways. Slopes are smooth to concave and range from 0 to 2 percent.

Typically, the surface layer is dark gray fine sand about 4 inches thick. The subsurface layer is grayish brown to light gray fine sand to a depth of 36 inches. The subsoil is olive gray fine sandy loan that has a few fine tongues and pockets of light gray subsurface material. Next is light gray fine sand to a depth of about 56 inches and mixed fine sand and shell fragments to a depth of 80 inches or more.

Included with this soil in mapping are small areas of soil that has a dark colored surface layer more than 6 inches thick and soil that has an organic stained layer above the subsoil. Also included are small areas of Floridana, Holopaw, Pineda, Wabasso, and Winder soils. Total inclusions in any area are less than 20 percent.

The water table is at a depth of less than 10 inches for 2 to 4 months in most years, and at a depth of 10 to 30 inches the rest of the time. It can recede below a depth of 40 inches for short periods in dry seasons. The available water capacity is low in the surface and subsurface layers and medium in the subsoil. Permeability is rapid in the surface and subsurface layers and slow to very slow in the subsoil. Natural fertility and the content of organic matter are low.

Several large areas of this soil are used for citrus, truck crops, and improved pasture grasses. Most areas are in natural vegetation of South Florida slash pine, cabbage palm, sawpalmetto, waxmyrtle, blue maidencane, broomsedge bluestem, pineland threeawn, cordgrass, panicums, and a variety of sedges.

Under natural conditions, this soil has severe limitations for cultivated crops because of wetness. However, if a water control system removes the excess surface water in wet seasons and provides subsurface irrigation in dry seasons, this soil is suitable for common vegetable crops. Good management includes crop rotations that keep close growing cover crops in the cropping system two-thirds of the time and includes the use of cover crops and all crop residue to protect the soil from erosion. Other management practices are good seedbed preparation, bedding, and applying fertilizers according to the need of the crop.

Under natural conditions, this soil is poorly suited to citrus trees. However, if water control is adequate, this soil is well suited to the production of oranges and grapefruit. A water control system that maintains good drainage to a depth of about 4 feet is needed. The trees should be planted on beds, and a close growing cover crop needs to be maintained on the beds to prevent soil blowing while the trees are young. Regular applications of fertilizers are needed.

This soil is well suited to pasture and hay crops. Excellent pasture of pangolagrass, bahiagrass, or grass-clover mixtures can be grown if management is good. A simple drainage system to remove the excess surface water in wet seasons is needed. Also needed are regular applications of fertilizers and controlled grazing.

The potential is medium for pine trees, but a water control system is needed if the potential productivity is to be realized. Equipment limitations, plant competition, and seedling mortality are the main management concerns.

This soil is in capability subclass IIIw.

Taken from USDA Soil Survey of Martin County, Florida, 1981 Edition.

49—Riviera fine sand, depressional. This nearly level soil is poorly drained. It is in depressions. Slopes are smooth to concave and range from 0 to 2 percent.

Typically, the surface layer is gray fine sand about 2 inches thick. The subsurface layer is gray fine sand to a depth of 28 inches. The upper 14 inches of the subsurface layer is light gray, the next 4 inches is gray, and the lower 8 inches is light brownish gray. The upper 10 inches of the subsoil is gray fine sandy loam that has pockets and tongues of material from the subsurface layer, and the lower 11 inches is grayish brown sandy clay loam. Below this is grayish brown loamy fine sand with pockets of fine sand to a depth of 50 inches or more.

Included with this soil in mapping are small areas of Chobee, Floridana, Holopaw, Pineda, Wabasso, and Winder soils. Also included are small spots of soils that have a thin layer of organic material on the surface. Total inclusions in any area are less than 20 percent.

This soil is ponded for 6 to 9 months in most years. During the dry season, the water table recedes to a depth of 10 to 40 inches. The available water capacity is low in the surface and subsurface layers, medium in the upper 10 inches of the subsoil, and low below this. Permeability is rapid in the sandy surface and subsurface layers, slow or very slow in the upper part of the subsoil, and rapid below this. Natural fertility and the content of organic matter are low.

Numerous areas of this soil are used for citrus and improved pasture grasses. Most areas remain in native vegetation of queensdelight, sand cordgrass, St. Johnswort, maidencane, and water tolerant grasses and sedges. Some areas have dense to scattered stands of cypress trees.

Under natural conditions, this soil is not suited to cultivated crops, improved pasture grasses, or citrus. It occupies the lowest positions in the landscape, and drainage outlets are generally not available. However, the depressions in which this soil occurs are generally so numerous in areas of soils being developed that they are included in the developments. Although this soil receives the same drainage and management as the adjoining soils, it generally does not produce so well.

In the natural state, areas of this soil provide nesting and feeding areas for a variety of wetland wildlife.

This soil is in capability subclass VIIw.

Tequesta Variant

Soils of the Tequesta Variant are fine-loamy, siliceous, hyperthermic Typic Umbraqualfs. They are very poorly drained, moderately permeable to slowly permeable soils that formed in sandy and loamy marine sediment under conditions favorable to the accumulation of organic material. These nearly level soils are in depressional areas and marshes. They are ponded for long periods. Slopes are less than 2 percent.

Tequesta Variant soils are geographically associated with Canova Variant, Chobee, Floridana, Gator, Okeelanta, Riviera, and Winder soils. Canova Variant soils do not have an umbric epipedon and have limestone within a depth of 40 inches. Chobee, Floridana, Riviera, and Winder soils do not have a histic or an umbric epipedon. Gator and Okeelanta soils are organic.

Typical pedon of Tequesta Variant muck in an undeveloped shallow depressional area in Caulkins Grove; about 2.3 miles southwest of Indiantown and 1.1 miles south of Florida Highway 76, NE1/4SW1/4 sec. 13, T. 40 S., R. 38 E.

Oa—14 inches to 0; black (10YR 2/1) muck; less than 5 percent fiber rubbed; weak medium granular structure; friable; estimated 40 percent sand; many uncoated sand grains; strongly acid; gradual wavy boundary.

A1—0 to 12 inches; black (10YR 2/1) sand; weak fine granular structure; very friable; estimated 15 percent organic matter; medium acid; gradual wavy boundary.

A2—12 to 16 inches; light brownish gray (10YR 6/2) sand; single grained; loose; common medium faint dark grayish brown (10YR 4/2) and gray (10YR 5/1) mottles; medium acid; clear irregular boundary.

B2tg—16 to 26 inches; grayish brown (10YR 5/2) sandy clay loam; common medium faint dark grayish brown (10YR 4/2) mottles; weak coarse subangular blocky structure; firm; slightly sticky and plastic; moderately alkaline; gradual wavy boundary.

B3g—26 to 34 inches; dark grayish brown (2.5Y 4/2) loamy sand; massive; nonsticky; few pockets of sand and sandy loam; few very dark grayish brown streaks in old root channels; moderately alkaline; gradual wavy boundary.

Cg—34 to 50 inches; light gray (2.5Y 7/2) and light brownish gray (2/5Y 6/2) sand; single grained; loose; few lenses or pockets of loamy sand; moderately alkaline.

Thickness of the solum is 30 inches or more. Reaction is strongly acid to neutral in the Oa and A horizons, and slightly acid to moderately alkaline in the Bt and C horizons.

The Oa horizon has hue of 10YR, value of 2, and chroma of 1; or hue of 5YR, value of 2, and chroma of 1 or 2; or value of 3 and chroma of 2 or 3. It ranges from 6 to 16 inches in thickness.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1; or it is neutral and has value of 2 or 3. It is 10 inches or more in thickness. The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 2 or less. In some pedons, the A2 horizon is absent. Total thickness of the A horizon is less than 20 inches.

The B2tg horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2; hue of 2.5Y, value of 3 to 5, and chroma of 2; or hue of 5Y, value of 4 or 5, and chroma of 1 or 2. Few to common mottles in shades of gray, brown, or olive may be present. The B2tg horizon is sandy clay loam, sandy loam, or fine sandy loam, but in most pedons this horizon has pockets of coarser textured material. Clay content of the Btg horizon ranges from 18 to 35 percent but is commonly 18 to 25 percent.

In some pedons the B3g horizon is absent. Where present, it has a color range similar to that of the B2tg horizon. It is loamy sand, loamy fine sand, or sandy loam, with or without pockets or lenses of coarser or finer material.

The Cg horizon has hue of 10YR or 5Y, value of 5 to 7, and chroma of 1 or 2; or hue of 2.5Y, value of 5 to 7, and chroma of 2. It is sand or loamy sand. In some pedons, this horizon has lenses or pockets of sandy loam or sandy clay loam. In a few pedons, all or part of the Cg horizon is mixed sand and shell fragments.

60—Tequesta Variant muck. This nearly level soil is very poorly drained. It is in depressions and marshy areas. Most areas are 5 to 20 acres, but a few range to 100 acres. Slopes are smooth to concave and range from 0 to 2 percent.

Typically, the surface layer is black muck about 14 inches thick. The next layer is black sand about 12 inches thick. Below this is a layer of light brownish gray sand about 4 inches thick. The subsoil is grayish brown, light sandy clay loam in the upper 10 inches and dark grayish brown loamy sand in the lower 8 inches. Below this is light gray and light brownish gray sand to a depth of 50 inches or more.

Included with this soil in mapping are small areas of soils that have a loamy sand A horizon or an A1 horizon less than 10 inches thick. Some small areas have soils in which the muck surface layer is slightly less than 6 inches thick or the subsoil is slightly deeper than 20 inches. Also included are small areas of Chobee, Floridana, Gator, Riviera, and Winder soils. Total inclusions in any area are less than 30 percent.

The water table is within a depth of 10 inches, or the soil is ponded for 6 to 9 months or more in most years. Permeability is rapid in the organic surface and sandy subsurface layers and is moderately slow or slow in the subsoil. The available water capacity is very high in the organic surface layer, low in the sandy layers below the organic material, and medium in the subsoil. Natural fertility is medium.

A few areas of this soil have been drained and used for citrus or improved pasture. Most areas remain in natural vegetation of sawgrass, waxmyrtle, willow, pickerelweed, smartweed, duckpotato, buttonbush, ferns, sedges, maidencane, and water tolerant grasses. Cypress trees are in some areas.

In the native condition, this soil is too wet for cultivated crops. If water control is adequate, this soil is well suited to many locally important crops. A well designed and maintained water control system should rapidly remove the excess water during heavy rains. Management practices include good seedbed preparation, crop rotations, and regular applications of fertilizers. Crop rows need to be bedded. Soil improving crops need to be rotated with the row crops, and all crop residue and soil improving crops should be used to protect the soil from erosion.

If a complete water control system is installed, this soil is moderately suited to citrus. A water control system that maintains good soil aeration to a depth of 4 feet is needed. Trees need to be planted on beds, and a close growing cover crop should be maintained between tree rows to prevent blowing and washing. Regular applications of fertilizers and lime are needed.

This soil is too wet for most improved pasture grasses, but if water control is adequate, it is well suited to pangolagrass, St. Augustine grass, and white clover. Simple water control measures are needed to remove excess water after heavy rains. Regular applications of fertilizers and lime are needed, and grazing should be controlled to maintain plant vigor for best yields.

Under natural conditions, this soil is not suited to pine trees. However, if water control is adequate, the potential is high for pine. Equipment limitations, seedling mortality, windthrow hazard, and plant competition are management concerns. South Florida slash pine is preferred for planting.

This soil is in capability subclass IIIw.

Taken from USDA Soil Survey of Martin County, Florida, 1981 Edition

17—Wabasso sand. This nearly level soil is poorly drained. It is in broad, openland areas in the flatwoods. Areas generally range up to about 1,000 acres. Slopes are smooth and range from 0 to 2 percent.

Typically, the surface layer is black and very dark gray sand about 7 inches thick. The subsurface layer is gray and light brownish gray sand. The upper part of the subsoil is black sand, and the lower part is very dark grayish brown, dark grayish brown, and olive gray sandy clay loam. The substratum is olive gray and greenish gray sandy clay loam.

Included with this soil in mapping are small areas of Boca, Oldsmar, Pineda, and Riviera soils. Also included are areas of soils that are similar to this Wabasso soil but have a thicker, dark colored surface layer, areas of soils that have a thicker sandy subsoil, and few to common, small, wet depressions that are less than 3 acres in size. Total inclusions in any area are less than 20 percent.

The water table is at a depth of 10 to 40 inches for more than 6 months in most years and at a depth of less than 10 inches for 1 to 2 months. The available water capacity is very low in the surface and subsurface layers, medium in the subsoil, and low in the substratum. Permeability is rapid in the surface and subsurface layers, moderate in the sandy part of the subsoil, and slow or very slow in the loamy part. Natural fertility is low.

Most areas of this soil are in natural vegetation consisting of slash pine, scattered cabbage palm, sawpalmetto, waxmyrtle, gallberry, fetterbush, pineland threeawn, bluestems, panicums, and other grasses.

Under natural conditions, this soil has severe limitations for cultivated crops because of wetness. The number of crops is limited unless intensive water control measures are used. Many crops can be grown if management is good and a good water control system is designed to remove excess surface water in wet seasons and provide subsurface irrigation in dry seasons. Crop residue and soil improving crops should be used to protect the soil from erosion. Seedbed preparation needs to include bedding. Fertilizer and lime should be applied according to the need of the crop.

Citrus trees are moderately suited if a well designed water control system is established to maintain the water table below a depth of 4 feet. Planting trees on beds helps lower the effective depth of the water table. A cover crop needs to be maintained between the tree rows. Fertilizer and lime should be applied as needed.

This soil is well suited to improved pasture grasses. Pangolagrass, improved bahiagrasses, and white clover grow well if well managed. Water control measures needed to remove the excess surface water in time high rainfall. Regular applications of fertilizer and lime are needed, and grazing should be controlled to maintain healthy plants.

The potential is medium for pine trees. The major management concerns are plant competition, equipment mobility, and seedling mortality during wet seasons. South Florida slash pine is preferred for planting. A simple water control system to remove excess surface water should be installed.

This soil is in capability subclass IIIw.

Wabasso series

Soils of the Wabasso series are sandy, siliceous, hyperthermic Alfic Haplaquods. They are poorly drained, slowly or very slowly permeable soils that formed in sandy and loamy marine sediment. These nearly level soils are in broad areas of flatwoods and in wet depressional areas in the flatwoods. Slopes range from 0 to 2 percent. The water table is between a depth of 10 and 40 inches for more than 6 months and at less than 10 inches for 1 to 2 months in most years. Depressions are ponded for 6 to 9 months in most years.

Wabasso soils are geographically associated with Floridana, Oldsmar, Pineda, Riviera, and Winder soils. Floridana soils have a mollic epipedon. Oldsmar soils have a Bh horizon within 30 inches of the surface and a Bt horizon within 40 inches. Pineda soils have a Bir horizon. Riviera and Winder soils do not have a spodic horizon.

Typical pedon of Wabasso sand; about 9.25 miles west of Palm City; 0.25 mile south of Florida Highway 714, and 0.8 mile east of power line, SE1/4NW1/4NW1/4 sec. 22, T. 38 S., R. 39 E.

A11—0 to 2 inches; black (N 2/0) sand; weak fine granular structure; very friable; many fine roots; mixture of organic matter and uncoated sand grains; very strongly acid; abrupt wavy boundary.

A12—2 to 7 inches; very dark gray (N 3/0) sand; weak fine granular structure; very friable; few fine roots; very strongly acid; clear wavy boundary.

A21—7 to 12 inches; gray (N 5/0) sand; single grained; loose; few to common fine roots; very strongly acid; clear wavy boundary.

A22—12 to 20 inches; light brownish gray (10YR 6/2) sand; single grained; loose; few to common fine and coarse roots; common very dark gray (10YR 3/1) streaks in old root channels; very strongly acid; clear wavy boundary.

B21h—20 to 23 inches; very dark gray (10YR 3/1) sand; single grained; loose; few coarse roots; common fine and medium pockets of black and dark gray sand; very strongly acid; clear wavy boundary.

B22h—23 to 36 inches; black (10YR 2/1) sand; massive; friable; few medium roots; common fine pockets of gray and dark gray sand; medium acid; clear wavy boundary.

B21t—36 to 41 inches; very dark grayish brown (10YR 3/2) fine sandy loam; few fine faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; slightly sticky and slightly plastic; common fine roots; sand grains bridged and coated with clay; slightly acid; clear wavy boundary.

B22t—41 to 49 inches; dark grayish brown (2.5Y 4/2) fine sandy loam; few medium faint olive brown (2.5Y 4/4) mottles; weak medium subangular blocky structure; slightly sticky and slightly plastic; common fine roots; sand grains bridged and coated with clay; neutral; clear wavy boundary.

B23t—49 to 58 inches; olive gray (5Y 5/2) fine sandy loam; many medium distinct light olive brown (2.5Y 5/4) mottles; massive; slightly sticky and slightly plastic; few fine roots; sand grains bridged and coated with clay; moderately alkaline; clear wavy boundary.

C1—58 to 73 inches; olive gray (5Y 5/2) fine sandy loam; few fine faint light olive brown (2.5Y 5/4) mottles; massive; slightly sticky; few fine roots; moderately alkaline; clear wavy boundary.

C2—73 to 80 inches; greenish gray (5GY 6/1) sandy loam; massive; slightly sticky and slightly plastic; moderately alkaline.

Reaction in the A and Bh horizons ranges from very strongly acid to slightly acid. Reaction in the Bt horizon ranges from medium acid to moderately alkaline. The C horizon is neutral to moderately alkaline and is calcareous in some places.

The A1 horizon is neutral or has hue of 10YR, value of 2 to 4, and chroma of 1 or less. It ranges from 3 to 8 inches in thickness. The A2 horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2 or less. Total thickness of the A horizon is less than 30 inches. In some pedons a thin transitional horizon that has hue of 10YR, value of 3 or 4, and chroma of 3 or less is at the base of the A horizon.

The B2h horizon has hue of 10YR or 5YR, value of 2, and chroma of 1 or 2; hue of 5YR, value of 3, and chroma of 2 to 4; or hue of 7.5YR, value of 3, and chroma of 2. Sand grains are well coated with organic matter. The B2h horizon ranges from 2 to 14 inches in thickness. The B2t horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3; or value of 5 or 6, and chroma 1 to 4; or hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 2 or less, with mottles in shades of gray, brown, yellow, or red. It is sandy loam or sandy clay loam. Some pedons have tongues or pockets of coarser material. Reaction ranges from medium acid to moderately alkaline. The B2t horizon is between a depth of 24 and 40 inches, and it ranges from 4 to more than 20 inches in thickness. In some pedons the Bt horizon is underlain by grayish fine sand or loamy sand.

The C horizon has hue of 5Y, 2.5Y, or 10YR, value of 4 to 6, and chroma of 3 or less; or hue of 5GY, value of 5 or 6, and chroma of 1 or less. It is loamy sand or fine sand, mixed with varying amounts of white shell fragments

Winder series

Soils of the Winder series are fine-loamy, siliceous, hyperthermic Typic Glossaqualfs. They are poorly drained, slowly to very slowly permeable soils that formed in beds of sandy and loamy marine sediment. These nearly level soils are in long, low depressional areas in the flatwoods. They are ponded for 6 to 9 months in most years. Slopes are less than 2 percent.

Winder soils are geographically closely associated with Chobee, Floridana, Gator, Pineda, Riviera, Tuscawilla, and Wabasso soils. Chobee and Floridana soils have a mollic epipedon, and Floridana soils have an argillic horizon between a depth of 20 and 40 inches. Gator soils are organic. Pineda and Riviera soils have an argillic horizon between a depth of 20 and 40 inches and, in addition, Pineda soils have a Bir horizon. Tuscawilla soils are in a carbonitic family. Wabasso soils have a spodic horizon.

Typical pedon of Winder sand on a broad, low flat in improved pasture; about 2.3 miles south of Florida Highway 714, and 0.3 mile west of Florida Highway 609. NW1/4SW1/4NE1/4 sec. 36, T. 38 S., R. 38 E.

Ap—0 to 7 inches; dark gray (10YR 4/1) sand; weak fine granular structure; very friable; mixture of organic matter and uncoated sand grains; many fine and medium roots; medium acid; gradual wavy boundary.

A2—7 to 15 inches; gray (10YR 6/1) sand; many coarse faint grayish brown (10YR 5/2) mottles in upper part and common coarse light gray (10YR 7/2) mottles in lower part; single grained; loose; common fine and medium roots; few carbonate nodules at base of horizon; moderately alkaline; abrupt irregular boundary.

B&A—15 to 26 inches; light brownish gray (2.5Y 6/2) sandy clay loam; common vertical tubular intrusions of dark grayish brown (10YR 4/2) sand; sand grains coated and bridged with clay; moderately alkaline; clear wavy boundary.

B2tg—26 to 42 inches; light gray (2.5Y 7/2) sandy clay loam; common fine and medium distinct brownish yellow (10YR 6/8) mottles; weak coarse subangular blocky structure; sticky and plastic; few medium roots; common fine white nodules of secondary carbonates; lower part more strongly gleyed; strongly alkaline; calcareous; gradual wavy boundary.

Cg—42 to 62 inches; greenish gray (5GY 6/1) loamy sand; common medium distinct olive brown (2.5Y 4/4) mottles; weak fine granular structure; friable; few to common white carbonate accumulations; strongly alkaline; calcareous; gradual wavy boundary.

IICg—62 to 80 inches; greenish gray (5GY 6/1) loamy sand mixed with many white shell fragments; single grained; loose; strongly alkaline; calcareous

Thickness of the solum ranges from 24 to 50 inches. Reaction ranges from medium acid to neutral in the A horizon and from neutral to strongly alkaline in the Bt horizon.

The Ap or A1 horizon has hue of 10YR, value of 4 or less, and chroma of 1 or less. It ranges from 3 to 8 inches in thickness. The A2 horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2 or less, with or without gray and brown mottles. Total thickness of the A horizon is less than 20 inches.

The B&A horizon has hue of 10YR, 2.5Y, 5Y, or it is neutral, has value of 4 to 7, and chroma of 2 or less, with mottles in shades of yellow, brown, or gray. The B part is sandy loam or sandy clay loam. Vertical intrusions of A2 horizon material about 1 inch in diameter are few to common. White nodules of secondary carbonates are in some pedons.

The B2tg horizon is similar in color and texture to the B part of the B&A horizon and has mottles of yellow, brown, and gray. Soft, white nodules of secondary carbonates are common to many.

The IICg horizon has hue of 10YR or 2.5Y, value of 5 to 8, and chroma of 2 or less; or hue of 5GY, value of 5 to 7, and chroma of 1, with or without mottles of yellow, brown, or olive. It is loamy sand, sand, fine sand, or loamy fine sand. Shell fragments are absent in some pedons.

19—Winder sand. This nearly level soil is poorly drained. It is in long, low depressions in the flatwoods. Areas are 5 to 10 acres or range to several hundred acres. Slopes are smooth to concave and are less than 2 percent.

Typically, the surface layer is dark gray sand about 7 inches thick. The subsurface layer is gray sand about 8 inches thick. The subsoil is light brownish gray sandy clay loam and has sandy streaks in the upper 11 inches and light gray sandy clay loam in the lower 16 inches. The substratum is below a depth of 42 inches. It is greenish gray loamy sand and has white shell fragments in the lower part.

Included with this soil in mapping are small areas of Chobee, Floridana, Gator, Riviera, and Wabasso soils. Also included are small spots of soils that are similar to this Winder soil but have a few inches of organic material on the surface or have a loamy fine sand or loamy sand surface layer. Total inclusions in any area are less than 25 percent.

This soil is ponded for 6 to 9 months in most years, and the water table is at a depth of less than 40 inches the rest of the time. Permeability is rapid in the surface and subsurface layers, moderately slow in the upper part of the subsoil, and slow to very slow in the lower part of the subsoil. The available water capacity is low in the surface and subsurface layers and medium in the subsoil.

Most areas of this soil are in natural vegetation consisting of waxmyrtle, maidencane, blue maidencane, sand cordgrass, queensdelight, and a wide variety of sedges.

Under natural conditions, this soil is not suited to cultivated crops. However, if a water control system removes the excess water rapidly and protects the soil from ponding, this soil is suited to vegetable crops. Good management includes crop rotations that keep close growing cover crops in the cropping system at least two-thirds of the time. The cover crops and all other crop residue should be used to protect the soil from erosion. Seedbed preparation needs to include bedding. Fertilizers should be applied according to the need of the crop.

This soil is not suited to citrus trees because of ponding and wetness. However, if water control is adequate, this soil is suitable for citrus. Water control systems that maintain good drainage to a depth of about 4 feet and protect the soil from ponding are needed. Planting the trees on beds helps lower the effective depth of the water table. A good close growing cover crop is needed between the tree rows to protect the soil from blowing when the trees are young. The trees require regular applications of fertilizer and occasional liming.

Under natural conditions, this soil is not suited to improved pasture. However, if water control is adequate, this soil is suitable for good quality pasture of improved grasses. Good pasture of grass alone or grass-clover mixtures can be grown if management is good. Pasture requires regular applications of fertilizers and controlled grazing for highest yields.

The potential is low for pine trees. Water control is needed before trees can be planted. Equipment limitations and seedling mortality are management concerns. Slash pine is better suited than other species

This soil is in capability subclass VIIw.

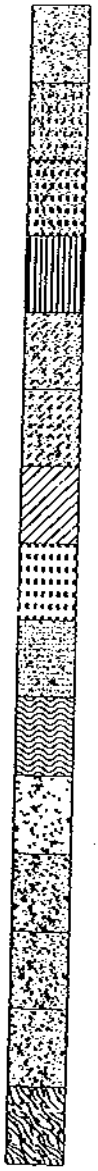
Taken from USDA Soil Survey of Martin County, Florida, 1981 Edition

Ardaman & Associates, Inc.

LEGEND

FILE No.: 03-2197

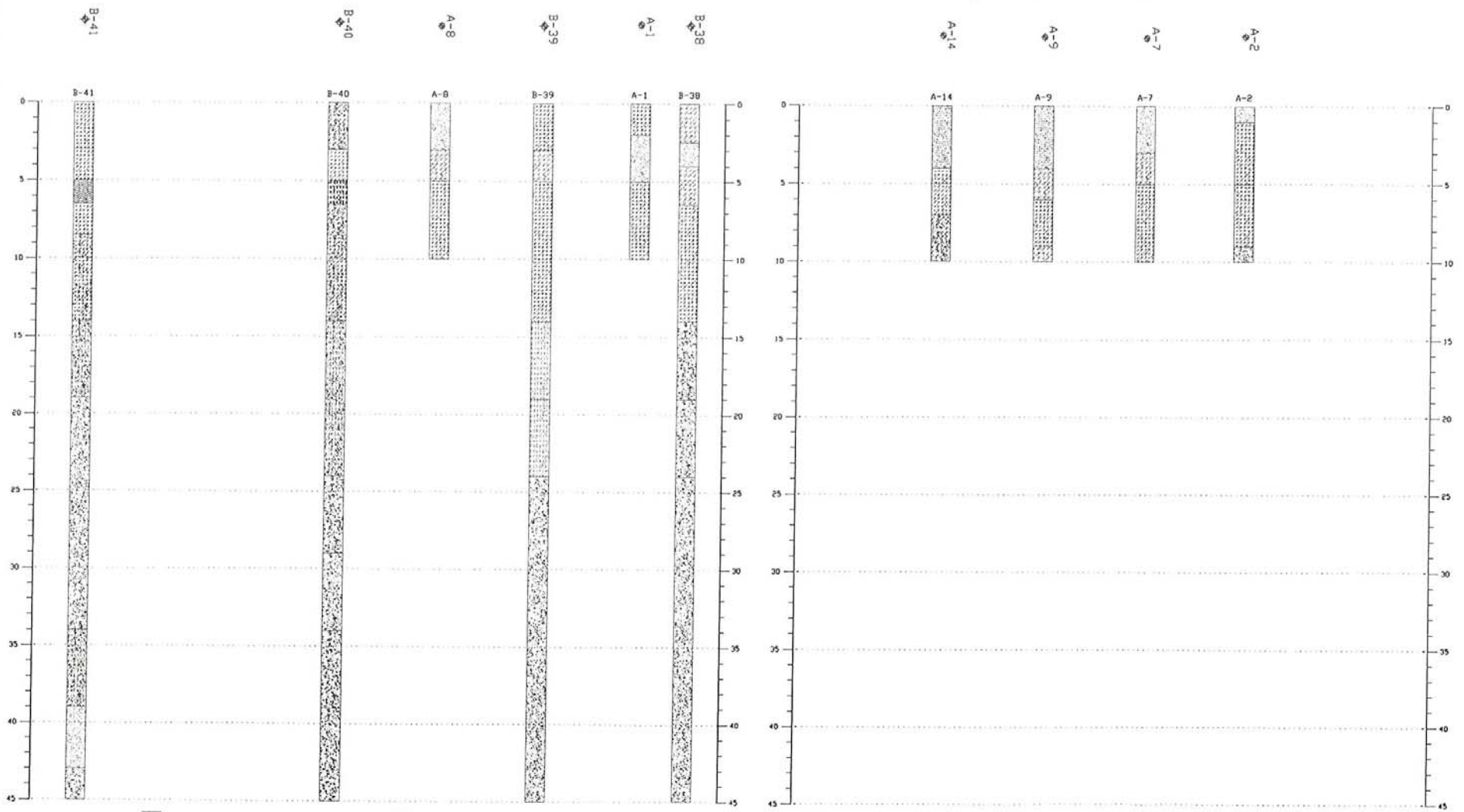
PROJECT: Troup-Indiantown Water Control District
Reservoir And STA

SYMBOL	DESCRIPTION
	Fine sand
	Slightly silty fine sand
	Silty fine sand
	Silt
	Slightly clayey fine sand
	Clayey fine sand
	Clay
	Marl
	Organic fine sand / slightly organic to organic sand
	Organincs
	Shell
	Sandy shell
	Fine sand with shell fragments
	Fine sand with cemented fragments
	Fragmented limestone

SECTION A

SECTION B

Scale: 1" = 2,500'



LEGEND:

- Fine sand
- Slightly silty fine sand
- Silty fine sand
- Silt
- Slightly clayey fine sand
- Clayey fine sand
- Clay
- Marl
- Fine sand with organics
- Organics
- Fine sand with shell fragments
- Sandy shell
- Shell
- Fine sand with cemented fragments
- Fragmented limestone

SUBSURFACE PROFILES
"SECTIONS A & B"

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

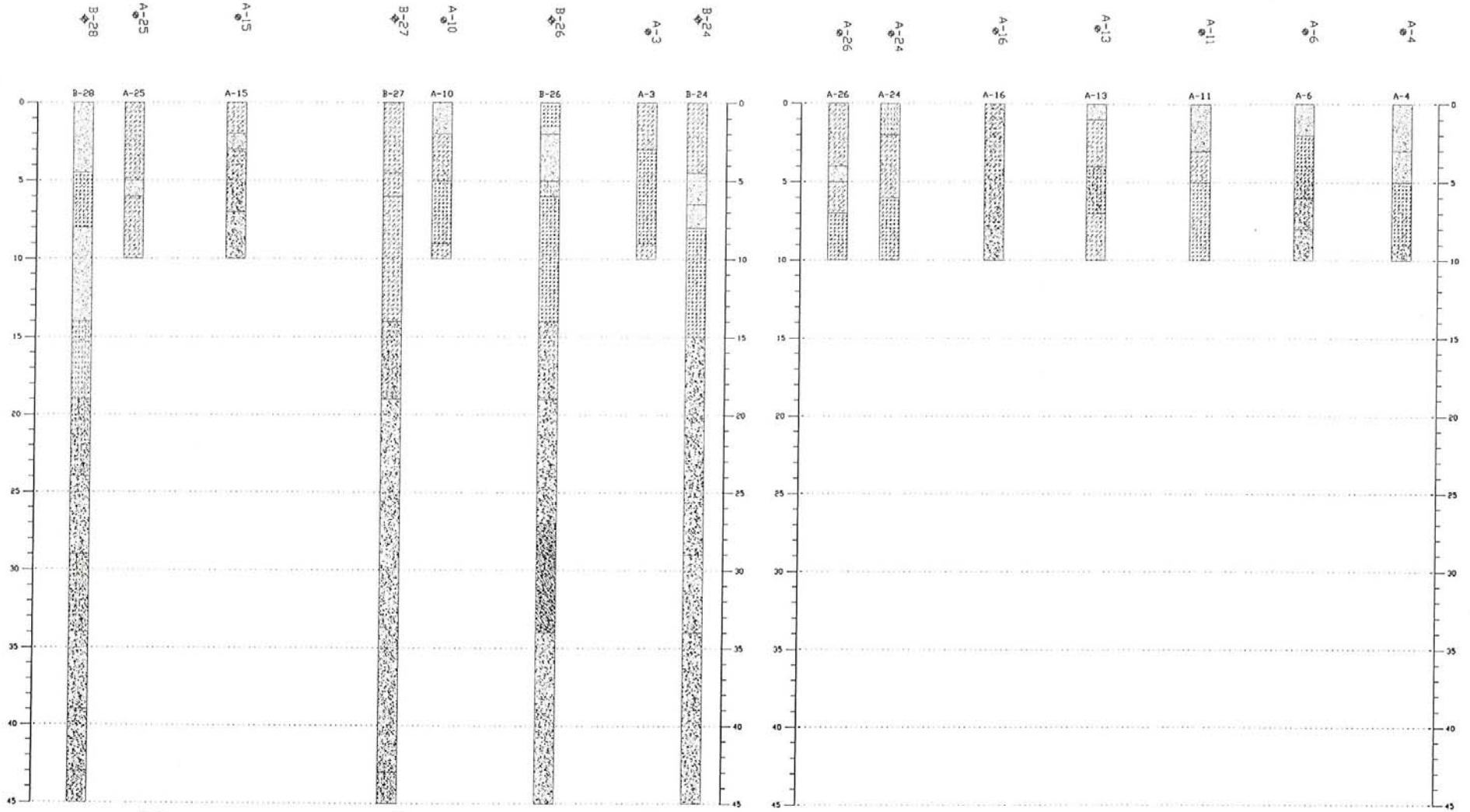
TROUP-INDIANTOWN
WATER CONTROL DISTRICT
RESERVOIR AND STA PROJECT
MARTIN COUNTY, FLORIDA

FILE NO.	BY:	FIGURE NO.:
03-2197	RF	

SECTION C

SECTION D

Scale: 1" = 2,500'



LEGEND:

- Fine sand
- Slightly silty fine sand
- Silty fine sand
- Silt
- Slightly clayey fine sand
- Clayey fine sand
- Clay
- Marl
- Fine sand with organics
- Organics
- Fine sand with shell fragments
- Sandy shell
- Shell
- Fine sand with cemented fragments
- Fragmented limestone

SUBSURFACE PROFILES
"SECTIONS C & D"

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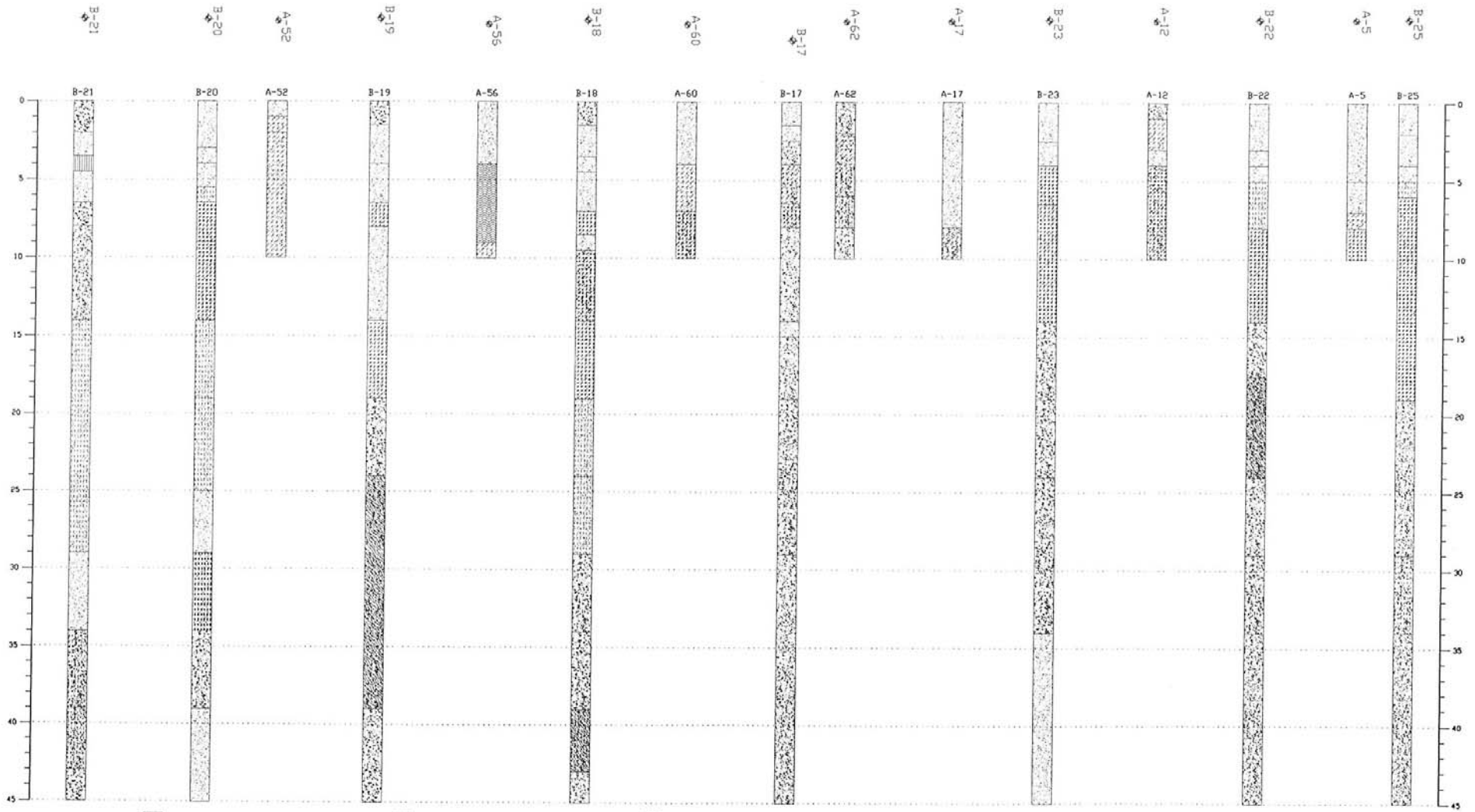
Geotechnical, Environmental and Materials Consultants

TROUP-INDIANTOWN
WATER CONTROL DISTRICT
RESERVOIR AND STA PROJECT
MARTIN COUNTY, FLORIDA

FILE NO.	BY	FIGURE NO.
03-2197	RF	

Scale: 1" = 2,500'



LEGEND:

- Fine sand
- Slightly silty fine sand
- Silty fine sand
- Silt
- Slightly clayey fine sand
- Clayey fine sand
- Clay
- Marl
- Fine sand with organics
- Organics
- Fine sand with shell fragments
- Sandy shell
- Shell
- Fine sand with cemented fragments
- Fragmented limestone

SUBSURFACE PROFILES
"SECTION E"

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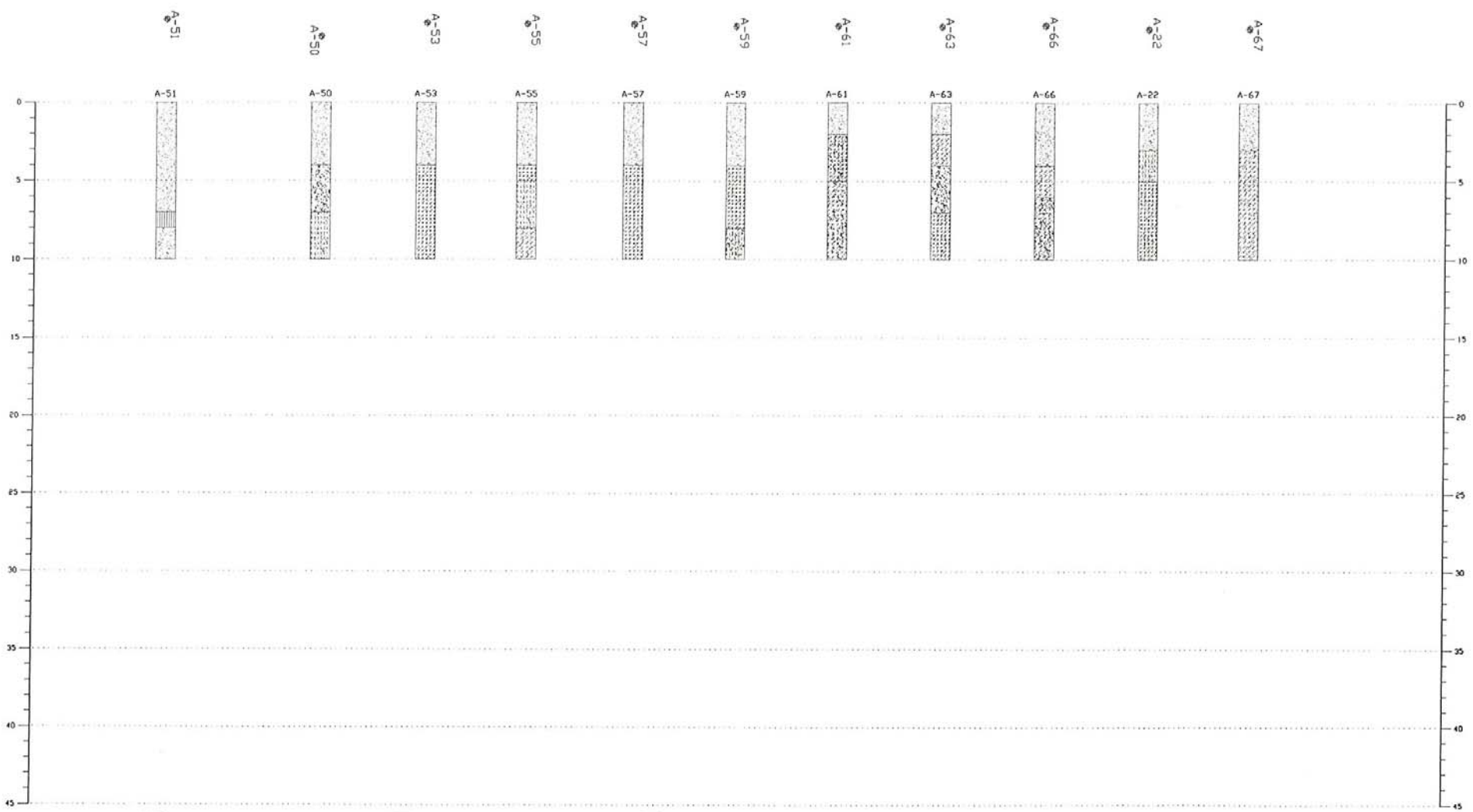
TROUP-INDIANTOWN
WATER CONTROL DISTRICT
RESERVOIR AND STA PROJECT
MARTIN COUNTY, FLORIDA

FILE NO.	BY:	FIGURE NO.:
03-2197	RF	

Scale: 1" = 2,500'



LEGEND:

- Fine sand
- Slightly silty fine sand
- Silty fine sand
- Silt
- Slightly clayey fine sand
- Clayey fine sand
- Clay
- Marl
- Fine sand with organics
- Organics
- Fine sand with shell fragments
- Sandy shell
- Shell
- Fine sand with cemented fragments
- Fragmented limestone

SUBSURFACE PROFILES
"SECTION F"

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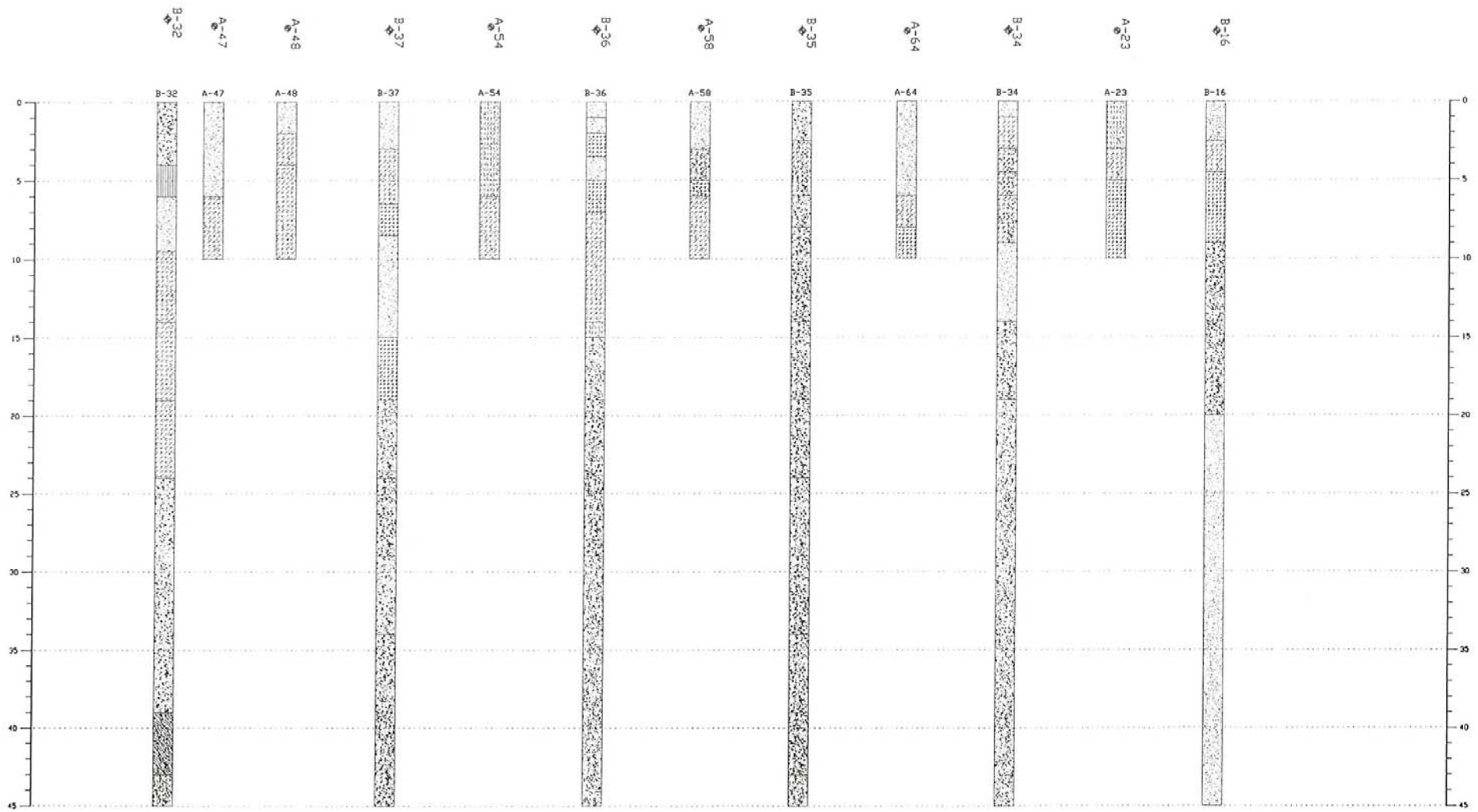
TROUP-INDIANTOWN
WATER CONTROL DISTRICT
RESERVOIR AND STA PROJECT
MARTIN COUNTY, FLORIDA

FILE NO.	BY:	FIGURE NO.:
03-2197	RF	

Scale: 1" = 2,500'



LEGEND:

- Fine sand
- Slightly silty fine sand
- Silty fine sand
- Silt
- Slightly clayey fine sand
- Clayey fine sand
- Clay
- Marl
- Fine sand with organics
- Organics
- Fine sand with shell fragments
- Sandy shell
- Shell
- Fine sand with cemented fragments
- Fragmented limestone

SUBSURFACE PROFILES
"SECTION G"

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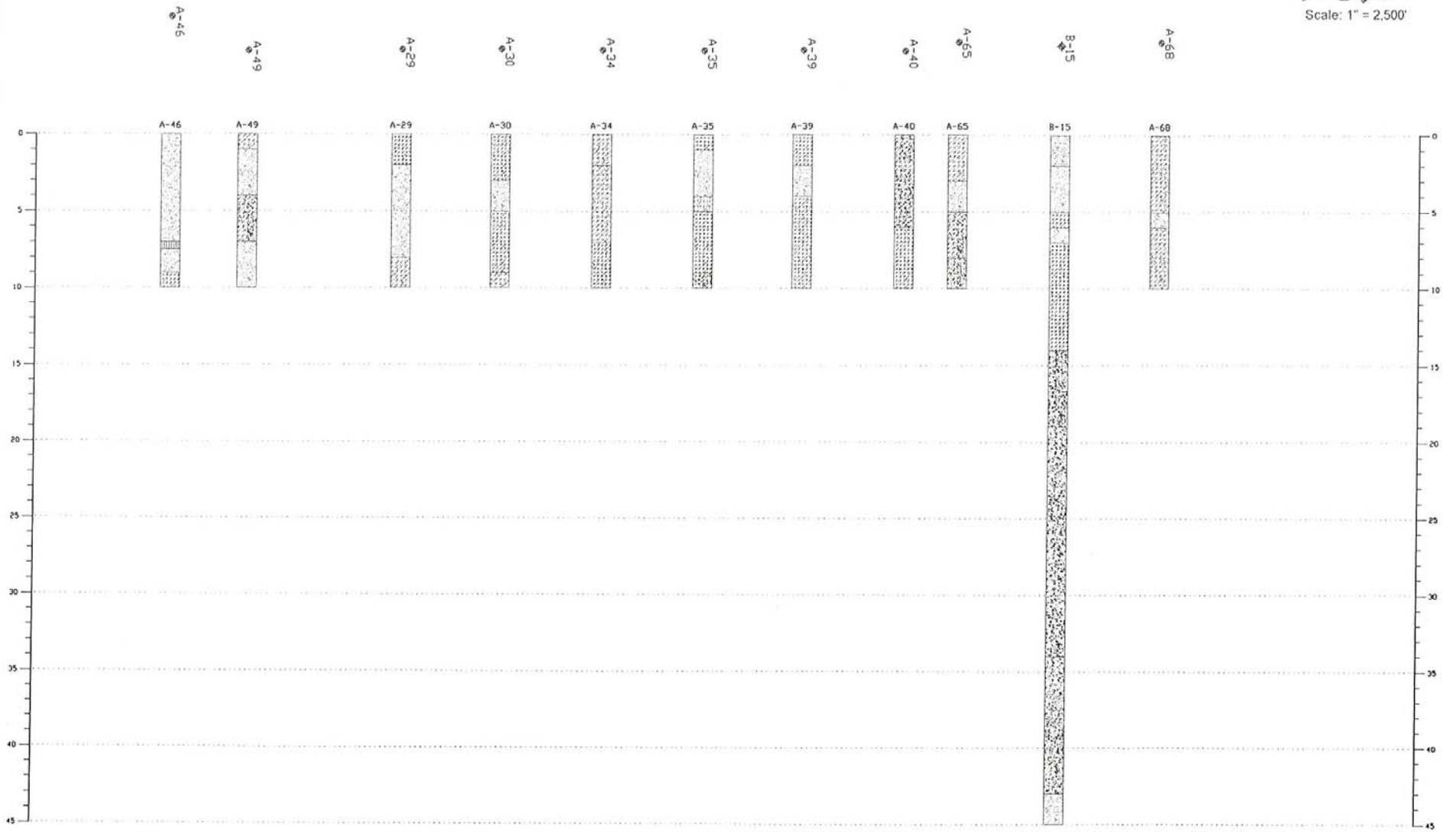
TROUP-INDIANTOWN
WATER CONTROL DISTRICT
RESERVOIR AND STA PROJECT
MARTIN COUNTY, FLORIDA

FILE NO.	BY:	FIGURE NO.:
03-2197	RF	

Scale: 1" = 2,500'



LEGEND:

- Fine sand
- Slightly silty fine sand
- Silty fine sand
- Silt
- Slightly clayey fine sand
- Clayey fine sand
- Clay
- Marl
- Fine sand with organics
- Organics
- Fine sand with shell fragments
- Sandy shell
- Shell
- Fine sand with cemented fragments
- Fragmented limestone

SUBSURFACE PROFILES
"SECTION H"

Ardaman & Associates, Inc.
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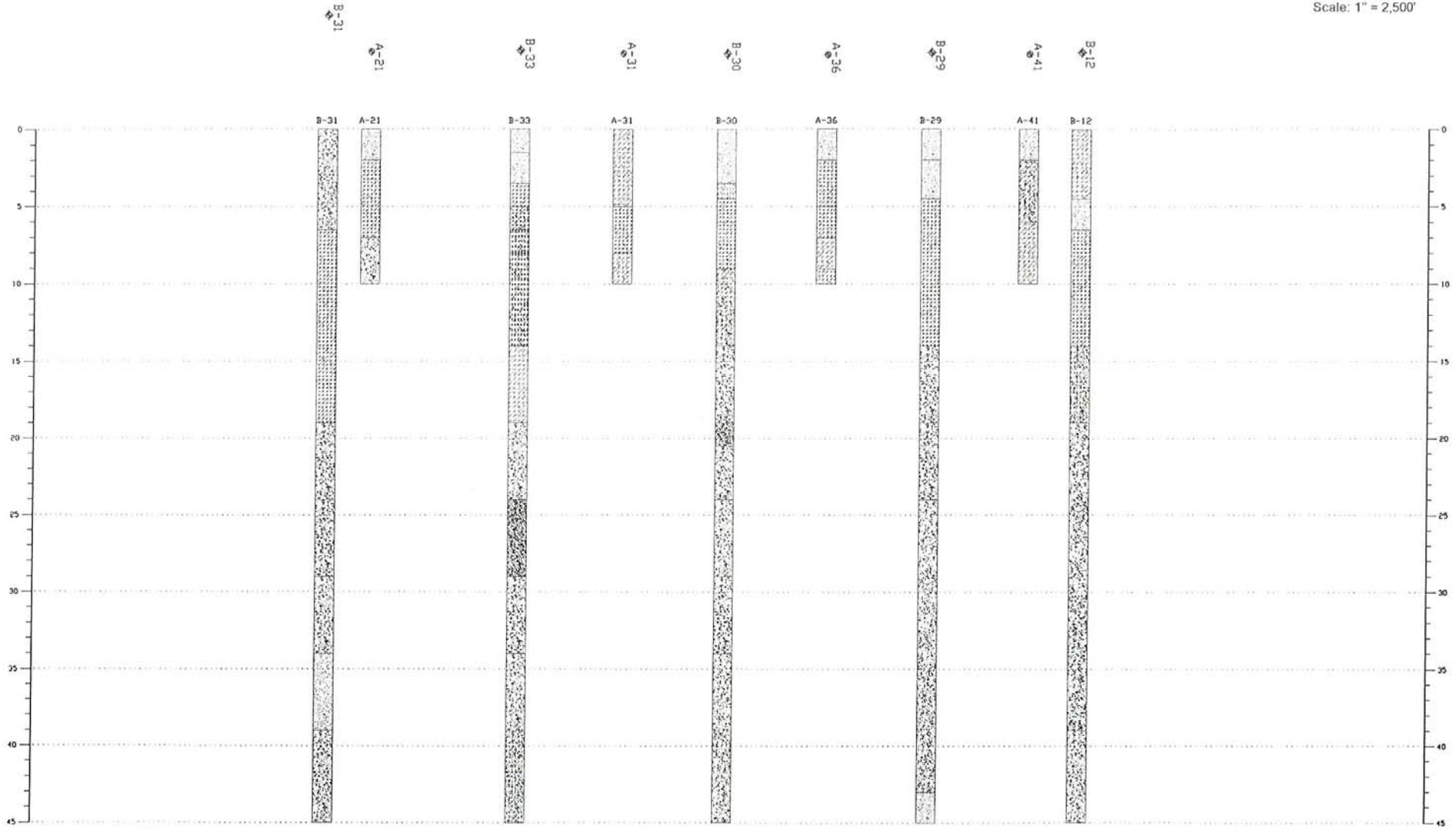
TROUP-INDIANTOWN
WATER CONTROL DISTRICT
RESERVOIR AND STA PROJECT
MARTIN COUNTY, FLORIDA

FILE NO.	BY:	FIGURE NO.:
03-2197	RF	

Scale: 1" = 2,500'



LEGEND:

- Fine sand
- Slightly silty fine sand
- Silty Fine sand
- Silt
- Slightly clayey fine sand
- Clayey Fine sand
- Clay
- Marl
- Fine sand with organics
- Organics
- Fine sand with shell fragments
- Sandy shell
- Shell
- Fine sand with cemented fragments
- Fragmented limestone

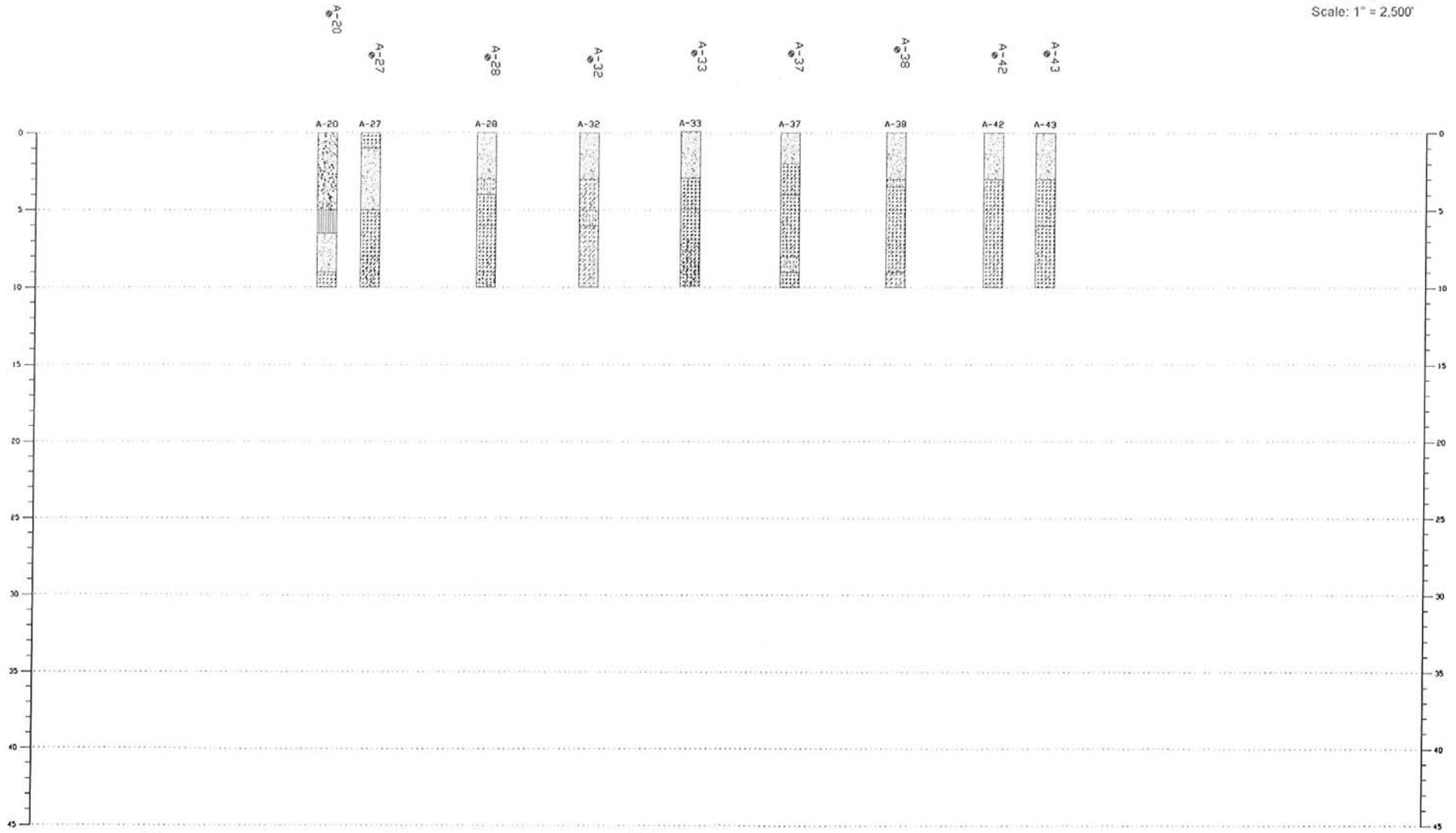
SUBSURFACE PROFILES
"SECTION I"

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

TROUP-INDIANTOWN
WATER CONTROL DISTRICT
RESERVOIR AND STA PROJECT
MARTIN COUNTY, FLORIDA

FILE NO.	BY:	FIGURE NO.:
03-2197	RF	

Scale: 1" = 2,500'



LEGEND:

- Fine sand
- Slightly silty fine sand
- Silty fine sand
- Silt
- Slightly clayey fine sand
- Clayey fine sand
- Clay
- Marl
- Fine sand with organics
- Organics
- Fine sand with shell fragments
- Sandy shell
- Shell
- Fine sand with cemented fragments
- Fragmented limestone

SUBSURFACE PROFILES
"SECTION J"

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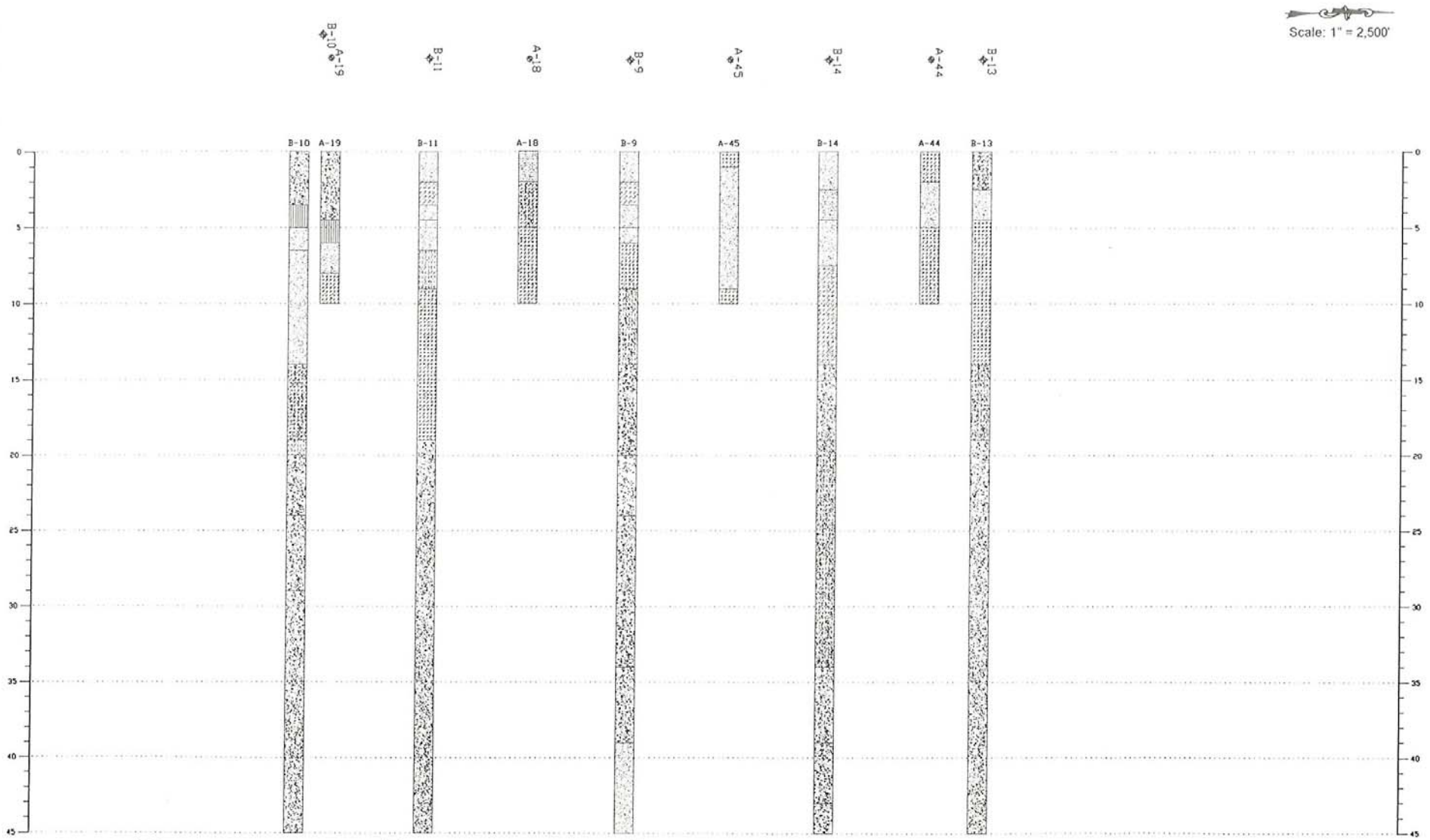
TROUP-INDIANTOWN
WATER CONTROL DISTRICT
RESERVOIR AND STA PROJECT
MARTIN COUNTY, FLORIDA

FILE NO.	BY:	FIGURE NO.:
03-2197	RF	



LEGEND:

- Fine sand
- Slightly silty fine sand
- Silty fine sand
- Silt
- Slightly clayey fine sand
- Clayey fine sand
- Clay
- Marl
- Fine sand with organics
- Organics
- Fine sand with shell fragments
- Sandy shell
- Shell
- Fine sand with cemented fragments
- Fragmented limestone

SUBSURFACE PROFILES
"SECTION K"

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

TROUP-INDIANTOWN
WATER CONTROL DISTRICT
RESERVOIR AND STA PROJECT
MARTIN COUNTY, FLORIDA

FILE NO.	BY:	FIGURE NO.:
03-2197	RF	

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-1

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-02-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE
0	2/6 4/6 4/6 4/6	Gray fine sand	1	8
	4/6 4/6 5/6 7/6	Brown and gray slightly clayey fine sand (-200:10.24%) (MC:16.56)	2	9
5	7/6 10/6 15/6 16/6	Light gray slightly clayey fine sand (-200:13.59) (MC:11.8)	3	25
	16/6 25/6 13/6 12/6		4	38
	11/6 14/6 30/6 29/6	Light gray fine sand with shell	5	44
10				
	10/6 18/6 16/6 17/6	Light gray sandy shell	6	34
15				
	21/6 18/6 27/6 27/6	Gray fine sand with shell	7	45
20				
	18/6 20/6 14/6 7/6		8	34
25				
	14/6 11/6 6/6 19/6	Gray silty fine sand	9	17
30				
	11/6 12/6 17/6 16/6	Gray fine sand with traces of shell	10	29
35				

N VALUE

NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-1

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

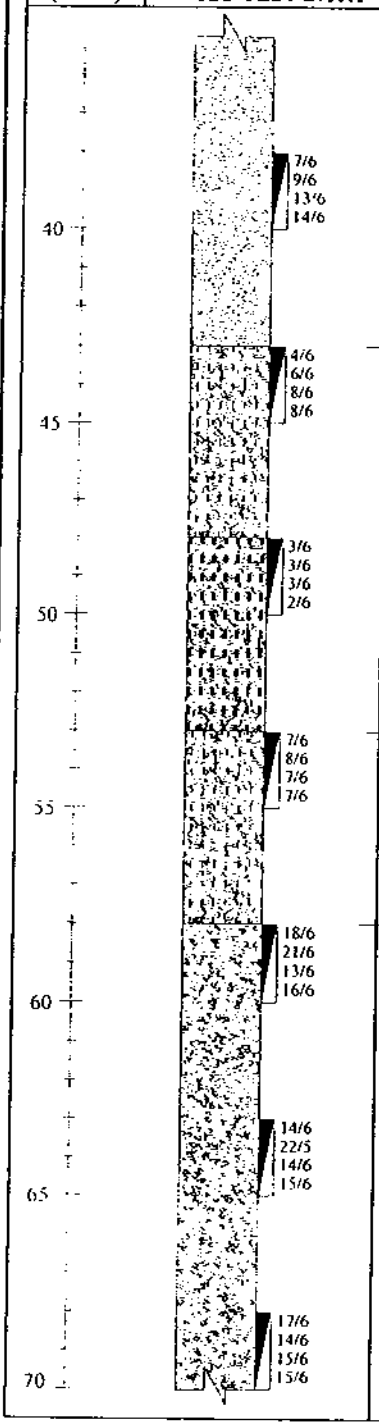
FILE No.: 03-2197

BORING LOCATION: As per plan

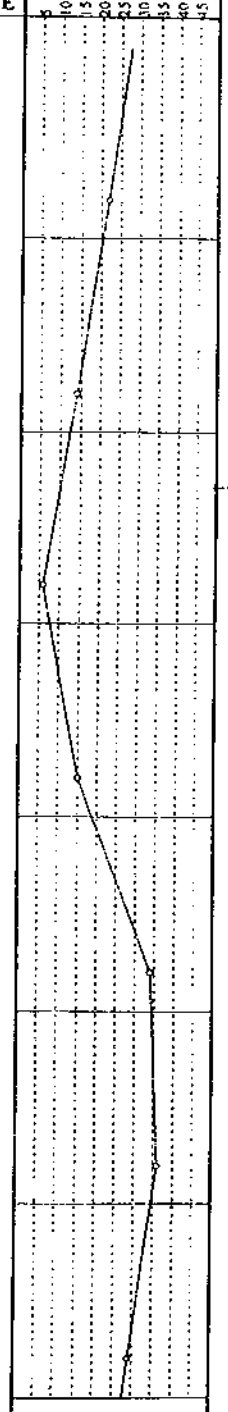
DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-02-03



SOIL DESCRIPTION	SAMPLE No.	N VALUE
	11	22
Gray slightly silty fine sand with shell	12	14
Gray silty fine sand with shell	13	6
Light gray slightly silty fine sand with shell	14	15
Gray sandy shell	15	34
	16	36
	17	29



NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-1

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

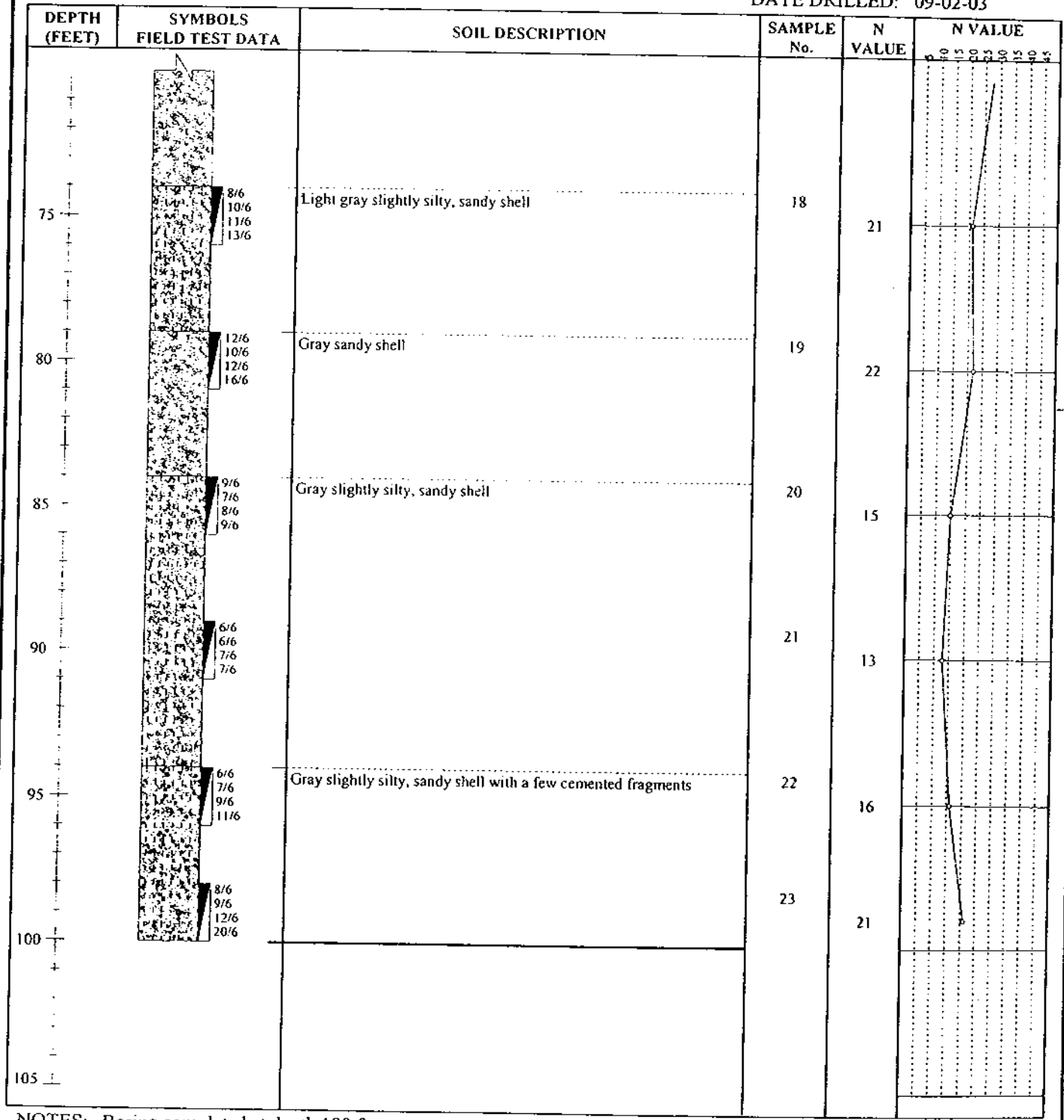
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-02-03



NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-2

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

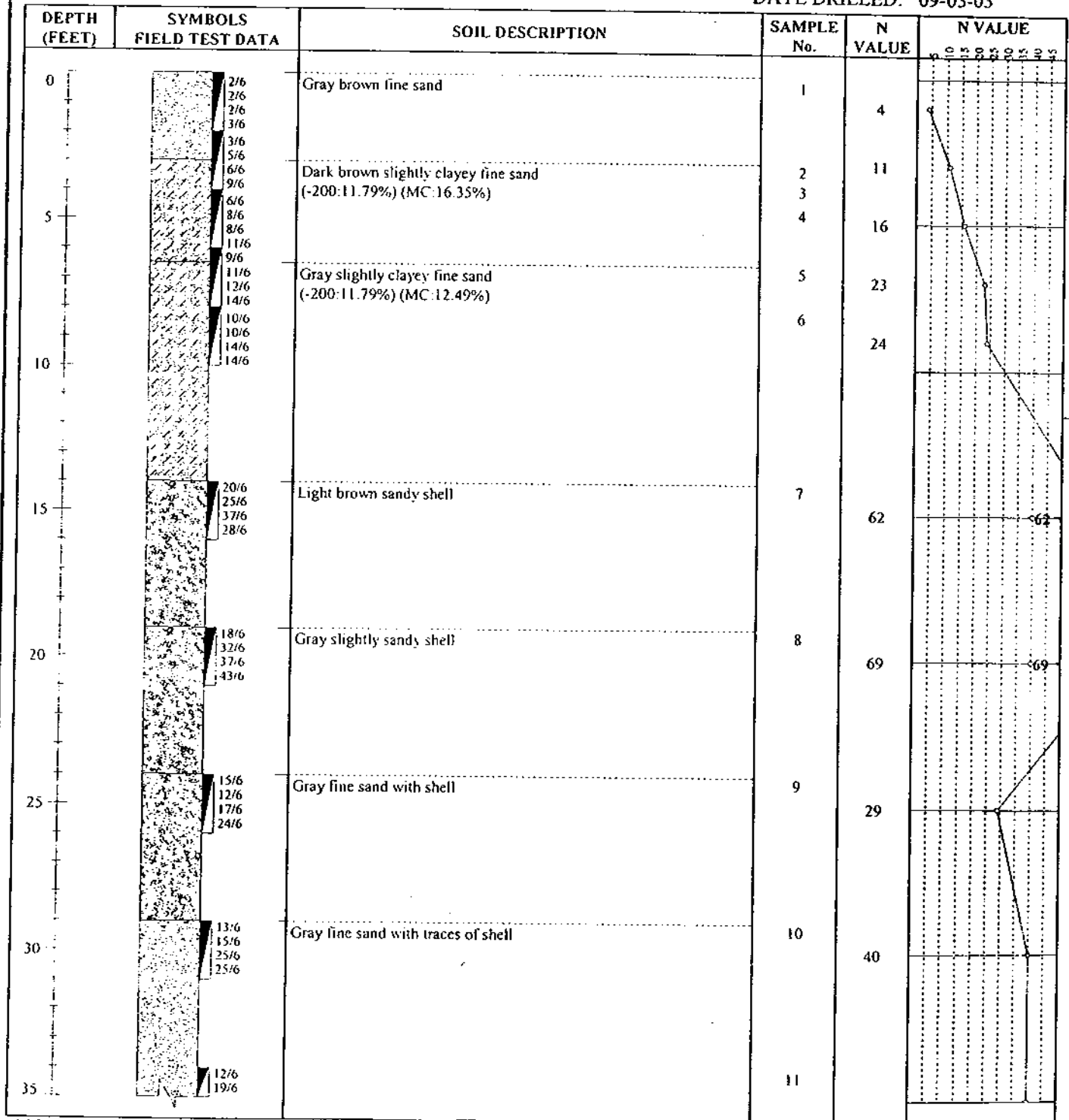
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-03-03



NOTES: Boring completed at depth 100 feet.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-2

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

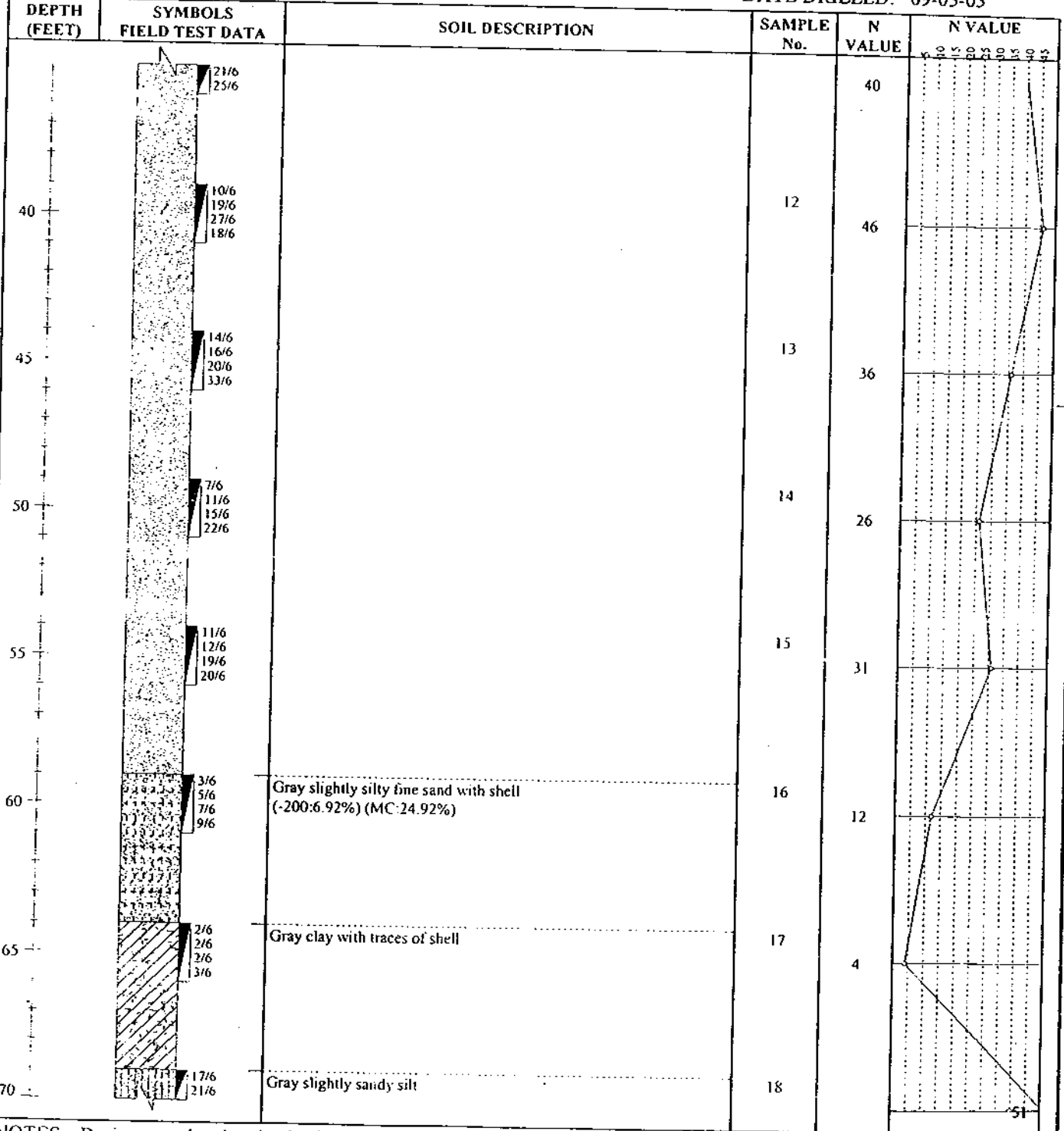
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-03-03



NOTES: Boring completed at depth 100 feet.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER. 30-INCH FALL (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-2

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

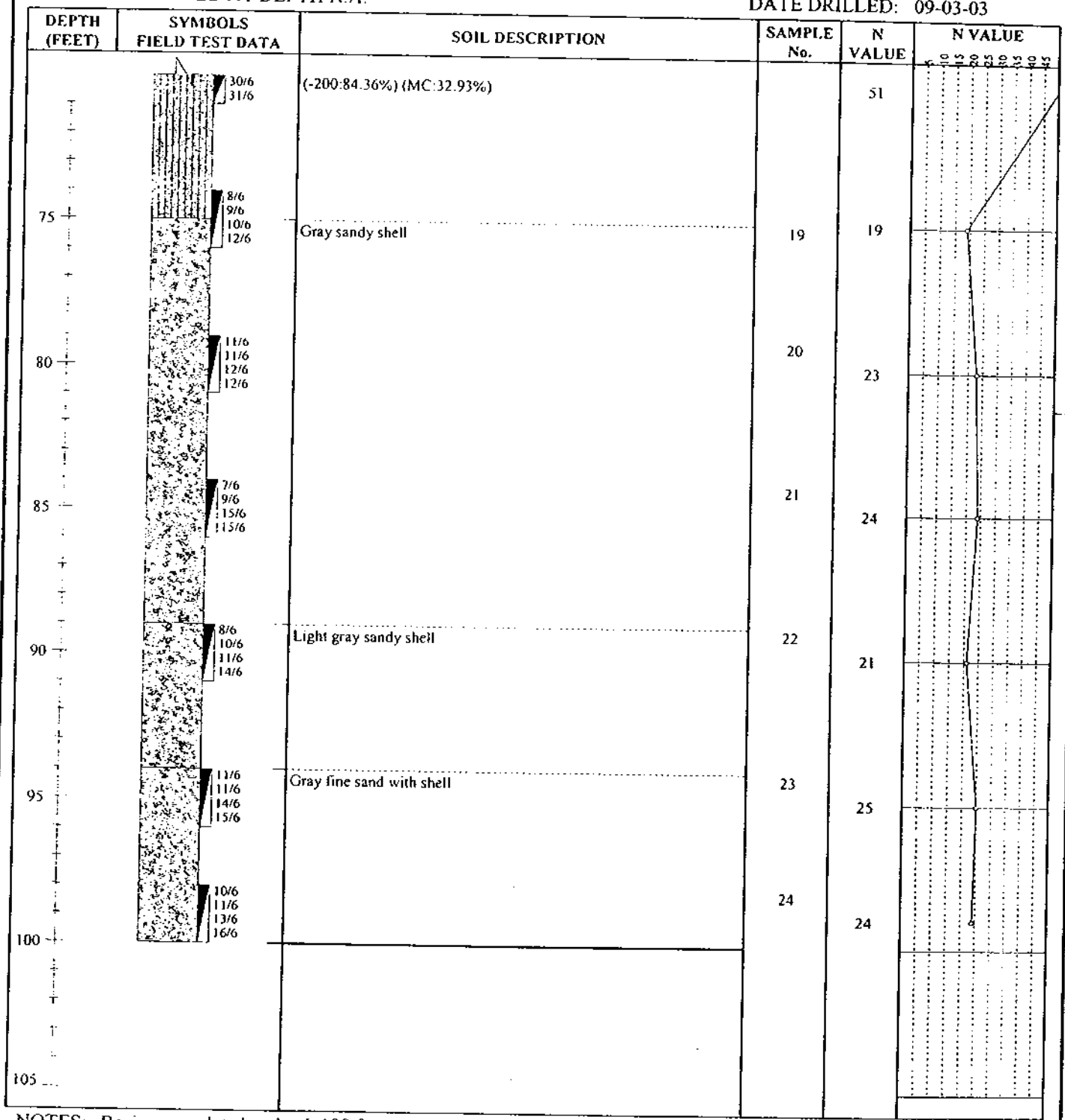
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-03-03



NOTES: Boring completed at depth 100 feet.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-3

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

FILE No.: 03-2197

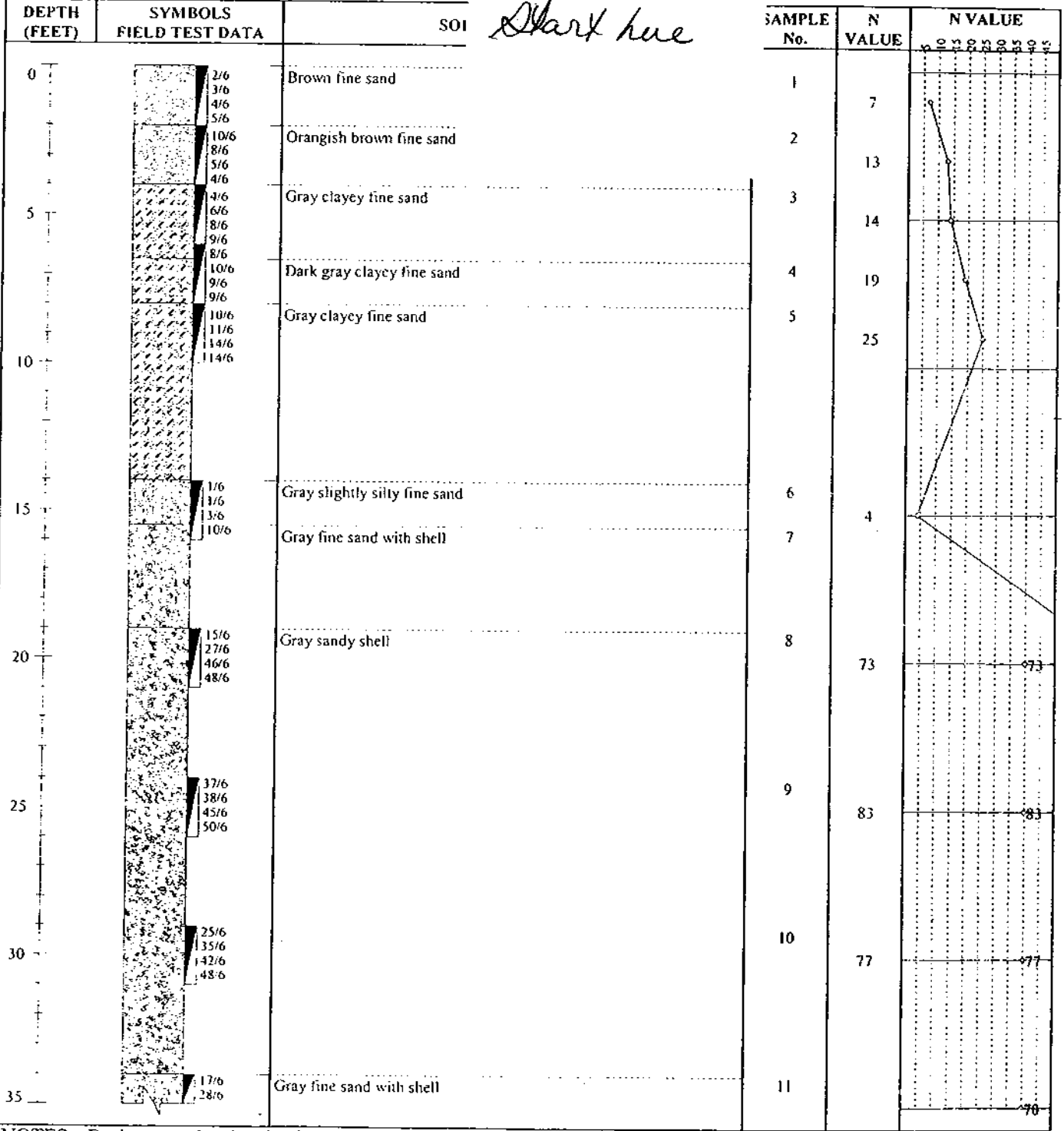
BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

4-22-04 Stark lue

ATE DRILLED: 09-03-03



NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-3

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

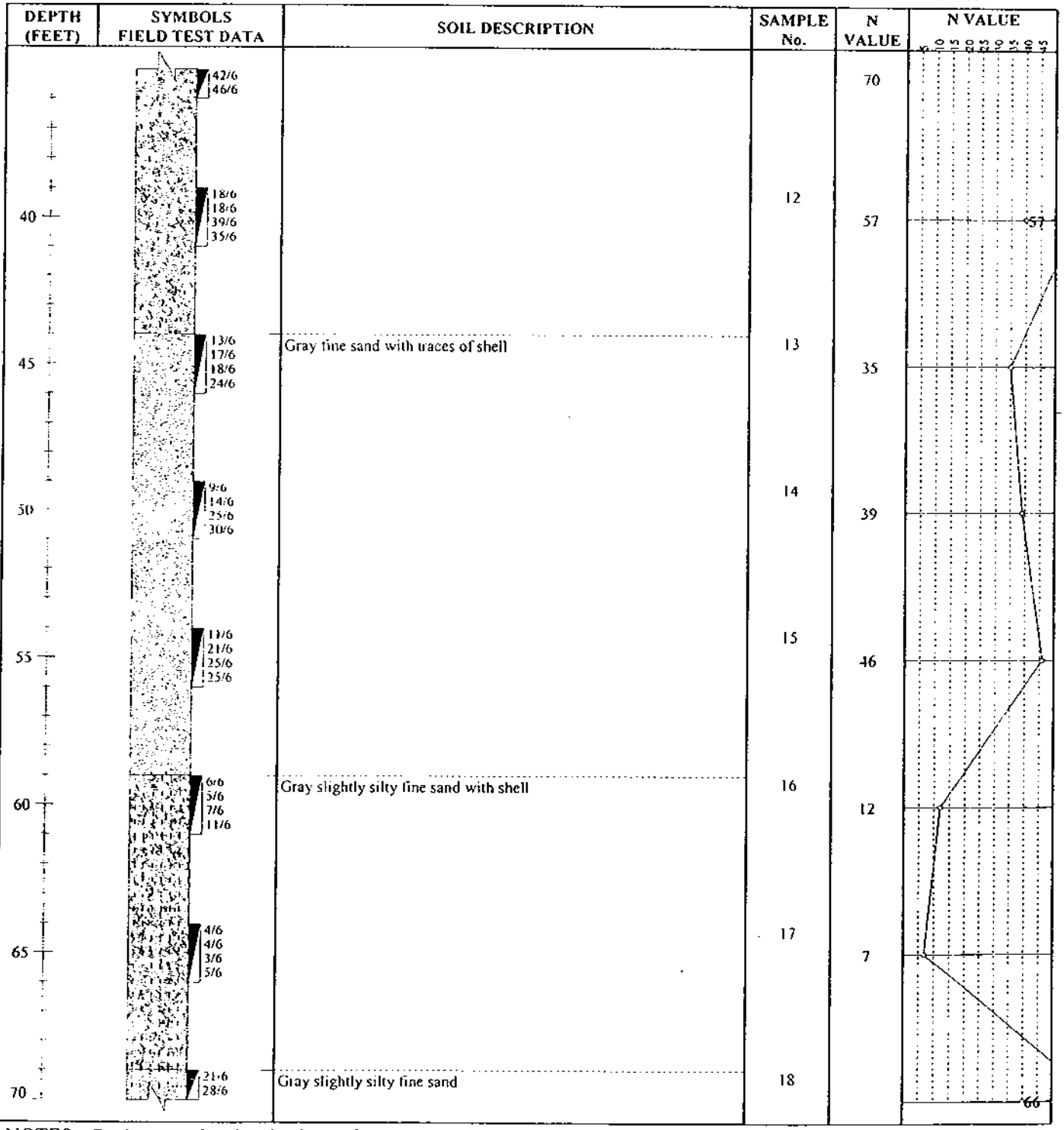
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-03-03



NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-3

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

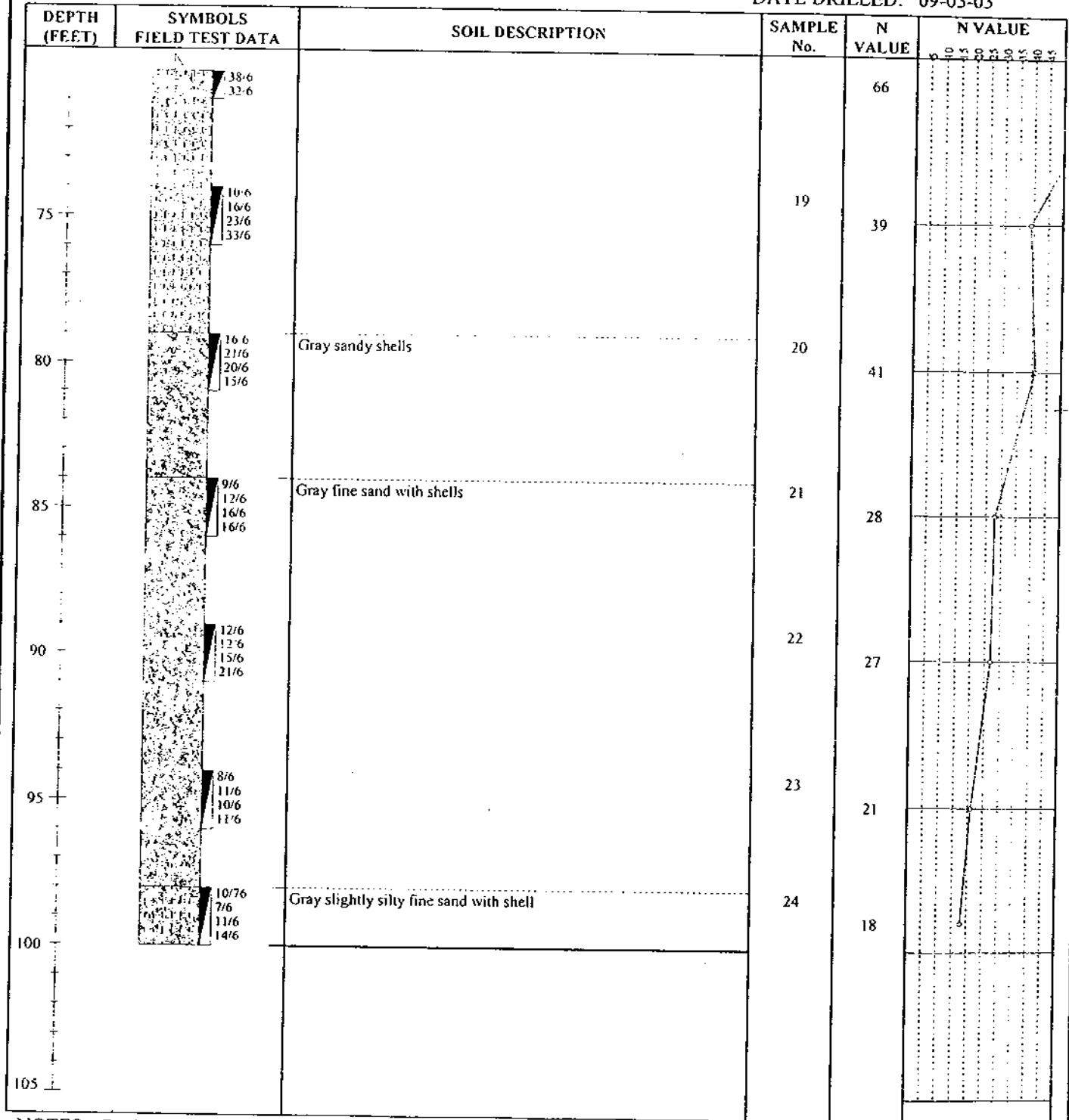
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-03-03



NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-4

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

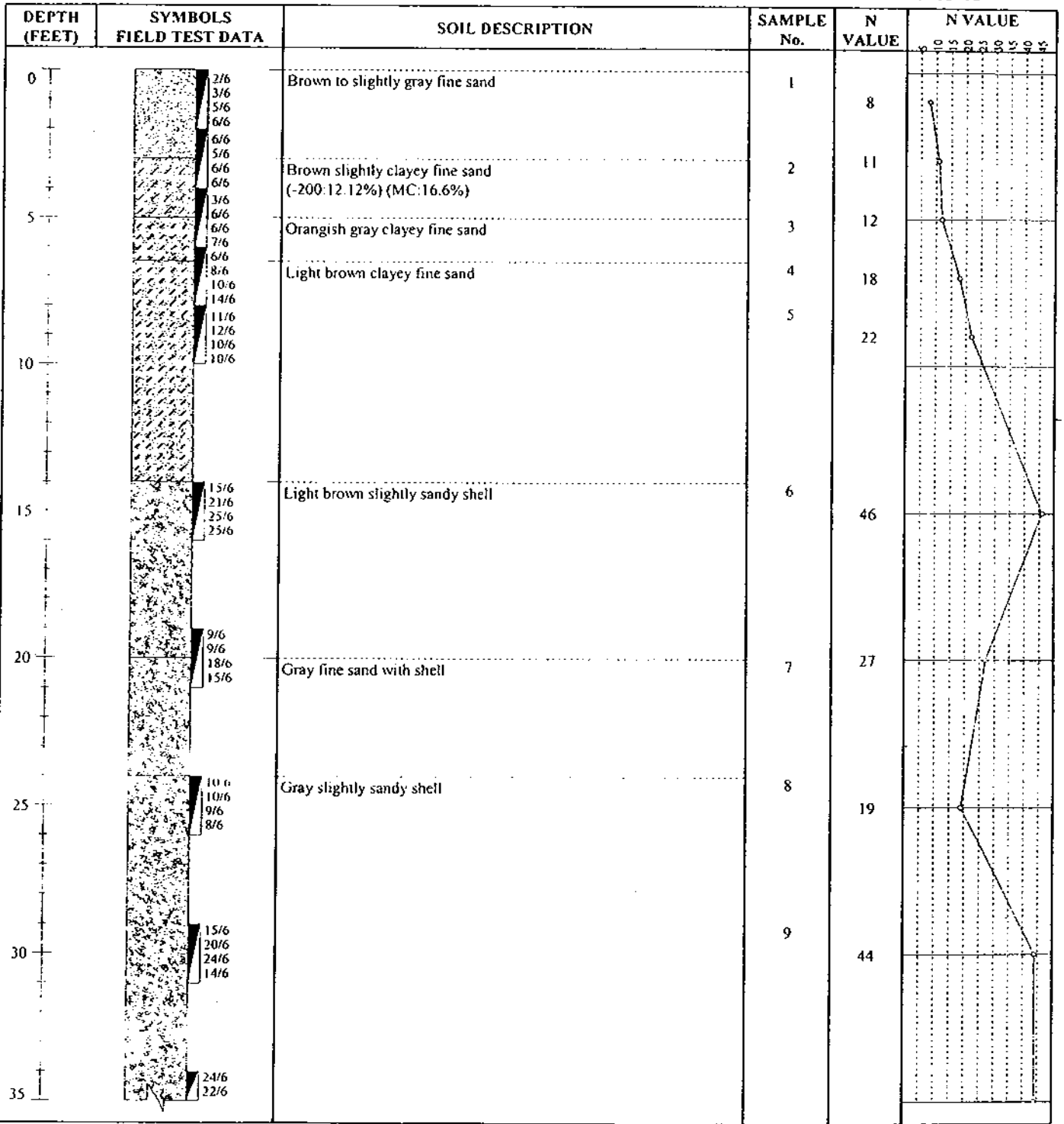
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-03-03



NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-4

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-03-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
	22/6 35/6	Gray fine sand with shell	10	44	
40	16/6 17/6 25/6 21/6		11	42	
45	11/6 20/6 25/6 25/6		12	45	
50	11/6 6/6 3/6 5/6	Gray silty fine sand with shell	13	9	
55	6/6 4/6 8/6 6/6	Gray fine sand with shell (-200:3.53%) (MC:27.97%)	14	12	
60	12/6 13/6 6/6 6/6		15	17	
65	10/6 11/6 6/6 8/6	Gray slightly sandy shell with cemented fragments	16	17	
70	11/6 8/6	Gray slightly silty, sandy shell	17		

NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-4

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

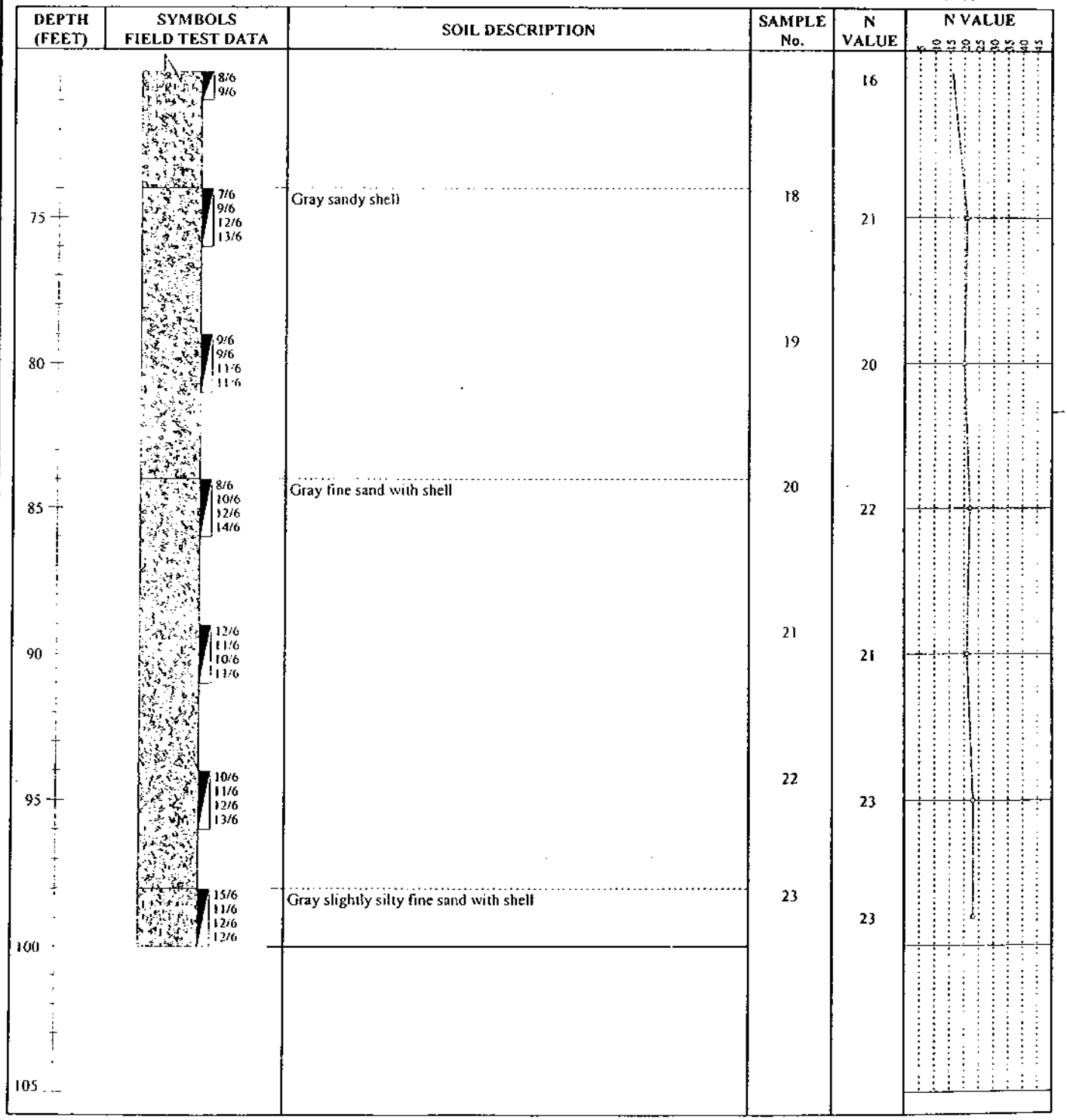
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-03-03



NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-5

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-15-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE
0	2/6, 3/6, 2/6, 3/6, 3/6, 4/6, 6/6, 6/6	Brown fine sand (-200:3.38%) (MC:15.68%)	1	5
		Brown slightly silty fine sand with cemented fragments	2	10
5	6/6, 8/6, 12/6, 12/6, 8/6, 6/6, 7/6	Light gray clay with fine roots	3	20
	6/6, 4/6, 9/6, 15/6, 32/6	Gray slightly clayey fine sand	4	13
10		Gray fine sand with shell	5	24
15	16/6, 19/6, 25/6, 22/6		6	44
20	15/6, 25/6, 25/6, 30/6	Dark gray sandy shell	7	50
25	16/6, 12/6, 15/6, 15/6	Gray fine sand with shell	8	27
30	17/6, 20/6, 21/6, 17/6	Gray sandy shell with cemented fragments	9	41
35	3/6, 3/6	Gray slightly silty fine sand with shell	10	

N VALUE: 5, 10, 15, 20, 25, 30, 35, 40, 45

NOTES: Boring completed at depth of 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-5

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-15-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE
	4/6 5/6			7
40	5/6 8/6 10/6 15/6		11	18
45	7/6 5/6 5/6 6/6	Gray slightly silty, sandy shell with cemented fragments	12	10
50	8/6 8/6 6/6 5/6		13	14
55	8/6 10/6 10/6 15/6	Gray slightly sandy shell	14	20
60	12/6 11/6 9/6 10/6		15	20
65	15/6 15/6 18/6 18/6		16	33
70	18/6 16/6	Gray fine sand with shell	17	

N VALUE: 5 10 15 20 25 30 35 40 45

NOTES: Boring completed at depth of 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-5

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

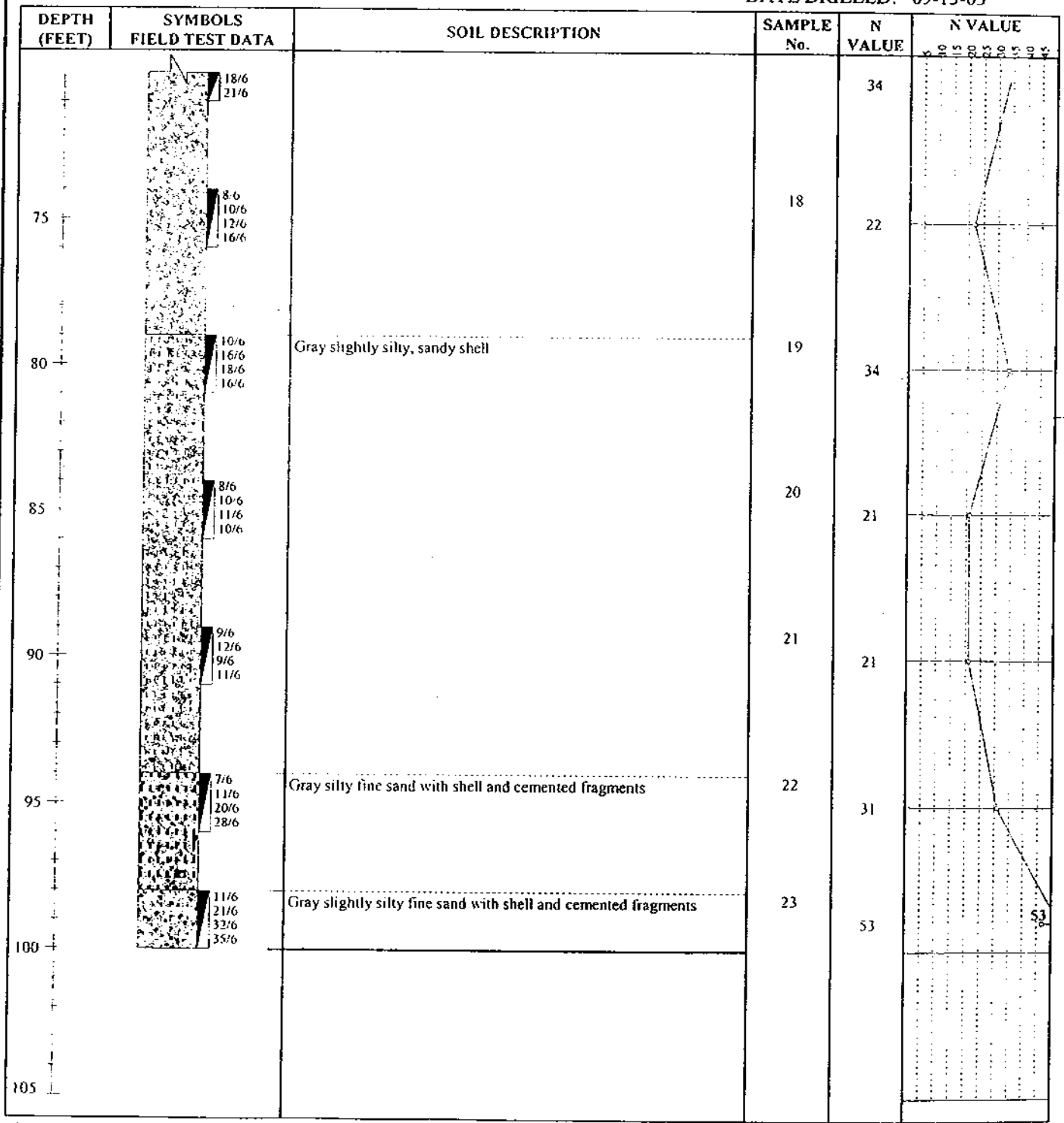
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-15-03



NOTES: Boring completed at depth of 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-6

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

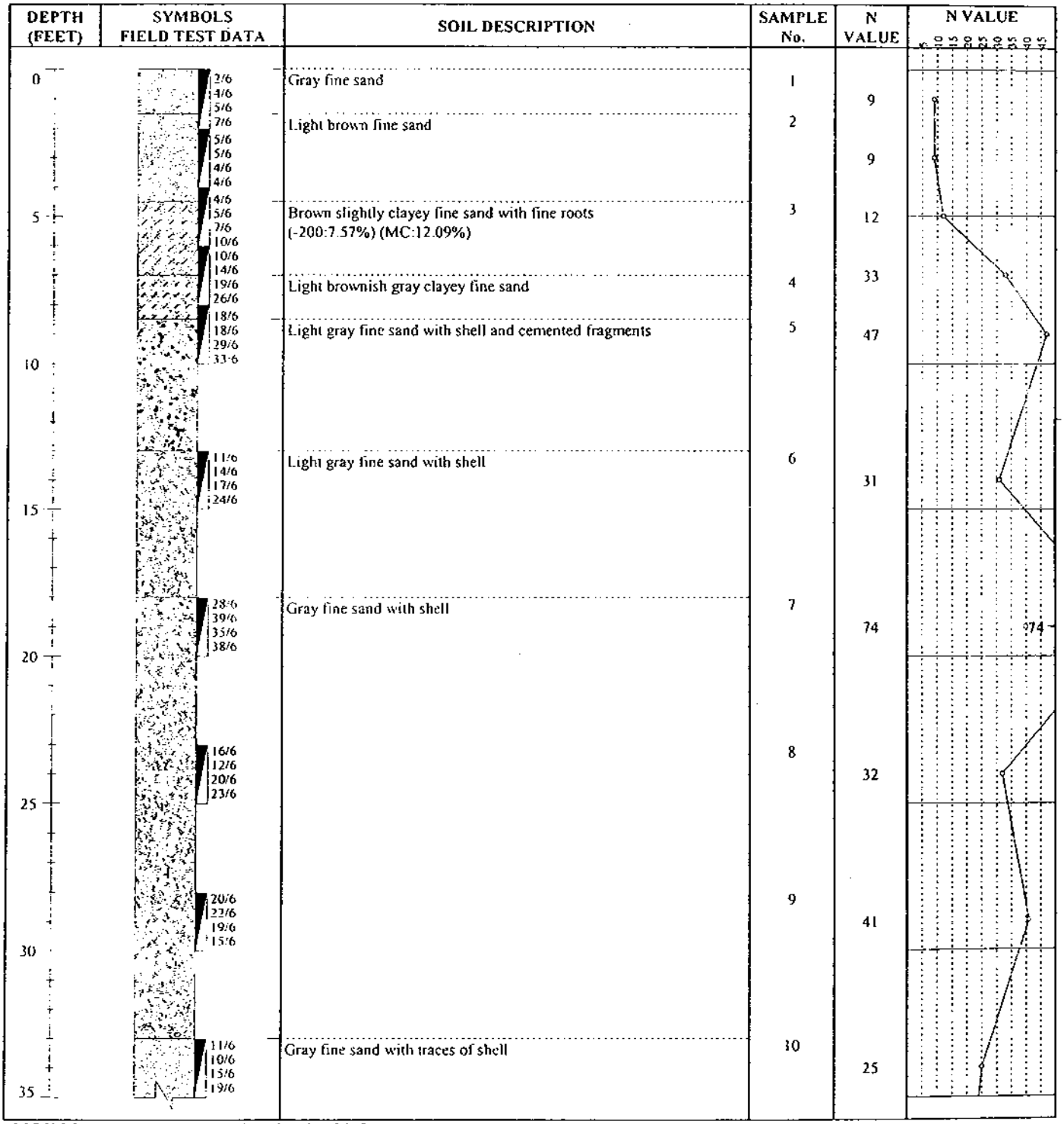
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: C.S./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-08-03



NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-6

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

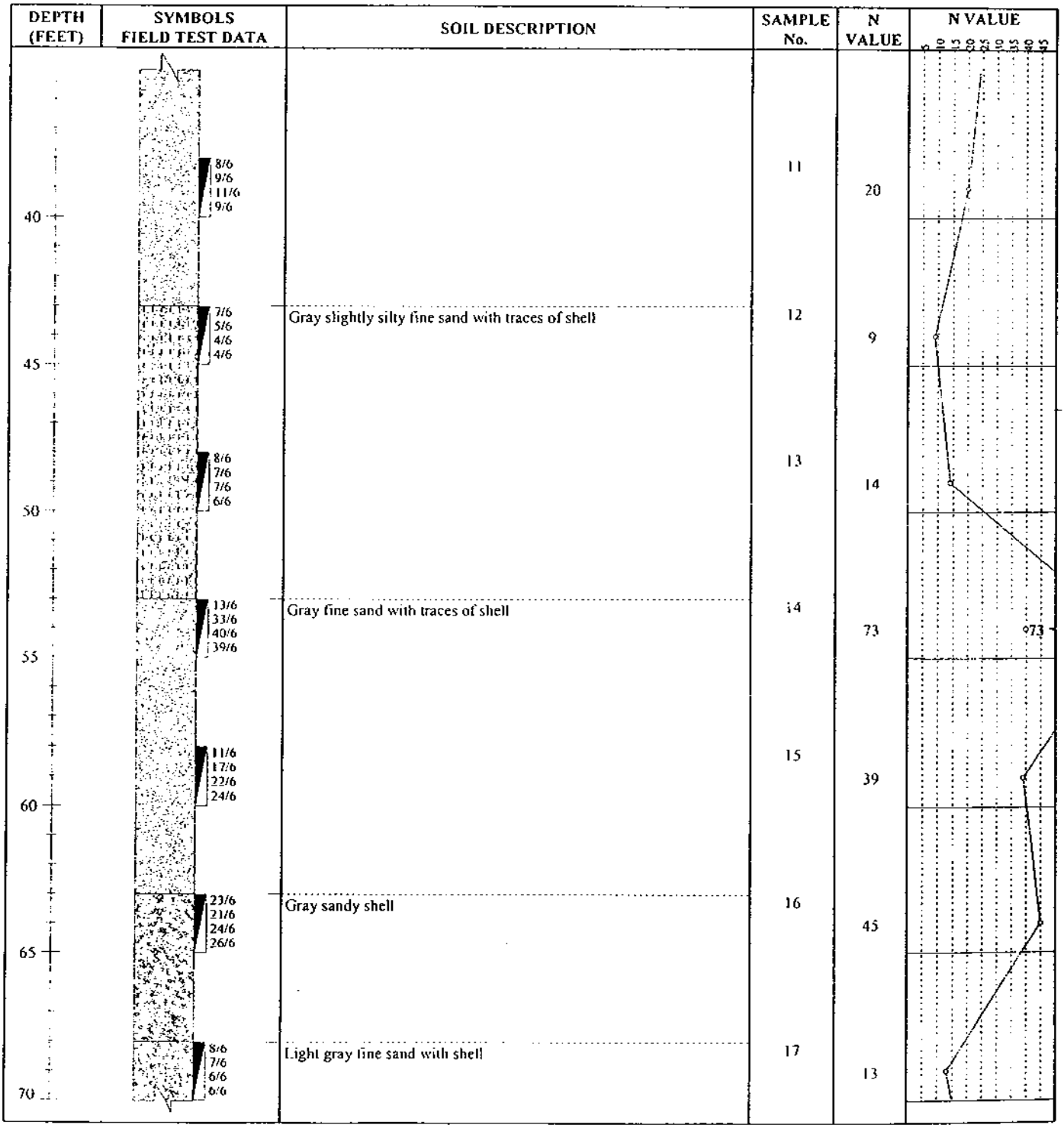
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: C.S./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-08-03



NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-6

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

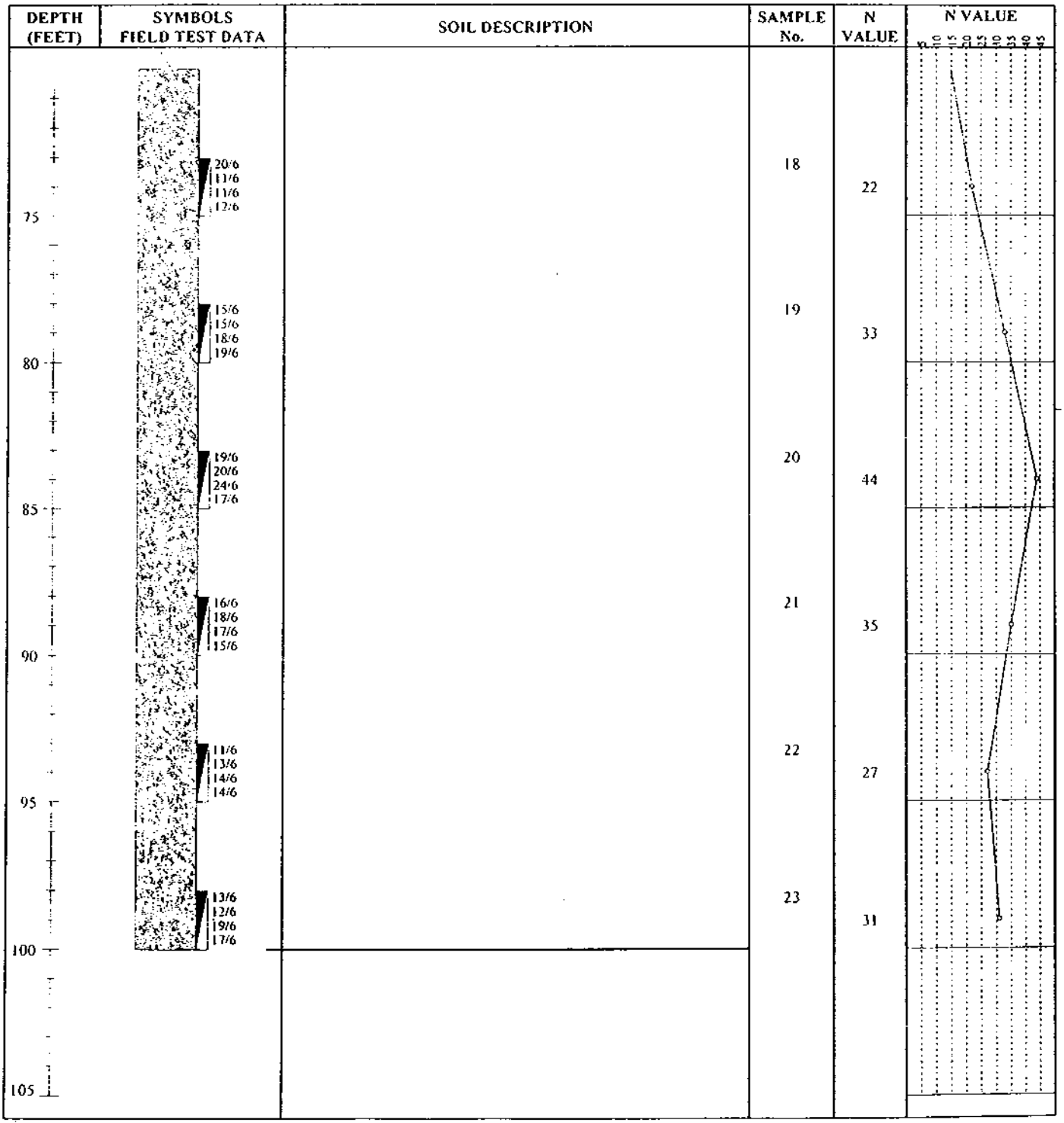
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: C.S./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-08-03



NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-7

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: C.S./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-17-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE
0	2/6, 2/6, 3/6, 4/6	Brown fine sand with shell and traces of clay	1	5
	4/6, 5/6, 7/6, 7/6	Grayish brown fine sand	2	12
	3/6, 4/6	Dark brown fine sand	3	
5	5/6, 6/6	Brown slightly clayey fine sand (-200:6.89%) (MC:12.79%)	4	9
	4/6, 4/6			
	5/6, 6/6	Orangish brown slightly clayey fine sand with cemented fragments (-200:12.81%) (MC:8.94%)	5	9
	1/6, 1/6, 0/6, 1/6	Dark brown silty fine sand	6	1
10				
15	15/6, 21/6, 40/6, 47/6	Light brown sandy shell with a few cemented fragments	7	61
20	22/6, 28/6, 19/6, 17/6	Gray sandy shell	8	47
25	20/6, 31/6, 27/6, 42/6	Gray fine sand with shell	9	58
30	15/6, 20/6, 29/6, 30/6	Gray sandy shell	10	49
35	17/6, 20/6	Gray fine sand with shell	11	

N VALUE

NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-7

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

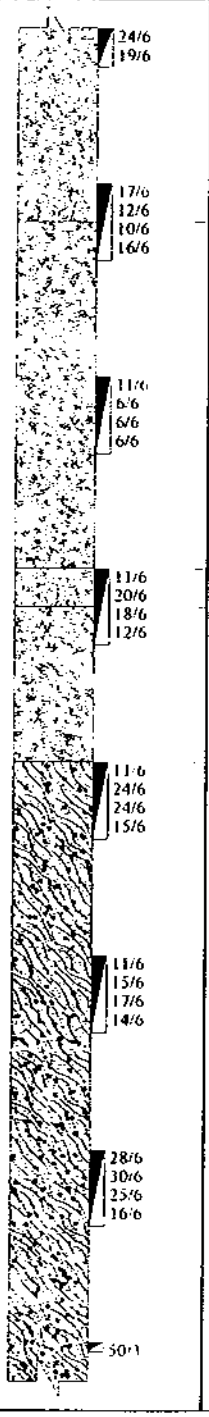
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: C.S./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-17-03



DEPTH (FEET)	SOIL DESCRIPTION	SAMPLE No.	N VALUE
			44
40	Gray slightly sandy shell	12	22
45		13	12
50	Gray fine sand with shell	14	
	Gray sandy shell	15	38
55	Gray slightly sandy fragmented limestone	16	48
60		17	32
65		18	55
70		19	50+

N VALUE 0 10 20 30 40 50 60

NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-7

PROJECT: Troup-Indiantown Water Control District Reservoir and STA

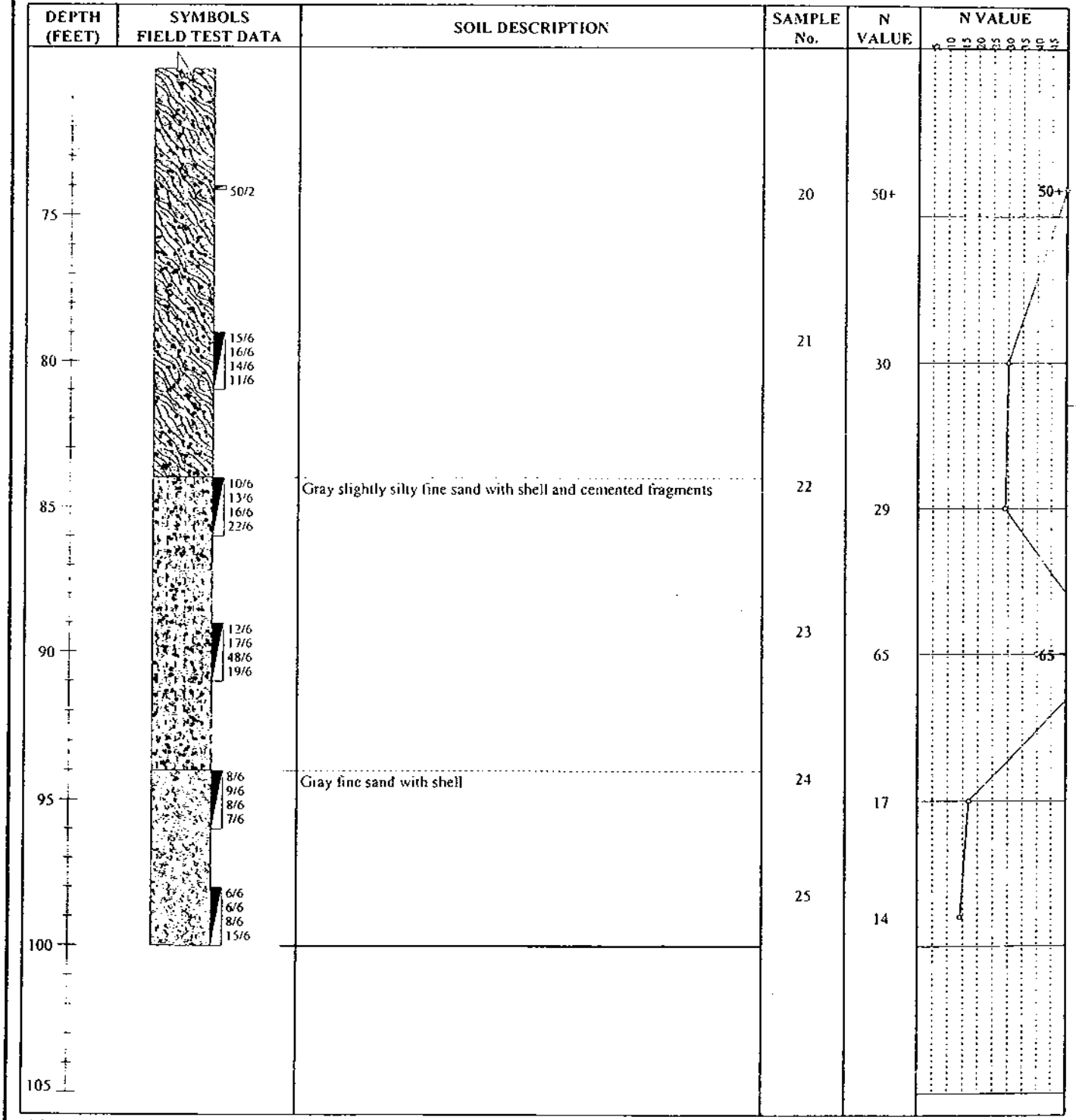
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: C.S./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-17-03



NOTES: Boring completed at depth 100 feet

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-8

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

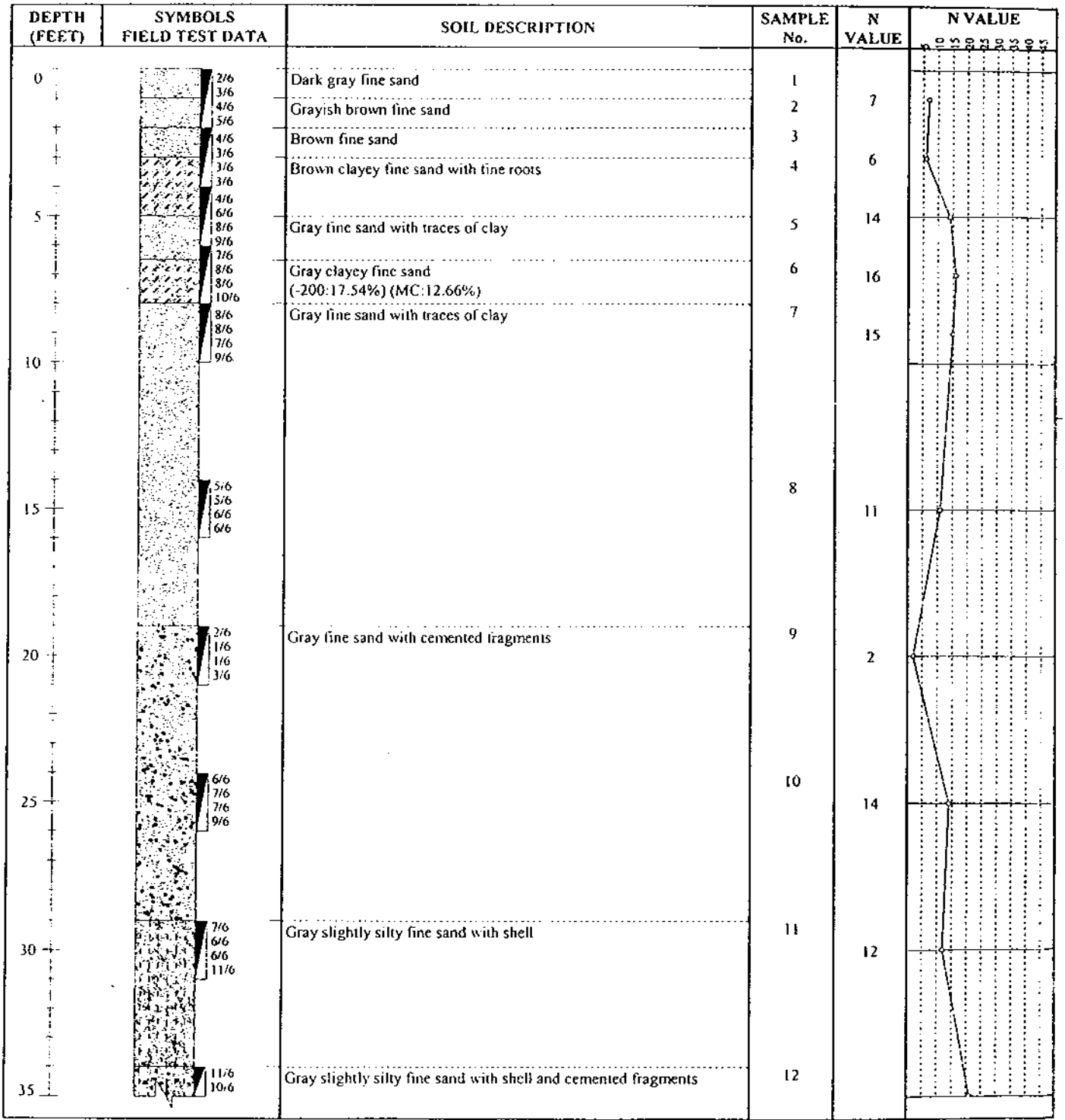
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: C.S./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-17-03



NOTES: Boring completed at depth of 100 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-8

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

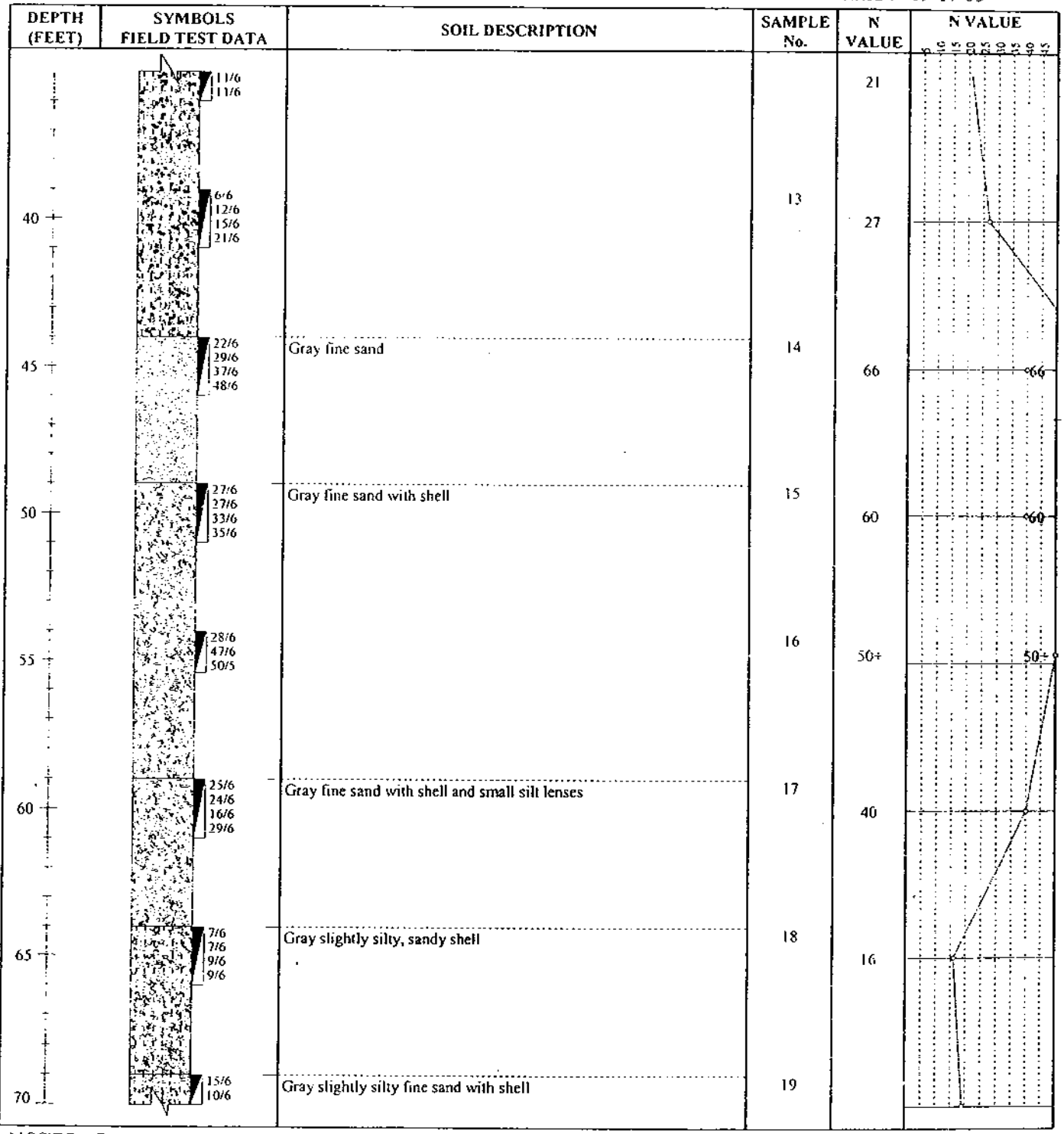
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: C.S./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-17-03



NOTES: Boring completed at depth of 100 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-8

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

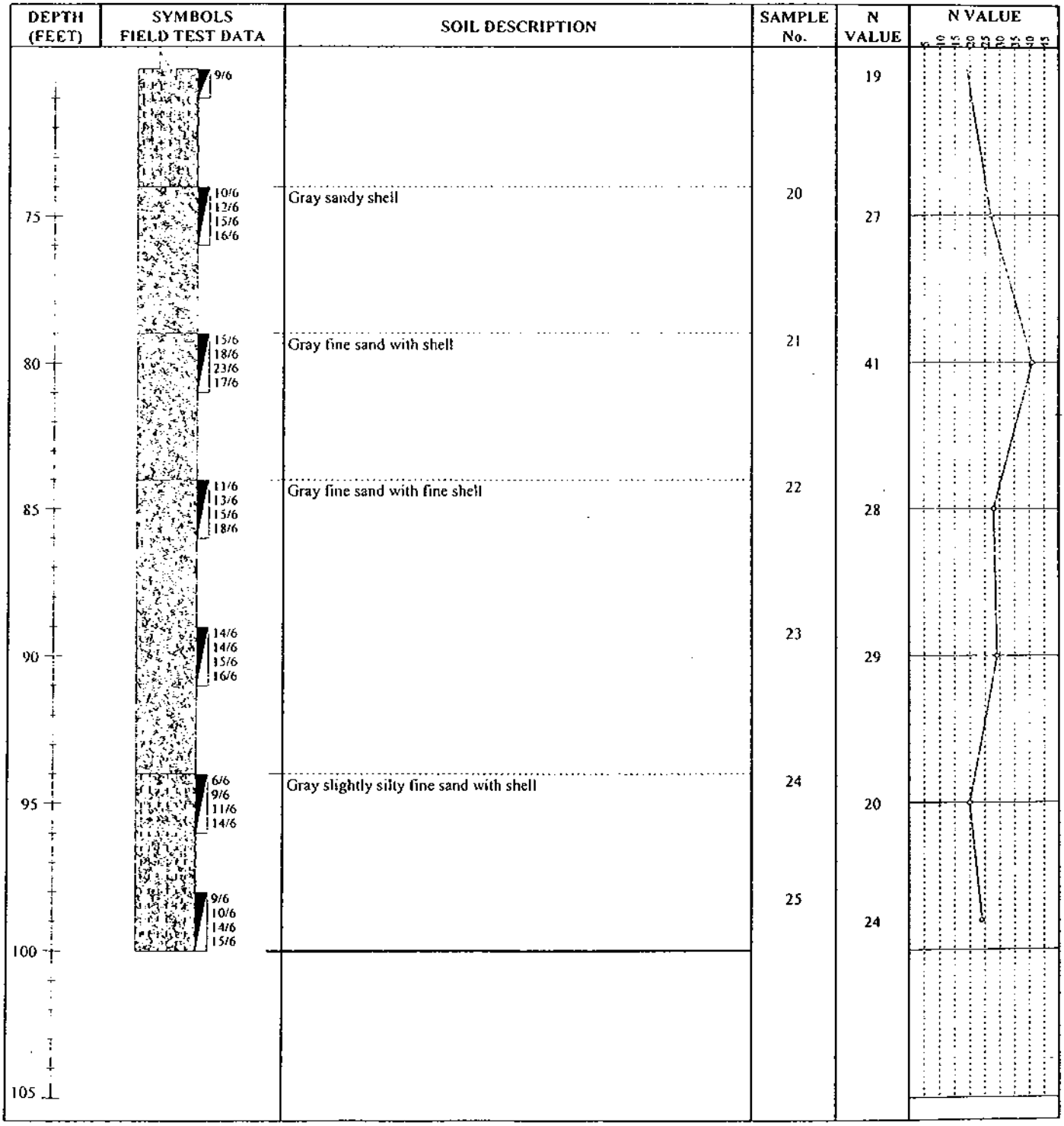
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: C.S./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-17-03



NOTES: Boring completed at depth of 100 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-9

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

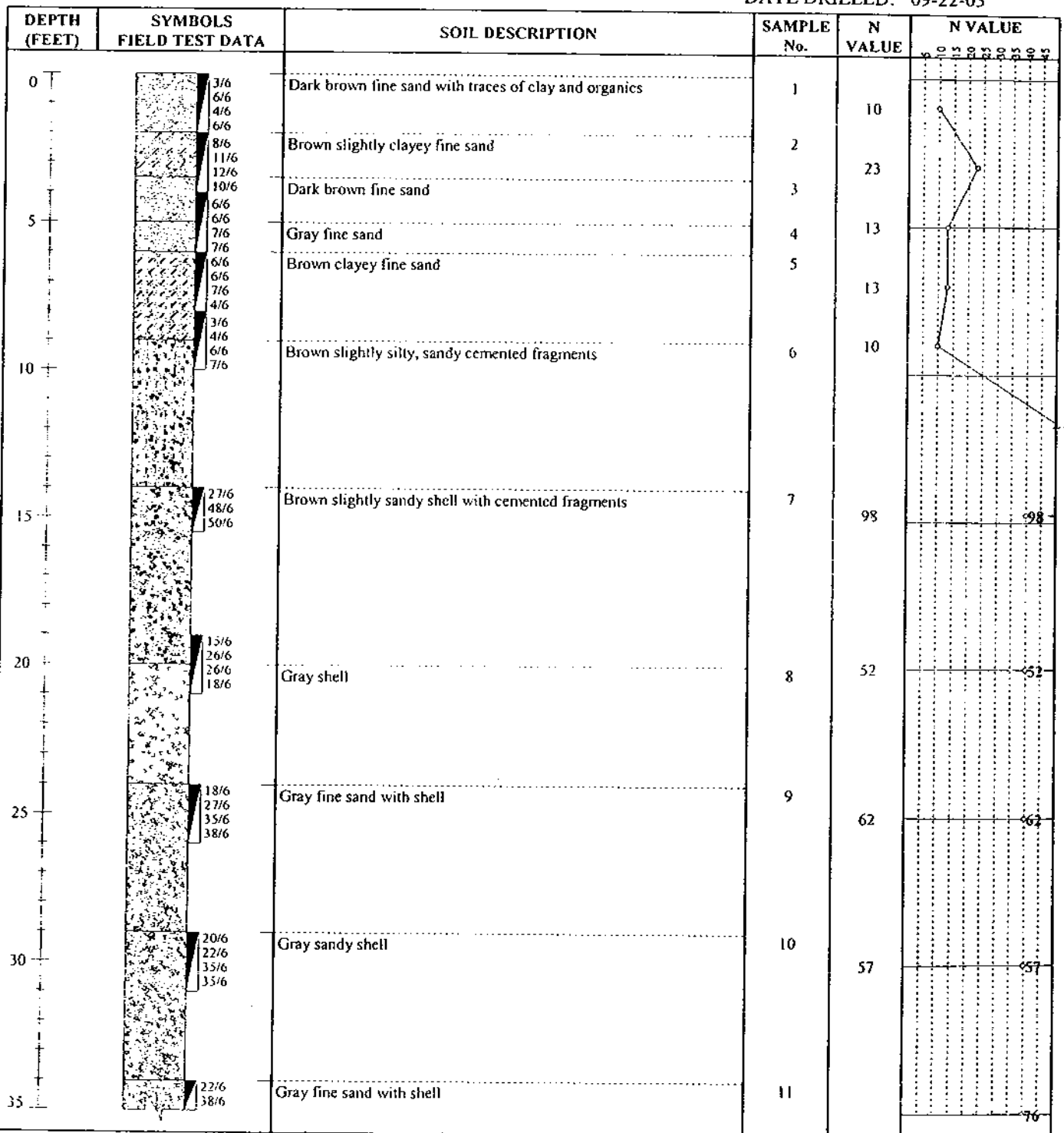
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-22-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-9

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-22-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
	38/6 45/6			76	
	14/6 18/6 26/6 36/6	Gray fine sand	12	44	
40					
	15/6 23/6 28/6 32/6		13	51	51
45					
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-10

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

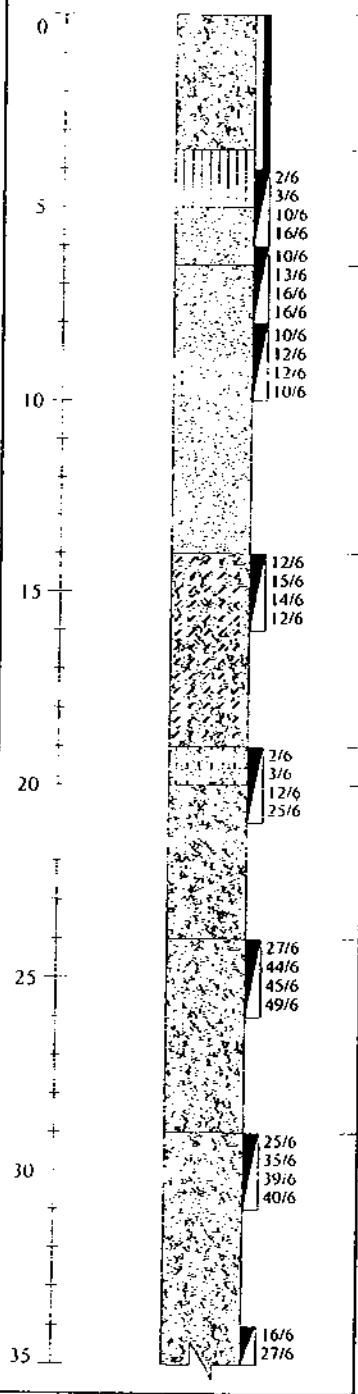
FILE No.: 03-2197

BORING LOCATION: As per plan

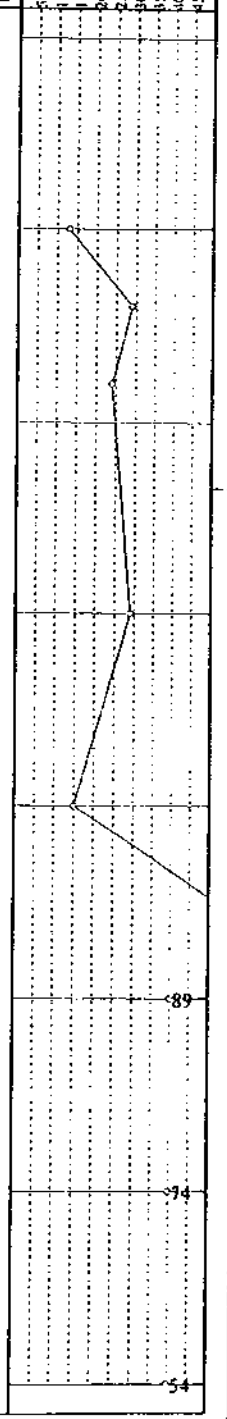
DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-17-03



SOIL DESCRIPTION	SAMPLE No.	N VALUE
Brown fine sand with shell	1	
Gray Silt	2	
Light gray fine sand	3	13
Brown fine sand	4	29
		24
Gray clayey fine sand with shell	5	29
Dark gray slightly silty fine sand	6	
Gray slightly sandy shell	7	15
Gray fine sand with shell	8	89
Gray fine sand with fine shell	9	74
	10	



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-10

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-17-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	27/6 29/6 15/6 28/6 35/6 35/6 6/6 8/6 15/6 27/6		11 12	54 63 23	63
45					
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN", 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-11

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

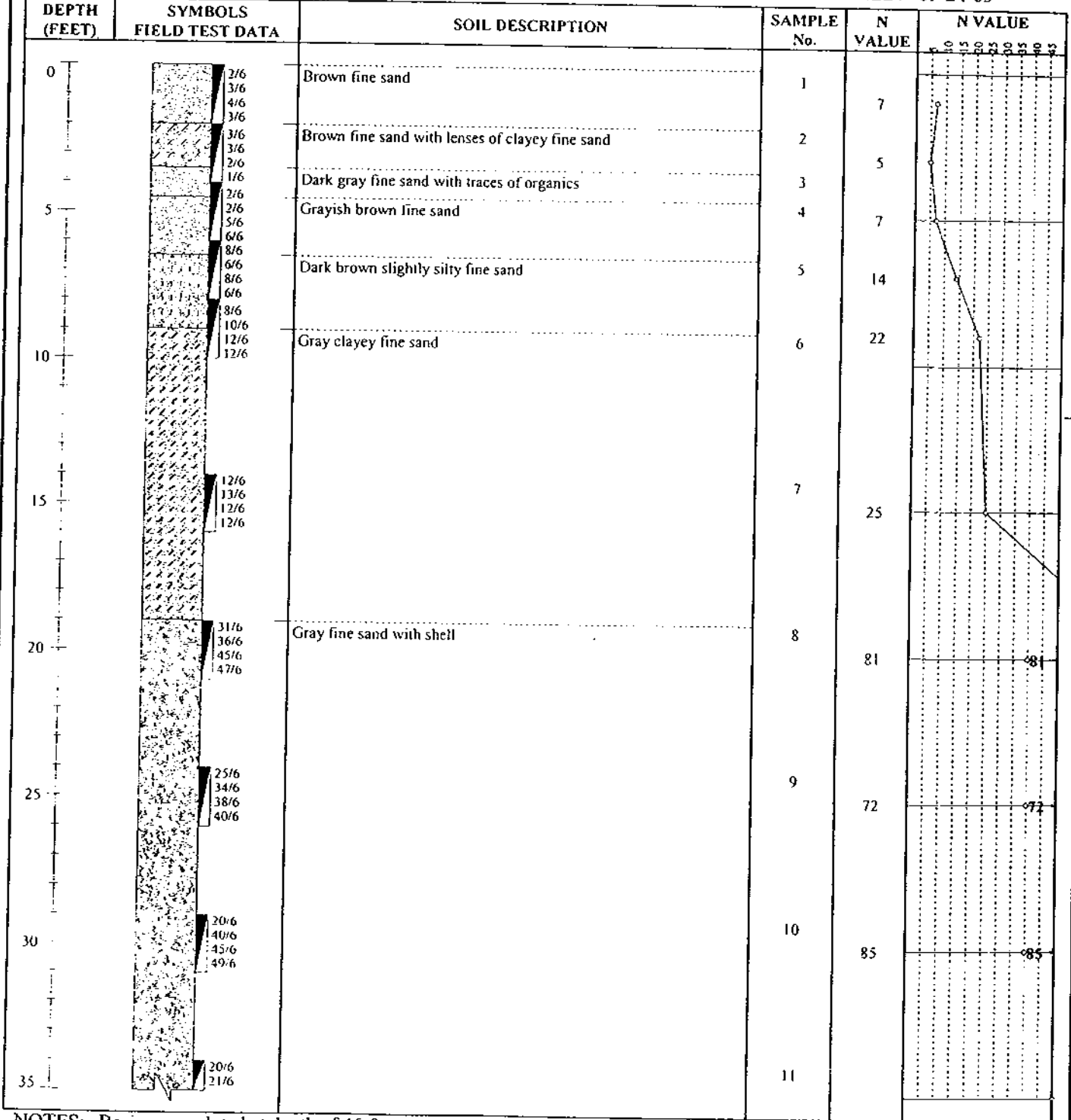
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-24-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-11

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

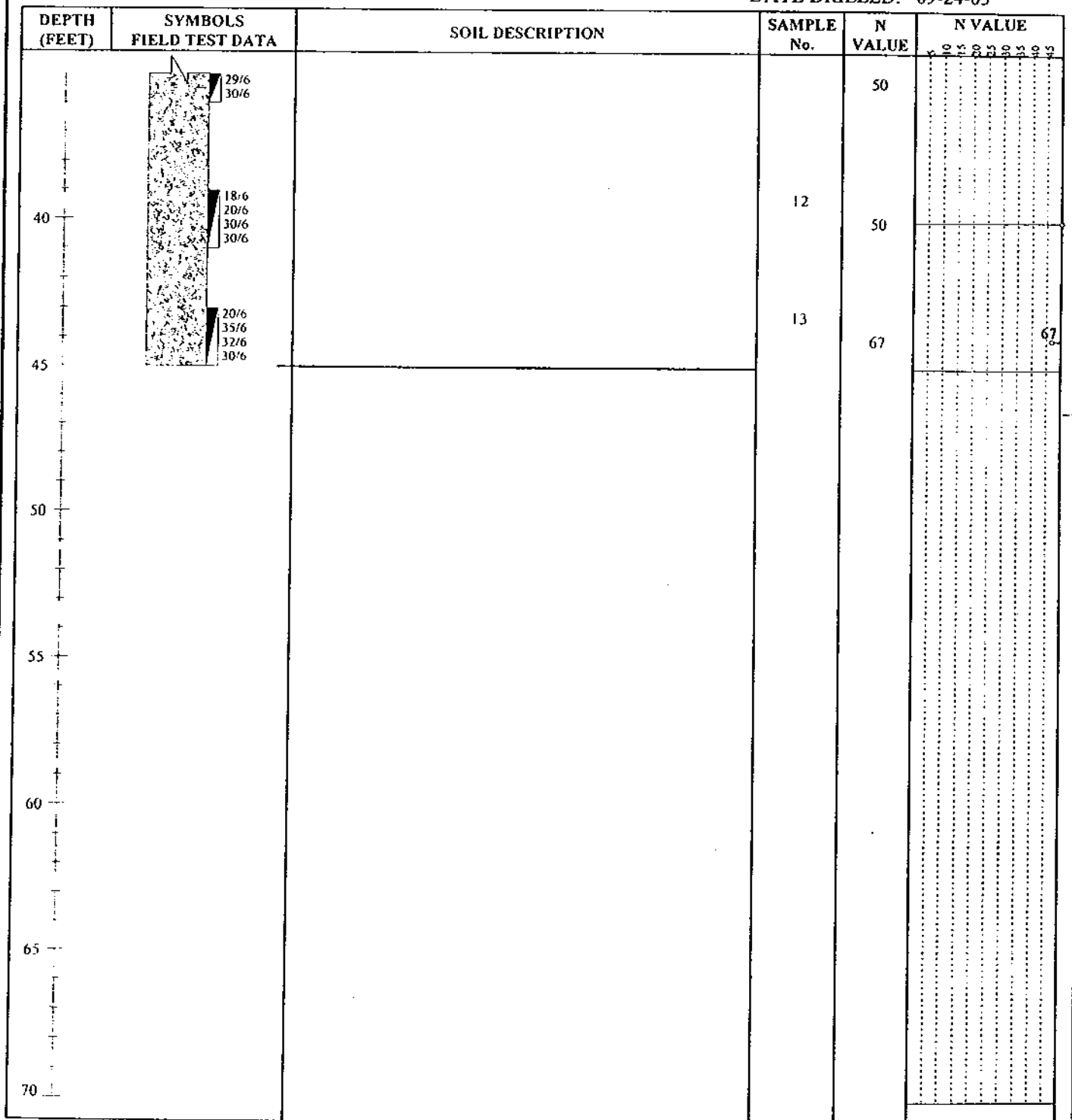
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-24-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-12

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

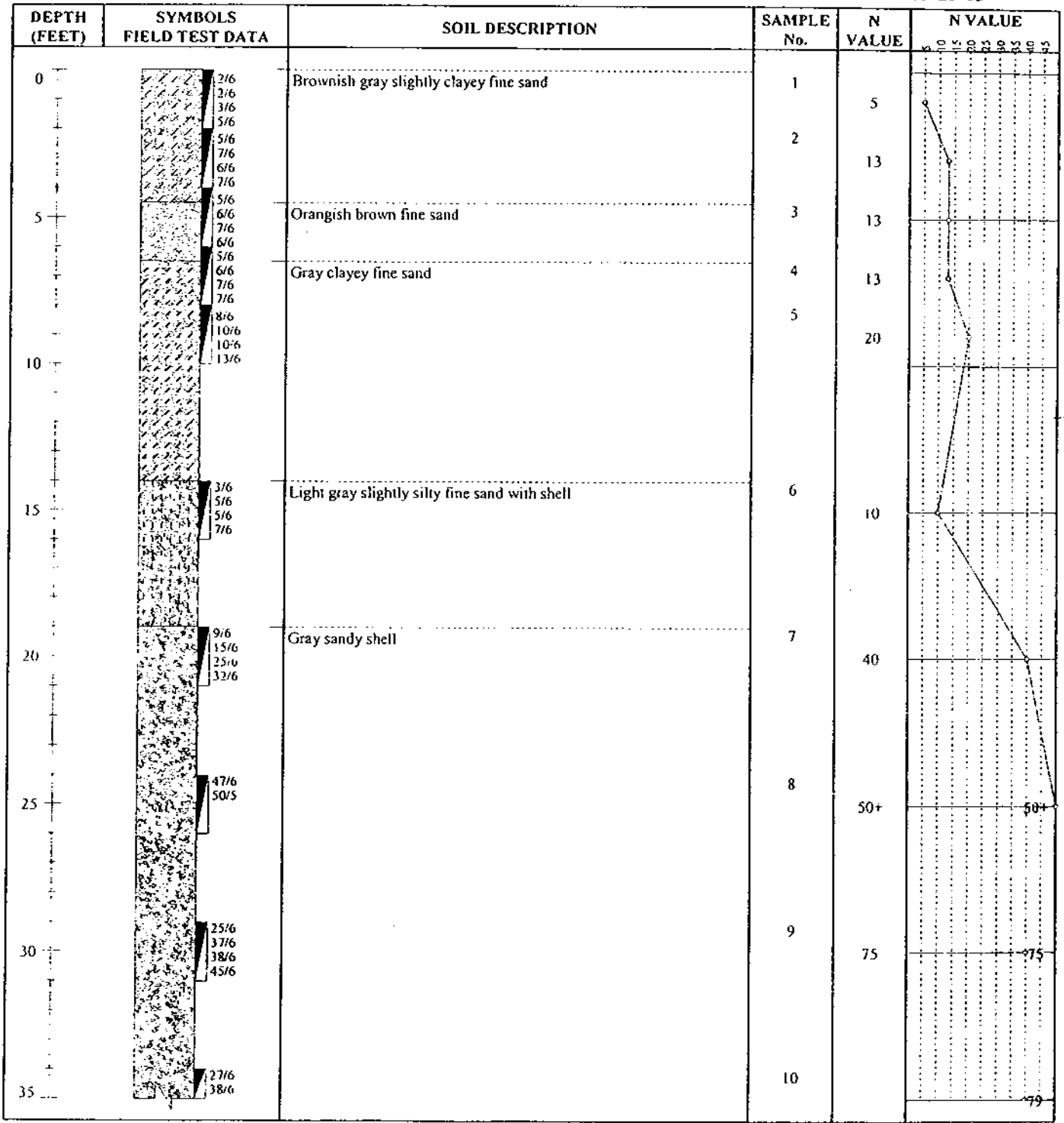
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-25-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-12

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

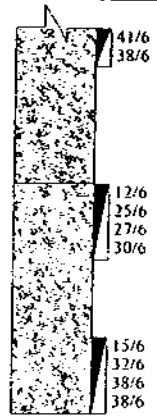
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-25-03



DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40		Gray fine sand with shell	11	79 52	52
45			12	70	70
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-13

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

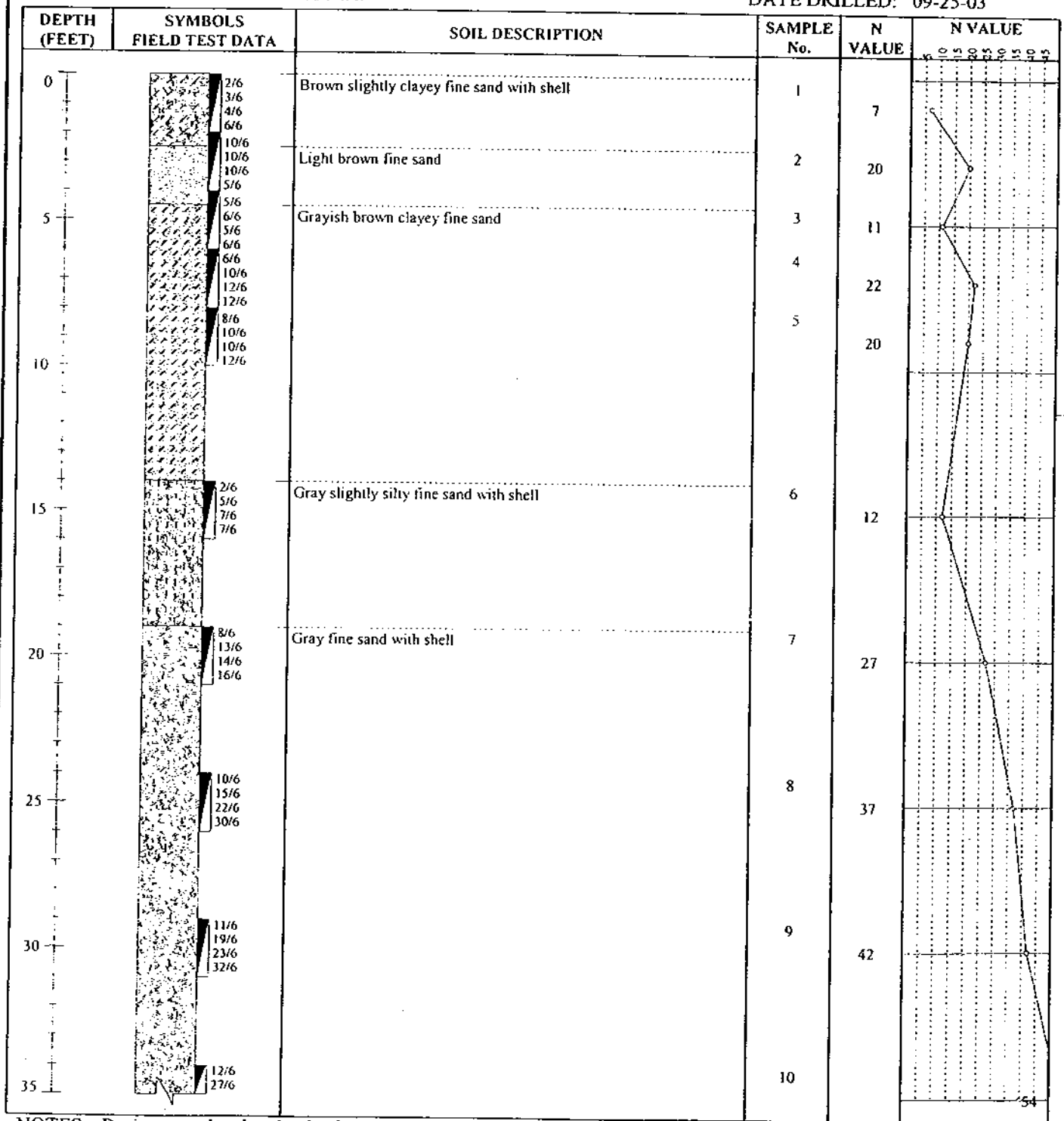
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-25-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-13

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-25-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	27/6 29/6 25/6 37/6 45/6 42/6 11/6 21/6 29/6 35/6		11 12	54 82 50	82
45					
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-14

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

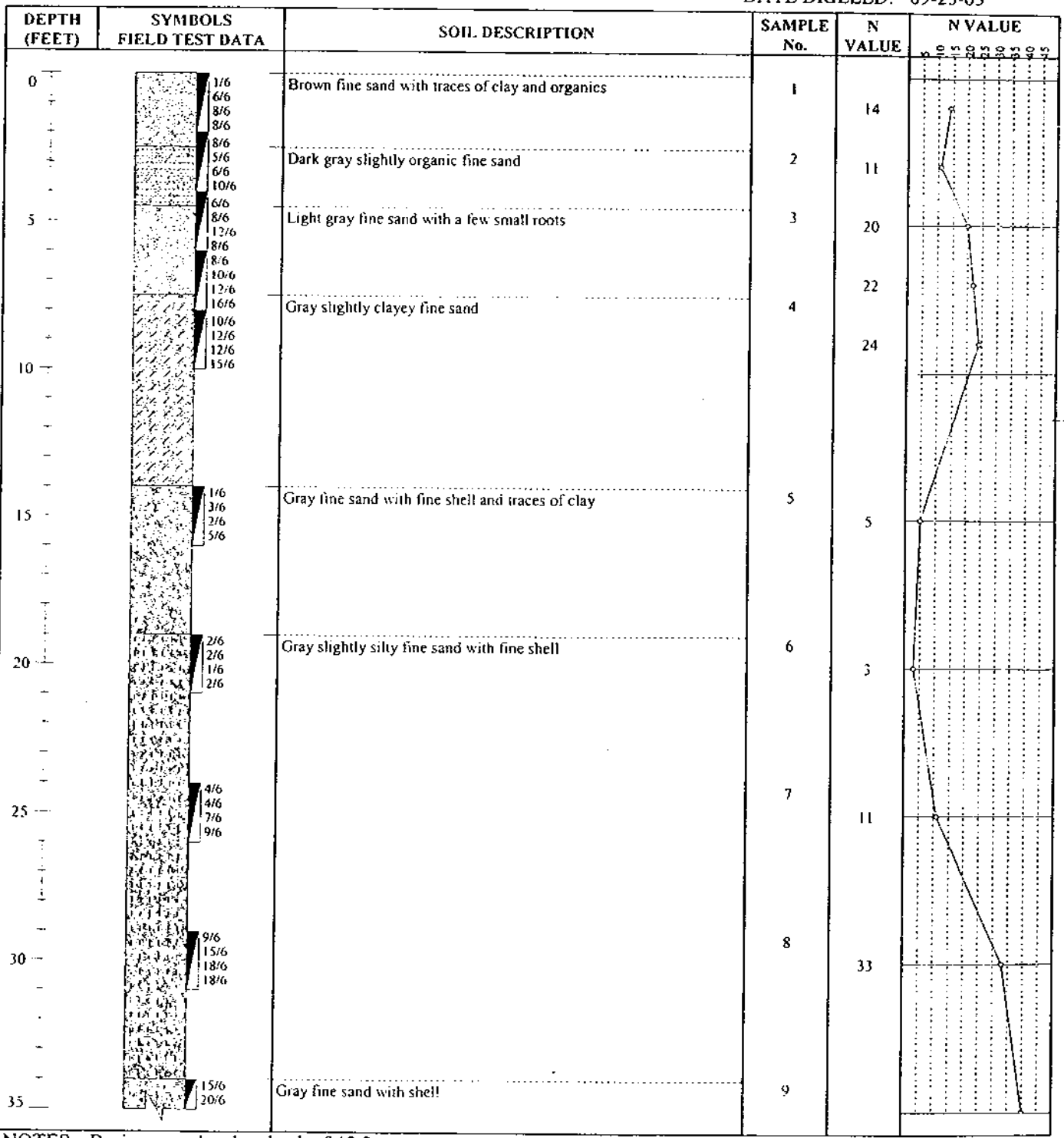
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-25-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-14

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

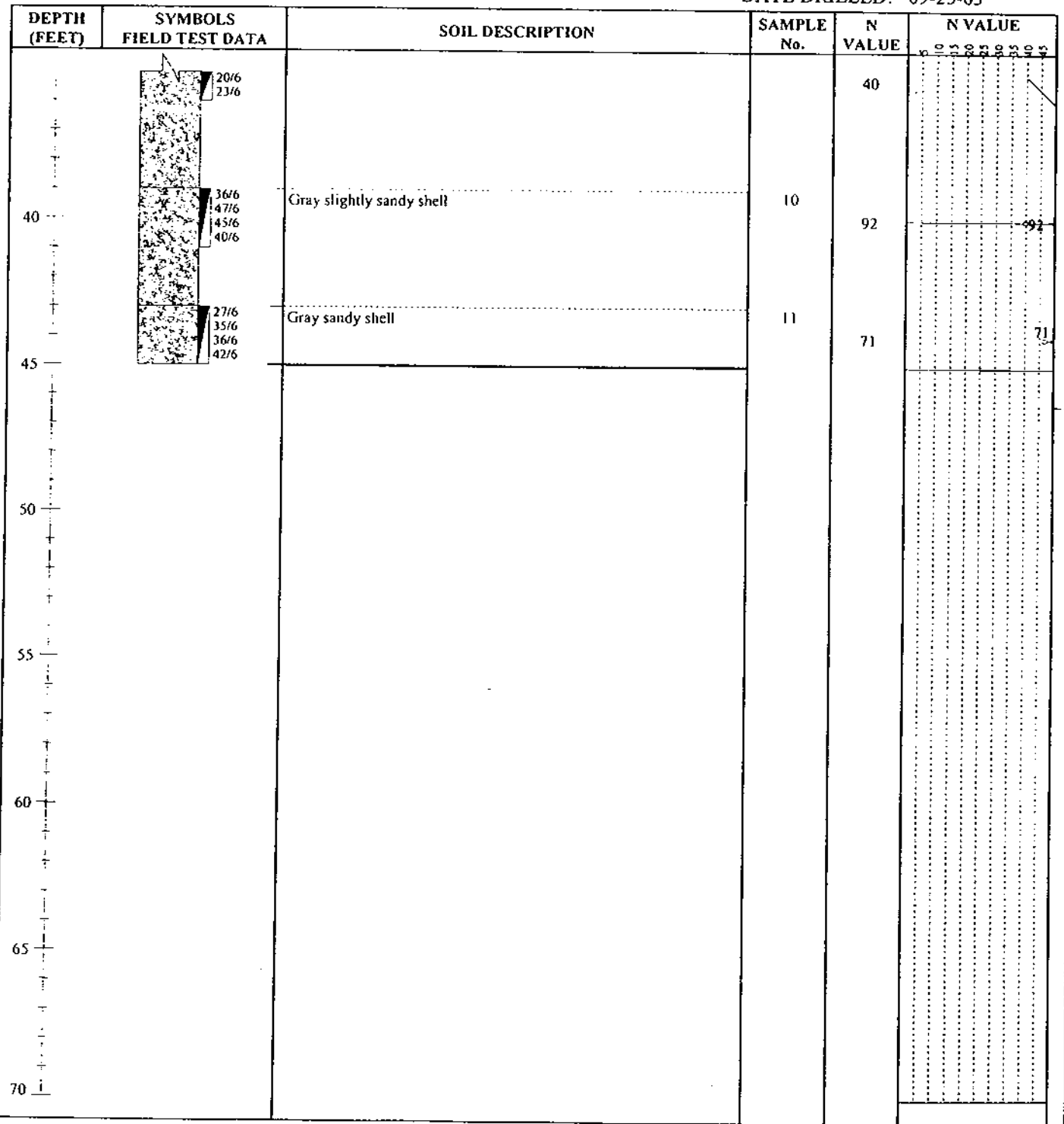
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-25-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-15

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

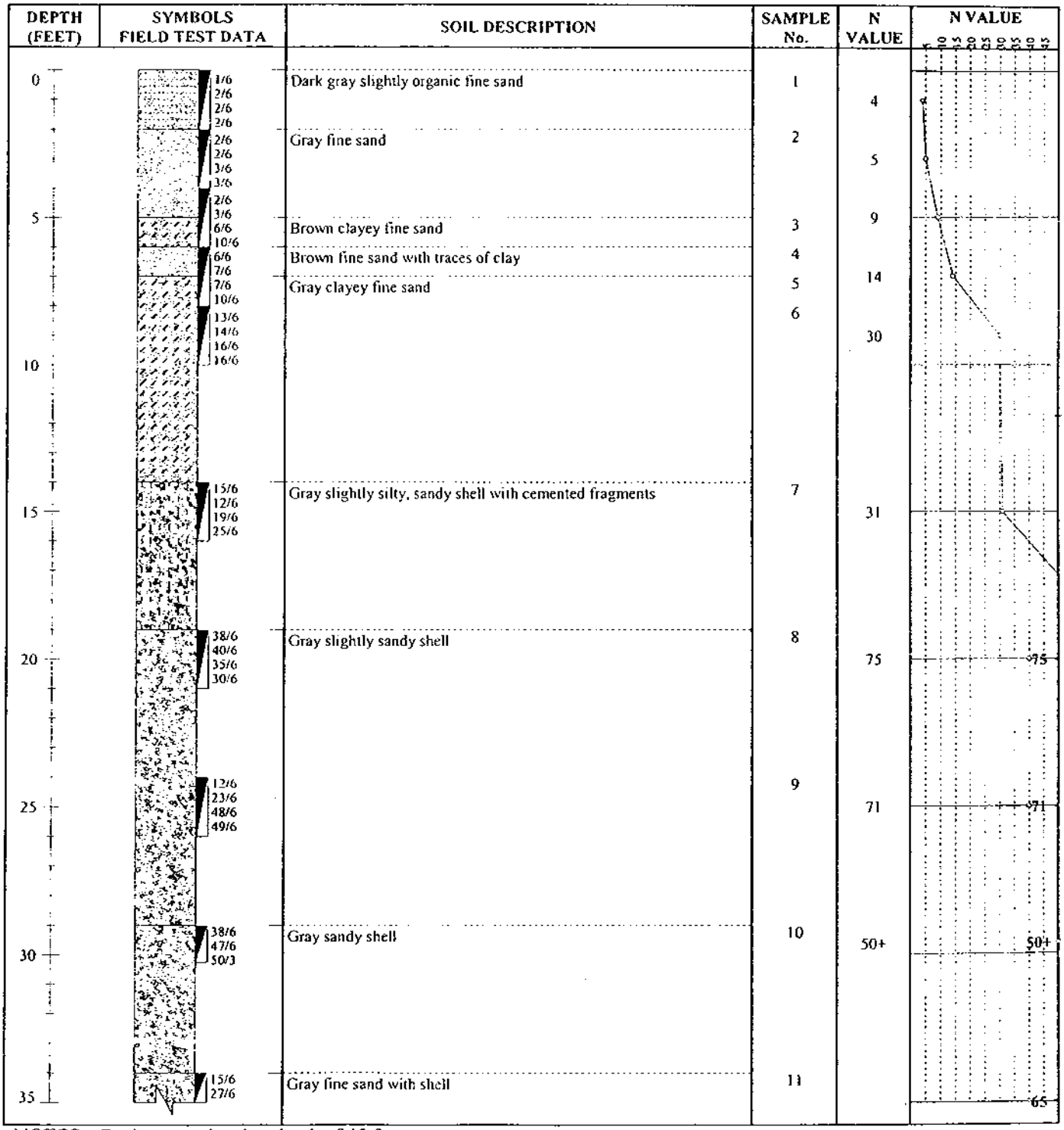
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-26-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-15

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

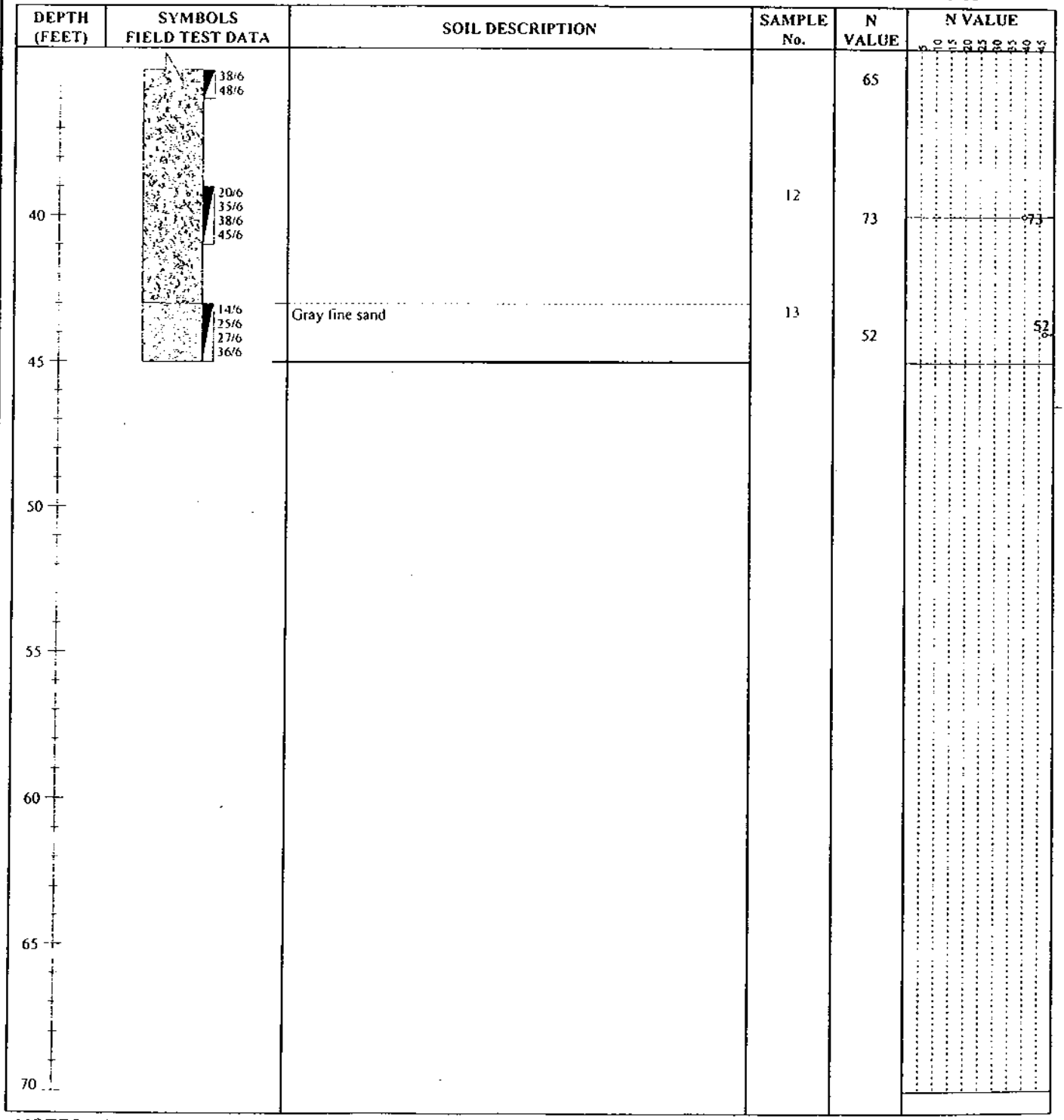
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 09-26-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-16

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

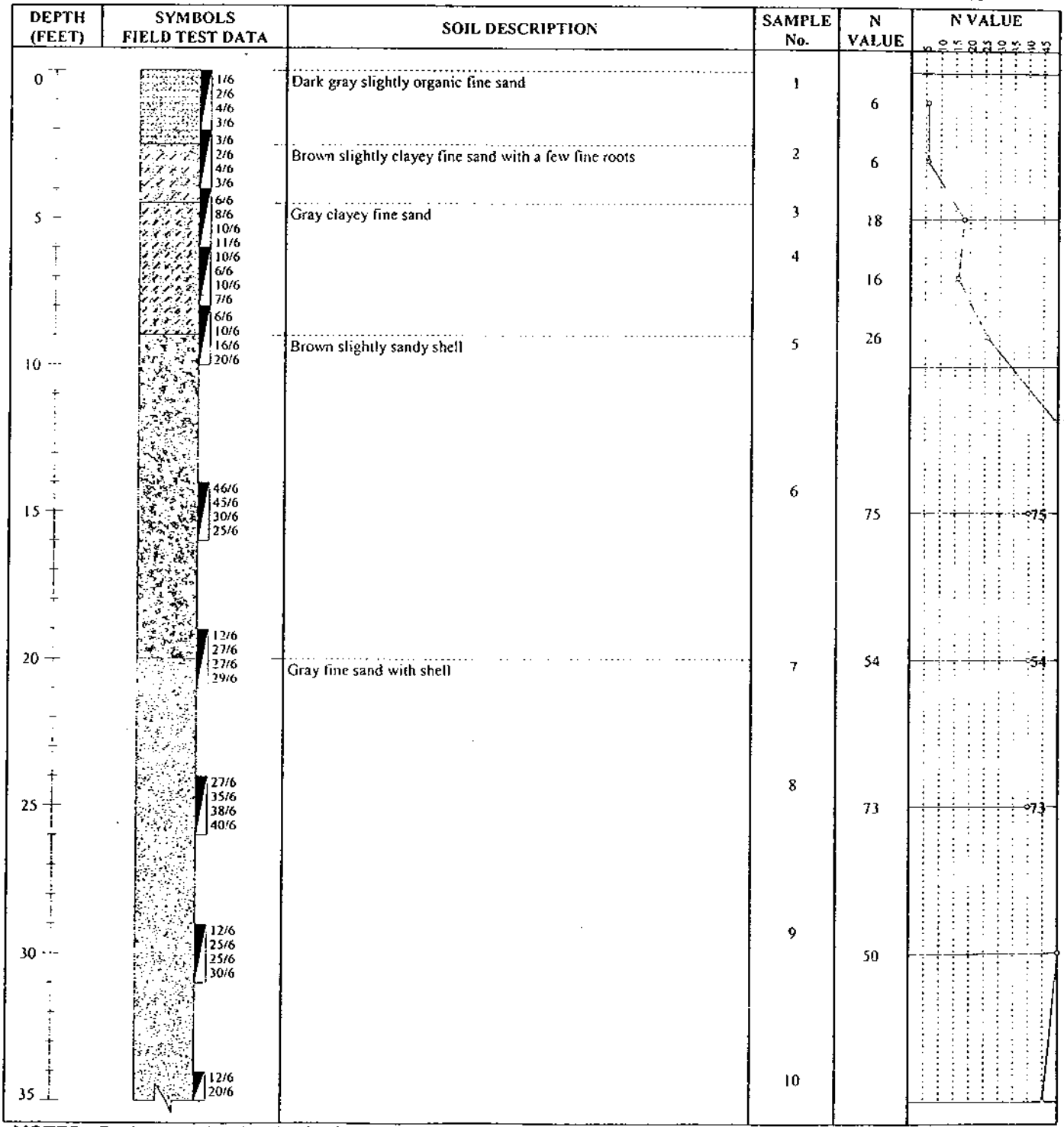
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-01-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-16

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-01-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	25/6 20/6 15/6 22/6 27/6 27/6		11	45 49	
45	17/6 23/6 28/6 40/6		12	51	51
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-17

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

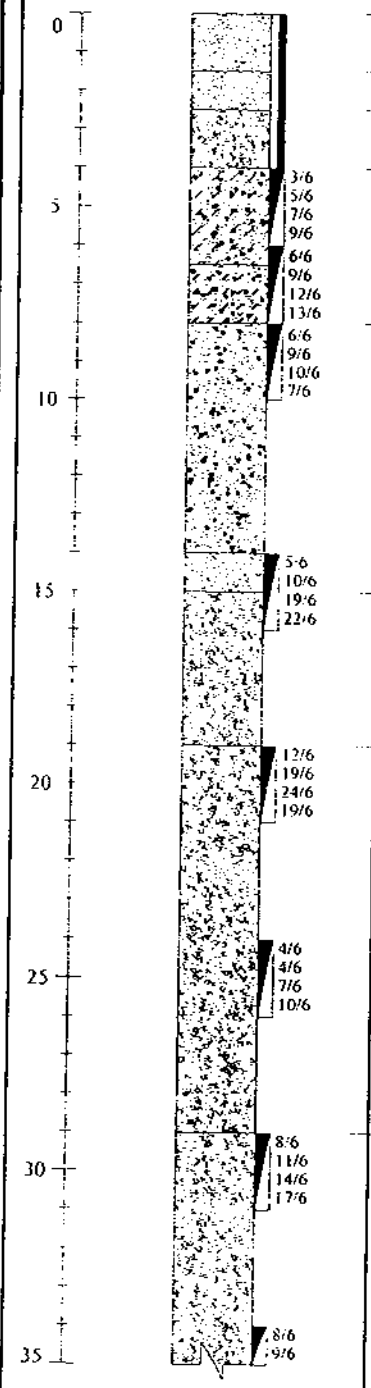
FILE No.: 03-2197

BORING LOCATION: As per plan

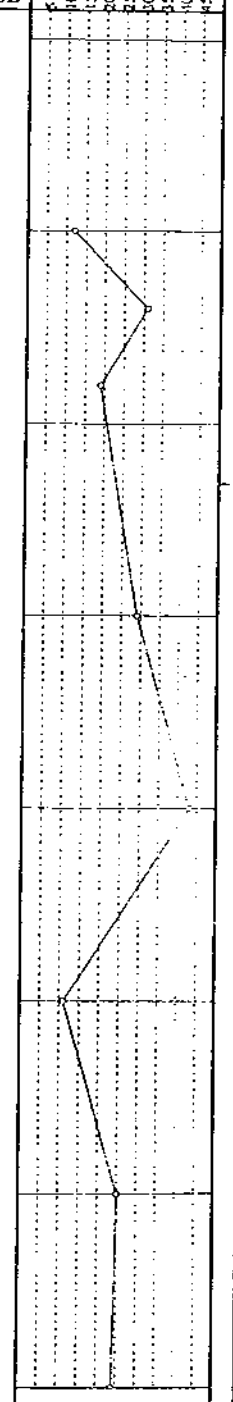
DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-02-03



DEPTH (FEET)	SOIL DESCRIPTION	SAMPLE No.	N VALUE
0	Brownish gray fine sand		
	Brown fine sand		
	Brown fine sand with shell and traces of clay	1	
5	Brownish gray slightly clayey fine sand with a few cemented fragments	2	12
	Gray clayey fine sand with a few cemented fragments	3	31
	Gray fine sand with traces of clay and a few cemented fragments	4	19
10			
15	Gray fine sand	5	
	Brown fine sand with shell	6	29
20	Gray sandy shell	7	43
25		8	11
30	Gray fine sand with shell	9	25
35		10	



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-17

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-02-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	15/6 17/6 6/6 6/6 5/6 8/6		11	24 11	
45	3/6 3/6 8/6 8/6		12	11	
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-17

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

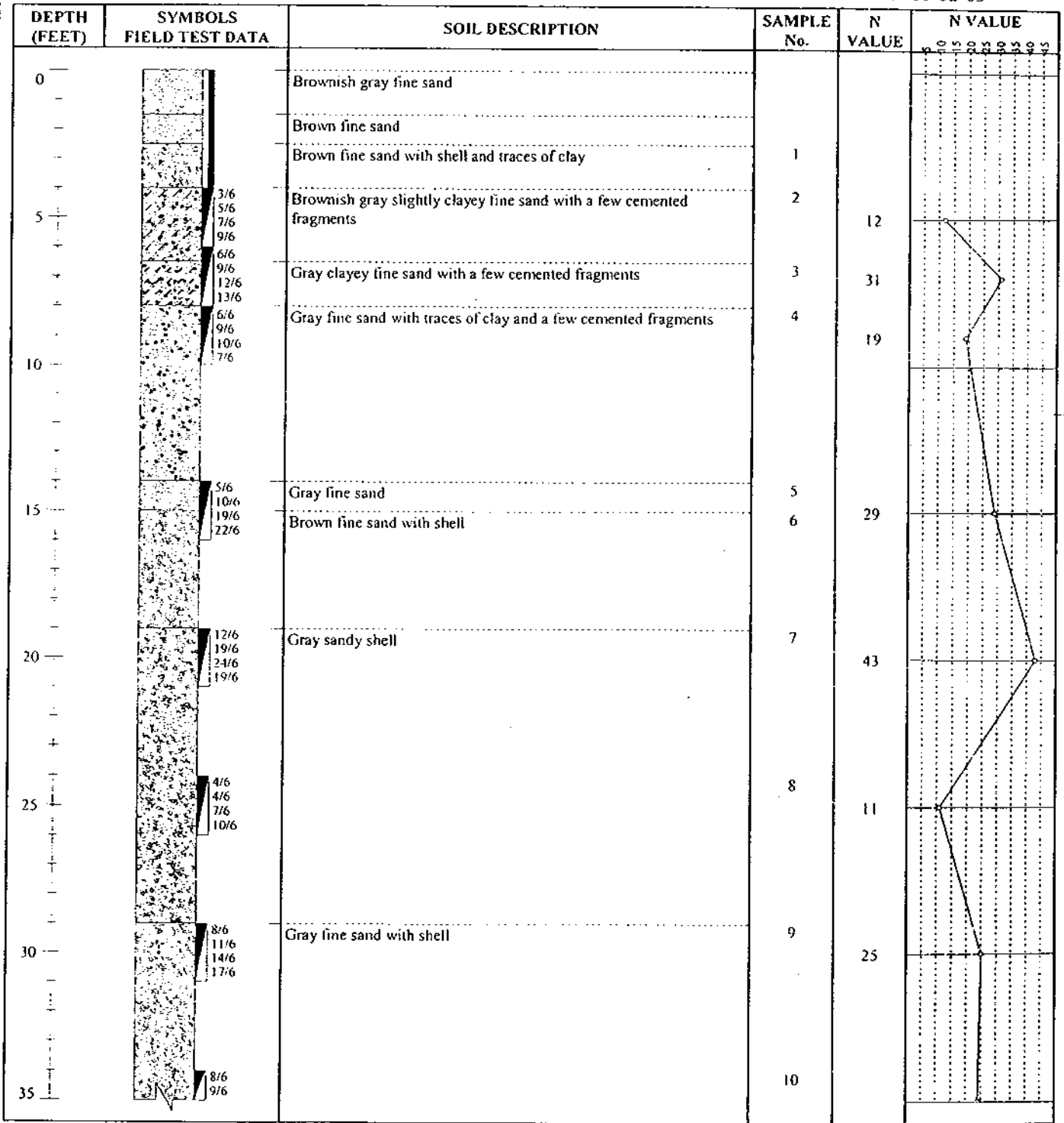
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-02-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-17

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-02-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	15/6 17/6 6/6 6/6 5/6 8/6		11	24 11	
45	3/6 3/6 8/6 8/6		12	11	
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-18

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

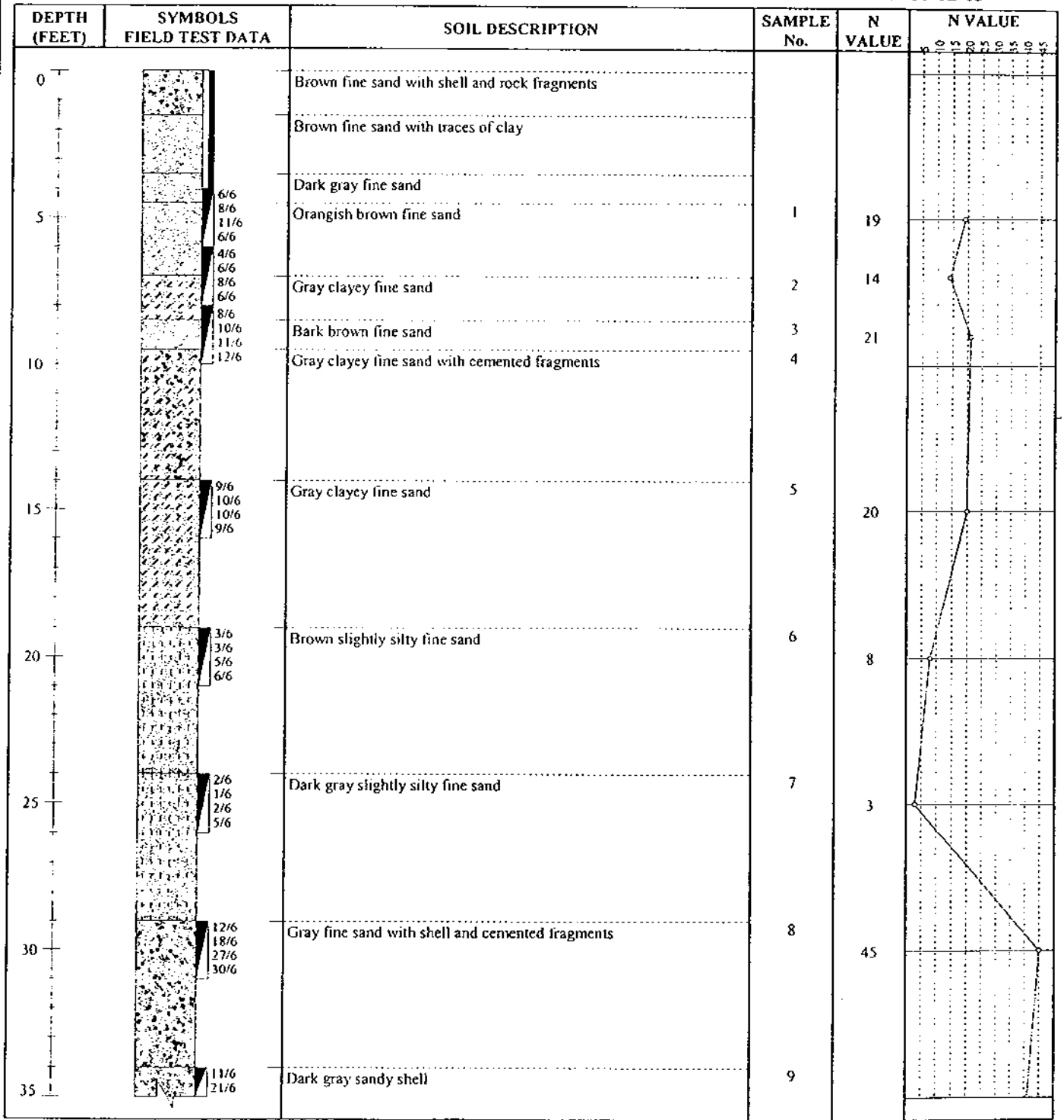
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-02-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-18

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-02-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
	20/6 20/6			41	
40	6/6 6/6 5/6 5/6	Gray slightly silty, slightly sandy fragmented limestone	10	11	
45	10/6 12/6 15/6 19/6	Gray fine sand with shell	11	27	
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-19

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

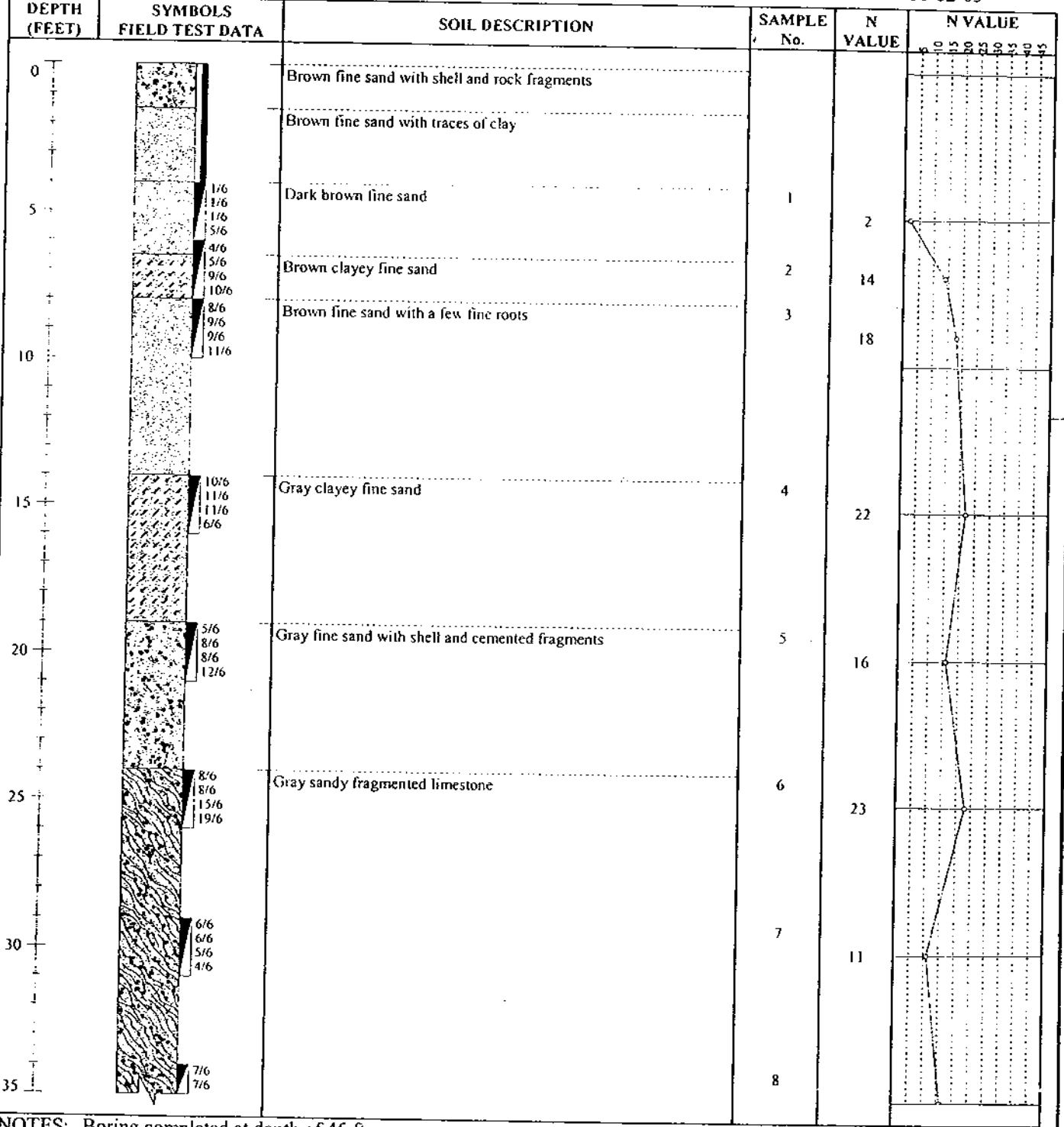
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-02-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-19

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-02-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	9/6 8/6 6/6 7/6 14/6 15/6	Gray fine sand with shell	9	16 21	
45	10/6 14/6 17/6 9/6	Gray sandy shell	10	38	
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-20

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

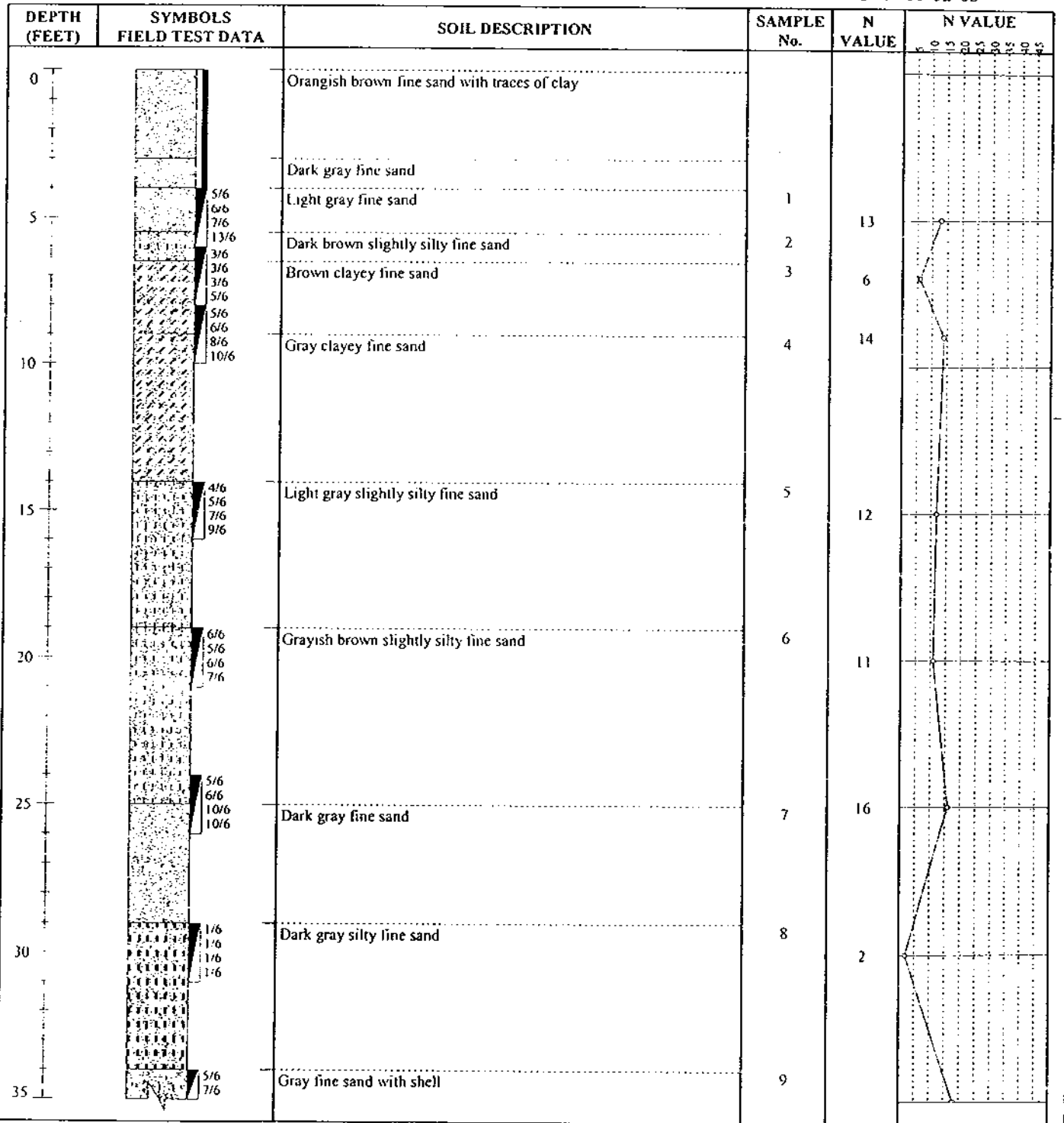
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-02-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-20

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-02-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	12/6 17/6 7/6 10/6 12/6 21/6	Gray fine sand	10	18 22	
45	9/6 17/6 27/6 29/6		11	44	
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-21

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

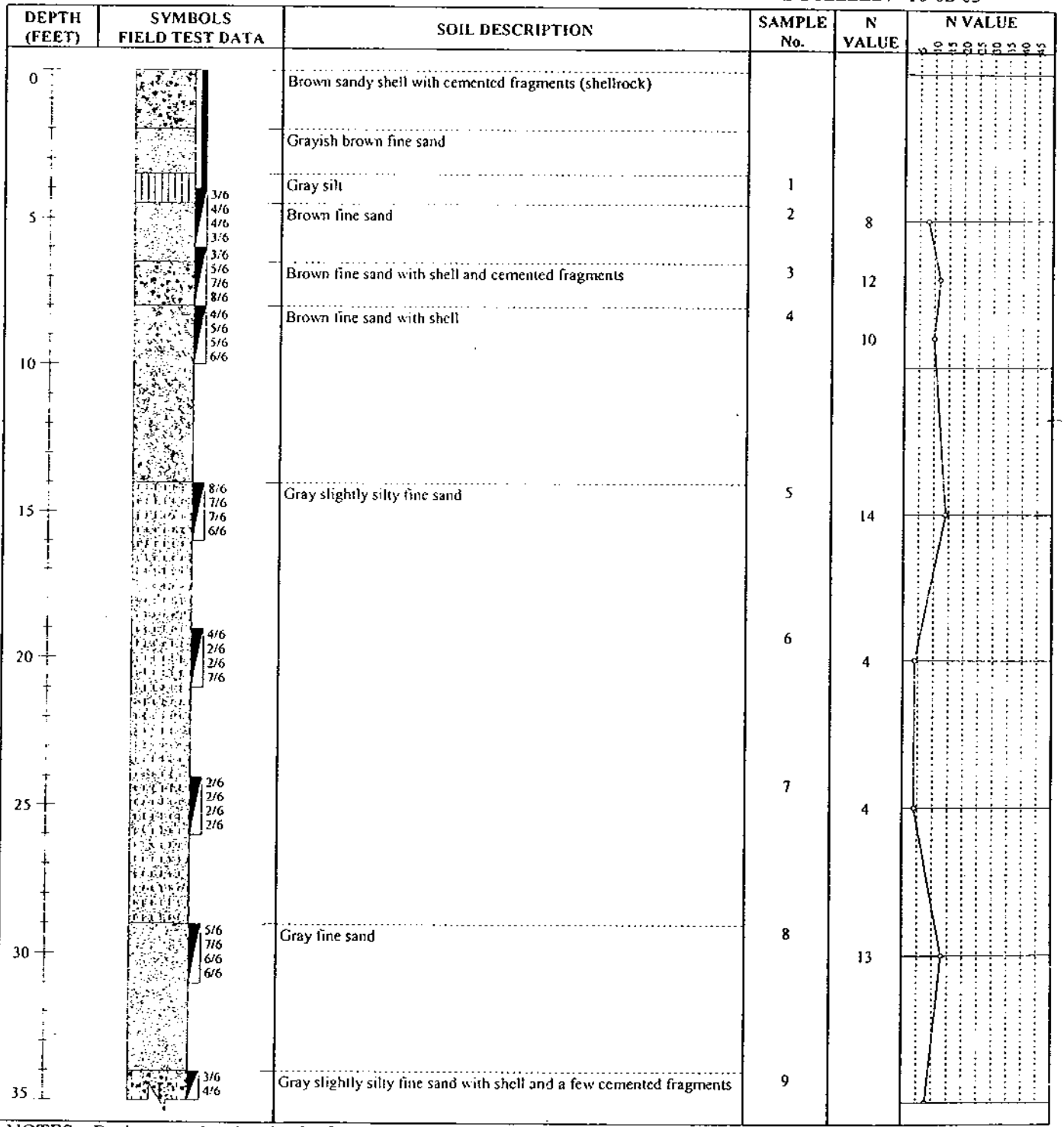
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-02-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-21

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-02-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	4/6 6/6 6/6 6/6 10/6 8/6	Gray slightly silty fine sand with shell	10	8 16	
45	5/6 6/6 9/6 9/6	Gray sandy shell	11	15	
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-22

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

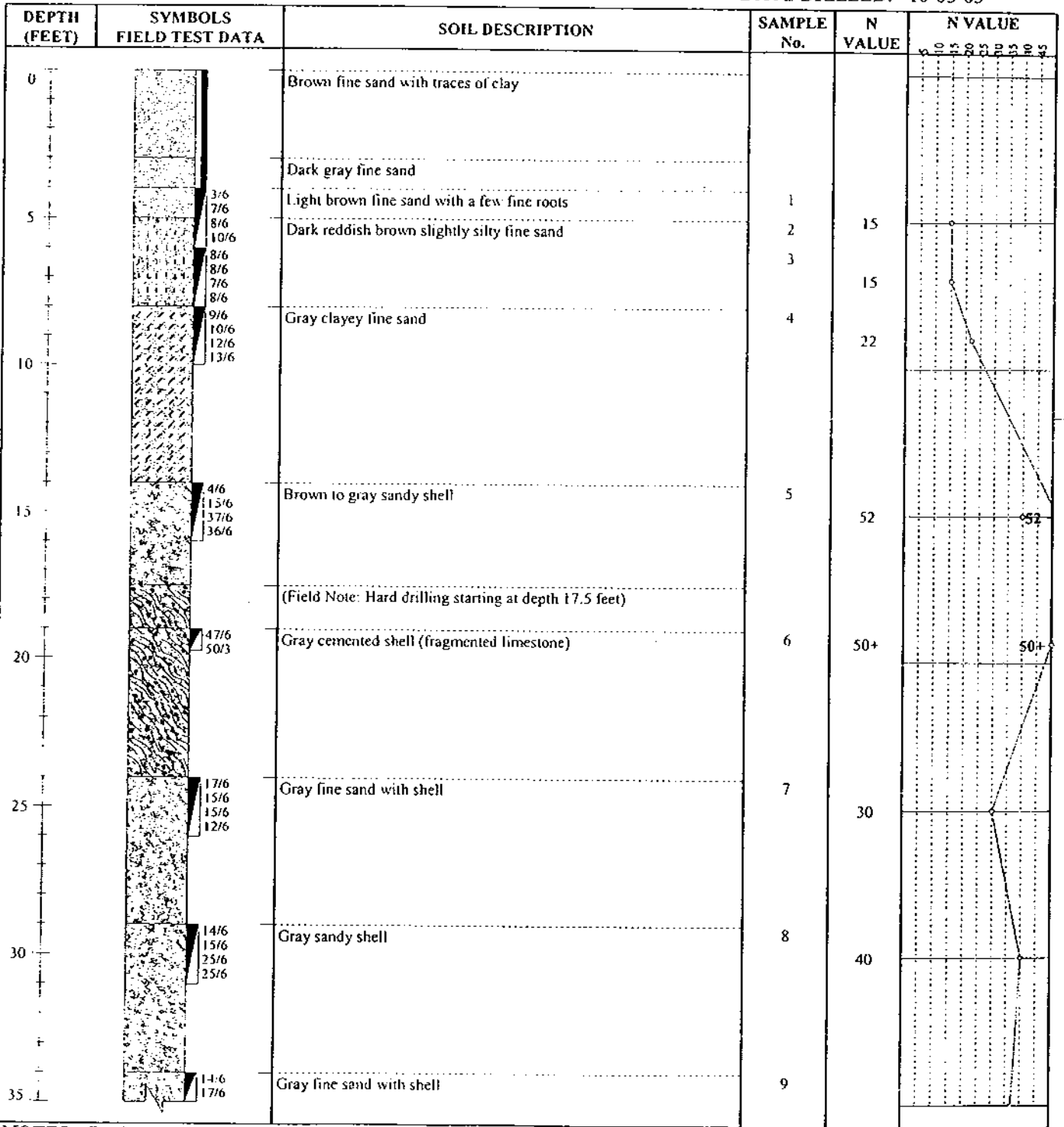
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-03-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-22

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-03-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE
40	20/6 20/6 6/6 9/6 22/6 23/6		10	37 31
45	11/6 9/6 9/6 12/6		11	18
50				
55				
60				
65				
70				

N VALUE: 5 10 15 20 25 30 35 40 45

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-23

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

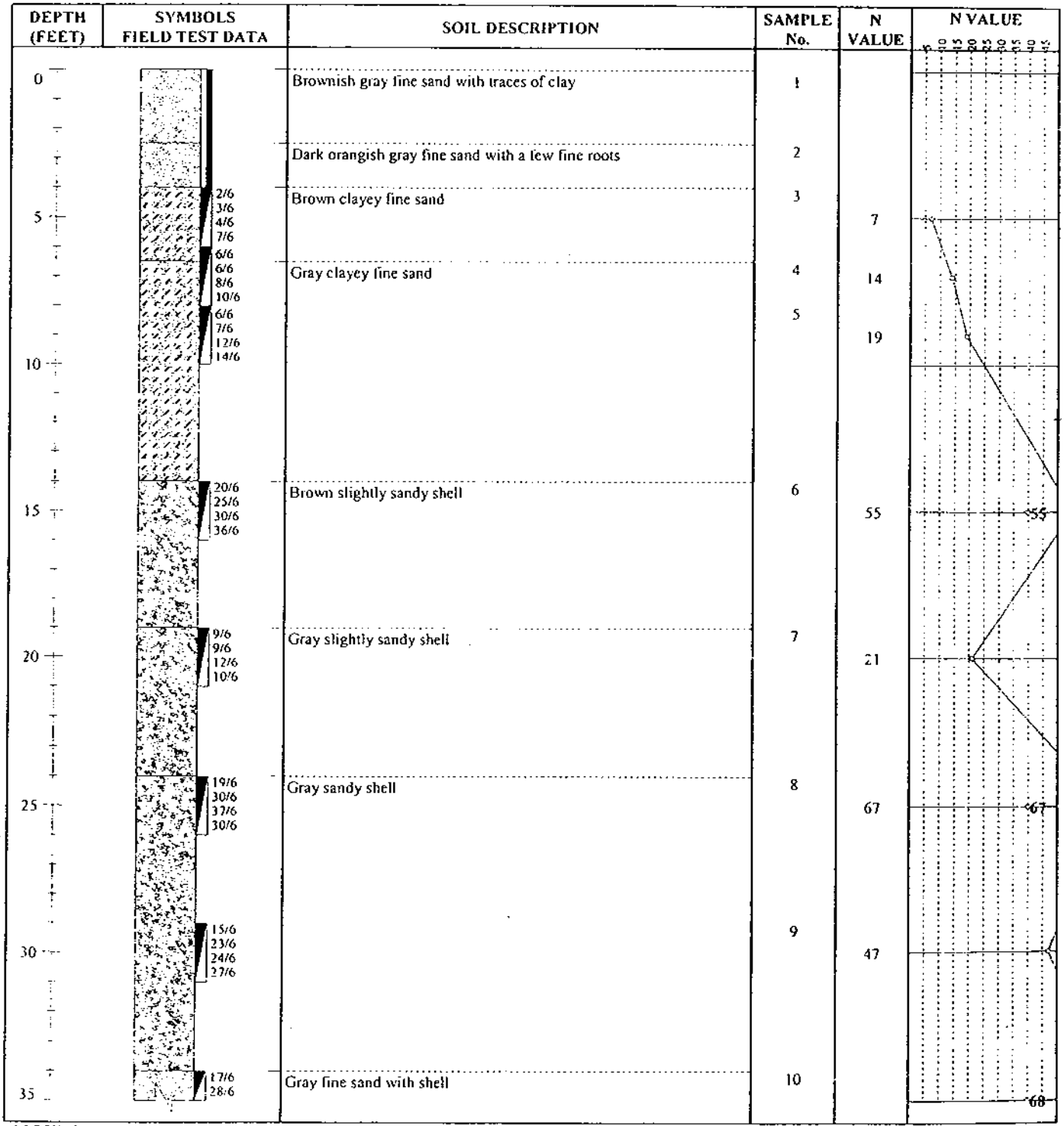
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-03-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-23

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

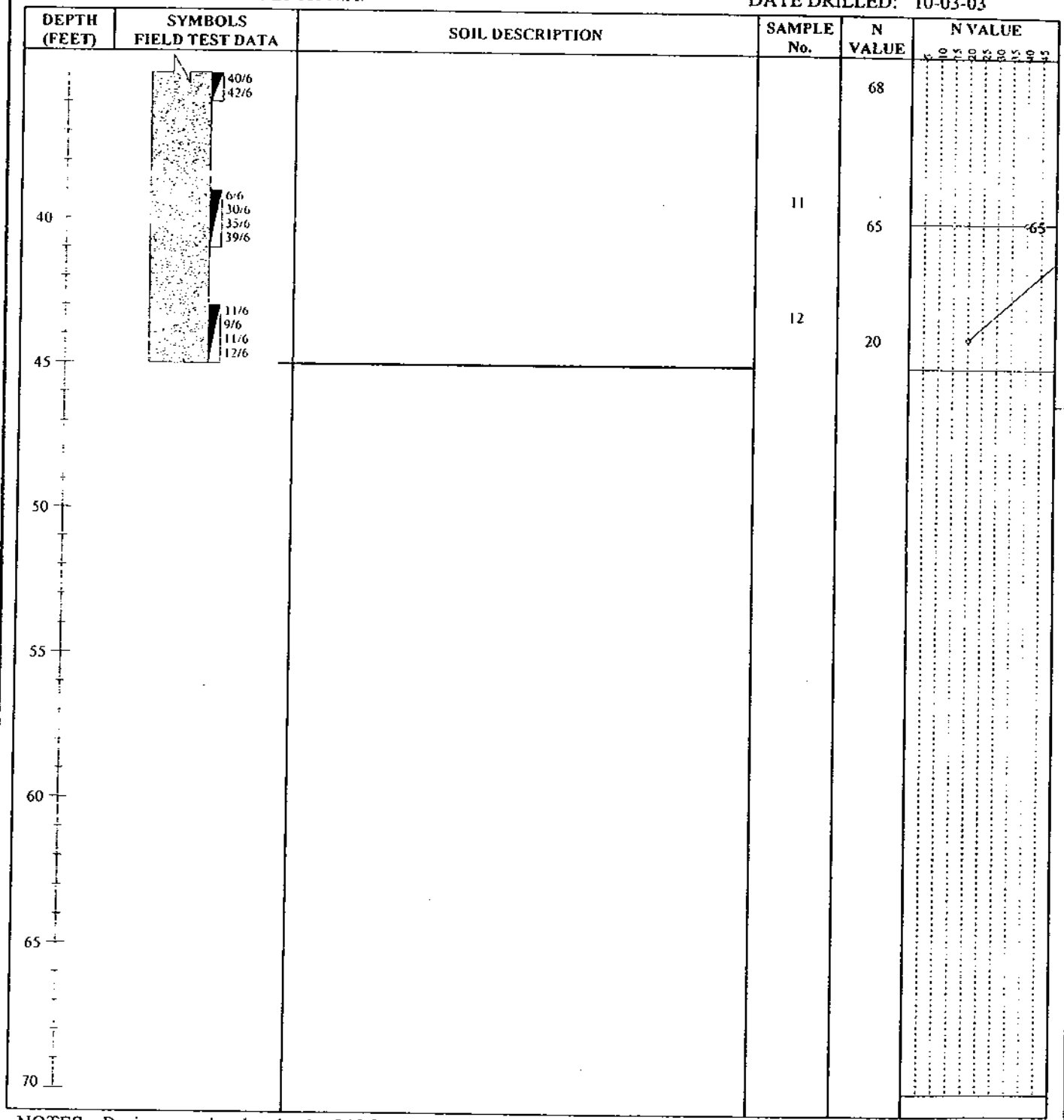
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-03-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-24

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

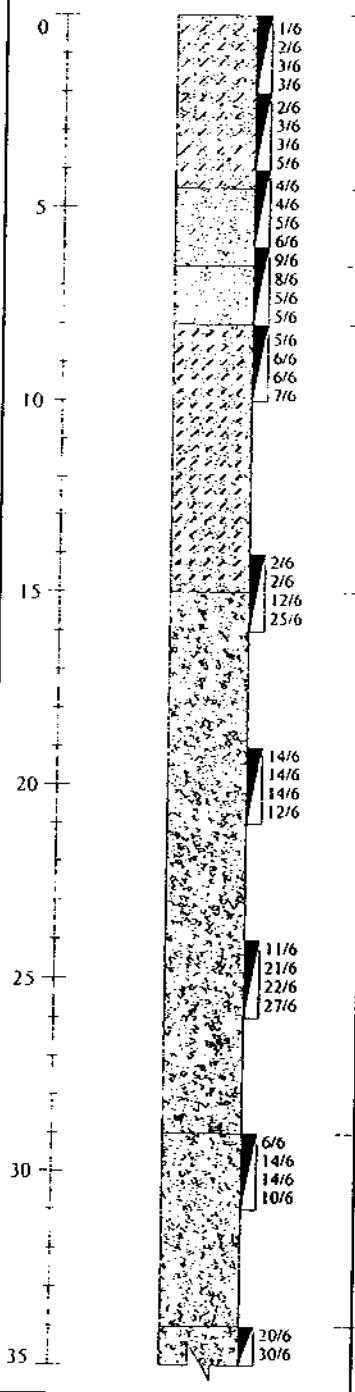
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-07-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-24

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-07-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
	36/6 36/6			66	
40	10/6 12/6 15/6 16/6	Gray fine sand with shell	11	27	
45	12/6 20/6 20/6 27/6		12	40	
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-25

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-07-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE
0	2/6, 3/6, 3/6, 4/6	Grayish brown fine sand	1	6
	4/6, 4/6, 4/6, 3/6	Dark orangish brown fine sand	2	8
5	4/6, 6/6, 4/6, 5/6	Grayish brown fine sand	3	10
	3/6, 4/6, 4/6, 8/6	Dark reddish brown slightly silty fine sand	4	8
	4/6, 6/6, 8/6, 6/6	Brownish gray clayey fine sand	5	14
10			6	
15	8/6, 9/6, 8/6, 10/6	Gray clayey fine sand	7	17
20	20/6, 35/6, 37/6, 43/6	Gray fine sand with shell	8	72
25	15/6, 27/6, 34/6, 38/6		9	61
30	14/6, 20/6, 25/6, 25/6	Gray slightly silty shell	10	45
35	12/6, 24/6	Gray fine sand with shells	11	59

N VALUE

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-25

PROJECT: Troup-Indiantown Water Control District
Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-07-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	35/6 38/6 17/6 27/6 28/6 35/6		12	59 55	55
45	18/6 25/6 24/6 20/6		13	49	
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-26

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

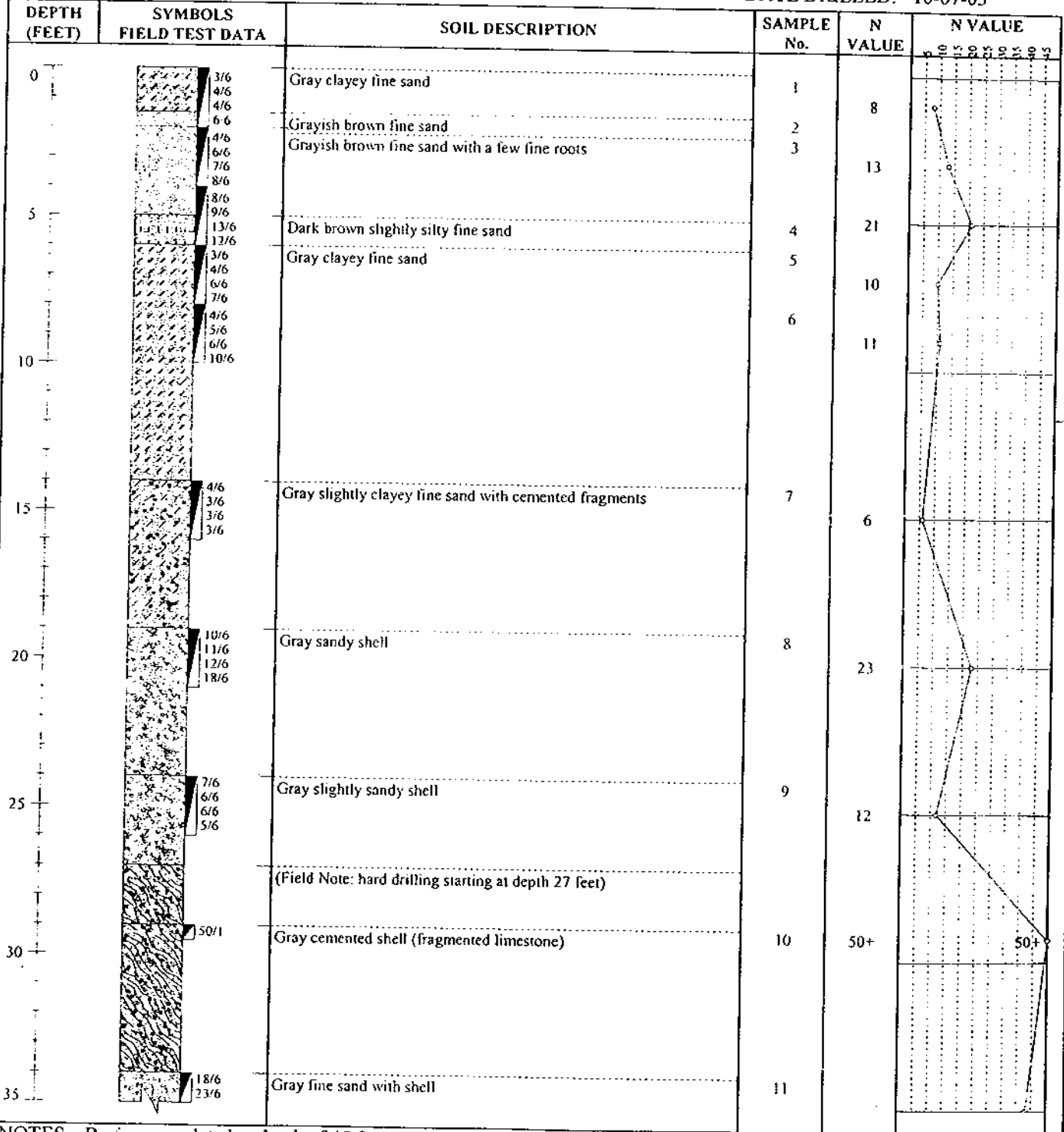
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-07-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-26

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

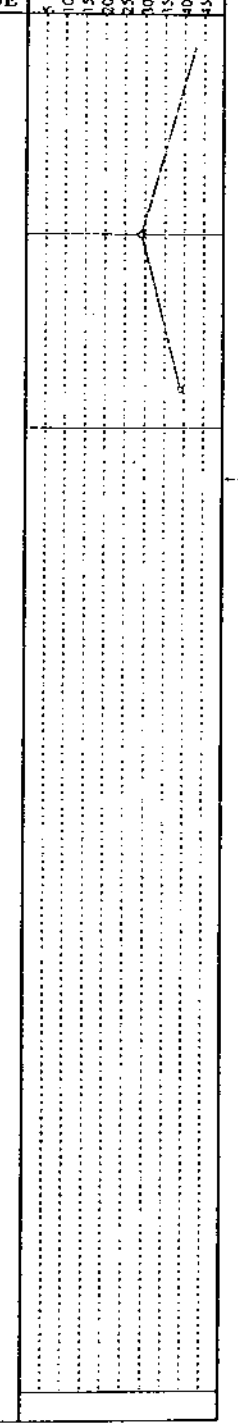
BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-07-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE
40	20/6 18/6 12/6 17/6 12/6 12/6		12	43 29
45	10/6 15/6 24/6 24/6		13	39
50				
55				
60				
65				
70				



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-27

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

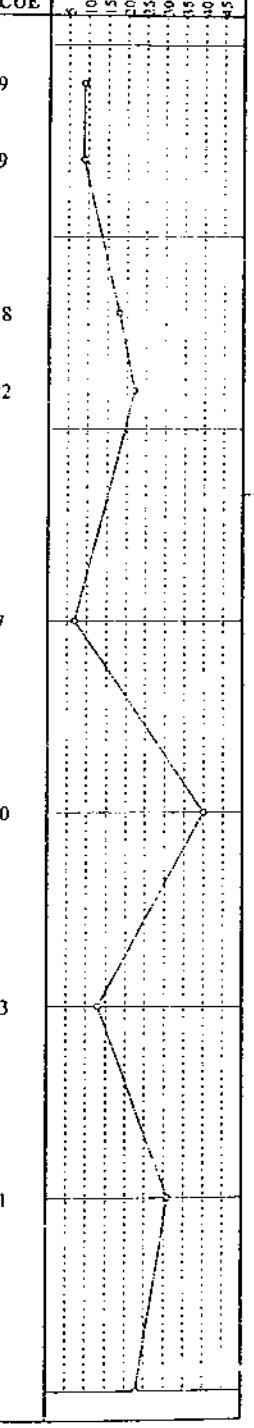
BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-08-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE
0	3/6, 4/6, 5/6, 3/6	Light brown fine sand with lenses of clayey sand	1	9
	4/6, 5/6, 4/6, 6/6		2	9
5		Brown slightly clayey fine sand	3	
	7/6, 9/6, 9/6, 12/6	Gray slightly clayey fine sand	4	18
	10/6, 10/6, 12/6, 9/6		5	22
10				
15	3/6, 3/6, 4/6, 5/6	Gray slightly clayey fine sand with shell	6	7
20	12/6, 15/6, 25/6, 28/6	Gray fine sand with shell	7	40
25	10/6, 6/6, 7/6, 14/6		8	13
30	7/6, 14/6, 17/6, 19/6		9	31
35	8/6, 8/6		10	



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-27

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-08-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	15/6 19/6 10/6 8/6 10/6 15/6		11	23 18	0 15 30 45 60 75 90 105 120
45	3/6 3/6 4/6 7/6	Gray slightly silty fine sand with shell	12	7	
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-28

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

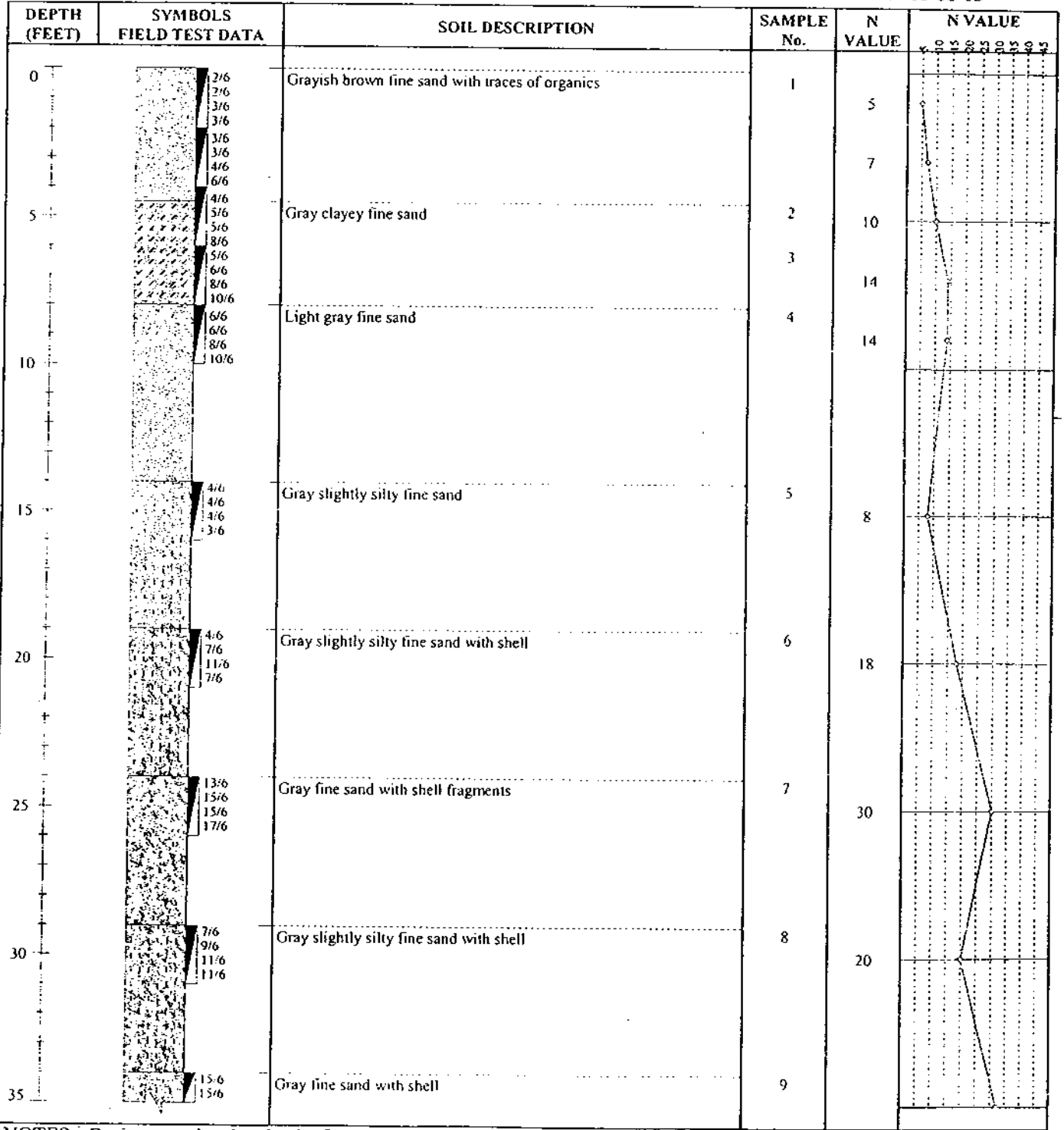
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-08-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-28

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

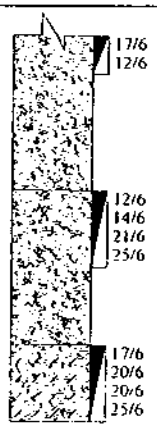
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-08-03



DEPTH (FEET)	SOIL DESCRIPTION	SAMPLE No.	N VALUE
40	Gray sandy shell	10	32
45	Gray fine sand with shell and lenses of clayey fine sand	11	35
50			40
55			
60			
65			
70			

N VALUE

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-29

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

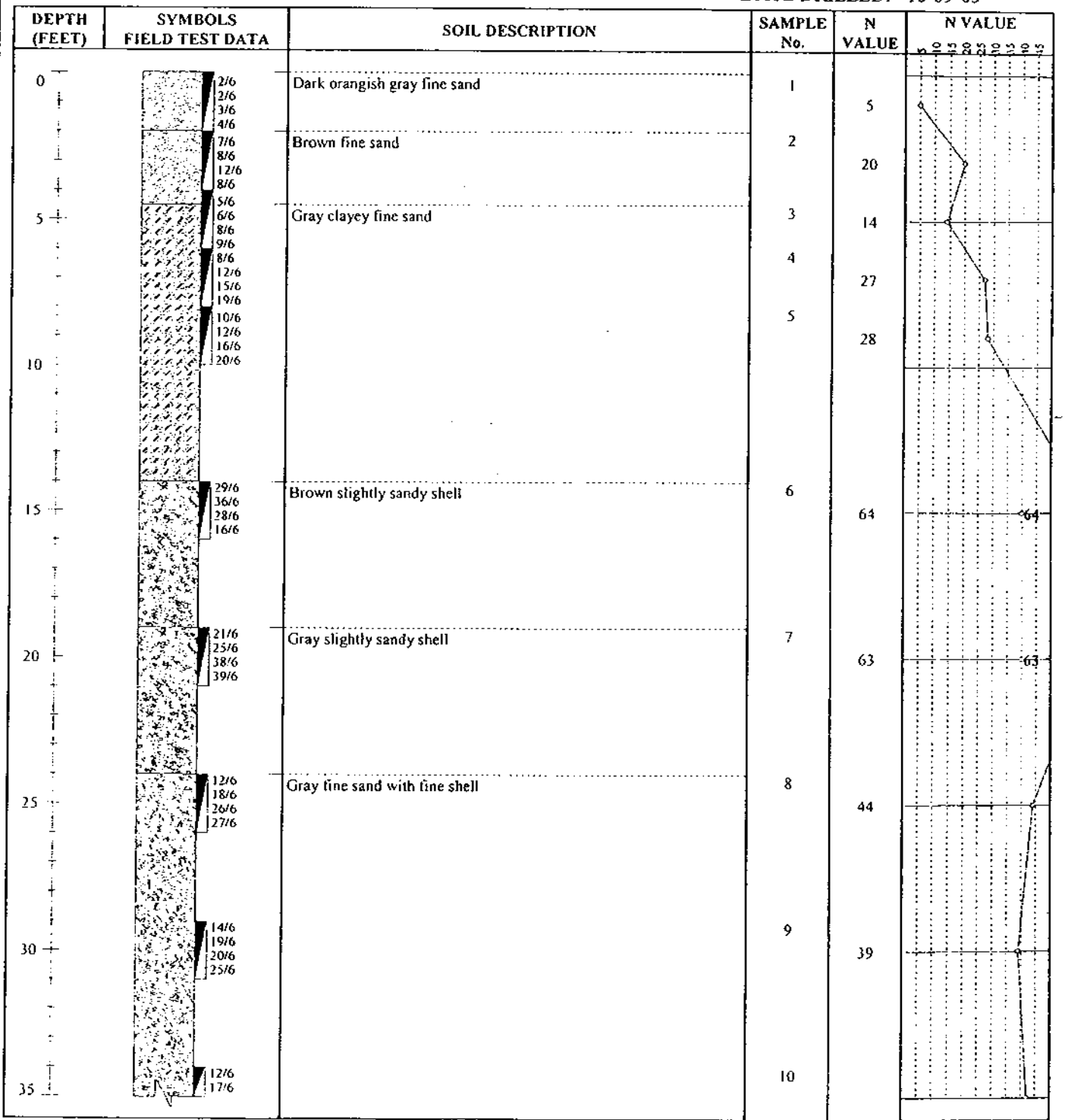
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-09-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-29

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

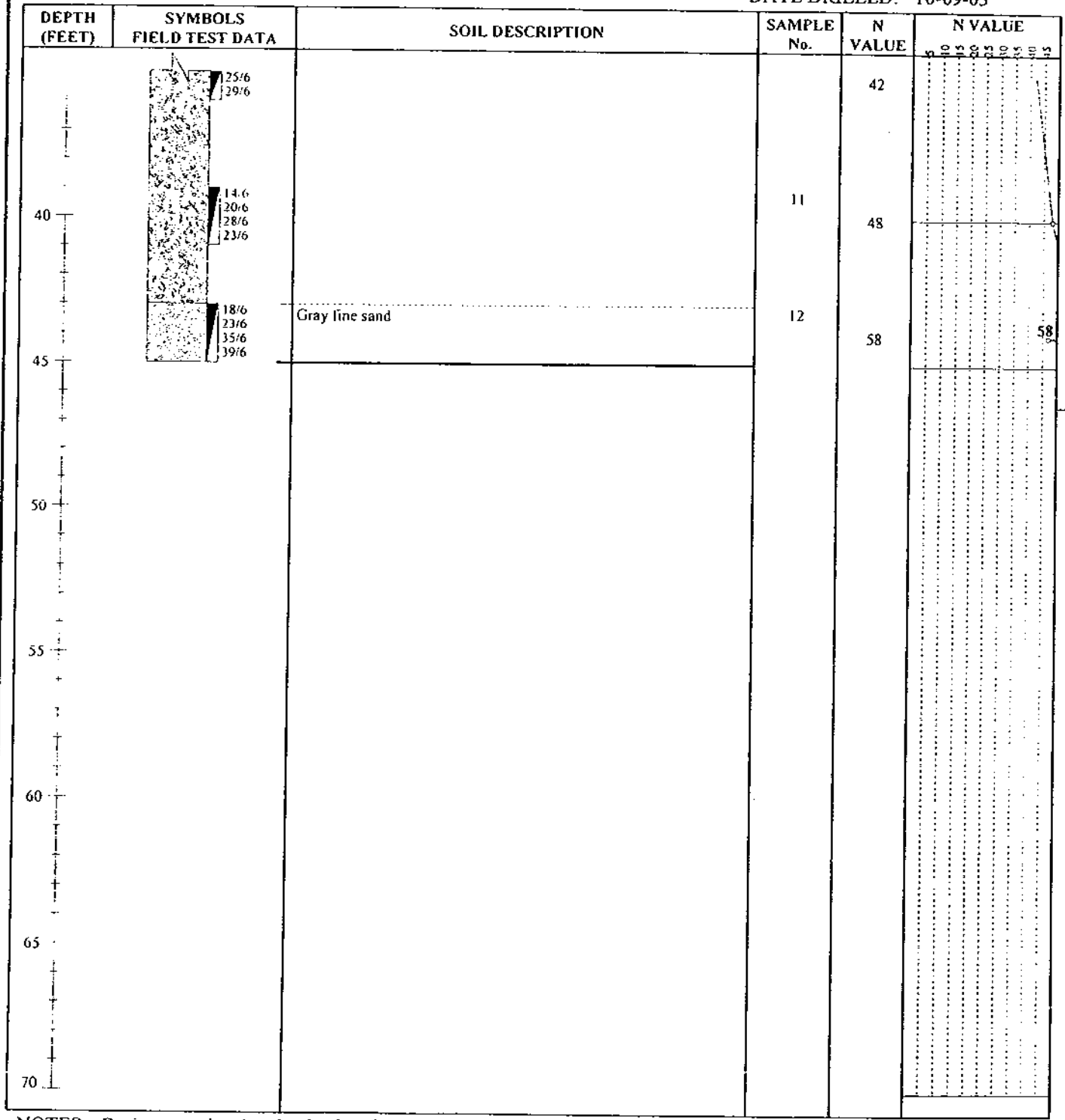
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-09-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-30

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

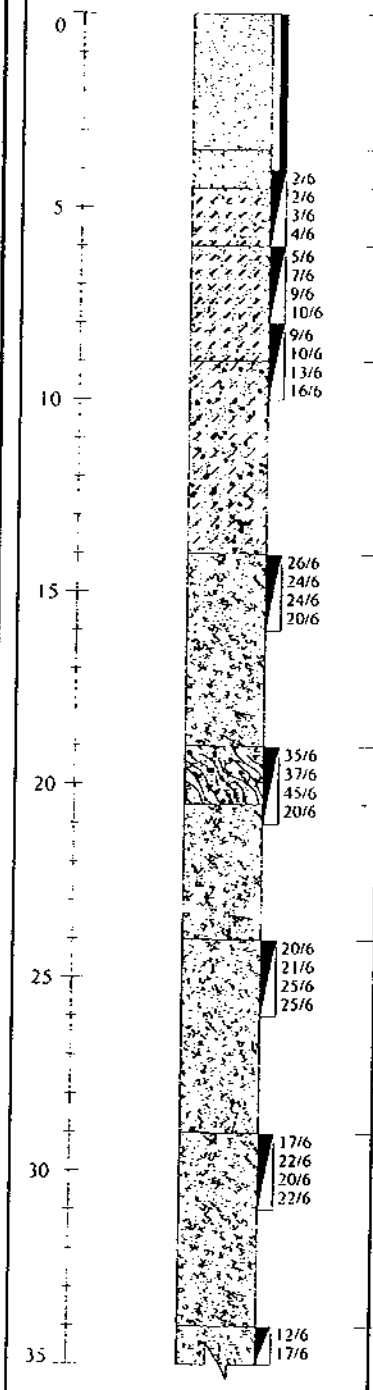
FILE No.: 03-2197

BORING LOCATION: As per plan

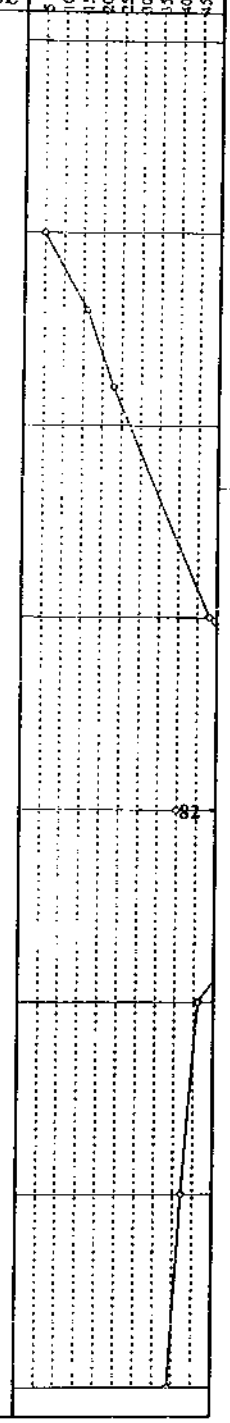
DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-09-03



DEPTH (FEET)	SOIL DESCRIPTION	SAMPLE No.	N VALUE
0	Gray fine sand		
	Dark brown slightly silty fine sand		
5	Brown clayey fine sand with a few fine roots	1	5
	Gray clayey fine sand	2	16
10	Gray slightly clayey fine sand with a few cemented fragments	3	23
15	Grayish brown sandy shell	4	48
20	Gray slightly sandy cemented shell (fragmented limestone)	5	82
	Gray sandy shell	6	
25	Gray fine sand with shell	7	46
30	Gray sandy shell	8	42
35	Gray fine sand with shell	9	



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-30

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

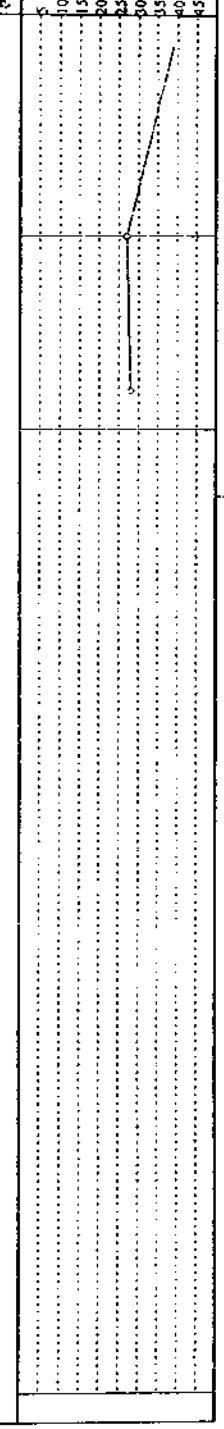
BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-09-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE
40	22/6 25/6 11/6 9/6 18/6 24/6		10	39 27
45	12/6 12/6 16/6 15/6		11	28
50				
55				
60				
65				
70				



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-31

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

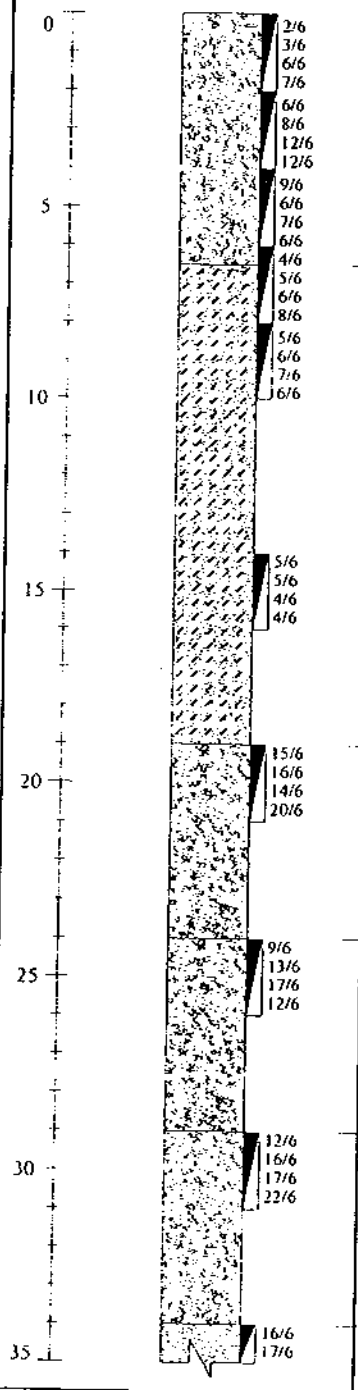
FILE No.: 03-2197

BORING LOCATION: As per plan

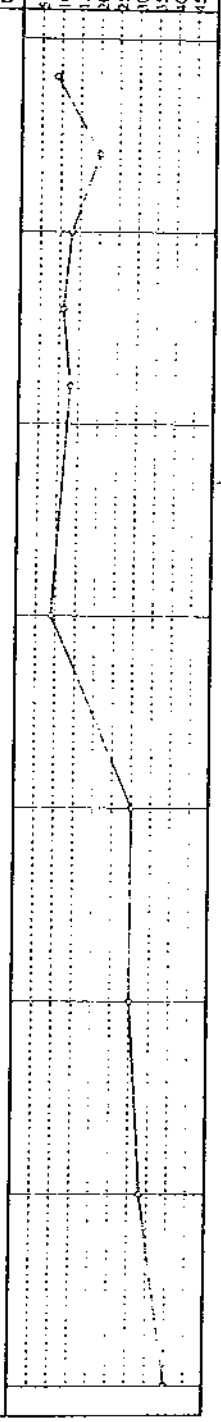
DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-10-03



SOIL DESCRIPTION	SAMPLE No.	N VALUE
Brown fine sand with shell	1	9
	2	20
	3	13
Gray clayey fine sand	3	11
	5	13
	6	9
Grayish brown slightly sandy shell fragments	7	30
Gray sandy shell	8	30
Gray fine sand with shell	9	33
Gray fine sand	10	



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-31

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-10-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	23/6 23/6 12/6 18/6 15/6 14/6	Gray fine sand with shell	11	40 33	
45	9/6 23/6 17/6 11/6		12	40	
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-32

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

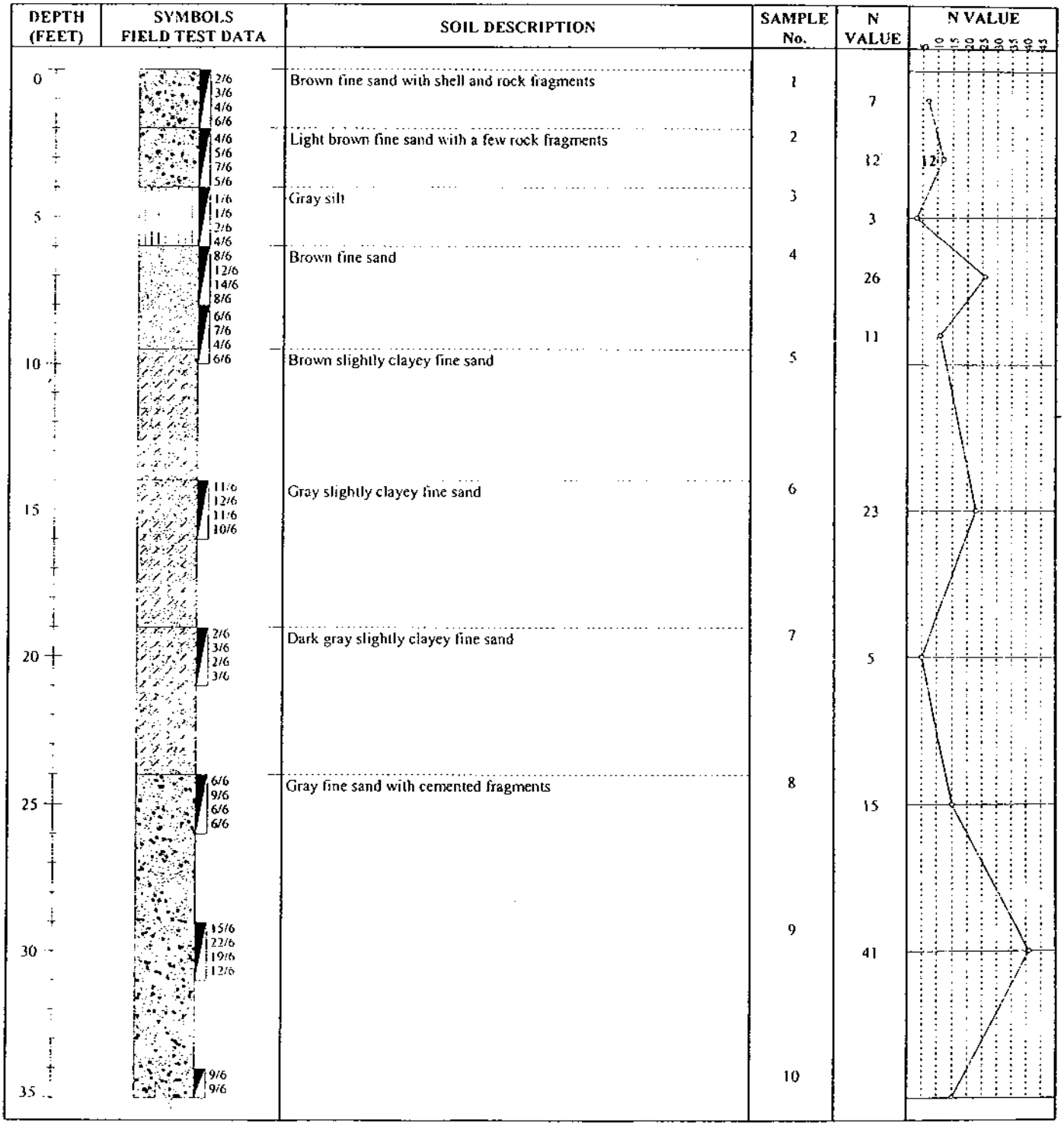
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-09-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-32

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-09-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
	6/6 7/6			15	
40	5/6 4/6 4/6 8/6	Gray slightly sandy fragmented limestone	11	8	
	5/6 4/6 4/6 5/6	Gray slightly silty fine sand with shell and cemented fragments	12	8	
45					
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-33

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

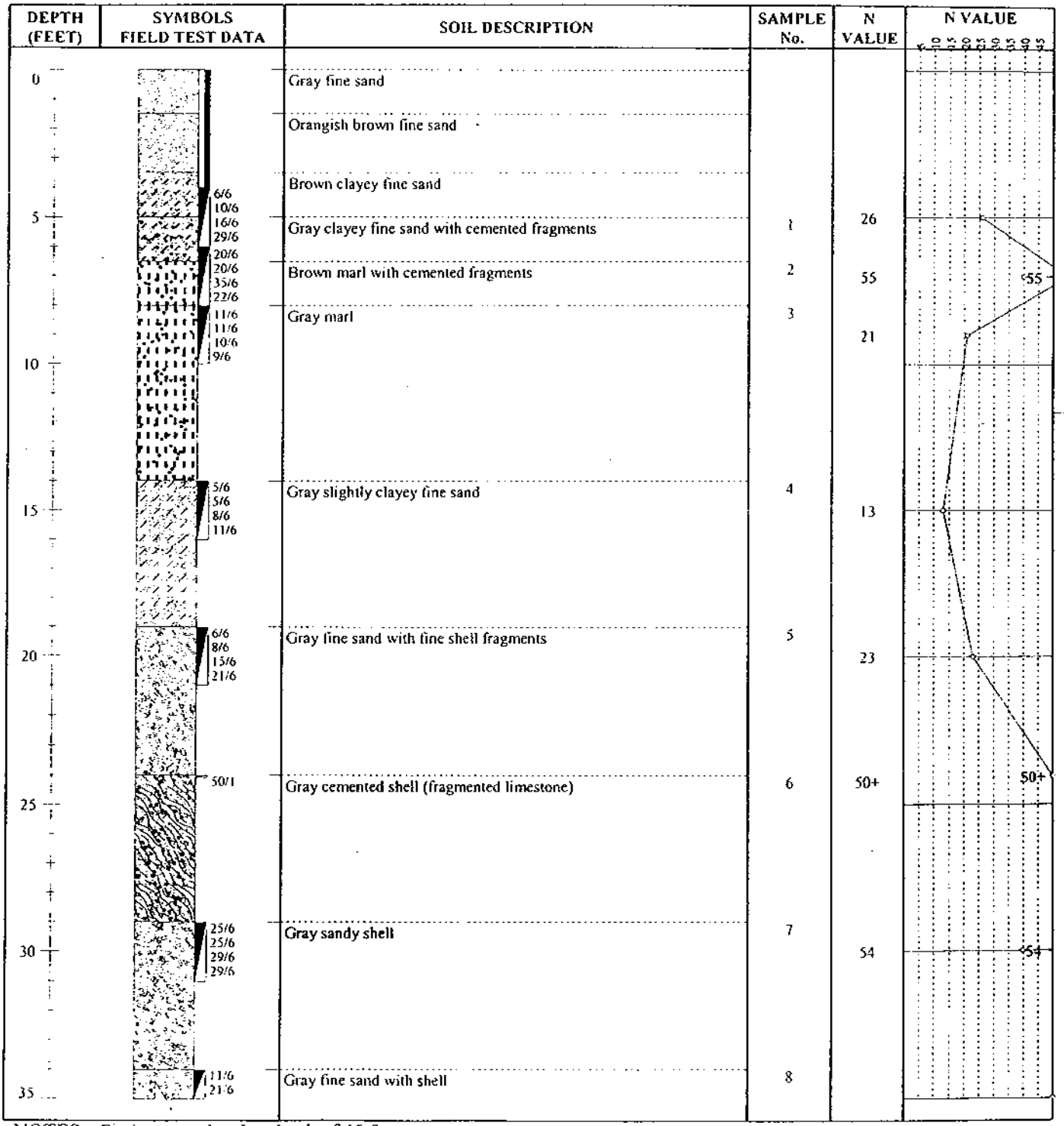
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-10-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-33

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-10-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
	29/6 29/6			50	
40	11/6 15/6 25/6 29/6	Gray slightly silty fine sand with shell	9	40	
	9/6 11/6 19/6 24/6		10	30	
45					
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-34

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

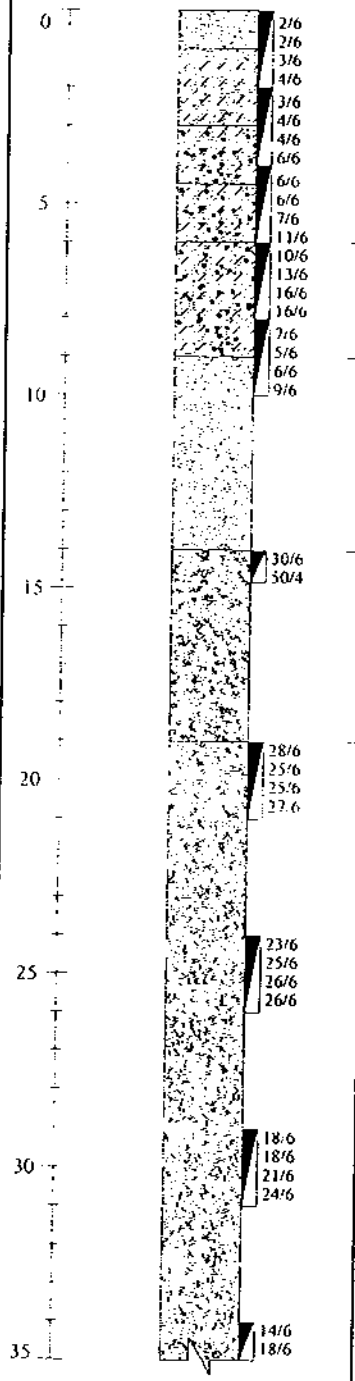
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-27-03



DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE
0		Dark gray fine sand	1	
		Brown slightly clayey fine sand	2	5
		Orange slightly clayey fine sand with cemented fragments	3	8
5		Orangish gray slightly clayey fine sand with cemented fragments	4	13
		Gray slightly clayey fine sand with cemented fragments	5	29
		Brown fine sand with traces of clay	6	11
10				
15		Brown sandy shell	7	50+
		Gray fine sand with shell	8	50
20				
25			9	51
30			10	39
35			11	

N VALUE

0 5 10 15 20 25 30 35 40 45 50

50+

51

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-34

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-27-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	23/6 27/6 21/6 29/6 21/6 32/6 20/6 22/6 29/6 32/6		12 13	41 50 41	10 15 20 25 30 35 40 45
45					
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-35

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

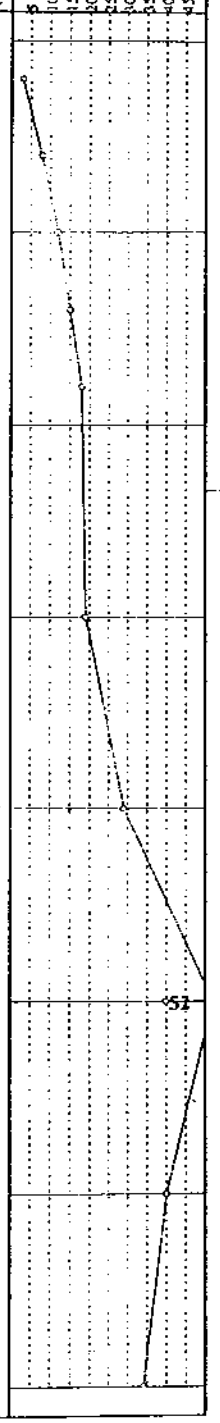
DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-27-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE
0	1/6 1/6 1/6 2/6	Dark brown fine sand with roots and rock fragments	1	3
	2/6 3/6 5/6 5/6	Brown slightly clayey fine sand with cemented fragments	2	8
5	5/6 6/6 6/6 9/6			12
	9/6 8/6 7/6 7/6	Brown fine sand with shell	3	15
	6/6 8/6 10/6 12/6	Brown sandy shell with traces of clay	4	18
10				
15	7/6 9/6 10/6 12/6	Grayish brown sandy shell	5	19
20	8/6 10/6 19/6 16/6	Gray sandy shell	6	29
25	23/6 23/6 29/6 38/6	Gray fine sand with shell	7	52
30	18/6 20/6 20/6 33/6	Gray sandy shell	8	40
35	15/6 15/6	Gray fine sand with shell	9	

N VALUE



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-35

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-27-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	19/6 24/6 7/6 9/6 12/6 16/6	Gray slightly sandy shell	10	34 21	
45	7/6 10/6 10/6 13/6	Gray fine sand with shell	11	20	
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-36

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

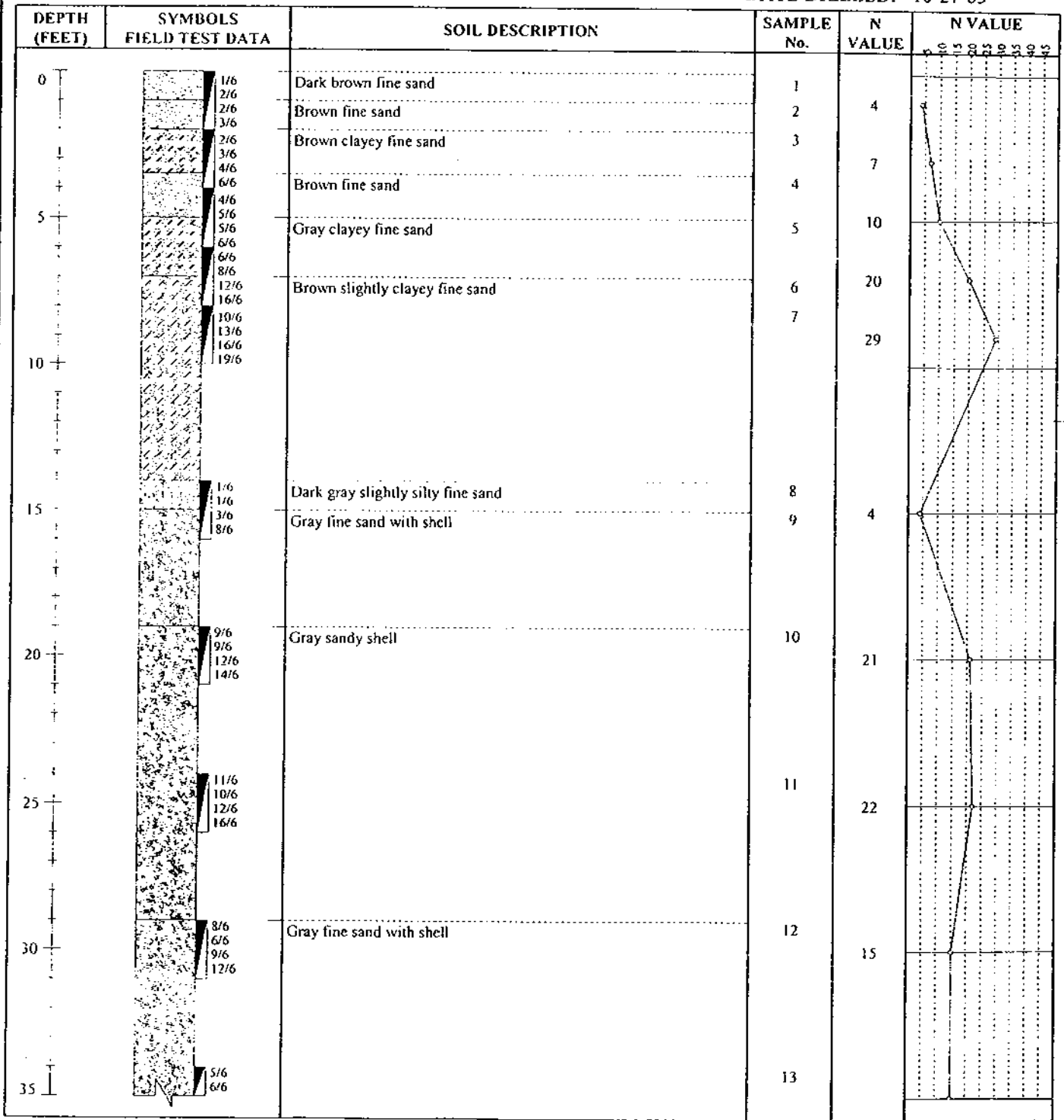
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-27-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-36

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-27-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE
	9/6 11/6			15
40	16/6 24/6 21/6 19/6		14	45
	8/6 5/6 6/6 6/6		15	11
45				
50				
55				
60				
65				
70				

N VALUE

5 10 15 20 25 30 35 40 45

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-37

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

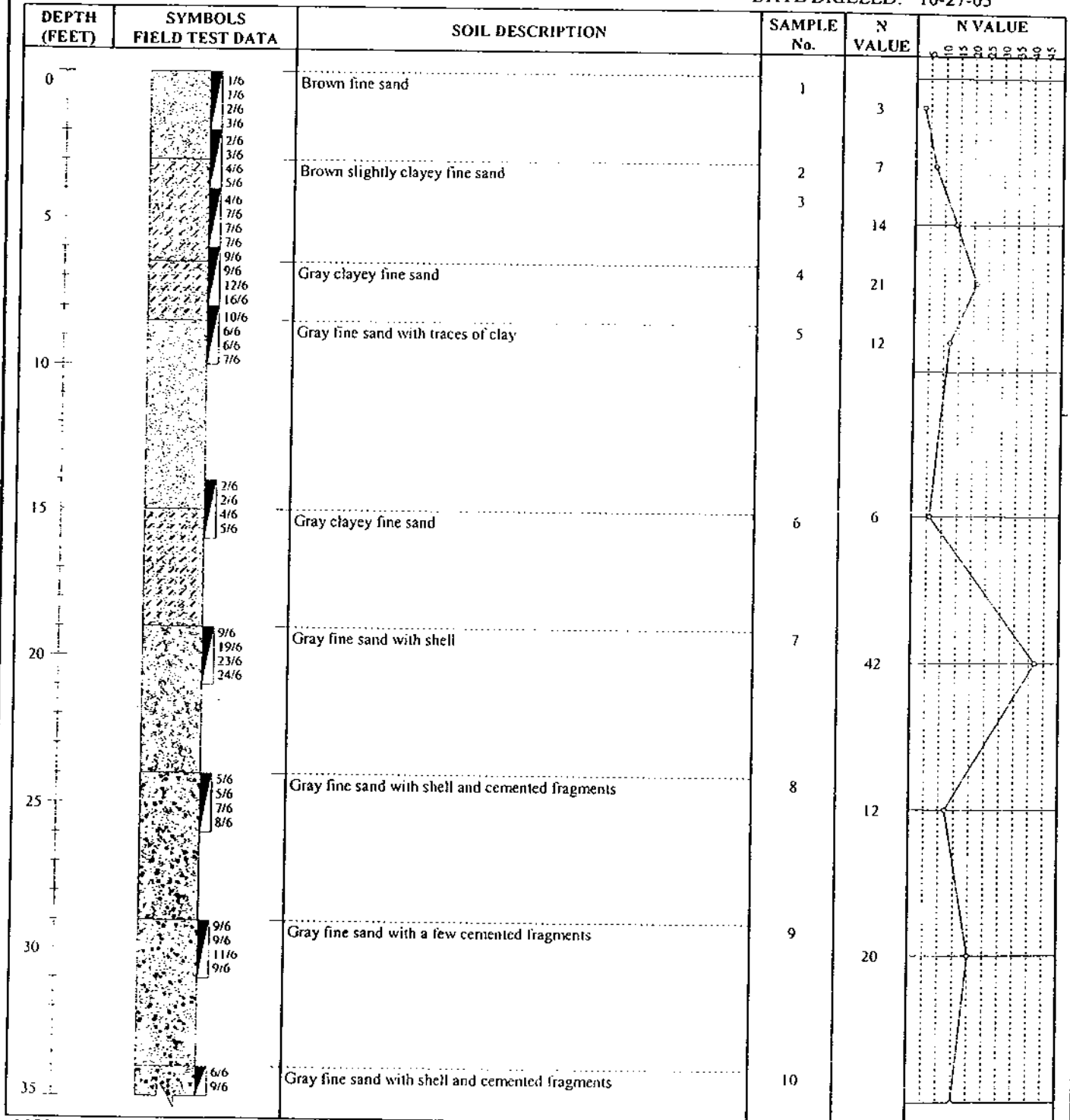
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-27-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-37

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-27-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	6/6 10/6 11/6 10/6 10/6 9/6		11	15 20	
45	5/6 6/6 6/6 5/6		12	12	
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-38

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

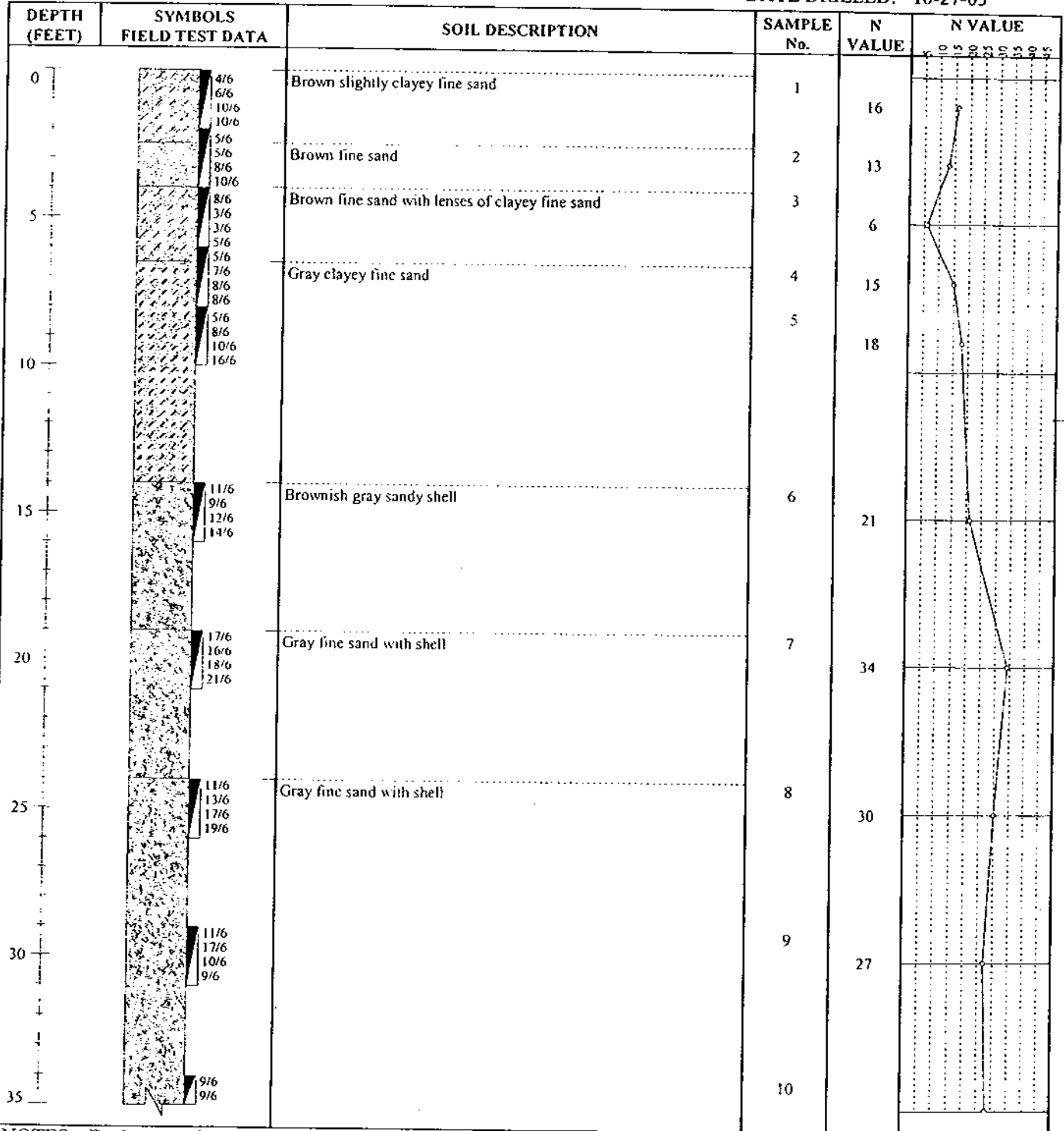
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-27-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-38

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-27-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	19/6 23/6 15/6 8/6 12/6 10/6		11	28 20	
45	8/6 6/6 5/6 5/6		12	11	
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-39

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

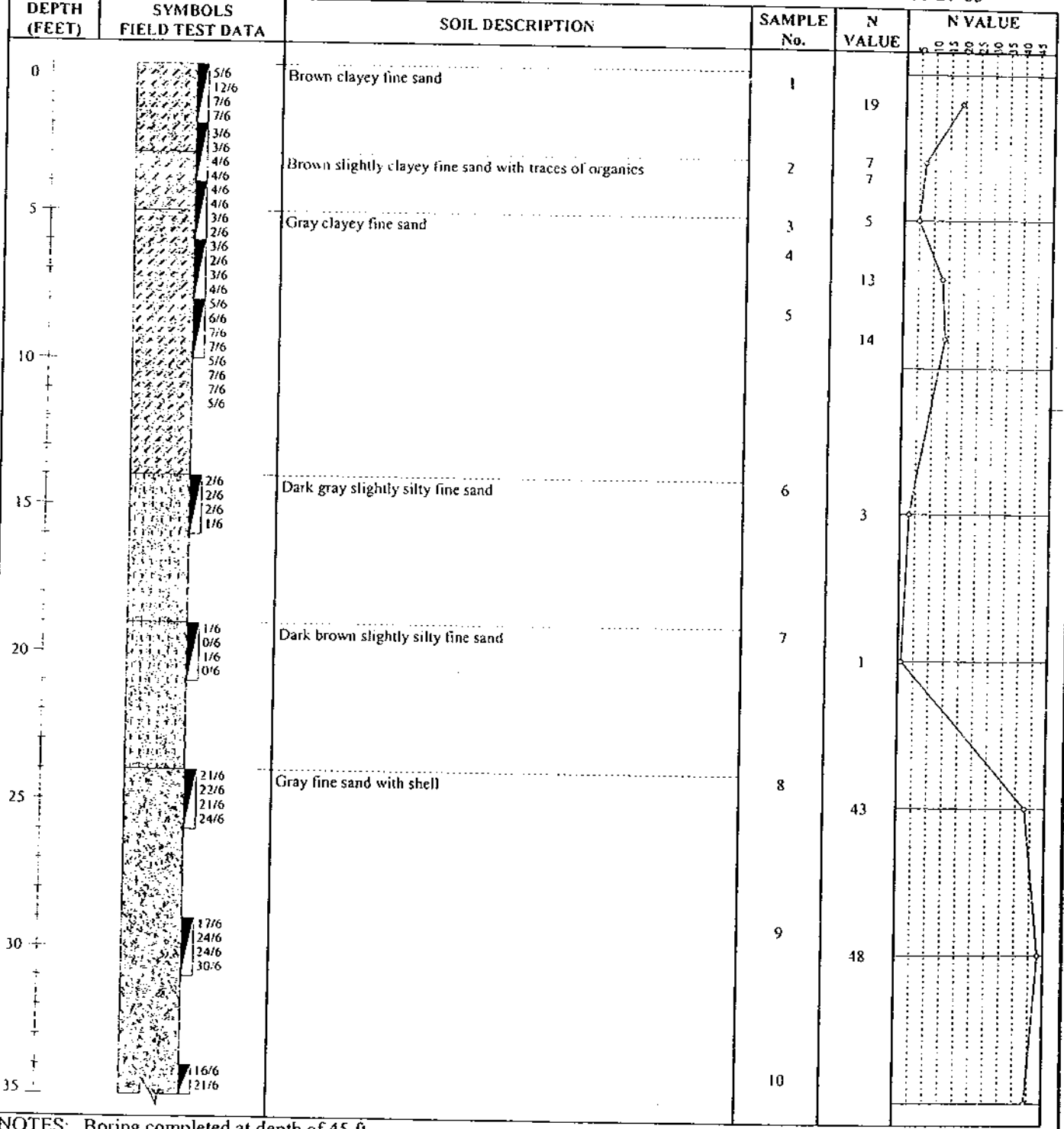
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-27-03



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-39

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-27-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
40	23/6 45/6 8/6 11/6 16/6 24/6		11	44 27	
45	11/6 15/6 16/6 18/6		12	31	
50					
55					
60					
65					
70					

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-40

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

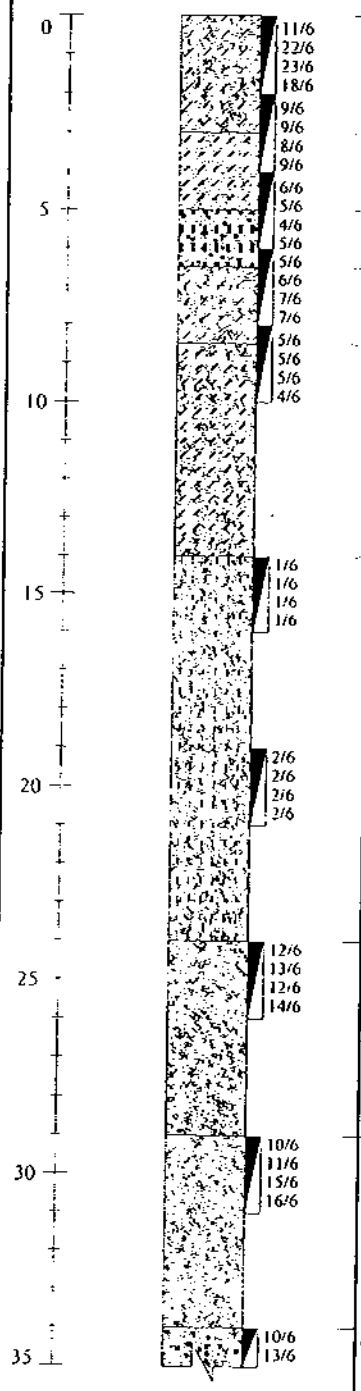
FILE No.: 03-2197

BORING LOCATION: As per plan

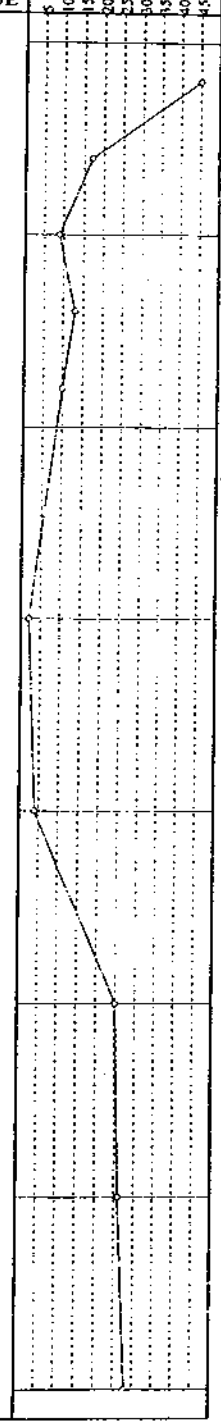
DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-27-03



SOIL DESCRIPTION	SAMPLE No.	N VALUE
Brown slightly clayey fine sand with shell	1	45
Dark gray clayey fine sand	2	17
Light brown silty fine sand with cemented fragments	3	9
Gray slightly clayey fine sand with shell	4	13
Brown clayey fine sand with shell	5	10
Gray slightly silty fine sand with shell	6	2
	7	4
Gray sandy shell	8	25
Gray fine sand with fine shell	9	26
Gray sandy shell with cemented fragments	10	



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-40

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-27-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE	N VALUE
	15/6 17/6			28	
40	8/6 6/6 8/6 10/6	Gray fine sand with shell and cemented fragments	11	14	
45	22/6 16/6 10/6 6/6	Gray sandy shell with cemented fragments	12	26	
50					
55					
60					
65					
70					

N VALUE scale: 0 10 15 20 25 30 35 40 45

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-41

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

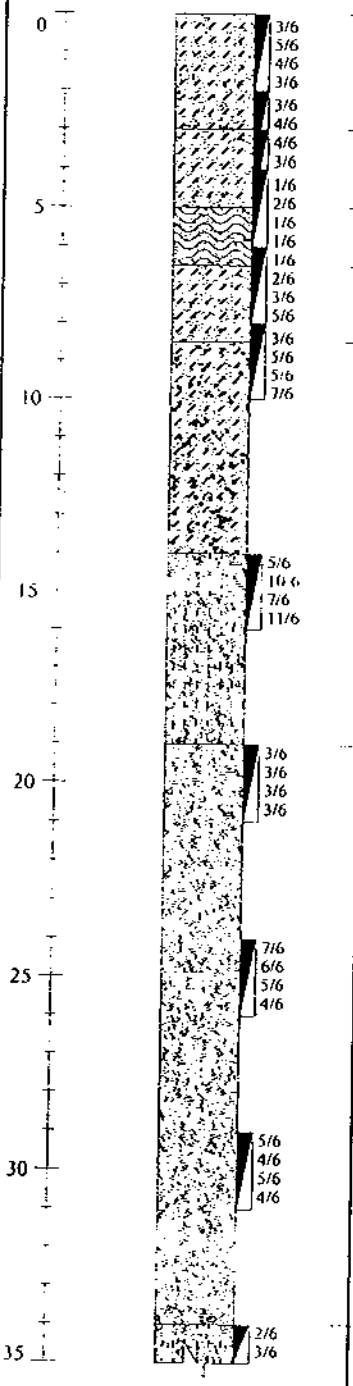
FILE No.: 03-2197

BORING LOCATION: As per plan

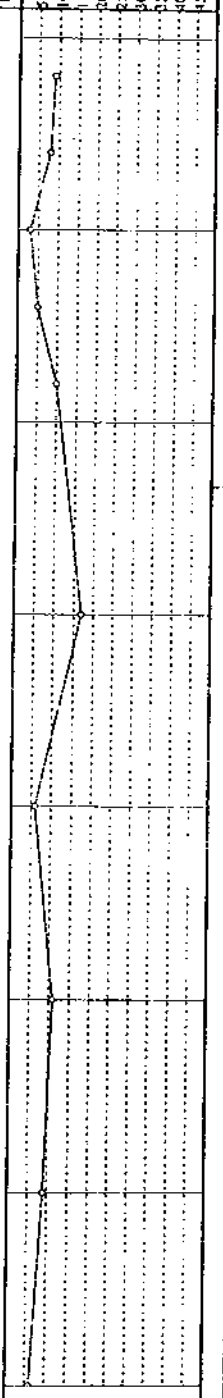
DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-29-03



SOIL DESCRIPTION	SAMPLE No.	N VALUE
Brown clayey fine sand	1	9
Gray clayey fine sand	2	8
Dark brown fibrous organics	3	3
Gray clayey fine sand with fine roots	4	5
Light gray clayey fine sand with a few cemented fragments	5	10
Light gray slightly silty fine sand with shell	6	17
Gray fine sand with shell	7	6
	8	11
	9	9
Gray slightly silty fine sand with shell	10	



NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN" 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

STANDARD PENETRATION TEST BORING LOG

BORING B-41

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./J.H.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 10-29-03

DEPTH (FEET)	SYMBOLS FIELD TEST DATA	SOIL DESCRIPTION	SAMPLE No.	N VALUE
	3/6 2/6			6
40	10/6 13/6 16/6 14/6	Gray fine sand	11	29
45	15/6 22/6 18/6 19/6	Gray fine sand with shell	12	40
50				
55				
60				
65				
70				

N VALUE: 0 10 15 20 25 30 35 40 45

NOTES: Boring completed at depth of 45 ft.

FIELD TEST DATA ARE "BLOWS"/"INCHES DRIVEN". 140-LB HAMMER, 30-INCH FALL. (ASTM D-1586)

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-1

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

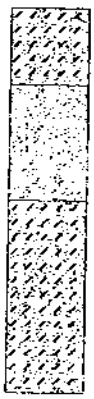
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown clayey fine sand	
		Brown fine sand	
5		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-2

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
		Brown clayey fine sand	
5		Gray clayey fine sand	
10		Gray fine sand with shell fragments and traces of clay	
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-3

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown slightly clayey fine sand	
		Gray clayey fine sand	
5			
		Gray slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-4

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand with traces of organics	
		Light brown fine sand with traces of clay	
5		Gray clayey fine sand	
		Gray fine sand with shell fragments and traces of clay	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-5

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

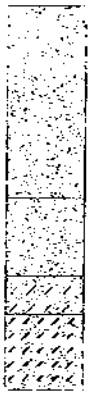
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
5		Dark brown fine sand	
		Dark brown slightly clayey fine sand	
		Brown to gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-6

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
		Brown clayey fine sand	
5		Brown clayey fine sand with cemented sand fragments	
		Light brown slightly clayey fine sand with cemented sand fragments	
		Gray fine sand with shell fragments and traces of clay	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-7

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand with some rock fragments	
		Light brown clayey fine sand	
5		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-8

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
		Brown clayey fine sand	
5		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-9

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Dark brown slightly organic fine sand	
5		Brown slightly clayey fine sand	
		Gray clayey fine sand	
10		Gray slightly clayey fine sand	
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-10

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Dark brown fine sand	
		Light brown slightly clayey fine sand	
5		Gray clayey fine sand	
		Gray slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-11

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Dark brown slightly organic fine sand	
		Brown slightly clayey fine sand	
5		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-12

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand with shell	
		Orangish brown slightly clayey fine sand	
		Brown fine sand	
5		Gray clayey fine sand with a few cemented fragments	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-13

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
		Light orangish brown slightly clayey fine sand	
5		Gray clayey fine sand with cemented fragments	
		Gray slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-14

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Dark brown fine sand with organics	
5		Brown clayey fine sand	
		Gray clayey fine sand	
		Gray slightly clayey fine sand with shell	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-15

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown slightly clayey fine sand	
		Dark gray slightly organic fine sand	
		Brown slightly clayey fine sand with cemented fragments	
5			
		Gray fine sand with shell	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-16

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown slightly clayey fine sand with cemented fragments	
5			
		Gray fine sand with shell	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-17

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Orangish brown fine sand	
5		Gray slightly clayey fine sand with shell	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-18

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Dark brown slightly organic fine sand	
		Brown clayey fine sand with cemented fragments	
5		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-19

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand with shell	
5		Gray silt	
		Gray fine sand	
		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-20

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand with shell	
5		Gray silt	
		Light brown fine sand	
10		Brown claycy fine sand	
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-21

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Orangish brown fine sand	
		Orangish brown clayey fine sand	
5			
		Brown fine sand with cemented fragments	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-22

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
		Orangish brown slightly silty fine sand	
5		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-23

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

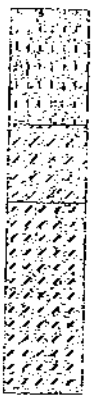
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Dark brown slightly silty fine sand	
		Dark brown slightly clayey fine sand	
5		Brown clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-24

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Dark brown slightly silty fine sand	
5		Brown slightly clayey fine sand	
10		Gray clayey fine sand	
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-25

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown slightly clayey fine sand	
5		Brownish gray fine sand	
		Gray slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-26

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

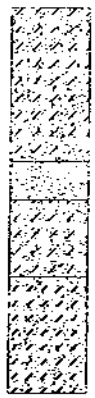
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown slightly clayey fine sand	
		Brown fine sand	
5		Gray slightly clayey fine sand	
		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-27

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

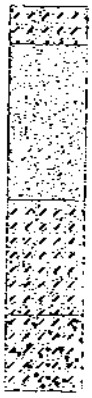
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown clayey fine sand	
		Grayish brown fine sand	
5		Orangish brown clayey fine sand	
		Light brown clayey fine sand with cemented fragments	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-28

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Gray fine sand	
		Dark reddish brown slighily silty fine sand	
5		Brown clayey fine sand	
		Gray clayey fine sand	
10		Gray clayey fine sand with cemented fragments	
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-29

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown clayey fine sand	
		Brown fine sand	
5			
		Brown slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-30

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

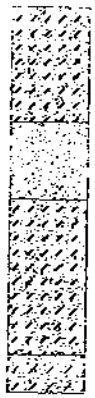
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown clayey fine sand	
		Brown fine sand	
5		Gray clayey fine sand	
		Gray slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-31

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown slightly clayey fine sand	
5		Gray clayey fine sand	
		Gray slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-32

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
		Brown slightly clayey fine sand	
5		Brown slightly silty fine sand	
		Gray slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-33

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Dark brown fine sand	
		Dark brown clayey fine sand	
5		Gray clayey fine sand	
		Gray clayey fine sand with shell	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-34

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown slightly clayey fine sand	
		Brown fine sand with lenses of clayey fine sand	
5			
		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-35

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

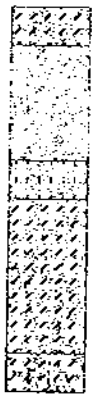
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown clayey fine sand	
		Dark gray fine sand	
5		Dark reddish brown slightly silty fine sand	
		Gray clayey fine sand	
10		Gray clayey fine sand with shell	
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-36

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
		Orangish brown clayey fine sand	
5		Orangish gray clayey fine sand	
		Brown slightly clayey fine sand	
10		Gray clayey fine sand	
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-37

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
		Dark brown clayey fine sand	
5		Gray clayey fine sand	
		Brown slightly silty fine sand	
10		Gray clayey fine sand	
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-38

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Gray fine sand	
		Dark reddish brown slightly silty fine sand	
		Dark brown clayey fine sand	
5		Gray clayey fine sand	
		Gray slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-39

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown clayey fine sand	
		Brown fine sand	
5		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-40

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown slightly clayey fine sand with shell	
5		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-41

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
5		Orangish brown slightly clayey fine sand with cemented fragments	
10		Gray slightly clayey fine sand	
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-42

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
		Gray clayey fine sand	
5			
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-43

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
		Brown clayey fine sand	
5		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-44

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

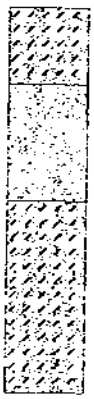
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown clayey fine sand	
		Brown fine sand	
5		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-45

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown clayey fine sand	
		Light orangish brown fine sand	
5			
10		Gray clayey fine sand	
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-46

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
5		Gray slightly sandy silt	
		Brown fine sand	
10		Gray clayey fine sand	
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-47

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
5		Brown slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-48

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Dark brown fine sand	
		Brown slightly clayey fine sand	
5		Gray slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-49

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown slightly clayey fine sand	
		Brown fine sand	
5		Light brown slightly clayey fine sand with cemented fragments	
		Light brown fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-50

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Dark brown fine sand with ash	
5		Light brown fine sand with shell	
		Gray slightly silty fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-51

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Light brown fine sand	
5		Gray silt	
		Brown fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-52

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
		Gray slightly clayey fine sand	
5		Brown fine sand with lenses of clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-53

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

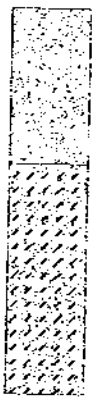
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
5		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-54

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

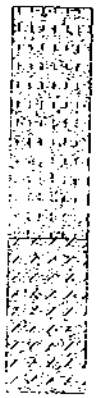
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown slightly silty fine sand	
5		Gray slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-55

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
5		Dark brown clayey fine sand	
		Dark brown slightly silty fine sand	
		Gray slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-56

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
5		Dark brown organics	
10		Gray slightly clayey fine sand	
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-57

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
5		Gray claycy fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-58

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
		Brown slightly clayey fine sand with cemented fragments	
5		Grayish brown clayey fine sand with cemented fragments	
		Gray slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-59

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
5		Gray clayey fine sand	
10		Brown slightly silty fine sand with cemented fragments	
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-60

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

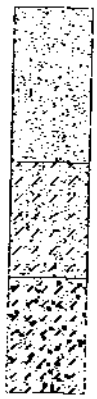
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand with traces of clay	
5		Brown slightly clayey fine sand	
		Gray clayey fine sand with cemented fragments	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-61

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

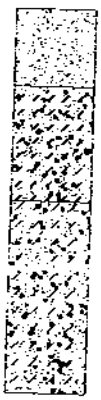
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brownish gray fine sand	
		Brown clayey fine sand with cemented fragments	
5		Light brown slightly clayey fine sand with cemented fragments	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-62

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

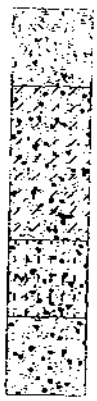
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand with shell and traces of clay	
		Brown slightly clayey fine sand with cemented fragments	
5		Brown slightly silty fine sand with cemented fragments	
		Gray fine sand with cemented fragments	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-63

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
		Brown slightly clayey fine sand	
5		Brownish gray fine sand with shell and traces of clay	
		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-64

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
5		Brown slightly clayey fine sand	
		Gray clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-65

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

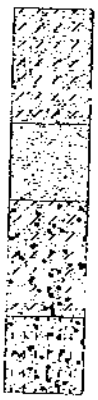
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown slightly clayey fine sand	
		Brown fine sand	
5		Orangish brown slightly clayey fine sand with cemented fragments	
		Light brown slightly silty fine sand with cemented fragments	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-66

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

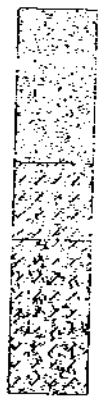
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
5		Brown slightly clayey fine sand	
		Light brown slightly clayey fine sand with shell	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-67

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown fine sand	
5		Gray slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Ardaman & Associates, Inc.

AUGER BORING LOG

BORING A-68

PROJECT: Troup-Indiantown Water Control District Reservoir And STA

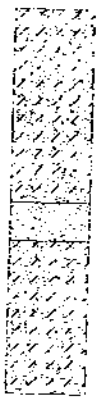
FILE No.: 03-2197

BORING LOCATION: As per plan

DRILL CREW: D.G./T.M.

WATER OBSERVED AT DEPTH N.A.

DATE DRILLED: 11/11-21/03

DEPTH	SYMBOLS	SOIL DESCRIPTION	SAMPLE No.
0		Brown slightly clayey fine sand	
5		Gray fine sand	
		Brownish gray slightly clayey fine sand	
10			
15			
20			
25			
30			

NOTES: Boring completed at depth of 10 feet.

Troup-Indiantown Water Control District
Reservoir and STA Project
File No. 03-2197

Permeability Tests Summary Table

Well Cluster	Screened Depth (ft)	Permeability (cm/s)			
		Constant Head	Falling Head	Falling Head	Average
W-1 (at boring B-1) N 27° 06' 51.2" W 80° 27' 37.1"	2.8 - 7.8	na	na	na	na
	20 - 25	3.86E-03	3.67E-03	4.00E-03	**3.84E-03**
	48 - 53	na	2.15E-04	2.18E-04	**2.17E-04**
W-2 (at boring B-3) N 27° 05' 06.9" W 80° 23' 55.2"	4.5 - 9.5	na	7.97E-05	7.35E-05	**7.66E-05**
	24 - 29	4.40E-03	3.46E-03	na	**3.93E-03**
	60 - 65	1.32E-03	1.25E-03	1.35E-03	**1.31E-03**
W-3 (at boring B-4) N 27° 04' 53.4" W 80° 25' 39.4"	7 - 12	na	7.20E-05	7.03E-05	**7.12E-05**
	25 - 30	5.56E-03	5.55E-03	6.06E-03	**5.72E-03**
	50 - 55	1.78E-03	2.08E-03	1.93E-03	**1.93E-03**
	75 - 80	2.18E-03	1.57E-03	1.26E-03	**1.67E-03**
W-4 (at boring B-7) N 27° 02' 37.8" W 80° 23' 10.3"	4.6 - 9.6	1.50E-03	1.37E-03	1.49E-03	**1.45E-03**
	25 - 30	7.35E-03	4.58E-03	na	**5.97E-03**
	65 - 70	3.44E-03	3.30E-03	na	**3.37E-03**
W-5 (at boring B-8) N 27° 02' 16.7" W 80° 25' 33.0"	4.85 - 9.85	na	8.67E-05	na	**8.67E-05**
	24.7 - 29.7	2.66E-03	2.05E-03	na	**2.36E-03**
	64.8 - 69.8	4.88E-03	8.09E-03	na	**6.49E-03**

Test ID: W-1B
Test Depth: 20' - 25'

Constant Head Permeability Test

D: 4.00 in = 10.2 cm
q: 3.70 gpm = 233.4 cm^3/s
L: 5.00 ft = 152.4 cm
H_c: 7.05 ft = 214.9 cm
k_h/k_v : 1
m: 1

k_h : 3.86E-03 cm/s

Variable Head Permeability Test
(12 inch drop)

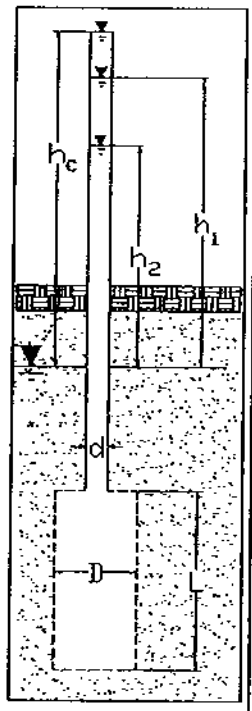
d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.05 ft = 214.9 cm
h_2: 6.05 ft = 184.4 cm
t: 3.00 sec
k_h/k_v : 1
m: 1

k_h : 3.67E-03 cm/s

Variable Head Permeability Test
(24 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.05 ft = 214.9 cm
h_2: 5.05 ft = 153.9 cm
t: 6.00 sec
k_h/k_v : 1
m: 1

k_h : 4.00E-03 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3 / sec)
h_c : constant piezometric head (cm)
h_1 : initial piezometric head (cm)
h_2 : final piezometric head (cm)
k_h : horizontal permeability (cm / sec)
k_v = vertical permeability (cm / sec)

Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

Test ID: W-1C
Test Depth: 48' - 53'

Variable Head Permeability Test
(7.2 inch drop)

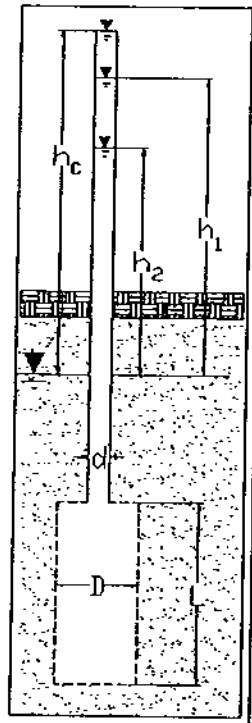
d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.00 ft = 213.4 cm
h_2: 6.40 ft = 195.1 cm
t: 30.00 sec
k_h/k_v : 1
m: 1

k_h : 2.15E-04 cm/s

Variable Head Permeability Test
(12 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.00 ft = 213.4 cm
h_2: 6.00 ft = 182.9 cm
t: 51.00 sec
k_h/k_v : 1
m: 1

k_h : 2.18E-04 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3 / sec)
h_c : constant piezometric head (cm)
h_1 : initial piezometric head (cm)
h_2 : final piezometric head (cm)
k_h : horizontal permeability (cm / sec)
k_v = vertical permeability (cm / sec)

Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

NOTES: Constant Head Permeability Test was not performed due to low permeability of well.

Test ID: W-2A
Test Depth: 4.5' - 9.5'

Variable Head Permeability Test
(7.2 inch drop)

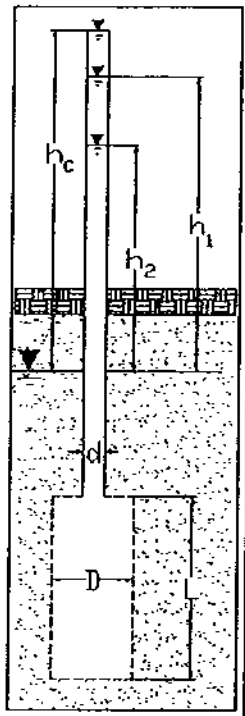
d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 8.05 ft = 245.4 cm
h_2: 7.45 ft = 227.1 cm
t: 70.00 sec
k_h/k_v : 1
m: 1

k_h : 7.97E-05 cm/s

Variable Head Permeability Test
(12 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 8.05 ft = 245.4 cm
h_2: 7.05 ft = 214.9 cm
t: 130.00 sec
k_h/k_v : 1
m: 1

k_h : 7.35E-05 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3 / sec)
h_c : constant piezometric head (cm)
h_1 : initial piezometric head (cm)
h_2 : final piezometric head (cm)
k_h : horizontal permeability (cm / sec)
k_v = vertical permeability (cm / sec)

Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

NOTES: Constant Head Permeability Test was not performed due to low permeability of well.

Test ID: W-2B
Test Depth: 24' - 29'

Constant Head Permeability Test

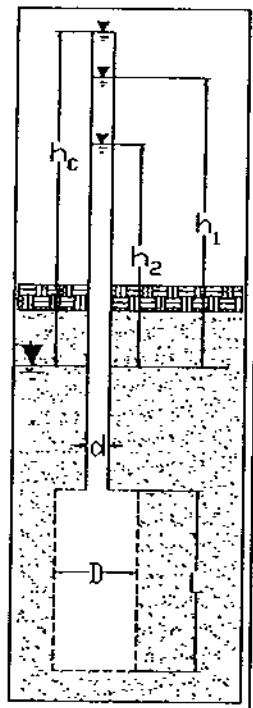
D: 4.00 in = 10.2 cm
q: 4.46 gpm = 281.4 cm^3/s
L: 5.00 ft = 152.4 cm
H_c: 7.45 ft = 227.1 cm
k_h/k_v : 1
m: 1

k_h : 4.40E-03 cm/s

Variable Head Permeability Test
(12 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.45 ft = 227.1 cm
h_2: 6.45 ft = 196.6 cm
t: 3.00 sec
k_h/k_v : 1
m: 1

k_h : 3.46E-03 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3 / sec)
h_c **: constant piezometric head (cm)**
h_1 **: initial piezometric head (cm)**
h_2 **: final piezometric head (cm)**
k_h **: horizontal permeability (cm / sec)**
k_v **= vertical permeability (cm / sec)**

Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

Test ID: W-2C
Test Depth: 60' - 65'

Constant Head Permeability Test

D: 4.00 in = 10.2 cm
q: 1.38 gpm = 87.1 cm^3/s
L: 5.00 ft = 152.4 cm
H_c: 7.70 ft = 234.7 cm
k_h/k_v : 1
m: 1

k_h : 1.32E-03 cm/s

Variable Head Permeability Test
(12 inch drop)

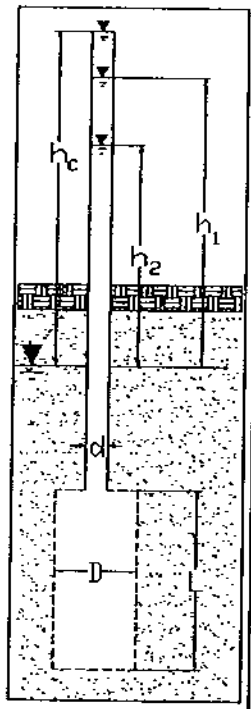
d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.70 ft = 234.7 cm
h_2: 6.70 ft = 204.2 cm
t: 8.00 sec
k_h/k_v : 1
m: 1

k_h : 1.25E-03 cm/s

Variable Head Permeability Test
(24 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.70 ft = 234.7 cm
h_2: 5.70 ft = 173.7 cm
t: 16.00 sec
k_h/k_v : 1
m: 1

k_h : 1.35E-03 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3 / sec)
h_c **: constant piezometric head (cm)**
h_1 **: initial piezometric head (cm)**
h_2 **: final piezometric head (cm)**
k_h **: horizontal permeability (cm / sec)**
k_v **= vertical permeability (cm / sec)**

Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

Test ID: W-3A
Test Depth: 7' - 12'

Variable Head Permeability Test
(7.2 inch drop)

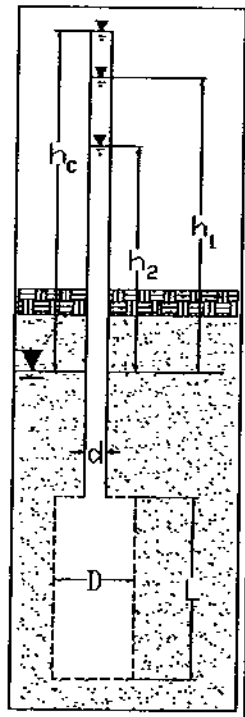
d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.62 ft = 232.3 cm
h_2: 7.02 ft = 214.0 cm
t: 82.00 sec
k_h/k_v : 1
m: 1

k_h : 7.20E-05 cm/s

Variable Head Permeability Test
(12 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.62 ft = 232.3 cm
h_2: 6.62 ft = 201.8 cm
t: 144.00 sec
k_h/k_v : 1
m: 1

k_h : 7.03E-05 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3 / sec)
h_c : constant piezometric head (cm)
h_1 : initial piezometric head (cm)
h_2 : final piezometric head (cm)
k_h : horizontal permeability (cm / sec)
k_v = vertical permeability (cm / sec)

Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

NOTES: Constant Head Permeability Test was not performed due to low permeability of well.

Test ID: W-3B
Test Depth: 25' - 30'

Constant Head Permeability Test

D: 4.00 in = 10.2 cm
q: 5.29 gpm = 333.7 cm^3/s
L: 5.00 ft = 152.4 cm
H_c: 7.00 ft = 213.4 cm
k_h/k_v : 1
m: 1

k_h : 5.56E-03 cm/s

Variable Head Permeability Test
(12 inch drop)

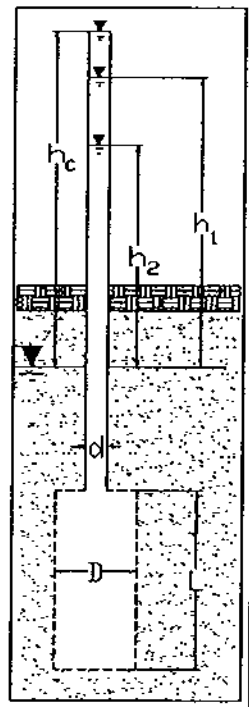
d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.00 ft = 213.4 cm
h_2: 6.00 ft = 182.9 cm
t: 2.00 sec
k_h/k_v : 1
m: 1

k_h : 5.55E-03 cm/s

Variable Head Permeability Test
(24 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.00 ft = 213.4 cm
h_2: 5.00 ft = 152.4 cm
t: 4.00 sec
k_h/k_v : 1
m: 1

k_h : 6.06E-03 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3 / sec)
h_c **: constant piezometric head (cm)**
h_1 **: initial piezometric head (cm)**
h_2 **: final piezometric head (cm)**
k_h **: horizontal permeability (cm / sec)**
k_v **= vertical permeability (cm / sec)**

Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

Test ID: W-3C
Test Depth: 50' - 55'

Constant Head Permeability Test

D: 4.00 in = 10.2 cm
q: 1.65 gpm = 104.1 cm^3/s
L: 5.00 ft = 152.4 cm
H_c: 6.80 ft = 207.3 cm
k_h/k_v : 1
m: 1

k_h : 1.78E-03 cm/s

Variable Head Permeability Test
(12 inch drop)

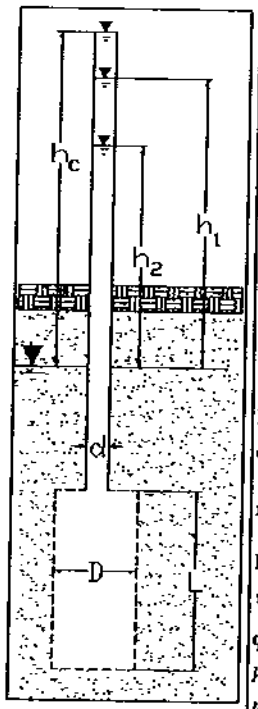
d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 6.80 ft = 207.3 cm
h_2: 5.80 ft = 176.8 cm
t: 5.50 sec
k_h/k_v : 1
m: 1

k_h : 2.08E-03 cm/s

Variable Head Permeability Test
(24 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 6.80 ft = 207.3 cm
h_2: 4.80 ft = 146.3 cm
t: 13.00 sec
k_h/k_v : 1
m: 1

k_h : 1.93E-03 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3 / sec)
h_c : constant piezometric head (cm)
h_1 : initial piezometric head (cm)
h_2 : final piezometric head (cm)
k_h : horizontal permeability (cm / sec)
k_v = vertical permeability (cm / sec)

Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

Test ID: W-3D
Test Depth: 75' - 80'

Constant Head Permeability Test

D: 4.00 in = 10.2 cm
q: 2.10 gpm = 132.5 cm^3/s
L: 5.00 ft = 152.4 cm
H_c: 7.07 ft = 215.5 cm
k_h/k_v : 1
m: 1

k_h : 2.18E-03 cm/s

Variable Head Permeability Test
(12 inch drop)

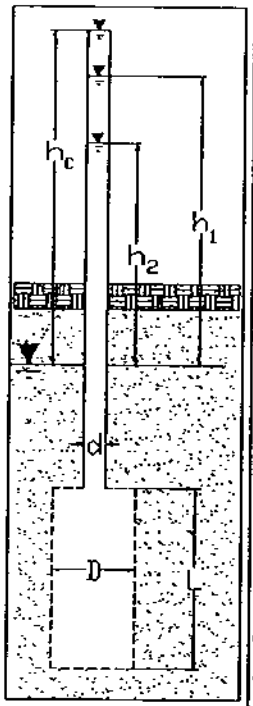
d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.07 ft = 215.5 cm
h_2: 6.07 ft = 185.0 cm
t: 7.00 sec
k_h/k_v : 1
m: 1

k_h : 1.57E-03 cm/s

Variable Head Permeability Test
(24 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.07 ft = 215.5 cm
h_2: 5.07 ft = 154.5 cm
t: 19.00 sec
k_h/k_v : 1
m: 1

k_h : 1.26E-03 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3 / sec)
h_c : constant piezometric head (cm)
h_1 : initial piezometric head (cm)
h_2 : final piezometric head (cm)
k_h : horizontal permeability (cm / sec)
k_v = vertical permeability (cm / sec)

Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

Test ID: W-4A
Test Depth: 4.6' - 9.6'

Constant Head Permeability Test

D: 4.00 in = 10.2 cm
q: 1.45 gpm = 91.5 cm^3/s
L: 5.00 ft = 152.4 cm
H_c: 7.10 ft = 216.4 cm
k_h/k_v : 1
m: 1

k_h : 1.50E-03 cm/s

Variable Head Permeability Test
(12 inch drop)

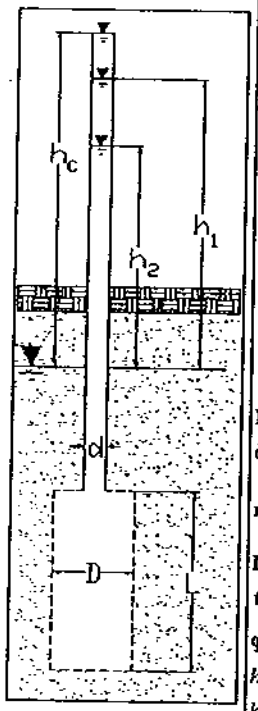
d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.10 ft = 216.4 cm
h_2: 6.10 ft = 185.9 cm
t: 8.00 sec
k_h/k_v : 1
m: 1

k_h : 1.37E-03 cm/s

Variable Head Permeability Test
(24 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 7.10 ft = 216.4 cm
h_2: 5.10 ft = 155.4 cm
t: 16.00 sec
k_h/k_v : 1
m: 1

k_h : 1.49E-03 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3 / sec)
h_c **: constant piezometric head** (cm)
h_1 **: initial piezometric head** (cm)
h_2 **: final piezometric head** (cm)
k_h **: horizontal permeability** (cm / sec)
k_v **= vertical permeability** (cm / sec)

Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

Test ID: W-4B
Test Depth: 25' - 30'

Constant Head Permeability Test

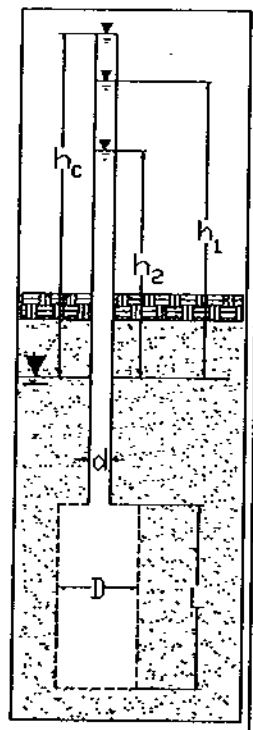
D: 4.00 in = 10.2 cm
q: 11.50 gpm = 725.5 cm^3/s
L: 5.00 ft = 152.4 cm
H_c: 11.50 ft = 350.5 cm
k_h/k_v : 1
m: 1

k_h : 7.35E-03 cm/s

Variable Head Permeability Test
(24 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 11.50 ft = 350.5 cm
h_2: 9.50 ft = 289.6 cm
t: 3.00 sec
k_h/k_v : 1
m: 1

k_h : 4.58E-03 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3 / sec)
h_c : constant piezometric head (cm)
h_1 : initial piezometric head (cm)
h_2 : final piezometric head (cm)
k_h : horizontal permeability (cm / sec)
k_v = vertical permeability (cm / sec)

Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

Test ID: W-4C
Test Depth: 65' - 70'

Constant Head Permeability Test

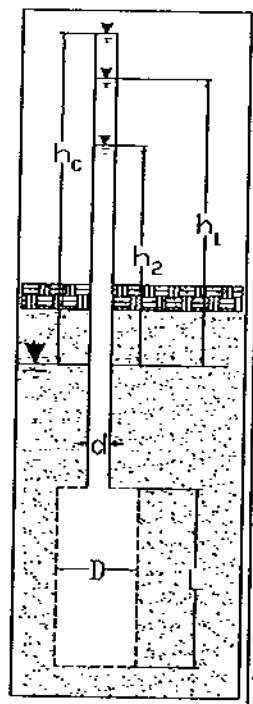
D: 4.00 in = 10.2 cm
q: 5.33 gpm = 336.3 cm^3/s
L: 5.00 ft = 152.4 cm
H_c: 11.40 ft = 347.5 cm
k_h/k_v : 1
m: 1

k_h : 3.44E-03 cm/s

Variable Head Permeability Test
(12 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 11.40 ft = 347.5 cm
h_2: 10.40 ft = 317.0 cm
t: 2.00 sec
k_h/k_v : 1
m: 1

k_h : 3.30E-03 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3 / sec)
h_c **: constant piezometric head (cm)**
h_1 **: initial piezometric head (cm)**
h_2 **: final piezometric head (cm)**
k_h **: horizontal permeability (cm / sec)**
k_v **= vertical permeability (cm / sec)**

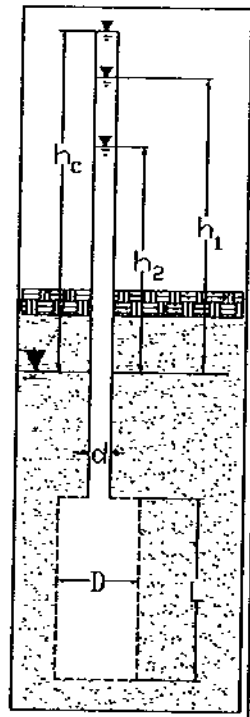
Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

Test ID: W-5A
Test Depth: 4.85'- 9.85'

Variable Head Permeability Test
(7.2 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 4.60 ft = 140.2 cm
h_2: 4.00 ft = 121.9 cm.
t: 116.00 sec
k_h/k_v: 1
m: 1

k_h : 8.67E-05 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3/sec)
h_c : constant piezometric head (cm)
h_1 : initial piezometric head (cm)
h_2 : final piezometric head (cm)
k_h : horizontal permeability (cm/sec)
k_v = vertical permeability (cm/sec)

Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

NOTES: Constant Head Permeability Test was not performed due to low permeability of well.

Test ID: W-5B
Test Depth: 24.7' - 29.7'

Constant Head Permeability Test

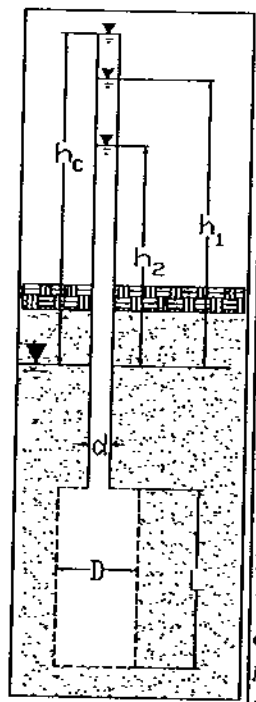
D: 4.00 in = 10.2 cm
q: 1.77 gpm = 111.7 cm^3/s
L: 5.00 ft = 152.4 cm
H_c: 4.90 ft = 149.4 cm
k_h/k_v : 1
m: 1

k_h : 2.66E-03 cm/s

Variable Head Permeability Test
(12 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 4.90 ft = 149.4 cm
h_2: 3.90 ft = 118.9 cm
t: 8.00 sec
k_h/k_v : 1
m: 1

k_h : 2.05E-03 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3 / sec)
h_c : constant piezometric head (cm)
h_1 : initial piezometric head (cm)
h_2 : final piezometric head (cm)
k_h : horizontal permeability (cm / sec)
k_v = vertical permeability (cm / sec)

Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

Test ID: W-5C
Test Depth: 64.8' - 69.8'

Constant Head Permeability Test

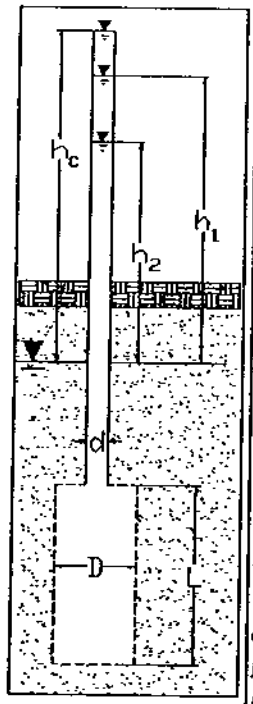
D: 4.00 in = 10.2 cm
q: 3.30 gpm = 208.2 cm^3/s
L: 5.00 ft = 152.4 cm
H_c: 4.97 ft = 151.5 cm
k_h/k_v : 1
m: 1

k_h : 4.88E-03 cm/s

Variable Head Permeability Test
(12 inch drop)

d: 2.00 in = 5.1 cm
D: 4.00 in = 10.2 cm
L: 5.00 ft = 152.4 cm
h_1: 4.97 ft = 151.5 cm
h_2: 3.97 ft = 121.0 cm
t: 2.00 sec
k_h/k_v : 1
m: 1

k_h : 8.09E-03 cm/s



Constant Head Permeability Test

$$k_h = \frac{q \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot h_c}$$

Variable Head Permeability Test

$$k_h = \frac{d^2 \cdot \ln\left[\frac{m \cdot L}{D} + \sqrt{1 + \left(\frac{m \cdot L}{D}\right)^2}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} \le 4$$

$$k_h = \frac{d^2 \cdot \ln\left[\frac{2 \cdot m \cdot L}{D}\right]}{8 \cdot L \cdot t} \ln\left(\frac{h_1}{h_2}\right) \quad for \quad \frac{m \cdot L}{D} > 4$$

Where:

D : intake diameter (cm)
d : standpipe diameter (cm)
m : transformation ratio $= \sqrt{\frac{k_h}{k_v}}$
L : intake length (cm)
t : elapsed time (sec)
q : water flow (cm^3 / sec)
h_c **: constant piezometric head** (cm)
h_1 **: initial piezometric head** (cm)
h_2 **: final piezometric head** (cm)
k_h **: horizontal permeability** (cm / sec)
k_v **= vertical permeability** (cm / sec)

Reference: Seepage, Drainage, and Flow Nets
Harry R. Cedergren, (1989)

State of Florida, Department of Environmental Protection
GROUNDWATER SAMPLING LOG

SITE NAME: Indiantown Reservoir		SITE LOCATION: Indiantown	
WELL NO: W-1B	SAMPLE ID:		DATE: 11/17/03

PURGING DATA

WELL DIAMETER (in):	TOTAL WELL DEPTH (ft):	STATIC DEPTH TO WATER (ft):	WELL CAPACITY (gal/ft):
2.0	25.06	6.82	0.16

1 WELL VOLUME (gal) = (TOTAL WELL DEPTH – DEPTH TO WATER) X WELL CAPACITY =

= (25.06 - 6.82) X 0.16 = 2.91

PURGE METHOD: peristaltic pump	PURGE INITIATED AT: 1038	PURGE ENDED AT: 1130	TOTAL VOL. PURGED (gal): 7.24

TIME	VOLUME PURGED (gal)	CUMUL. VOLUME PURGED (gal)	PURGE RATE (gpm)	DEPTH TO WATER (ft)	pH	TEMP. (°C)	COND. ~~(umhos)~~ ms/cm	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	COLOR	ODOR	Total Dissolved Solids (TDS)
1059	2.9	2.9	0.14	6.82								
1106	0.98	3.88	0.14	6.82	6.79	25.17	1.07	2.49	11.1	light yellow	Sulfur	0.69
1109	0.42	4.3	0.14	6.82	6.79	25.19	1.06	2.62	5.83	light yellow	Sulfur	0.69
1112	0.42	4.72	0.14	6.82	6.78	25.21	1.06	2.62	10.66	light yellow	Sulfur	0.69
1115	0.42	5.14	0.14	6.82	6.79	25.19	1.06	2.49	7.31	Light Yellow	Sulfur	0.69
1118	0.42	5.56	0.14	6.82	6.78	25.16	1.07	2.48	6.29	Light yellow	Sulfur	0.69
1121	0.42	5.98	0.14	6.82	6.78	25.19	1.07	2.42	6.01	light yellow	Sulfur	0.69
1124	0.42	6.4	0.14	6.82	6.78	25.20	1.07	2.43	5.45	light yellow	Sulfur	0.69
1127	0.42	6.82	0.14	6.82	6.78	25.19	1.07	2.44	4.98	Light Yellow	Sulfur	0.69
										76		

WELL CAPACITY (Gallons per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION	SAMPLER(S) SIGNATURE(S)	
Samantha Webb Adamas	Samantha Webb	
SAMPLING METHOD(S): peristaltic pump	SAMPLING INITIATED AT: 1155	SAMPLING ENDED AT: 1213
FIELD DECONTAMINATION: Y N	FIELD-FILTERED: Y N	DUPLICATE: Y N

SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD
NO.	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOLUME ADDED IN FIELD (mL)	FINAL pH	
1	PE	Ice	125 mL			Phosphates
1	PE	NaOH	125 mL			Nitrates / Ammonia
1	PE	HNO_3	125 mL			Hardness
1	PE	HNO_3	125 mL			Metals
1	PE	NaOH	125 mL			TKN

REMARKS:

MATERIAL CODES: AG = AMBER GLASS; CG = CLEAR GLASS; PE = POLYETHYLENE; O = OTHER (SPECIFY)

NOTE: The above do not constitute all of the information required by Chapter 62-160, F.A.C.

State of Florida, Department of Environmental Protection

GROUNDWATER SAMPLING LOG

SITE NAME:	Indiantown Reservoir	SITE LOCATION:	Indiantown
WELL NO:	W-1A	SAMPLE ID:	DATE: 11/17/03

PURGING DATA

WELL DIAMETER (in):	TOTAL WELL DEPTH (ft):	STATIC DEPTH TO WATER (ft):	WELL CAPACITY (gal/ft):
2.0	7.76	6.76	0.16

1 WELL VOLUME (gal) = (TOTAL WELL DEPTH – DEPTH TO WATER) X WELL CAPACITY =

= (7.76 - 6.76) x 0.16 = 0.16

PURGE METHOD: peristaltic pump	PURGE INITIATED AT: 1228	PURGE ENDED AT: 1235	TOTAL VOL. PURGED (gal): ≈0.16

TIME	VOLUME PURGED (gal)	CUMUL. VOLUME PURGED (gal)	PURGE RATE (gpm)	DEPTH TO WATER (ft)	pH	TEMP. (°C)	COND. (µmhos)	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	COLOR	ODOR

WELL CAPACITY (Gallons per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION	SAMPLER(S) SIGNATURE(S)	
SAMPLING METHOD(S): peristaltic pump	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
FIELD DECONTAMINATION: Y N	FIELD-FILTERED: Y N	DUPLICATE: Y N

SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD
NO.	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOLUME ADDED IN FIELD (mL)	FINAL pH	

REMARKS: Well purged dry, unable to sample
Water was very dark grey, clay like.

MATERIAL CODES: AG = AMBER GLASS; CG = CLEAR GLASS; PE = POLYETHYLENE; O = OTHER (SPECIFY)

NOTE: The above do not constitute all of the information required by Chapter 62-160, F.A.C.

State of Florida, Department of Environmental Protection
GROUNDWATER SAMPLING LOG

SITE NAME:	Indiantown Reservoir	SITE LOCATION:	Indiantown
WELL NO:	W-3A	SAMPLE ID:	DATE: 11/17/03

PURGING DATA

WELL DIAMETER (in):	TOTAL WELL DEPTH (ft):	STATIC DEPTH TO WATER (ft):	WELL CAPACITY (gal/ft):
2.0	11.58	6.56	0.16

1 WELL VOLUME (gal) = (TOTAL WELL DEPTH – DEPTH TO WATER) X WELL CAPACITY =

= (11.58 - 6.56) x 0.16 = 0.8

PURGE METHOD: peristaltic pump	PURGE INITIATED AT: 1358	PURGE ENDED AT: 1409	TOTAL VOL. PURGED (gal): 1.44

TIME	VOLUME PURGED (gal)	CUMUL. VOLUME PURGED (gal)	PURGE RATE (gpm)	DEPTH TO WATER (ft)	pH	TEMP. (°C)	COND. ~~(µmhos)~~ ms/cm	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	COLOR	ODOR	Total Dissolv Solid (g/L)
1401	0.4	0.4	0.13	6.50	6.67	27.25	1.64	1.53	349	grey/brown	Sulfur smell	1.06
1404	0.39	0.79	0.13	6.43	6.96	27.88	1.49	1.75	321	grey/brown	rotten eggs	0.89
1407	0.39	1.18	0.13	6.38	6.78	26.71	1.36	1.74	195	grey/brown	sulfur	0.88
										100		

WELL CAPACITY (Gallons per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION	Samantha Webb / Ardaman + Associates	SAMPLER(S) SIGNATURE(S)	Samantha Webb
SAMPLING METHOD(S): peristaltic pump		SAMPLING INITIATED AT: 1410	SAMPLING ENDED AT: 1420
FIELD DECONTAMINATION: (Y) N	FIELD-FILTERED: Y (N)	DUPLICATE: Y (N)	

SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD
NO.	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOLUME ADDED IN FIELD (mL)	FINAL pH	
1	PE	125 mL	~~None~~ Ice			Phosphates
1	PE	125 mL	NaOH			Nitrates/Ammonia
1	PE	125 mL	HNO_3			Hardness
1	PE	125 mL	HNO_3			metals
1	PE	125 mL	NaOH			TKN

REMARKS:
well started to purge dry, so took sample.

MATERIAL CODES: AG = AMBER GLASS; CG = CLEAR GLASS; PE = POLYETHYLENE; O = OTHER (SPECIFY)

NOTE: The above do not constitute all of the information required by Chapter 62-160, F.A.C.

State of Florida, Department of Environmental Protection
GROUNDWATER SAMPLING LOG

SITE NAME:	Indiantown Reservoir	SITE LOCATION:	Indiantown
WELL NO:	W-3B	SAMPLE ID:	DATE:

PURGING DATA

WELL DIAMETER (in):	TOTAL WELL DEPTH (ft):	STATIC DEPTH TO WATER (ft):	WELL CAPACITY (gal/ft):
2.0	30.22	6.89	0.16

1 WELL VOLUME (gal) = (TOTAL WELL DEPTH – DEPTH TO WATER) X WELL CAPACITY =

= (30.22 - 6.89) X 0.16 = 3.74

PURGE METHOD: peristaltic pump	PURGE INITIATED AT: 1252	PURGE ENDED AT: 1332	TOTAL VOL. PURGED (gal): 11.4

TIME	VOLUME PURGED (gal)	CUMUL. VOLUME PURGED (gal)	PURGE RATE (gpm)	DEPTH TO WATER (ft)	pH	TEMP. (°C)	COND. ~~(µmhos)~~ ms/cm	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	COLOR	ODOR	Total Dissolved Solids (g/L)
1302	3.0	3.0	0.3	6.89	6.97	25.24	0.77	0.11	11.8	Light Yellow	Sulfur	0.50
1305	0.9	3.9	0.3	6.89	6.94	25.35	0.78	0.08	20.3	Light Yellow	Sulfur	0.50
1308	0.9	4.8	0.3	6.89	6.50	25.23	1.23	0.04	28.3	Light Yellow	Sulfur	0.79
1311	0.9	5.7	0.3	6.89	6.83	25.08	0.24	2.46	11.6	Light Yellow	Sulfur	0.01
1316	0.9	6.6	0.3	6.89	6.93	25.21	0.78	0.16	8.45	Light Yellow	Sulfur	0.50
1319	0.9	7.5	0.3	6.89	6.94	25.26	0.77	0.06	8.82	Light Yellow	Sulfur	0.50
1322	0.9	8.4	0.3	6.89	6.93	25.18	0.77	0.04	8.60	Light Yellow	Sulfur	0.50
1325	0.9	9.3	0.3	6.89	6.94	25.18	0.77	0.04	8.61	Light Yellow	Sulfur	0.50
										70		

WELL CAPACITY (Gallons per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION	Samantha Webb Ardaman & Associates	SAMPLER(S) SIGNATURE(S)	Samantha Webb
SAMPLING METHOD(S): peristaltic pump		SAMPLING INITIATED AT: 1335	SAMPLING ENDED AT: 1355

FIELD DECONTAMINATION: Y N | FIELD-FILTERED: Y N | DUPLICATE: Y N

SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD
NO.	MATERIAL CODE	VOLUME mL	PRESERVATIVE USED	TOTAL VOLUME ADDED IN FIELD (mL)	FINAL pH	
1	PE	125	Ice			Phosphates
1	PE	125	NaOH			Nitrates / ammonia
1	PE	125	HNO_3			Hardness
1	PE	125	HNO_3			metals
1	PE	125	NaOH			TKN

REMARKS:

MATERIAL CODES: AG = AMBER GLASS; CG = CLEAR GLASS; PE = POLYETHYLENE; O = OTHER (SPECIFY)

NOTE: The above do not constitute all of the information required by Chapter 62-160, F.A.C.

State of Florida, Department of Environmental Protection
GROUNDWATER SAMPLING LOG

SITE NAME:	Indiantown Reservoir	SITE LOCATION:	Indiantown
WELL NO:	W-5B	SAMPLE ID:	DATE:

PURGING DATA

WELL DIAMETER (in):	TOTAL WELL DEPTH (ft):	STATIC DEPTH TO WATER (ft):	WELL CAPACITY (gal/ft):
2.0	29.71	7.91	0.16

1 WELL VOLUME (gal) = (TOTAL WELL DEPTH – DEPTH TO WATER) X WELL CAPACITY =

= (29.71 - 7.91) X 0.16 = 3.49

PURGE METHOD: peristaltic pump	PURGE INITIATED AT: 1447	PURGE ENDED AT: 1519	TOTAL VOL. PURGED (gal): 9.6

TIME	VOLUME PURGED (gal)	CUMUL. VOLUME PURGED (gal)	PURGE RATE (gpm)	DEPTH TO WATER (ft)	pH	TEMP. (°C)	COND. ~~(umhos)~~ mS/cm	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	COLOR	ODOR	Tota Diss Solid (g/L)
1457	3.0	3.0	0.3	7.91	6.85	25.31	0.884	0.04	35.4	Light yellow	sulfur	0.57
1500	0.9	3.9	0.3	7.91	7.14	32.14	0.011	0.84	32.2	Light yellow	sulfur	0.00
1503	0.9	4.8	0.3	7.91	7.07	25.47	1.007	0.03	28.7	Light yellow	sulfur	0.6
1506	0.9	5.7	0.3	7.91	6.94	25.30	0.818	0.03	25.2	Light yellow	sulfur	0.5
1509	0.9	6.6	0.3	7.91	6.95	25.31	0.812	0.03	23.9	Light yellow	Sulfur	0.5
1512	0.9	7.5	0.3	7.91	6.95	25.31	0.809	0.02	23.7	Light yellow	Sulfur	0.5
1515	0.9	8.4	0.3	7.91	6.95	25.31	0.810	0.02	22.6	Light yellow	Sulfur	0.5
1518	0.9	9.3	0.3	7.91	6.94	25.31	0.809	0.02	19.9	Light yellow	Sulfur	0.52
										15		

WELL CAPACITY (Gallons per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION	Samantha Webb / Arcadis & Associates	SAMPLER(S) SIGNATURE(S)	Samantha Webb
SAMPLING METHOD(S): peristaltic pump		SAMPLING INITIATED AT: 1538	SAMPLING ENDED AT: 1558
FIELD DECONTAMINATION: Y N	FIELD-FILTERED: Y N		DUPLICATE: Y N

SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD
NO.	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOLUME ADDED IN FIELD (mL)	FINAL pH	
1	PE	125 mL	Ice Only (6W)			phosphates
1	PE	125 mL	NaOH			Nitrates / Ammonia
1	PE	125 mL	HNO_3			Hardness
1	PE	125 mL	HNO_3			metals
1	PE	125 mL	NaOH			TKN
X(6W)						

REMARKS:

MATERIAL CODES: AG = AMBER GLASS; CG = CLEAR GLASS; PE = POLYETHYLENE; O = OTHER (SPECIFY)

NOTE: The above do not constitute all of the information required by Chapter 62-160, F.A.C.

State of Florida, Department of Environmental Protection
GROUNDWATER SAMPLING LOG

SITE NAME:	Indiantown Reservoir	SITE LOCATION:	Indiantown	
WELL NO:	W-59	SAMPLE ID:		DATE: 11/17/03

PURGING DATA

WELL DIAMETER (in):	TOTAL WELL DEPTH (ft):	STATIC DEPTH TO WATER (ft):	WELL CAPACITY (gal/ft):
2.0	8.40	5.25	0.16

1 WELL VOLUME (gal) = (TOTAL WELL DEPTH – DEPTH TO WATER) X WELL CAPACITY =

= (8.40 - 5.25) X 0.16 = 0.5

PURGE METHOD: peristaltic pump	PURGE INITIATED AT: 1610	PURGE ENDED AT: 1615	TOTAL VOL. PURGED (gal): ≈ .16

TIME	VOLUME PURGED (gal)	CUMUL. VOLUME PURGED (gal)	PURGE RATE (gpm)	DEPTH TO WATER (ft)	pH	TEMP. (°C)	COND. (µmhos)	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	COLOR	ODOR

WELL CAPACITY (Gallons per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION	SAMPLER(S) SIGNATURE(S)	
SAMPLING METHOD(S): peristaltic pump	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
FIELD DECONTAMINATION: Y N	FIELD-FILTERED: Y N	DUPLICATE: Y N

SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD
NO.	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOLUME ADDED IN FIELD (mL)	FINAL pH	

REMARKS: Well purged dry, unable to sample.

MATERIAL CODES: AG = AMBER GLASS; CG = CLEAR GLASS; PE = POLYETHYLENE; O = OTHER (SPECIFY)

NOTE: The above do not constitute all of the information required by Chapter 62-160, F.A.C.

State of Florida, Department of Environmental Protection

GROUNDWATER SAMPLING LOG

SITE NAME: Indiantown Reservoir	SITE LOCATION: Indiantown
WELL NO: W-3A	SAMPLE ID:
DATE: 11/18/03	

PURGING DATA

WELL DIAMETER (in): 2.0	TOTAL WELL DEPTH (ft): 9.88	STATIC DEPTH TO WATER (ft): Dry	WELL CAPACITY (gal/ft):

1 WELL VOLUME (gal) = (TOTAL WELL DEPTH – DEPTH TO WATER) X WELL CAPACITY =

= (–) X =

PURGE METHOD: peristaltic pump	PURGE INITIATED AT:	PURGE ENDED AT:	TOTAL VOL. PURGED (gal):

TIME	VOLUME PURGED (gal)	CUMUL. VOLUME PURGED (gal)	PURGE RATE (gpm)	DEPTH TO WATER (ft)	pH	TEMP. (°C)	COND. (µmhos)	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	COLOR	ODOR

WELL CAPACITY (Gallons per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION	SAMPLER(S) SIGNATURE(S)	
SAMPLING METHOD(S): peristaltic pump	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
FIELD DECONTAMINATION: Y N	FIELD-FILTERED: Y N	DUPLICATE: Y N

SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD
NO.	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOLUME ADDED IN FIELD (mL)	FINAL pH	

REMARKS: Well Dry could not Sample

MATERIAL CODES: AG = AMBER GLASS; CG = CLEAR GLASS; PE = POLYETHYLENE; O = OTHER (SPECIFY)

NOTE: The above do not constitute all of the information required by Chapter 62-160, F.A.C.

State of Florida, Department of Environmental Protection
GROUNDWATER SAMPLING LOG

SITE NAME:	Indiantown Reservoir	SITE LOCATION:	Indiantown
WELL NO:	W-4B	SAMPLE ID:	DATE: 11/18/03

PURGING DATA

WELL DIAMETER (in):	TOTAL WELL DEPTH (ft):	STATIC DEPTH TO WATER (ft):	WELL CAPACITY (gal/ft):
2.0	30.00	11.49	0.16

1 WELL VOLUME (gal) = (TOTAL WELL DEPTH – DEPTH TO WATER) X WELL CAPACITY =

= (30.00 - 11.49) x 0.16 = 2.96

PURGE METHOD: peristaltic pump	PURGE INITIATED AT: 1159	PURGE ENDED AT: 1245	TOTAL VOL. PURGED (gal): 3.31

TIME	VOLUME PURGED (gal)	CUMUL. VOLUME PURGED (gal)	PURGE RATE (gpm)	DEPTH TO WATER (ft)	pH	TEMP. (°C)	COND. ~~(umhos)~~ ms/cm	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	COLOR	ODOR	Tote Dissol Solid (g/L)
1220	0.56	1.56	0.07	11.49	7.33	28.53	0.005	8.39	37.9	grey/brown	Sulfur	0.00
1223	0.21	1.77	0.07	11.49	6.71	26.34	1.369	3.48	35.3	grey/brown	Sulfur	0.89
1226	0.21	1.98	0.07	11.49	6.69	26.34	1.379	2.03	27.8	grey/brown	Sulfur	0.8
1229	0.21	2.19	0.07	11.49	6.67	26.22	1.401	2.58	31.2	grey/brown	Sulfur	0.91
1232	0.21	2.4	0.07	11.49	6.66	26.27	1.407	2.23	24.2	grey/brown	Sulfur	0.91
1235	0.21	2.61	0.07	11.49	6.66	26.37	1.413	2.16	22.5	grey/brown	Sulfur	0.91
1238	0.21	2.82	0.07	11.49	6.66	26.47	1.413	1.55	21.7	grey/brown	Sulfur	0.91
1241	0.21	3.03	0.07	11.49	6.66	26.58	1.413	1.85	21.1	grey/brown	Sulfur	0.91
1244	0.21	3.24	0.07	11.49	6.66	26.66	1.414	2.05	19.8	grey/brown	Sulfur	0.91
										48		

WELL CAPACITY (Gallons per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION	Samantha Webb Ardaman Associates	SAMPLER(S) SIGNATURE(S)	Samantha Webb
SAMPLING METHOD(S): peristaltic pump		SAMPLING INITIATED AT: 1245	SAMPLING ENDED AT: 1308
FIELD DECONTAMINATION: Y N	FIELD-FILTERED: Y N		DUPLICATE: Y N

SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD
NO.	MATERIAL CODE	VOLUME mL	PRESERVATIVE USED	TOTAL VOLUME ADDED IN FIELD (mL)	FINAL pH	
1	PE	125	Ice			Phosphates
1	PE	125	NaOH			Nitrates / Ammonia
1	PE	125	HNO_3			Hardness
1	PE	125	HNO_3			metals
1	PE	125	NaOH			TKN

REMARKS:

MATERIAL CODES: AG = AMBER GLASS; CG = CLEAR GLASS; PE = POLYETHYLENE; O = OTHER (SPECIFY)

NOTE: The above do not constitute all of the information required by Chapter 62-160, F.A.C.

State of Florida, Department of Environmental Protection

GROUNDWATER SAMPLING LOG

SITE NAME:	Indiantown Reservoir	SITE LOCATION:	Indiantown
WELL NO:	W-2B	SAMPLE ID:	DATE: 11/18/03

PURGING DATA

WELL DIAMETER (in):	TOTAL WELL DEPTH (ft):	STATIC DEPTH TO WATER (ft):	WELL CAPACITY (gal/ft):
2.0	29.68	7.32	0.16

1 WELL VOLUME (gal) = (TOTAL WELL DEPTH – DEPTH TO WATER) X WELL CAPACITY =

= (29.68 - 7.32) X 0.16 = 5.92

PURGE METHOD: peristaltic pump	PURGE INITIATED AT: 1029	PURGE ENDED AT:	TOTAL VOL. PURGED (gal):

TIME	VOLUME PURGED (gal)	CUMUL. VOLUME PURGED (gal)	PURGE RATE (gpm)	DEPTH TO WATER (ft)	pH	TEMP. (°C)	COND. (µmhos) ms/cm	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	COLOR	ODOR	Total Diss Solid (g/L)
1037	2.0	2.0	0.25	7.32	7.12	23.74	1.060	9.74	94	Light Yellow	Sulfur	0.68
1040	0.75	2.75	0.25	7.32	6.51	25.55	1.223	1.97	46.4	Light Yellow	Sulfur	0.79
1043	0.75	3.50	0.25	7.32	6.53	25.51	1.250	0.54	28.9	Light Yellow	Sulfur	0.81
1048	1.25	4.75	0.25	7.32	6.57	25.54	1.276	4.84	12.8	Light Yellow	Sulfur	0.82
1051	0.75	5.5	0.25	7.32	6.74	25.36	1.227	0.81	13.1	Light Yellow	Sulfur	0.79
1054	0.75	6.25	0.25	7.32	6.76	25.36	1.203	0.64	11.4	Light Yellow	Sulfur	0.78
1057	0.75	7.0	0.25	7.32	6.76	25.40	1.198	0.52	12.6	Light Yellow	Sulfur	0.77
										15		

WELL CAPACITY (Gallons per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION	Samantha Webb Arcadis	SAMPLER(S) SIGNATURE(S)	Samantha Webb
SAMPLING METHOD(S): peristaltic pump		SAMPLING INITIATED AT: 1103	SAMPLING ENDED AT: 1120

FIELD DECONTAMINATION: Y N FIELD-FILTERED: Y N DUPLICATE: Y N

SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD
NO.	MATERIAL CODE	VOLUME mL	PRESERVATIVE USED	TOTAL VOLUME ADDED IN FIELD (mL)	FINAL pH	
1	PE	125	Ice			Phosphates
1	PE	125	NaOH			Nitrates/Ammonia
1	PE	125	HNO_3			Hardness
1	PE	125	HNO_3			metals
1	PE	125	NaOH			TKN

REMARKS:

MATERIAL CODES: AG = AMBER GLASS; CG = CLEAR GLASS; PE = POLYETHYLENE; O = OTHER (SPECIFY)

NOTE: The above do not constitute all of the information required by Chapter 62-160, F.A.C.

State of Florida, Department of Environmental Protection

GROUNDWATER SAMPLING LOG

SITE NAME:	Indiantown Reservoir	SITE LOCATION:	Indiantown
WELL NO:	W-2A	SAMPLE ID:	DATE: 11/18/03

PURGING DATA

WELL DIAMETER (in):	TOTAL WELL DEPTH (ft):	STATIC DEPTH TO WATER (ft):	WELL CAPACITY (gal/ft):
2.0	9.64	7.61	0.16

1 WELL VOLUME (gal) = (TOTAL WELL DEPTH – DEPTH TO WATER) X WELL CAPACITY =

= (9.64 - 7.01) X 0.16 = 0.4

PURGE METHOD: peristaltic pump	PURGE INITIATED AT: 1125	PURGE ENDED AT: 1130	TOTAL VOL. PURGED (gal): ≈ 0.3

TIME	VOLUME PURGED (gal)	CUMUL. VOLUME PURGED (gal)	PURGE RATE (gpm)	DEPTH TO WATER (ft)	pH	TEMP. (°C)	COND. (µmhos)	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	COLOR	ODOR

WELL CAPACITY (Gallons per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION	SAMPLER(S) SIGNATURE(S)	
SAMPLING METHOD(S): peristaltic pump	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
FIELD DECONTAMINATION: Y N	FIELD-FILTERED: Y N	DUPLICATE: Y N

SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD
NO.	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOLUME ADDED IN FIELD (mL)	FINAL pH	

REMARKS: well purged dry, unable to collect sample.

MATERIAL CODES: AG = AMBER GLASS; CG = CLEAR GLASS; PE = POLYETHYLENE; O = OTHER (SPECIFY)

NOTE: The above do not constitute all of the information required by Chapter 62-160, F.A.C.

Jupiter
Environmental Laboratories, Inc.

Client # 1061
Address: Ardaman & Associates, W.P.B.
2511 Westgate Ave., #10
West Palm Beach, FL 33409
Attn: Samantha Webb

Page: 1 of 4
Date: 11/26/2003
Log # 10023-01

Sample Description: COC # 15986
Project # 03-2197
Location: Indiantown Reservoir
Matrix: Water

Label: W-1B
Date Sampled: 11/17/2003
Date Received: 11/17/2003 4:48:00
Collected By: Client

Description	Results	Units	Method	Dilution Factor	Detection Limit	Extraction Date	Analysis Date	Analyst
SM4500B in Water								
Chloride	84.0	mg/L	/SM4500B	5	5	11/20/2003	11/20/2003	ESC
Iron by ICP-MS								
Iron	5.02	mg/L	3010A/200.8	1	0.03	11/24/2003	11/24/2003	DS
Manganese by ICP-MS								
Manganese	0.023	mg/L	3010A/200.8	1	0.005	11/24/2003	11/24/2003	DS
Mercury by Cold Vapor AA								
Mercury	U	mg/L	3010A/245.1	1	0.001	11/24/2003	11/24/2003	DS
EPA Method 353.2 in Water								
Nitrate-N	65.0	mg/L	/353.2	5	0.05	11/20/2003	11/20/2003	ESC
EPA Method 354.1 in Water								
trite-N	U	mg/L	/354.1	1	0.01	11/20/2003	11/20/2003	ESC
hosphate-Ortho								
Phosphate-Ortho	0.067	mg/L	/365.2	1	0.025	11/19/2003	11/19/2003	ESC
Phosphate-Ortho Diss								
Phosphate-Ortho	U	mg/L	/365.2	1	0.025	11/19/2003	11/19/2003	ESC

U = Below Laboratory Detection Limit

Soil results are reported in dry weight

All Analysis were performed using EPA, ASTM, USGS or Standard Methods
CompQAP #960152 EPA #FL01040 HRS #E86546
NELAC Certified

Respectfully Submitted,

Ram Shore
Quality Assurance Director

Jupiter
Environmental Laboratories, Inc.

Client # 1061
Address: Ardaman & Associates, W.P.B.
2511 Westgate Ave., #10
West Palm Beach, FL 33409
Attn: Samantha Webb

Page: 2 of 4
Date: 11/26/2003
Log # 10023-02

Sample Description: COC # 15986
Project # 03-2197
Location: Indiantown Reservoir
Matrix: Water

Label: W-3B
Date Sampled: 11/17/2003
Date Received: 11/17/2003 4:48:00
Collected By: Client

Description	Results	Units	Method	Dilution Factor	Detection Limit	Extraction Date	Analysis Date	Analyst
SM4500B in Water								
Chloride	30.0	mg/L	/SM4500B	5	5	11/20/2003	11/20/2003	ESC
Iron by ICP-MS								
Iron	5.60	mg/L	3010A/200.8	1	0.03	11/24/2003	11/24/2003	DS
Manganese by ICP-MS								
Manganese	0.158	mg/L	3010A/200.8	1	0.005	11/24/2003	11/24/2003	DS
Mercury by Cold Vapor AA								
Mercury	U	mg/L	3010A/245.1	1	0.001	11/24/2003	11/24/2003	DS
EPA Method 353.2 in Water								
Nitrate-N	U	mg/L	/353.2	1	0.01	11/20/2003	11/20/2003	ESC
EPA Method 354.1 in Water								
Nitrite-N	U	mg/L	/354.1	1	0.01	11/20/2003	11/20/2003	ESC
Phosphate-Ortho								
Phosphate-Ortho	0.027	mg/L	/365.2	1	0.025	11/19/2003	11/19/2003	ESC
Phosphate-Ortho Diss								
Phosphate-Ortho	U	mg/L	/365.2	1	0.025	11/19/2003	11/19/2003	ESC

U = Below Laboratory Detection Limit

Soil results are reported in dry weight

All Analysis were performed using EPA, ASTM, USGS or Standard Methods.
CompQAP #960152 EPA #FL01040 HRS #E86546
NELAC Certified

Respectfully Submitted,

Pam Shore
Quality Assurance Director

Jupiter
Environmental Laboratories, Inc.

Client # 1061
Address: Ardaman & Associates, W.P.B.
2511 Westgate Ave., #10
West Palm Beach, FL 33409
Attn: Samantha Webb

Page: 3 of 4
Date: 11/26/2003
Log # 10023-03

Sample Description: COC # 15986
Project # 03-2197
Location: Indiantown Reservoir
Matrix: Water

Label: W-3A
Date Sampled: 11/17/2003
Date Received: 11/17/2003 4:48:00
Collected By: Client

Description	Results	Units	Method	Dilution Factor	Detection Limit	Extraction Date	Analysis Date	Analyst
SM4500B in Water								
Chloride	21.0	mg/L	/SM4500B	5	5	11/20/2003	11/20/2003	ESC
Iron by ICP-MS								
Iron	4.26	mg/L	3010A/200.8	1	0.03	11/24/2003	11/24/2003	DS
Manganese by ICP-MS								
Manganese	0.218	mg/L	3010A/200.8	1	0.005	11/24/2003	11/24/2003	DS
Mercury by Cold Vapor AA								
Mercury	U	mg/L	3010A/245.1	1	0.001	11/24/2003	11/24/2003	DS
EPA Method 353.2 in Water								
Nitrate-N	71.0	mg/L	/353.2	5	0.05	11/20/2003	11/20/2003	ESC
EPA Method 354.1 in Water								
Nitrite-N	U	mg/L	/354.1	1	0.01	11/20/2003	11/20/2003	ESC
Phosphate-Ortho								
Phosphate-Ortho	0.079	mg/L	/365.2	1	0.025	11/19/2003	11/19/2003	ESC
Phosphate-Ortho Diss								
Phosphate-Ortho	U	mg/L	/365.2	1	0.025	11/19/2003	11/19/2003	ESC

U = Below Laboratory Detection Limit

Soil results are reported in dry weight

All Analysis were performed using EPA, ASTM, USGS or Standard Methods.
CompQAP #960152 EPA #FL01040 HRS #E86546
NELAC Certified

Respectfully Submitted,

Pam Shore
Quality Assurance Director

Jupiter
Environmental Laboratories, Inc.

Client # 1061
Address: Ardaman & Associates, W.P.B.
2511 Westgate Ave., #10
West Palm Beach, FL 33409
Attn: Samantha Webb

Page: 4 of 4
Date: 11/26/2003
Log # 10023-04

Sample Description: COC # 15986
Project # 03-2197
Location: Indiantown Reservoir
Matrix: Water

Label: W-5B
Date Sampled: 11/17/2003
Date Received: 11/17/2003 4:48:00
Collected By: Client

Description	Results	Units	Method	Dilution Factor	Detection Limit	Extraction Date	Analysis Date	Analyst
SM4500B in Water								
Chloride	46.0	mg/L	/SM4500B	5	5	11/20/2003	11/20/2003	ESC
Iron by ICP-MS								
Iron	2.71	mg/L	3010A/200.8	1	0.03	11/24/2003	11/24/2003	DS
Manganese by ICP-MS								
Manganese	0.065	mg/L	3010A/200.8	1	0.005	11/24/2003	11/24/2003	DS
Mercury by Cold Vapor AA								
Mercury	U	mg/L	3010A/245.1	1	0.001	11/24/2003	11/24/2003	DS
EPA Method 353.2 in Water								
Nitrate-N	64.0	mg/L	/353.2	5	0.05	11/20/2003	11/20/2003	ESC
EPA Method 354.1 in Water								
Nitrite-N	U	mg/L	/354.1	1	0.01	11/20/2003	11/20/2003	ESC
Phosphate-Ortho								
Phosphate-Ortho	0.026	mg/L	/365.2	1	0.025	11/19/2003	11/19/2003	ESC
Phosphate-Ortho Diss								
Phosphate-Ortho	U	mg/L	/365.2	1	0.025	11/19/2003	11/19/2003	ESC

U = Below Laboratory Detection Limit

Soil results are reported in dry weight

All Analysis were performed using EPA, ASTM, USGS or Standard Methods.
CompQAP #960152 EPA #FL01040 HRS #E86546
NELAC Certified

Respectfully Submitted,

Pam Shore
Quality Assurance Director

BAR CODE

Chain of Custody Record

LAB USE ONLY

J.E.L. Log # 123

P.O. #

Quote#

Jupiter Environmental Laboratories

Company Name: Ardaman & Associates

Address: 2511 Westgate Ave

City: WPB State: FL Zip: 3347

Sampling Site Address: Indiantown

Attn: S. Webb Fax/Email: swebb@ardaman.com

Project Name: Trap-Indiantown Reservoir Project #: 03-2197

Sampler Name/Signature: Samuel Webb

#	Sample Label (Client ID)	Collected Date	Collected Time	Matrix Code*	# of Cont	Press Codes	Mercury	Iron, Manganese	Chloride	Total + Dissolved ortho phosphorus	Nitrite + Nitrate	Ammonia (SW)	Field Filtered (Y/N)	Integrity OK (Y/N)
1	W-1B	11/17/03	1155	GW	6 (18)		X	+	X	X	X			
2	W-3B	"	1335	GW	6 (12)		X	X	X	X	X			
3	W-3A	"	1409	GW	6		X	X	X	X	X			
4	W-5B	✓	1538	GW	6		X	X	X	X	X	(MS)		
5														
6														
7														
8														
9														
10														

Chain - 1

Comments

could not get turbidity down well for analysis

ORIGINAL

Matrix Codes*

S	Soil/Solid Sediment	SW	Surface Water
GW	Ground Water	SL	Sludge
WW	Waste Water	O	Other (Please Specify)
DW	Drinking Water		

Pres Codes**

A- none		I- Ice	
B- HNO_3		O- Other	
C- H_2SO_4		M- MeOH	
D- NaOH			
E- HCl			

Relinquished by	Date	Time	Received by	Date	Time
Samuel Webb	11/17/03	1648		11/17/03	1649

QA/QC level with report

None X 1 2 3 See price guide for applicable fees

T.A.T. Request

X Standard

___ Rush

FDEP___

SFWMD___

Date Required _____

Temp Control: Ice °C

Page 1 of 1

Jupiter Environmental Laboratories, Inc.
150 Old Dixie Highway, Jupiter, FL 33458
(561) 575-0030 • Fax (561) 575-4118 • jupiterlabs@bellsouth.net

C.O.C.# 15986

Jupiter

Environmental Laboratories, Inc.

Client # 1061
Address: Ardaman & Associates, W.P.B.
2511 Westgate Ave., #10
West Palm Beach, FL 33409
Attn: Samantha Webb

Page: 1 of 4
Date: 12/1/2003
Log # 10024-01

Sample Description: COC # 15724
Project # 03-2197
Location: Indiantown Reservoir
Matrix: Water

Label: W-1B
Date Sampled: 11/18/2003
Date Received: 11/18/2003 4:48:00
Collected By: Client

Description	Results	Units	Method	Dilution Factor	Detection Limit	Extraction Date	Analysis Date	Analyst
EPA Method 350.3 in Water								
Ammonia-N	0.210	mg/L	/350.3	1	0.1	11/24/2003	11/24/2003	ESC
Arsenic by ICP-MS								
Arsenic	U	mg/L	3010A/200.8	1	0.0028	11/21/2003	11/21/2003	DS
Cadmium by ICP-MS								
Cadmium	U	mg/L	3010A/200.8	1	0.0002	11/21/2003	11/21/2003	DS
Copper by ICP-MS								
Copper	0.002	mg/L	3010A/200.8	1	0.0012	11/21/2003	11/21/2003	DS
EPA Method 130.2 in Water								
Hardness, Total	580	mg/L	/130.2	1	1	11/19/2003	11/19/2003	ESC
Lead by ICP-MS								
Lead	U	mg/L	3010A/200.8	1	0.001	11/21/2003	11/21/2003	DS
Kjeldahl Nitrogen, TKN								
Kjeldahl Nitrogen, TKN	1.90	mg/L	/351.2	1	0.5	11/20/2003	11/20/2003	ESC
Zinc by ICP-MS								
Zinc	0.005	mg/L	3010A/200.8	1	0.002	11/21/2003	11/21/2003	DS

U = Below Laboratory Detection Limit

Soil results are reported in dry weight

All Analysis were performed using EPA, ASTM, USGS or Standard Methods.
CompQAP #960152 EPA #FL01040 HRS #E86546
NELAC Certified

Respectfully Submitted,

Pam Shore
Quality Assurance Director

Jupiter
Environmental Laboratories, Inc.

Client # 1061
Address: Ardaman & Associates, W.P.B.
2511 Westgate Ave., #10
West Palm Beach, FL 33409
Attn: Samantha Webb

Page: 2 of 4
Date: 12/1/2003
Log # 10024-02

Sample Description: COC # 15724
Project # 03-2197
Location: Indiantown Reservoir
Matrix: Water

Label: W-3B
Date Sampled: 11/18/2003
Date Received: 11/18/2003 4:48:00
Collected By: Client

Description	Results	Units	Method	Dilution Factor	Detection Limit	Extraction Date	Analysis Date	Analyst
EPA Method 350.3 in Water								
Ammonia-N	0.380	mg/L	/350.3	1	0.1	11/24/2003	11/24/2003	ESC
Arsenic by ICP-MS								
Arsenic	U	mg/L	3010A/200.8	1	0.0028	11/21/2003	11/21/2003	DS
Cadmium by ICP-MS								
Cadmium	U	mg/L	3010A/200.8	1	0.0002	11/21/2003	11/21/2003	DS
Copper by ICP-MS								
Copper	0.002	mg/L	3010A/200.8	1	0.0012	11/21/2003	11/21/2003	DS
EPA Method 130.2 in Water								
Hardness, Total	390	mg/L	/130.2	1	1	11/19/2003	11/19/2003	ESC
Lead by ICP-MS								
Lead	U	mg/L	3010A/200.8	1	0.001	11/21/2003	11/21/2003	DS
Kjeldahl Nitrogen, TKN								
Kjeldahl Nitrogen, TKN	1.80	mg/L	/351.2	1	0.5	11/20/2003	11/20/2003	ESC
Zinc by ICP-MS								
Zinc	0.003	mg/L	3010A/200.8	1	0.002	11/21/2003	11/21/2003	DS

U = Below Laboratory Detection Limit

Soil results are reported in dry weight

All Analysis were performed using EPA, ASTM, USGS or Standard Methods.
CompQAP #960152 EPA #FL01040 HRS #E86546
NELAC Certified

Respectfully Submitted,

Pam Shore
Quality Assurance Director

Jupiter
Environmental Laboratories, Inc.

Client # 1061
Address: Ardaman & Associates, W.P.B.
2511 Westgate Ave., #10
West Palm Beach, FL 33409
Attn: Samantha Webb

Page: 3 of 4
Date: 12/1/2003
Log # 10024-03

Sample Description: COC # 15724
Project # 03-2197
Location: Indiantown Reservoir
Matrix: Water

Label: W-3A
Date Sampled: 11/18/2003
Date Received: 11/18/2003 4:48:00
Collected By: Client

Description	Results	Units	Method	Dilution Factor	Detection Limit	Extraction Date	Analysis Date	Analyst
EPA Method 350.3 In Water								
Ammonia-N	0.360	mg/L	/350.3	1	0.1	11/24/2003	11/24/2003	ESC
Arsenic by ICP-MS								
Arsenic	0.007	mg/L	3010A/200.8	1	0.0028	11/21/2003	11/21/2003	DS
Cadmium by ICP-MS								
Cadmium	U	mg/L	3010A/200.8	1	0.0002	11/21/2003	11/21/2003	DS
Copper by ICP-MS								
Copper	0.003	mg/L	3010A/200.8	1	0.0012	11/21/2003	11/21/2003	DS
EPA Method 130.2 In Water								
Hardness, Total	600	mg/L	/130.2	1	1	11/19/2003	11/19/2003	ESC
Lead by ICP-MS								
Lead	U	mg/L	3010A/200.8	1	0.001	11/21/2003	11/21/2003	DS
Kjeldahl Nitrogen, TKN								
Kjeldahl Nitrogen, TKN	2.40	mg/L	/351.2	1	0.5	11/20/2003	11/20/2003	ESC
Zinc by ICP-MS								
Zinc	0.008	mg/L	3010A/200.8	1	0.002	11/21/2003	11/21/2003	DS

U = Below Laboratory Detection Limit

Soil results are reported in dry weight

All Analysis were performed using EPA, ASTM, USGS or Standard Methods.
CompQAP #960152 EPA #FL01040 HRS #E86546
NELAC Certified

Respectfully Submitted,

Pam Shore
Quality Assurance Director

Jupiter

Environmental Laboratories, Inc.

Client # 1061
Address: Ardaman & Associates, W.P.B.
2511 Westgate Ave., #10
West Palm Beach, FL 33409
Attn: Samantha Webb

Page: 4 of 4
Date: 12/1/2003
Log # 10024-04

Sample Description: COC # 15724
Project # 03-2197
Location: Indiantown Reservoir
Matrix: Water

Label: W-5B
Date Sampled: 11/18/2003
Date Received: 11/18/2003 4:48:00
Collected By: Client

Description	Results	Units	Method	Dilution Factor	Detection Limit	Extraction Date	Analysis Date	Analyst
EPA Method 350.3 in Water								
Ammonia-N	0.620	mg/L	/350.3	1	0.1	11/24/2003	11/24/2003	ESC
Arsenic by ICP-MS								
Arsenic	U	mg/L	3010A/200.8	1	0.0028	11/21/2003	11/21/2003	DS
Cadmium by ICP-MS								
Cadmium	U	mg/L	3010A/200.8	1	0.0002	11/21/2003	11/21/2003	DS
Copper by ICP-MS								
Copper	0.002	mg/L	3010A/200.8	1	0.0012	11/21/2003	11/21/2003	DS
EPA Method 130.2 in Water								
Hardness, Total	370	mg/L	/130.2	1	1	11/19/2003	11/19/2003	ESC
Lead by ICP-MS								
Lead	U	mg/L	3010A/200.8	1	0.001	11/21/2003	11/21/2003	DS
Kjeldahl Nitrogen, TKN								
Kjeldahl Nitrogen, TKN	1.70	mg/L	/351.2	1	0.5	11/20/2003	11/20/2003	ESC
Zinc by ICP-MS								
Zinc	0.006	mg/L	3010A/200.8	1	0.002	11/21/2003	11/21/2003	DS

U = Below Laboratory Detection Limit

Soil results are reported in dry weight

All Analysis were performed using EPA, ASTM, USGS or Standard Methods.
CompQAP #960152 EPA #FL01040 HRS #E86546
NELAC Certified

Respectfully Submitted,

Pam Shore
Quality Assurance Director

Chain of Custody Record

BAR CODE

LAB USE ONLY

J.E.L. Log # 10024

P.O. #

Quote#

Jupiter Environmental Laboratories

Company Name: Ardaman & Associates
Address: 2511 Westgate Ave
City: WPB State: FL Zip: 3347
Sampling Site Address: Indiantown
Attn: swebb Fax/Email: swebb@ardaman
Project Name: Trap Indiantown Reservoir Project #: 03-2147
Sampler Name/Signature: [signature]

LAB ANALYSIS

#	Sample Label (Client ID)	Collected Date	Collected Time	Matrix Code*	# of Cont	Pres Codes	copper, Cadmium, Lead, Zinc, Arsenic	Hardness	Nitrogen (TKN)	TKN (Total Kjeldahl Nitrogen)	Ammonia							Field Filtered (Y/N)	Integrity OK (Y/N)	Chain-2 Comments
1	W-1B	11/17/03	1155	GW	6 (7)		X	X		X	X									
2	W-3B	↓	1335	GW	6		X	X		X	X									
3	W-3A		1409	GW	6		X	X		X	X									coold not get turbidity down well. Ied to go
4	W-5B		1338	GW	6		X	X		X	X									SW
5																				
6																				
7																				
8																				
9																				
0																				

Matrix Codes*
S Soil/Solid Sediment; SW Surface Water; GW Ground Water; SL Sludge; WW Waste Water; O Other (Please Specify); DW Drinking Water

Pres Codes
A- none; B- HNO_3; C- H_2SO_4; D- NaOH; E- HCl; I- Ice; O- Other; M- MeOH

Relinquished by	Date	Time	Received by	Date	Time
[signature]	11/17/03	1648	[signature]	11/17/03	1648

QA/QC level with report
None X 1___ 2___ 3___ See price guide for applicable fees

T.A.T. Request: X Standard ___ Rush
FDEP___ SFWMD___ Date Required ______

Temp Control: Ice °C

ORIGINAL

Jupiter Environmental Laboratories, Inc.
150 Old Dixie Highway, Jupiter, FL 33458
(561) 575-0030 • Fax (561) 575-4118 • jupiterlabs@bellsouth.net

Page 1 of 1

C.O.C.# 157_4

Jupiter
Environmental Laboratories, Inc.

Client # 1061
Address: Ardaman & Associates, W.P.B.
2511 Westgate Ave., #10
West Palm Beach, FL 33409
Attn: Samantha Webb

Page: 1 of 2
Date: 11/26/2003
Log # 10030-01

Sample Description: COC # 16040
Project # 03-2197
Location: Indiantown Reservoir
Matrix: Water

Label: W-2B
Date Sampled: 11/18/2003
Date Received: 11/18/2003 2:35:00
Collected By: Client

Description	Results	Units	Method	Dilution Factor	Detection Limit	Extraction Date	Analysis Date	Analyst
SM4500B in Water								
Chloride	73.0	mg/L	/SM4500B	1	1	11/25/2003	11/25/2003	ESC
Iron by ICP-MS								
Iron	6.38	mg/L	3010A/200.8	1	0.03	11/24/2003	11/24/2003	DS
Manganese by ICP-MS								
Manganese	0.158	mg/L	3010A/200.8	1	0.005	11/24/2003	11/24/2003	DS
Mercury by Cold Vapor AA								
Mercury	U	mg/L	3010A/245.1	1	0.001	11/24/2003	11/24/2003	DS
EPA Method 353.2 in Water								
Nitrate-N	U	mg/L	/353.2	1	0.01	11/25/2003	11/25/2003	ESC
EPA Method 354.1 in Water								
Nitrite-N	U	mg/L	/354.1	1	0.01	11/25/2003	11/25/2003	ESC
hosphate-Ortho								
Phosphate-Ortho	0.067	mg/L	/365.2	1	0.025	11/19/2003	11/19/2003	ESC
Phosphate-Ortho Diss								
Phosphate-Ortho	U	mg/L	/365.2	1	0.025	11/19/2003	11/19/2003	ESC

U = Below Laboratory Detection Limit

Soil results are reported in dry weight

All Analysis were performed using EPA, ASTM, USGS or Standard Methods.
CompQAP #960152 EPA #FL01040 HRS #E86546
NELAC Certified

Respectfully Submitted,

Pam Shore
Quality Assurance Director

Jupiter

Environmental Laboratories, Inc.

Client # 1061
Address: Ardaman & Associates, W.P.B.
2511 Westgate Ave., #10
West Palm Beach, FL 33409
Attn: Samantha Webb

Page: 2 of 2
Date: 11/26/2003
Log # 10030-02

Sample Description: COC # 16040
Project # 03-2197
Location: Indiantown Reservoir
Matrix: Water

Label: W-4B
Date Sampled: 11/18/2003
Date Received: 11/18/2003 2:35:00
Collected By: Client

Description	Results	Units	Method	Dilution Factor	Detection Limit	Extraction Date	Analysis Date	Analyst
SM4500B in Water								
Chloride	60.0	mg/L	/SM4500B	1	1	11/25/2003	11/25/2003	ESC
Iron by ICP-MS								
Iron	10.9	mg/L	3010A/200.8	1	0.03	11/24/2003	11/24/2003	DS
Manganese by ICP-MS								
Manganese	0.406	mg/L	3010A/200.8	1	0.005	11/24/2003	11/24/2003	DS
Mercury by Cold Vapor AA								
Mercury	U	mg/L	3010A/245.1	1	0.001	11/24/2003	11/24/2003	DS
EPA Method 353.2 in Water								
Nitrate-N	U	mg/L	/353.2	1	0.01	11/25/2003	11/25/2003	ESC
EPA Method 354.1 in Water								
Nitrite-N	U	mg/L	/354.1	1	0.01	11/25/2003	11/25/2003	ESC
Phosphate-Ortho								
Phosphate-Ortho	0.130	mg/L	/365.2	1	0.025	11/19/2003	11/19/2003	ESC
Phosphate-Ortho Diss								
Phosphate-Ortho	U	mg/L	/365.2	1	0.025	11/19/2003	11/19/2003	ESC

U = Below Laboratory Detection Limit

Soil results are reported in dry weight

All Analysis were performed using EPA, ASTM, USGS or Standard Methods.
CompQAP #960152 EPA #FL01040 HRS #E86546
NELAC Certified

Respectfully Submitted,

Pam Shore
Quality Assurance Director

BAR CODE

Chain of Custc Record

LAB USE ONLY

A

J.E.L. Log # 31

P.O. #

Quote#

Jupiter Environmental Laboratories

Company Name: Ardaman & Associates

Address: 2571 Westgate Ave

City: WPB State: FL Zip: 33409

Sampling Site Address: Indiantown

Attn: S Webb Fax/Email: SWebb@ardamanassoc

Project Name: Trop Indiantown Reservoir Project #: 03-2197

Sampler Name/Signature:

LAB ANALYSIS

#	Sample Label (Client ID)	Collected Date	Collected Time	Matrix Code*	# of Cont	Parameters	Copper, Cadmium, Lead, Zinc, Arsenic	Hardness	TKN	Ammonia	Field Filtered (Y/N)	Integrity OK (Y/N)
1	W-2B	11/18/03	1103	GW	6		X	X	X	X		
2	W-4B	11/18/03	1248	GW	4		X	X	X	X		
3												
4												
5												
6												
7												
8												
9												
10												

chain-2

Comments

ORIGINAL

Matrix Codes*

S	Soil/Solid Sediment	SW	Surface Water
GW	Ground Water	SL	Sludge
WW	Waste Water	O	Other (Please Specify)
DW	Drinking Water		

Pres Codes**

A-	none	I-	Ice
B-	HNO_3	O-	Other
C-	H_2SO_4	M-	MeOH
D-	NaOH		
E-	HCl		

Relinquished by	Date	Time	Received by	Date	Time

QA/QC level with report

None ___1___2___3___ See price guide for applicable fees

T.A.T. Request: Standard / Rush

FDEP___ SFWMD___ Date Required ___

Temp Control: Ice °C

Page 1 of 1

Jupiter Environmental Laboratories, Inc.
150 Old Dixie Highway, Jupiter, FL 33458
(561) 575-0030 • Fax (561) 575-4118 • jupiterlabs@bellsouth.net

C.O.C.# 15725

Jupiter
Environmental Laboratories, Inc.

Client # 1061
Address: Ardaman & Associates, W.P.B.
2511 Westgate Ave., #10
West Palm Beach, FL 33409
Attn: Samantha Webb

Page: 1 of 2
Date: 11/26/2003
Log # 10031-01

Sample Description: COC # 15725
Project # 03-2197
Location: Indiantown Reservoir
Matrix: Water

Label: W-2B
Date Sampled: 11/18/2003
Date Received: 11/18/2003 2:35:00
Collected By: Client

Description	Results	Units	Method	Dilution Factor	Detection Limit	Extraction Date	Analysis Date	Analyst
EPA Method 350.3 in Water								
Ammonia-N	0.230	mg/L	/350.3	1	0.1	11/24/2003	11/24/2003	ESC
Arsenic by ICP-MS								
Arsenic	U	mg/L	/200.8	1	0.0028	11/24/2003	11/24/2003	DS
Cadmium by ICP-MS								
Cadmium	U	mg/L	/200.8	1	0.0002	11/24/2003	11/24/2003	DS
Copper by ICP-MS								
Copper	U	mg/L	/200.8	1	0.0012	11/24/2003	11/24/2003	DS
EPA Method 130.2 in Water								
Hardness, Total	530	mg/L	/130.2	5	5	11/19/2003	11/19/2003	ESC
Lead by ICP-MS								
Lead	U	mg/L	/200.8	1	0.001	11/24/2003	11/24/2003	DS
Kjeldahl Nitrogen, TKN								
Kjeldahl Nitrogen, TKN	1.60	mg/L	/351.2	1	0.5	11/20/2003	11/20/2003	ESC
Zinc by ICP-MS								
Zinc	U	mg/L	/200.8	1	0.002	11/24/2003	11/24/2003	DS

U = Below Laboratory Detection Limit

Soil results are reported in dry weight

All Analysis were performed using EPA, ASTM, USGS or Standard Methods.
CompQAP #960152 EPA #FL01040 HRS #E86546
NELAC Certified

Respectfully Submitted,

Pam Shore
Quality Assurance Director

Jupiter
Environmental Laboratories, Inc.

Client # 1061
Address: Ardaman & Associates, W.P.B.
2511 Westgate Ave., #10
West Palm Beach, FL 33409
Attn: Samantha Webb

Page: 2 of 2
Date: 11/26/2003
Log # 10031-02

Sample Description: COC # 15725
Project # 03-2197
Location: Indiantown Reservoir
Matrix: Water

Label: W-4B
Date Sampled: 11/18/2003
Date Received: 11/18/2003 2:35:00
Collected By: Client

Description	Results	Units	Method	Dilution Factor	Detection Limit	Extraction Date	Analysis Date	Analyst
EPA Method 350.3 in Water								
Ammonia-N	0.130	mg/L	/350.3	1	0.1	11/24/2003	11/24/2003	ESC
Arsenic by ICP-MS								
Arsenic	U	mg/L	/200.8	1	0.0028	11/24/2003	11/24/2003	DS
Cadmium by ICP-MS								
Cadmium	U	mg/L	/200.8	1	0.0002	11/24/2003	11/24/2003	DS
Copper by ICP-MS								
Copper	0.002	mg/L	/200.8	1	0.0012	11/24/2003	11/24/2003	DS
EPA Method 130.2 in Water								
Hardness, Total	510	mg/L	/130.2	5	5	11/19/2003	11/19/2003	ESC
Lead by ICP-MS								
Lead	U	mg/L	/200.8	1	0.001	11/24/2003	11/24/2003	DS
Jeldahl Nitrogen, TKN								
Jeldahl Nitrogen, TKN	2.40	mg/L	/351.2	1	0.5	11/20/2003	11/20/2003	ESC
Zinc by ICP-MS								
Zinc	0.002	mg/L	/200.8	1	0.002	11/24/2003	11/24/2003	DS

U = Below Laboratory Detection Limit

Soil results are reported in dry weight

All Analysis were performed using EPA, ASTM, USGS or Standard Methods.
CompQAP #960152 EPA #FL01040 HRS #E86546
NELAC Certified

Respectfully Submitted,

Pam Shore
Quality Assurance Director

BAR CODE

Chain of Custody Record

LAB USE ONLY

J.E.L. Log # 16036

P.O. #

Quote#

Jupiter Environmental Laboratories

Company Name: Ardaman & Associates

Address: 2971 Westgate Ave

City: WPB State: FL Zip: 33409

Sampling Site Address: Indiantown

Attn: Snebb Fax/Email: Snebb@ardaman

Project Name: The Indiantown Reserve Project #: 03-2197

Sampler Name/Signature:

#	Sample Label (Client ID)	Collected Date	Collected Time	Matrix Code*	# of Cont	Press Codes	Parameters: Iron, Manganese	Chloride	Total + Dissolved Phosphorus	N, Nitrite + Nitrate	Field Filtered (Y/N)	Integrity OK (Y/N)
1	W-2B	11/18/03	1103	GW	6	B	X	X	X	X		
2	W-4B	11/18/03	1248	GW	6		X	X	X	X		
3												
4												
5												
6												
7												
8												
9												
10												

LAB ANALYSIS

Chain - 1

Comments

ORIGINAL

Matrix Codes*

S Soil/Solid Sediment; GW Ground Water; WW Waste Water; DW Drinking Water; SW Surface Water; SL Sludge; O Other (Please Specify)

Pres Codes**

A- none; B- HNO_3; C- H_2SO_4; D- NaOH; E- HCl; I- Ice; O- Other; M- MeOH

Relinquished by	Date	Time	Received by	Date	Time
	11/19			11/19/03	1435

QA/QC level with report

None ___1___2___3___ See price guide for applicable fees

T.A.T. Request: ___ Standard; ___ Rush

FDEP___ SFWMD___ Date Required _____

Temp Control: Ice °C

Jupiter Environmental Laboratories, Inc.
150 Old Di[illegible]ighway, Jupiter, FL 33458
(561) 575-0030 • Fax (.[illegible]575-4118 • jupiterlabs@bellsouth.net

C.O.C.# 16[illegible]

Troup-Indiantown
File Number 02-2197
December 11, 2003

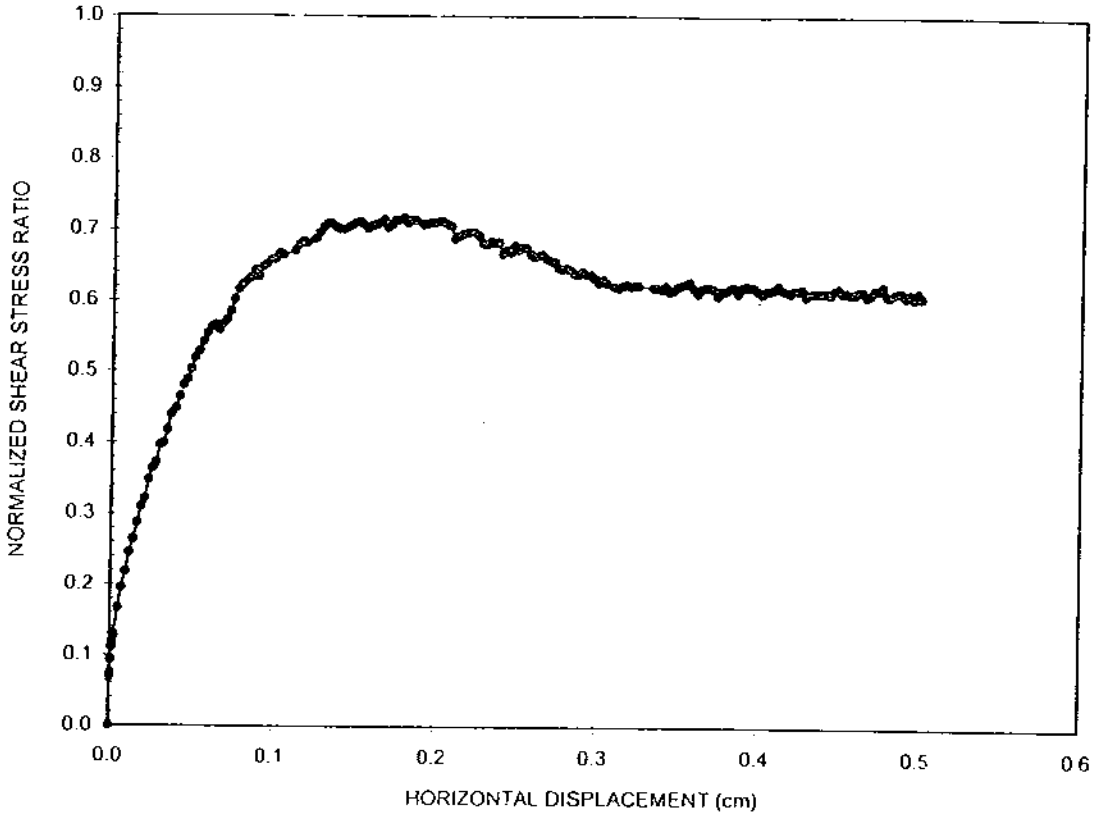
Table 1

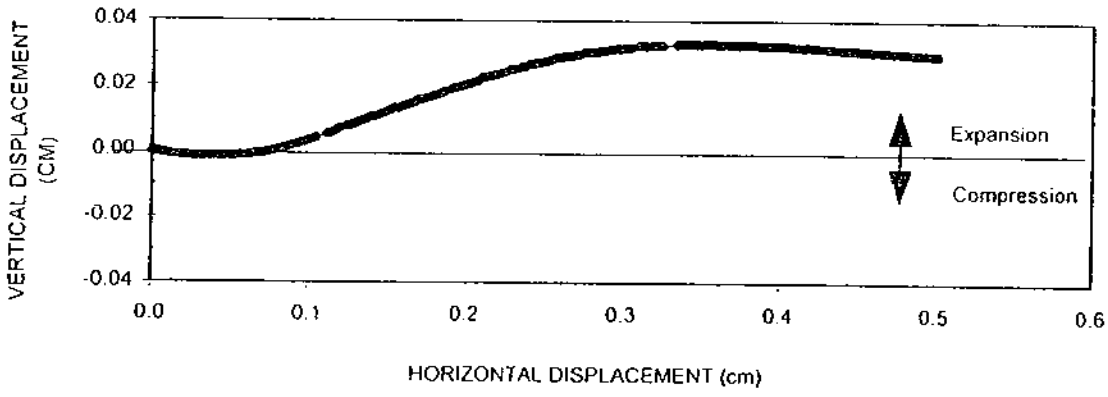
SUMMARY OF RESULTS FROM DIRECT SHEAR TESTS

Sample	Specimen No	Initial Conditions					σ'_n (kg/cm²)	Pre-Shear Conditions		Final Condition		Shear Stress (kg/cm²)		ϕ'_p	ϕ'_{ecv}	-200 (%)
		H (cm)	D (cm)	w_c (%)	γ_d (lb/ft³)	S (%)		ε_v (%)	γ_d (lb/ft³)	w_c (%)	γ_d (lb/ft³)	τ_p	τ_{ecv}			
B-11, US-1 9.0 - 11.5 ft	1	2.78	5.83	15.1	113.6	85	0.24	-1.01	114.8	16.2	113.6	0.176	0.148	35.7°	31.2°	15.1
	2	2.78	5.83	14.9	116.7	92	0.37	-1.21	116.2	15.7	116.5	0.255	0.231	34.8°	32.2°	15.8
	3	2.78	5.83	16.6	114.7	97	0.49	-1.54	116.5	16.6	115.7	0.311	0.267	32.4°	28.5°	17.2

Where: H = Specimen thickness; D = Specimen diameter; w_c = Moisture content; γ_d = Dry density; S = Calculated degree of saturation using an assumed specific gravity of 2.68; σ'_n = Applied normal stress; ε_v = Vertical strain under applied normal stress (-denotes consolidation and +denotes expansion); τ_p = Peak shear stress; τ_{ecv} = Shear stress at end of test; ϕ'_p = Peak friction angle assuming zero cohesion; ϕ'_{ecv} = Friction angle at end of test assuming zero cohesion; and -200 = Fines content.

C:\WPDOCS\Indiantown table.wpd





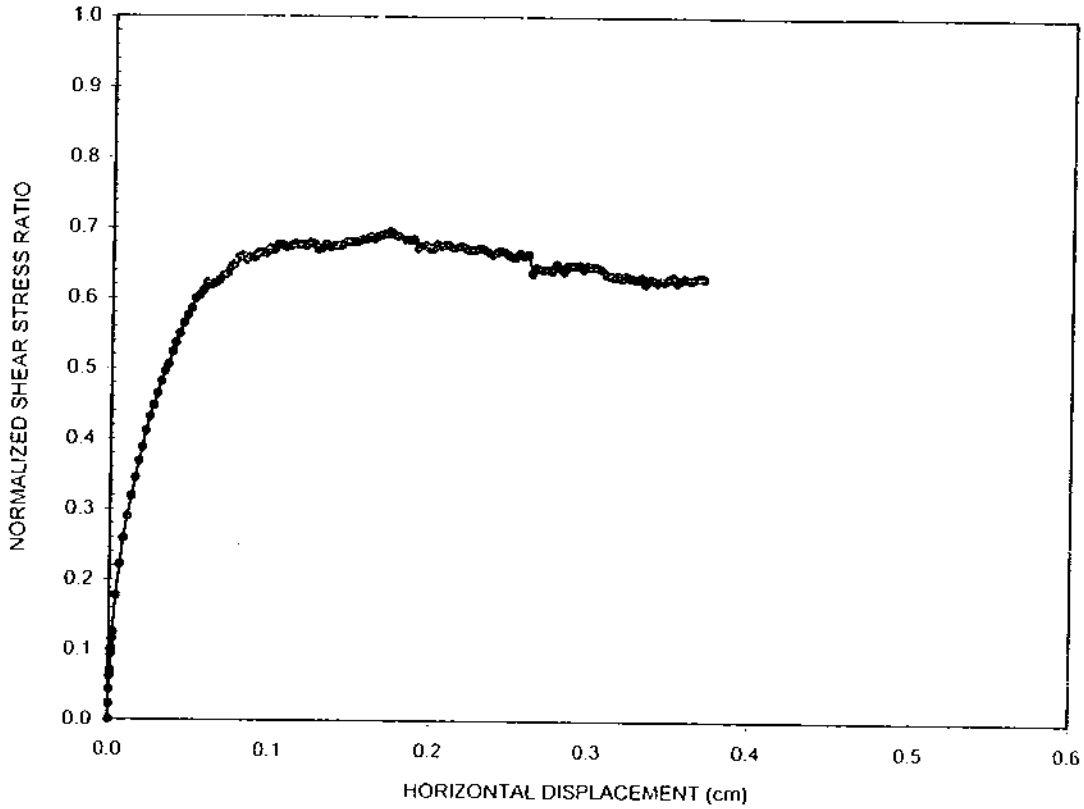
DIRECT SHEAR TEST

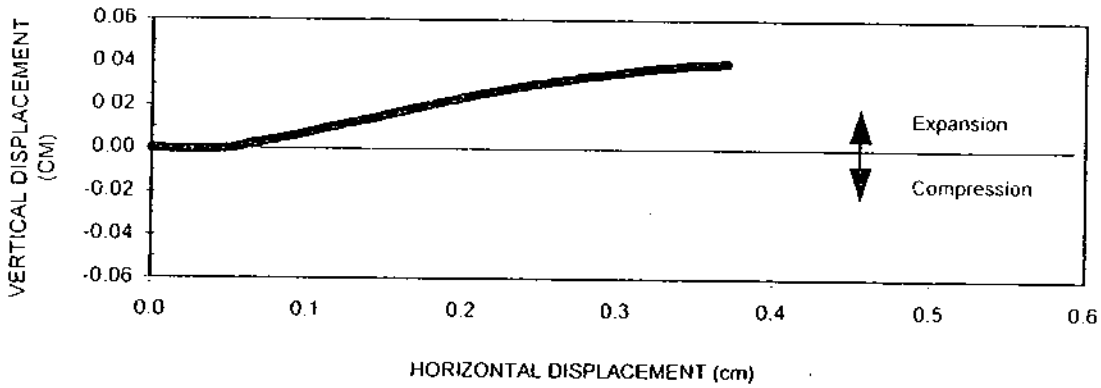
Sample Name	B-11, US-1, 9 - 11.5 FT
Normal Stress (kg/cm^2)	0.24
Displacement Rate (cm/min)	0 0005

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

TROUP - INDIANTOWN

DRAWN BY: SA	CHECKED BY: SA	DATE: 12-10-03
FILE NO: 03-2197	APPROVED BY	FIGURE: 1



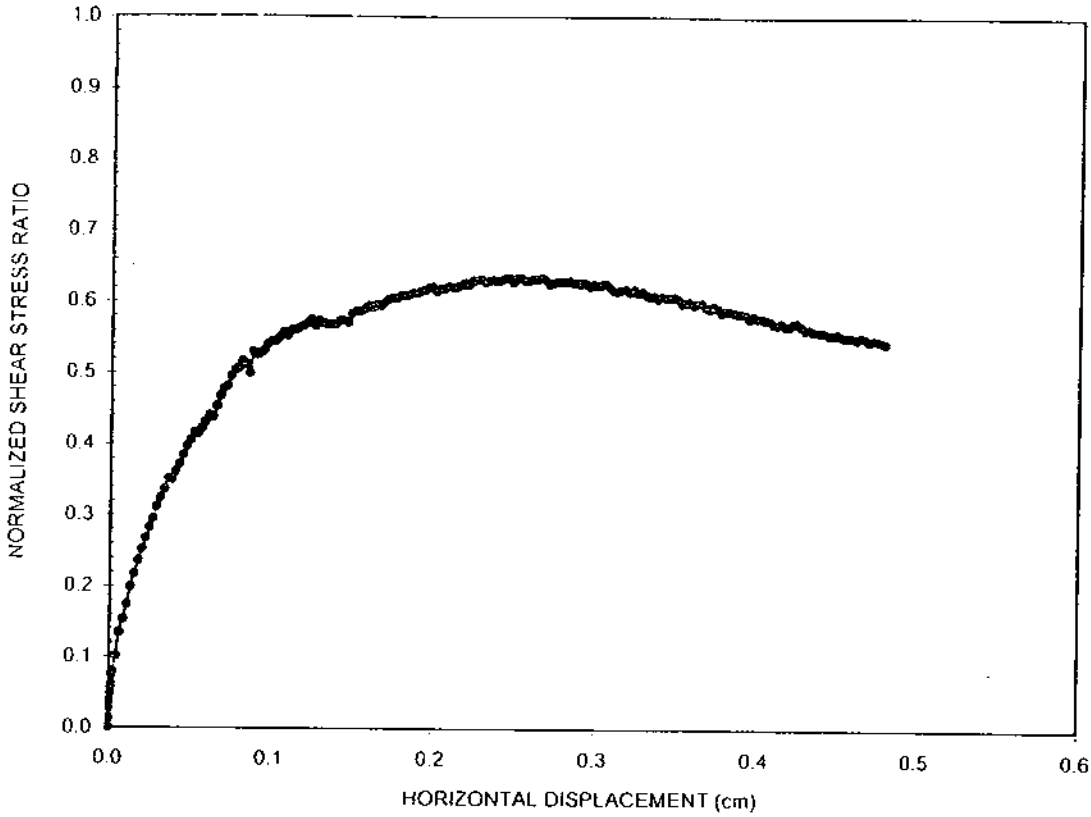


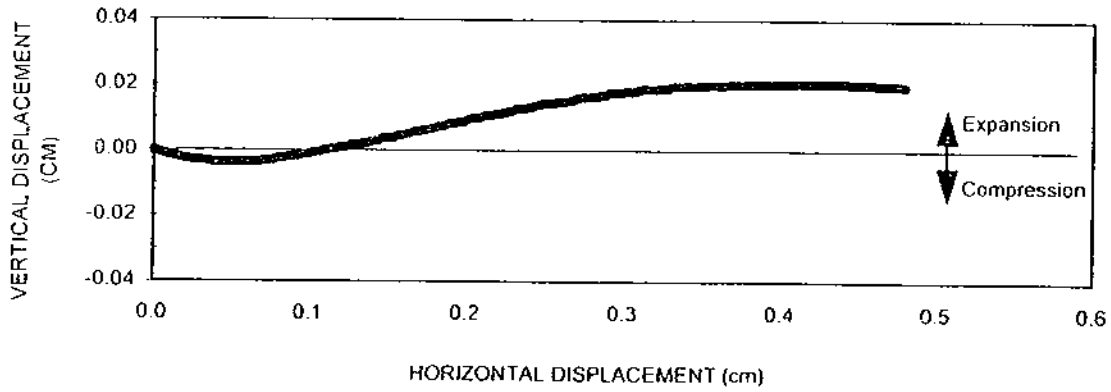
Sample Name	B-11, US-1, 9 - 11.5 FT.
Normal Stress (kg/cm^2)	0.37
Displacement Rate (cm/min)	0.0005

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

TROUP - INDIANTOWN

DRAWN BY: SA	CHECKED BY: SA	DATE: 12-10-03
FILE NO.: 03-2197	APPROVED BY:	FIGURE: 2



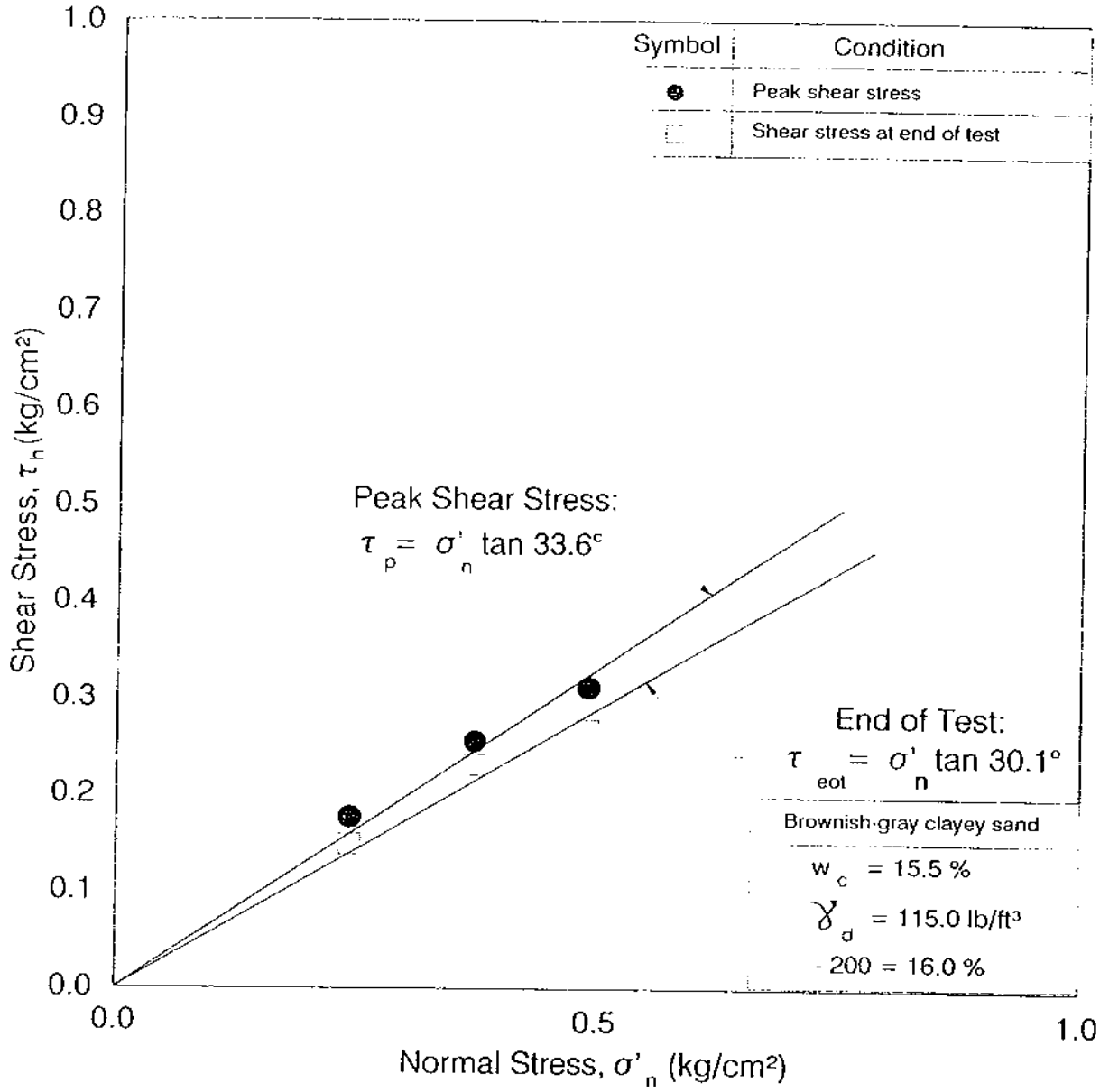


Sample Name	B-11, US-1, 9 - 11.5 FT
Normal Stress (kg/cm^2)	0.49
Displacement Rate (cm/min)	0.0005

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

TROUP - INDIANTOWN

DRAWN BY: SA	CHECKED BY: SA	DATE: 12-10-03
FILE NO. 03-2197	APPROVED BY	FIGURE 3



MOHR-COULOMB FAILURE ENVELOPE FROM

DIRECT SHEAR TESTS ON B-11, US-1, 9.0 - 11.5 FT

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

TROUP - INDIANTOWN

DRAWN BY: SA	CHECKED BY: SA	DATE: 12/10/03
FILE NO.: 03-2197	APPROVED BY:	FIGURE: 4

Regression Analysis

File No. 03-2197 Indiantown

Direc shear Tests B-11, US-1, 9.0 - 11.5 ft

At peak

Sigma Nor	Tau
0.24	0.176
0.37	0.255
0.49	0.311

Regression Output:

Constant		0.048989	
Std Err of Y Est		0.007183	
R Squared		0.994392	
No. of Observations		3	
Degrees of Freedom		1	
X Coefficient(s)	0.540938	1	
Std Err of Coef.	0.040624	ERR	

c' *0.05*

ϕ' 28.4

At peak (Intercept constrained to zero)

Sigma Nor	Tau
0.24	0.176
0.37	0.255
0.49	0.311

Regression Output:

Constant		0
Std Err of Y Est		0.016876
R Squared		0.938093
No. of Observations		3
Degrees of Freedom		2
X Coefficient(s)	0.664933	
Std Err of Coef	0.025599	

c' *0.00*

ϕ' 33.6

At End of Test

Sigma Nor	Tau
0.24	0.148
0.37	0.231
0.49	0.267

Regression Output:

Constant		0 039974	
Std Err of Y Est		0.01724	
R Squared		0 960099	
No. of Observations		3	
Degrees of Freedom		1	
X Coefficient(s)	0.478252		
Std Err of Coef.	0.097497		

c' *0.04*

ϕ' 25.6

At End of Test (Intercept constrained to zero)

Sigma Nor	Tau
0.24	0.148
0.37	0.231
0.49	0.267

Regression Output:

Constant		0
Std Err of Y Est		0.017918
R Squared		0.913797
No. of Observations		3
Degrees of Freedom		2
X Coefficient(s)	0.579429	
Std Err of Coef.	0.027179	

c' *0.00*

ϕ' 30.1

Ardaman & Associates, Inc.

ATTERBERG LIMITS WORKSHEET

File No. 03-2197

Project Identification INDIAN TOWN

Sample Identification B-11 US1 9.0' - 11.5'

Sample Description BROWNISH GRAY CLAYEY SAND

Set-UpDate 11/4/03
Technician WAW
Checked By SA
Date

Sample Preperation:

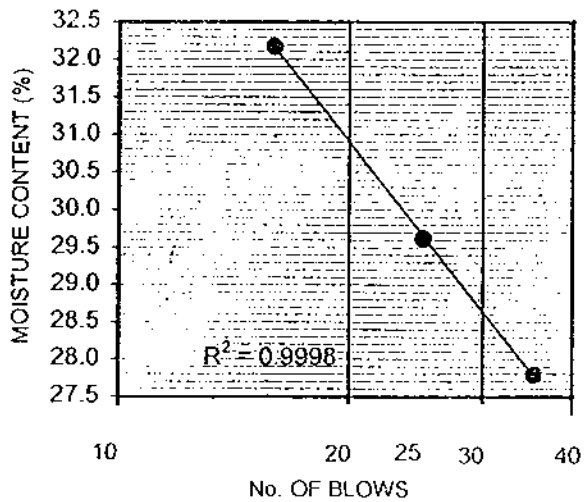
Plus No.40 Material Removed: BY SIEVE
Specimen Dried : No
Specimen Hydrated For: >16HRS AT >LL

ITEM	As-Received	Plastic-1	Plastic-2	Liquid-1	Liquid-2	Liquid-3
Tare No.	57	440	442	101	717	609
WWS+Tare(g)	97.48	43.35	43.55	42.71	35.49	42.18
WDS+Tare(g)	88.41	40.85	41.18	40.47	33.04	39.69
WW (g)	9.07	2.50	2.37	2.24	2.45	2.49
Wt Tare (g)	24.49	32.05	32.79	32.41	24.77	31.95
WDS (g)	63.92	8.80	8.39	8.06	8.27	7.74
NM (%)	14.2	28.4	28.2	27.8	29.6	32.2
No. of Blows	x	x	x	35	25	16
One Point Correlation				29	30	30

SUMMARY OF RESULTS

MOISTURE CONTENT, NM	14.2
LIQUID LIMIT, LL	30
PLASTIC LIMIT, PL	28
PLASTICITY INDEX, PI	2
LIQUIDITY INDEX, LI	
UNIFIED SOIL CLASSIFICATION	SM

-200 = 18.0%



LIQUID LIMIT FLOW CURVE

Ardaman & Associates, Inc.

ATTERBERG LIMITS WORKSHEET

File No. 03-2197

Project Identification INDIAN TOWN

Sample Identification B-12 US2 7.0' - 9.5'

Sample Description GREENISH BROWN CLAYEY SAND

Set-UpDate 11/4/03
Technician WAW
Checked By SK
Date

Sample Preperation:

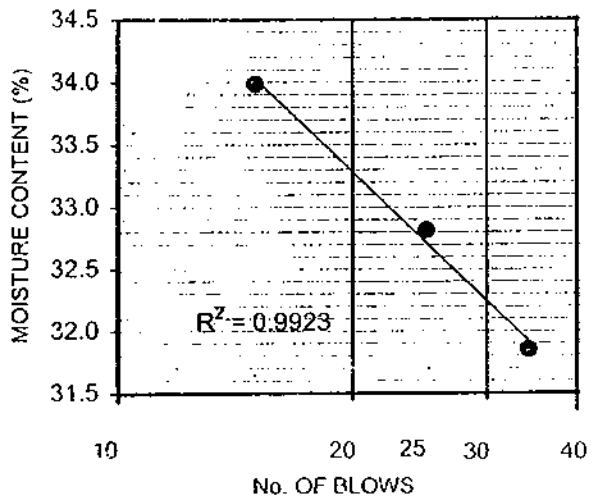
Plus No.40 Material Removed: BY SIEVE
Specimen Dried : No
Specimen Hydrated For: >16HRS AT >LL

ITEM	As-Received	Plastic-1	Plastic-2	Liquid-1	Liquid-2	Liquid-3
Tare No.	703	AF-4	AF-16	58	69	79
WWS+Tare(g)	101.65	43.81	42.38	42.65	35.03	42.20
WDS+Tare(g)	92.50	42.17	41.03	40.14	32.48	39.60
WW (g)	9.15	1.64	1.35	2.51	2.55	2.60
Wt Tare (g)	31.65	32.11	32.29	32.26	24.71	31.95
WDS (g)	60.85	10.06	8.74	7.88	7.77	7.65
NM (%)	15.0	16.3	15.4	31.9	32.8	34.0
No. of Blows	x	x	x	34	25	15
One Point Correlation				33	33	32

SUMMARY OF RESULTS

MOISTURE CONTENT, NM	15.0
LIQUID LIMIT, LL	33
PLASTIC LIMIT, PL	16
PLASTICITY INDEX, PI	17
LIQUIDITY INDEX, LI	0.0
UNIFIED SOIL CLASSIFICATION	SC

-200 : 21.7



LIQUID LIMIT FLOW CURVE

Ardaman & Associates, Inc.

ATTERBERG LIMITS WORKSHEET

File No. 03-2197

Project Identification INDIAN TOWN

Sample Identification B2O US3 8.0' - 10.5'

Sample Description LIGHT BROWN CLAYEY FINE SAND TRACE PLANT MATERIAL

Set-UpDate 11/11/03
Technician WAW
Checked By SK
Date

Sample Preperation:

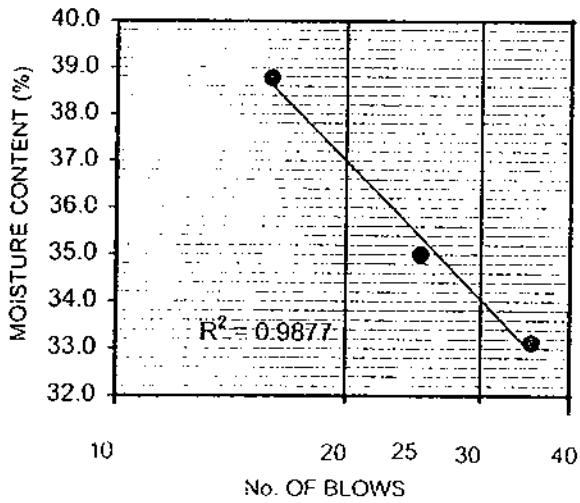
Plus No.40 Material Removed: BY SIEVE
Specimen Dried : No
Specimen Hydrated For: >16HRS AT >LL

ITEM	As-Received	Plastic-1	Plastic-2	Liquid-1	Liquid-2	Liquid-3
Tare No.	485	78	87	A-2	B-21	C-25
WWS+Tare(g)	78.87	41.85	35 04	43.67	42.39	41.72
WDS+Tare(g)	71.26	40.74	33.95	40.92	39.67	38.73
WW (g)	7.61	1.11	1.09	2.75	2.72	2.99
Wt Tare (g)	24.71	31.59	24.86	32.62	31.90	31.02
WDS (g)	46.55	9.15	9.09	8.30	7.77	7.71
NM (%)	16.3	12.1	12.0	33.1	35.0	38.8
No. of Blows	x	x	x	35	25	16
One Point Correlation				35	35	37

SUMMARY OF RESULTS

MOISTURE CONTENT, NM	16.3
LIQUID LIMIT, LL	36
PLASTIC LIMIT, PL	12
PLASTICITY INDEX, PI	24
LIQUIDITY INDEX, LI	0.2
UNIFIED SOIL CLASSIFICATION	SC

-200 = 21.2%



LIQUID LIMIT FLOW CURVE

Ardaman & Associates, Inc.

ATTERBERG LIMITS WORKSHEET

File No. 03-2197

Project Identification INDIAN TOWN

Sample Identification B25 US4 B-3 7.0' - 9.5'

Sample Description BROWN CLAYEY FINE SAND

Set-UpDate 11/11/03
Technician WAW
Checked By SA
Date

Sample Preperation:

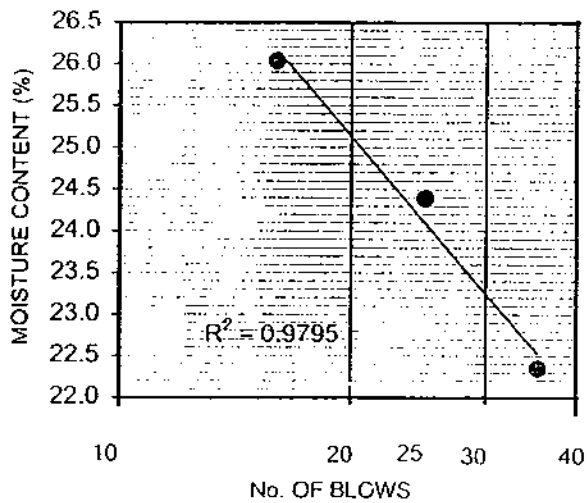
Plus No.40 Material Removed: BY SIEVE
Specimen Dried : No
Specimen Hydrated For: >16HRS AT >LL

ITEM	As-Received	Plastic-1	Plastic-2	Liquid-1	Liquid-2	Liquid-3
Tare No.	Y	111	444	P-7	P-12	P-14
WWS+Tare(g)	64.04	41.9	36.39	42.56	42.97	42.58
WDS+Tare(g)	59.80	40.72	34.96	40.66	40.95	40.51
WW (g)	4.24	1.18	1.43	1.90	2.02	2.07
Wt Tare (g)	30.95	31.89	25.28	32.16	32.67	32.56
WDS (g)	28.85	8.83	9.68	8.50	8.28	7.95
NM (%)	14.7	13.4	14.8	22.4	24.4	26.0
No. of Blows	x	x	x	35	25	16
One Point Correlation				23	24	25

SUMMARY OF RESULTS

MOISTURE CONTENT, NM	14.7
LIQUID LIMIT, LL	24
PLASTIC LIMIT, PL	14
PLASTICITY INDEX, PI	10
LIQUIDITY INDEX, LI	0.1
UNIFIED SOIL CLASSIFICATION	SC

-200 = 19.4%



LIQUID LIMIT FLOW CURVE

PERM BILITY TEST SUMMARY SHEET

File Number 03-2197
Project Indian Town
Sample B-11, US 1, 9-11.5 ft

Initial Specimen Conditions

Dimensions

D1	7.307 cm
D2	7.275 cm
D3	7.230 cm
D_{avg}	7.271 cm
Area	41.518 cm^2
L1	10.296 cm
L2	10.313 cm
L3	10.238 cm
L_{avg}	10.282 cm
V_i	426.905 cm^3

Trimming Moisture Content

WWS + Tare	156.61 g
WDS + Tare	141.22 g
Tare	30.75 g
w	13.9 %
WWS_i	919.03 g
G_s	2.68 (Assumed)

Physical Properties Based on WDS_f

WDS_f	805.10 g
S_i	90 %
e_i	0.42
n_i	0.30
w_i	14.2 %
γ_{di}	117.7 pcf

Final Specimen Conditions

Dimensions

D1	7.280 cm
D2	7.224 cm
D3	7.219 cm
D_{avg}	7.241 cm
Area	41.180 cm^2
L1	10.276 cm
L2	10.179 cm
L3	10.141 cm
L_{avg}	10.199 cm
V_f	419.983 cm^3

Final Moisture Content

WWS + Tare	1032.93 g
WDS + Tare	914.30 g
Tare	109.20 g
w_f	14.7 %
WWS_f	924.53 g

Physical Properties Based on WDS_f

WDS_f	805.10 g
S_f	100 %
e_f	0.40
n_f	0.28
w_f	14.7 %
γ_{df}	119.6 pcf
$(V_f - V_i)/V_i$	-1.6 % (Consolidation)

Permeabilty Test Conditions

Cell Pressure	190 psi
Inflow/Outflow Press $_{avg}$	183 psi
σ_c	7 psi
B-Factor	100 %
Head $_{avg}$	272 cm
i_{avg}	26.5

Retained on #200	679.12 g
-200	15.6 %

Hydraulic Conductivity

k_{20avg} 5.6E-06 cm/sec

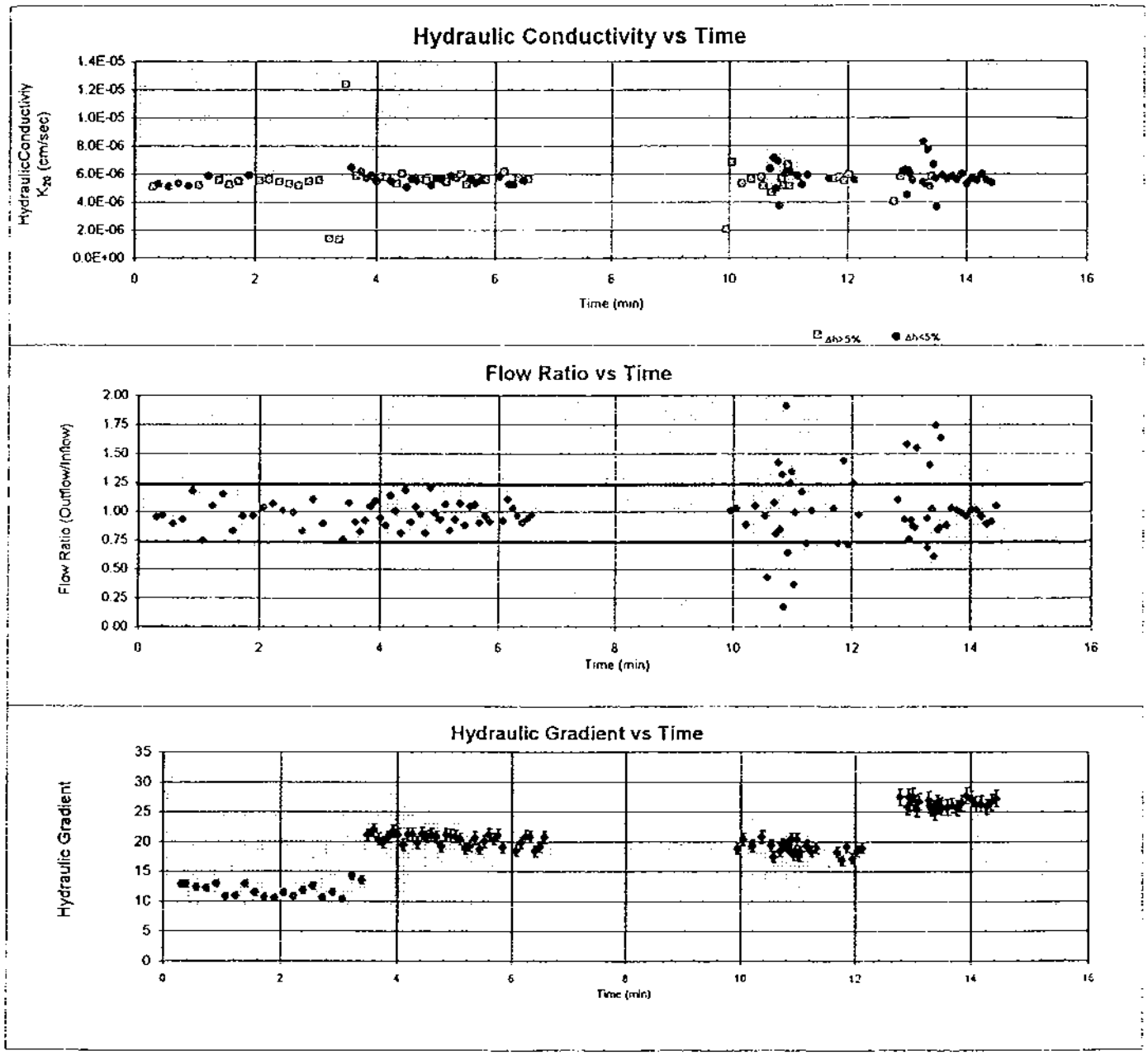
ARDAMAN & ASSOCIATES
Constant Head Permeability Test

Project Name:	INDIANTOWN
Project Number:	03-2197
Sample Name:	B11 US1 BL3
Depth:	9-11.5'
File Name:	C:\Dac-2\K-J-B11 US1 BL3.dat
Date Created:	11/10/03 9:25
Sensor Group:	PERM-J
Reading Schedule:	PERM1min
Maximum Readings:	120
Cell Number	T5
Station Number	J

Cell Pressure	190.0	psi
Inflow Pressure	184.0	psi
Outflow Pressure	182.0	psi

Initial Specimen Conditions

Wt Wet Soil	919.03	gms
Assumed Gs	2.70	
Wc	13.6	%
Yt	134.4	pcf
Yd	118.3	pcf
S	88	%
Vv	126.14	cc
e	0.429	
Sample Area	41.518	square cm
Sample Ht	10.28	cm



PERM .BILITY TEST SUMMARY SHEET

File Number 03-2197
Project Indian Town
Sample B-12, US-2, 7-9.5 ft

Initial Specimen Conditions

Dimensions

D1	7.295 cm
D2	7.304 cm
D3	7.257 cm
D_{avg}	7.285 cm
Area	41.686 cm^2
L1	10.364 cm
L2	10.330 cm
L3	10.343 cm
L_{avg}	10.346 cm
V_i	431.269 cm^3

Trimming Moisture Content

WWS + Tare	160.13 g
WDS + Tare	143.87 g
Tare	24.76 g
w	13.7 %
WWS_i	939.45 g
G_s	2.68 (Assumed)

Physical Properties Based on WDS_f

WDS_f	827.04 g
S_i	92 %
e_i	0.40
n_i	0.28
w_i	13.6 %
γ_{di}	119.7 pcf

Final Specimen Conditions

Dimensions

D1	7.282 cm
D2	7.256 cm
D3	7.238 cm
D_{avg}	7.259 cm
Area	41.381 cm^2
L1	10.337 cm
L2	10.311 cm
L3	10.306 cm
L_{avg}	10.318 cm
V_f	426.973 cm^3

Final Moisture Content

WWS + Tare	1106.49 g
WDS + Tare	993.21 g
Tare	166.17 g
w_f	13.7 %
WWS_f	941.04 g

Physical Properties Based on WDS_f

WDS_f	827.04 g
S_f	96 %
e_f	0.38
n_f	0.28
w_f	13.7 %
γ_{df}	120.9 pcf
$(V_f - V_i)/V_i$	-1.0 % (Consolidation)

Permeabilty Test Conditions

Cell Pressure	190 psi
Inflow/Outflow Press $_{avg}$	183 psi
σ'_c	7 psi
B-Factor	100 %
Head $_{avg}$	201 cm
i_{avg}	19.4

Retained on #200	672.27 g
-200	18.7 %

Hydraulic Conductivity

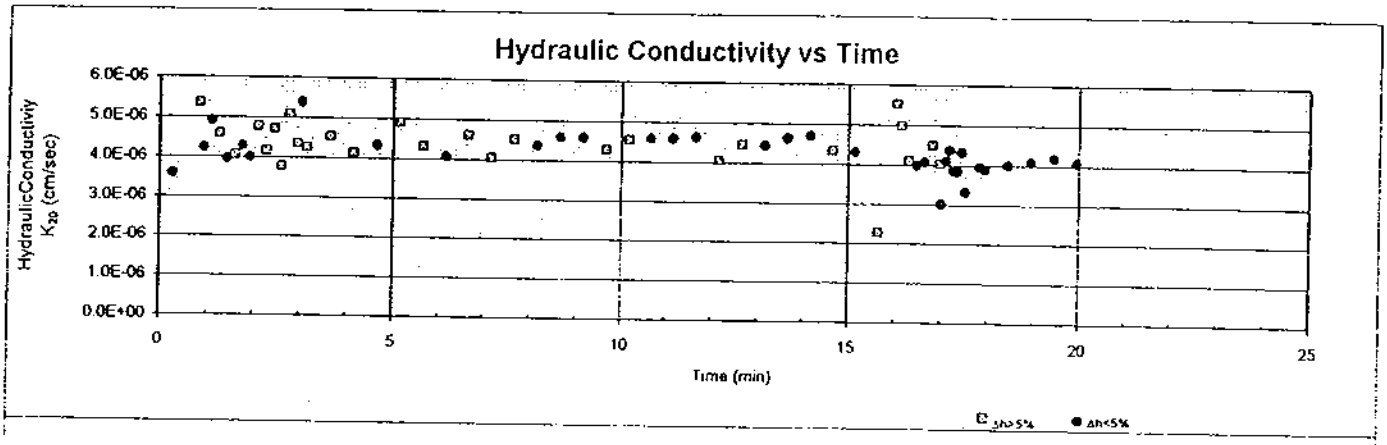
k_{20avg} 4.0E-06 cm/sec

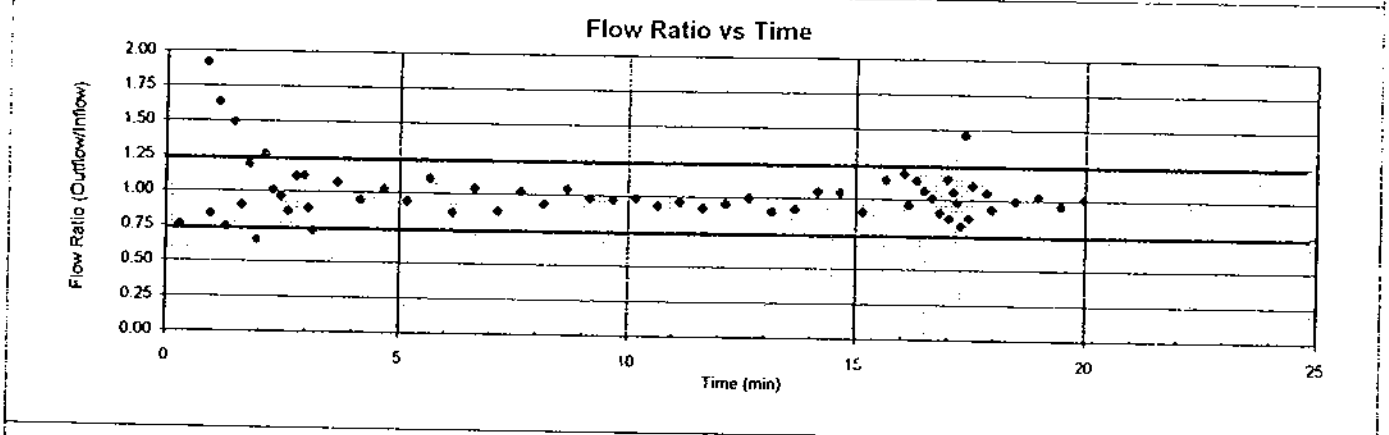
ARDAMAN & ASSOCIATES
Constant Head Permeability Test

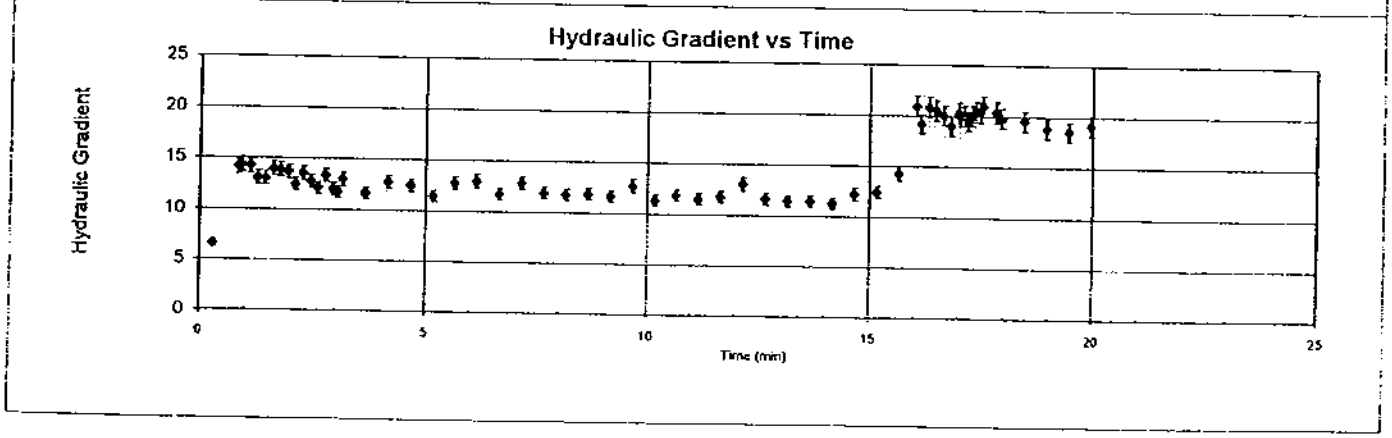
Project Name:	INDIANTOWN
Project Number:	03-2197
Sample Name:	B12 US2 BL3
Depth:	7-9.5
File Name:	C:\Dac-ZK-K-B12 US2 BL3.dat
Date Created:	11/10/03 9:43
Sensor Group:	PERM-K
Reading Schedule:	PERM1min
Maximum Readings:	120
Cell Number	T9
Station Number	K
Cell Pressure	190.0 psi
Inflow Pressure	184.0 psi
Outflow Pressure	182.0 psi

Initial Specimen Conditions

Wt Wet Soil	939.45	gms
Assumed Gs	2.70	
Wc	13.7	%
Yt	136.0	pcf
Yd	119.7	pcf
S	90	%
Vv	125.12	cc
e	0.409	
Sample Area	41.685	square cm
Sample Ht	10.35	cm







PERM ABILITY TEST SUMMARY SHEET

File Number 03-2197
Project Indian Town
Sample B-20, US-3, 8-10.5 ft

Initial Specimen Conditions

Dimensions

D1	7.350 cm
D2	7.256 cm
D3	7.335 cm
D_{avg}	7.314 cm
Area	42.011 cm^2
L1	10.308 cm
L2	10.287 cm
L3	10.275 cm
L_{avg}	10.290 cm
V_i	432.291 cm^3

Trimming Moisture Content

WWS + Tare	133.75 g
WDS + Tare	120.04 g
Tare	24.99 g
w	14.4 %
WWS_i	926.35 g
G_s	2.68 (Assumed)

Physical Properties Based on WDS_f

WDS_f	811.71 g
S_i	89 %
e_i	0.43
n_i	0.30
w_i	14.1 %
γ_{di}	117.2 pcf

Final Specimen Conditions

Dimensions

D1	7.250 cm
D2	7.294 cm
D3	7.144 cm
D_{avg}	7.229 cm
Area	41.048 cm^2
L1	10.180 cm
L2	10.233 cm
L3	10.225 cm
L_{avg}	10.213 cm
V_f	419.205 cm^3

Final Moisture Content

WWS + Tare	1041.23 g
WDS + Tare	928.02 g
Tare	116.31 g
w_f	13.9 %
WWS_f	925.56 g

Physical Properties Based on WDS_f

WDS_f	811.71 g
S_f	98 %
e_f	0.38
n_f	0.28
w_f	13.9 %
γ_{df}	120.8 pcf
$(V_f - V_i)/V_i$	-3.0 % (Consolidation)

Permeabilty Test Conditions

Cell Pressure	190 psi
Inflow/Outflow Press $_{avg}$	183 psi
σ'_c	7 psi
B-Factor	100 %
Head $_{avg}$	202 cm
i_{avg}	19.6

Retained on #200	639.46 g
-200	21.2 %

Hydraulic Conductivity

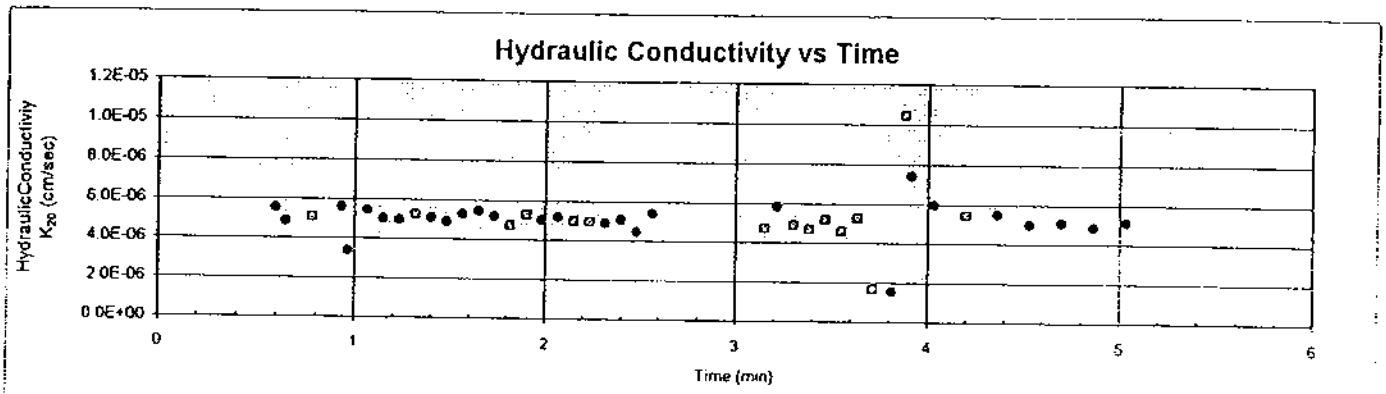
k_{20avg} 5.1E-06 cm/sec

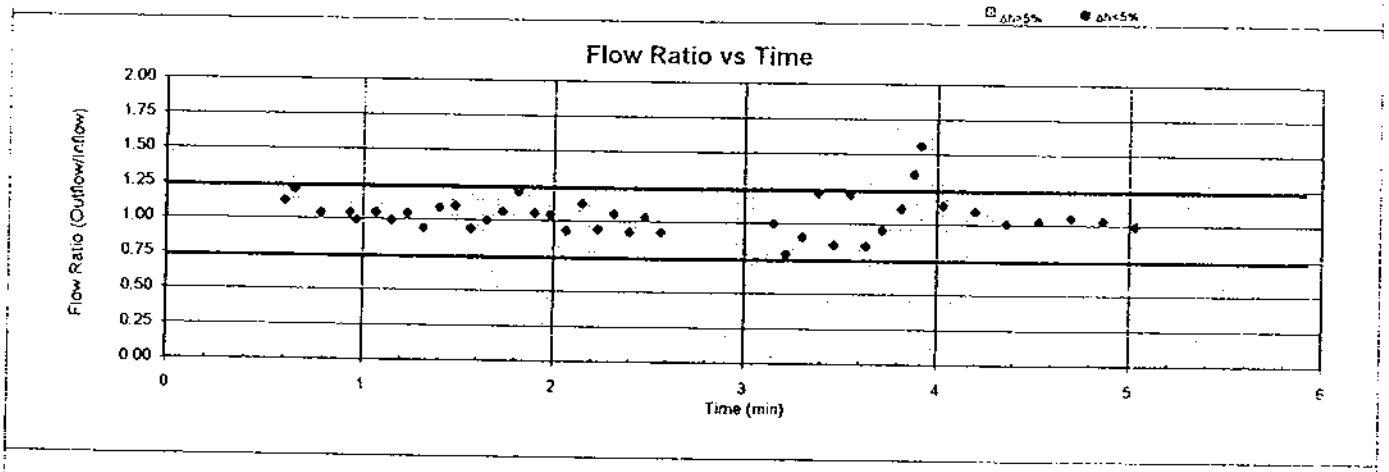
ARDAMAN & ASSOCIATES
Constant Head Permeability Test

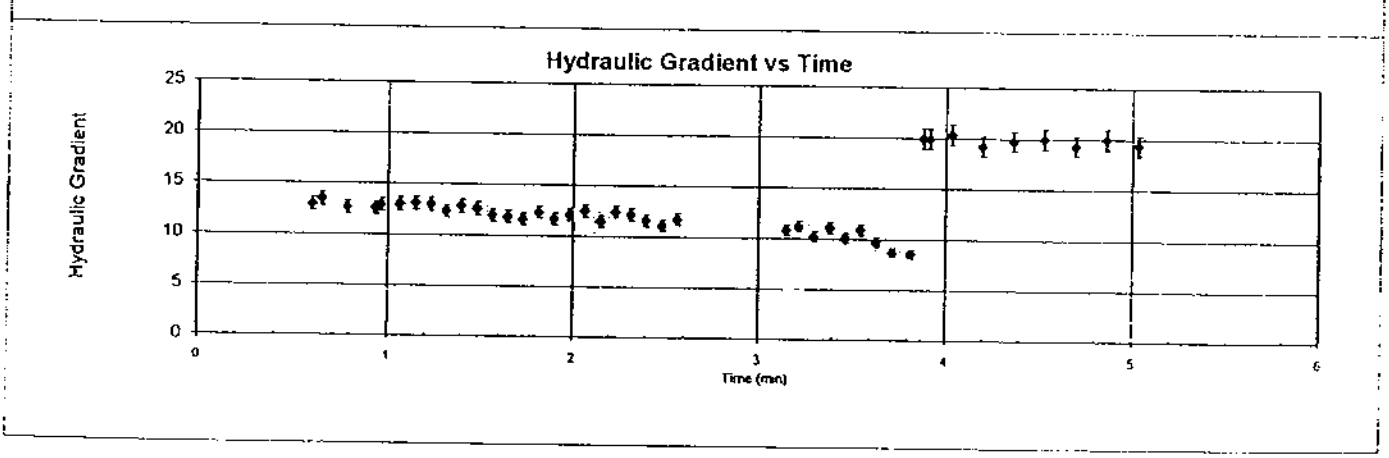
Project Name:	INDIANTOWN
Project Number:	03-2197
Sample Name:	B20 US3 BL3
Depth:	8-10.5
File Name:	C:\Dac-2\K-M-B20 US3 BL3.dat
Date Created:	11/10/03 9:50
Sensor Group:	PERM-M
Reading Schedule:	PERM30sec
Maximum Readings:	120
Cell Number	T7
Station Number	M
Cell Pressure	190.0 psi
Inflow Pressure	184.0 psi
Outflow Pressure	182.0 psi

Initial Specimen Conditions

Wt Wet Soil	926.35	gms
Assumed Gs	2.70	
Wc	14.4	%
Yt	133.8	pcf
Yd	116.9	pcf
S	88	%
Vv	132.45	cc
e	0.442	
Sample Area	42.011	square cm
Sample Ht	10.29	cm







PERM BILITY TEST SUMMARY SHEET

File Number 03-2197
Project Indian Town
Sample B25, US 4, 7-9.5 ft

Initial Specimen Conditions

Dimensions

D1	7.195 cm
D2	7.252 cm
D3	7.159 cm
D_{avg}	7.202 cm
Area	40.738 cm^2
L1	10.317 cm
L2	10.328 cm
L3	10.305 cm
L_{avg}	10.317 cm
V_i	420.278 cm^3

Trimming Moisture Content

WWS + Tare	165.15 g
WDS + Tare	147.04 g
Tare	32.17 g
w	15.8 %
WWS_i	906.40 g
G_s	2.68 (Assumed)

Physical Properties Based on WDS_f

WDS_f	784.22 g
S_i	96 %
e_i	0.44
n_i	0.30
w_i	15.6 %
γ_{di}	116.4 pcf

Final Specimen Conditions

Dimensions

D1	7.310 cm
D2	7.181 cm
D3	7.237 cm
D_{avg}	7.243 cm
Area	41.199 cm^2
L1	10.231 cm
L2	10.207 cm
L3	10.158 cm
L_{avg}	10.199 cm
V_f	420.176 cm^3

Final Moisture Content

WWS + Tare	1019.57 g
WDS + Tare	899.16 g
Tare	114.94 g
w_f	15.4 %
WWS_f	906.36 g

Physical Properties Based on WDS_f

WDS_f	784.22 g
S_f	96 %
e_f	0.44
n_f	0.30
w_f	15.4 %
γ_{df}	116.5 pcf
$(V_f - V_i)/V_i$	-0.0 % (Consolidation)

Permeabilty Test Conditions

Cell Pressure	190 psi
Inflow/Outflow Press $_{avg}$	183 psi
σ'_c	7 psi
B-Factor	100 %
Head $_{avg}$	118 cm
i_{avg}	11.4

Retained on #200	632.1 g
-200	19.4 %

Hydraulic Conductivity

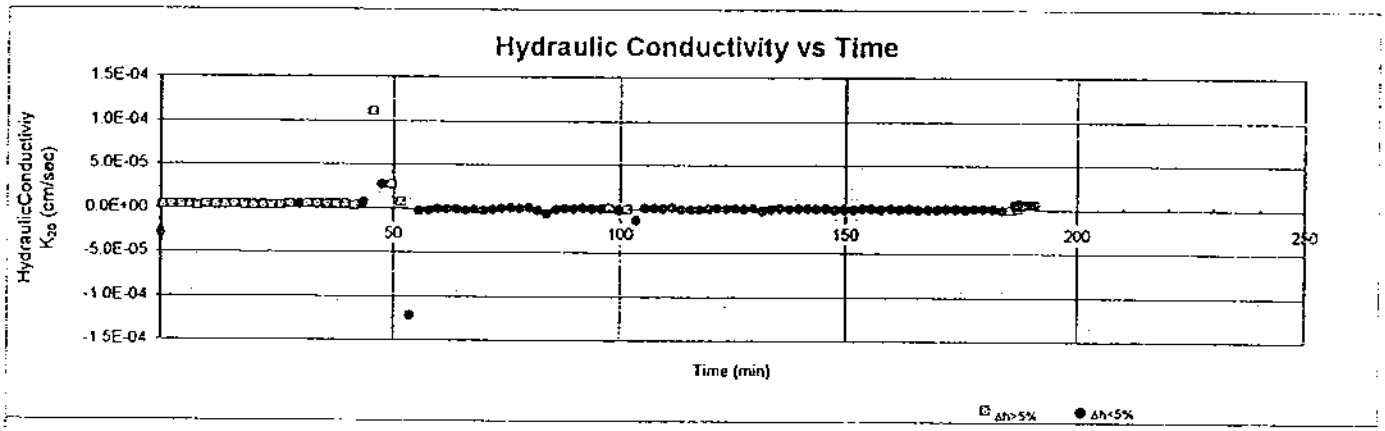
k_{20avg} **4.6E-06 cm/sec**

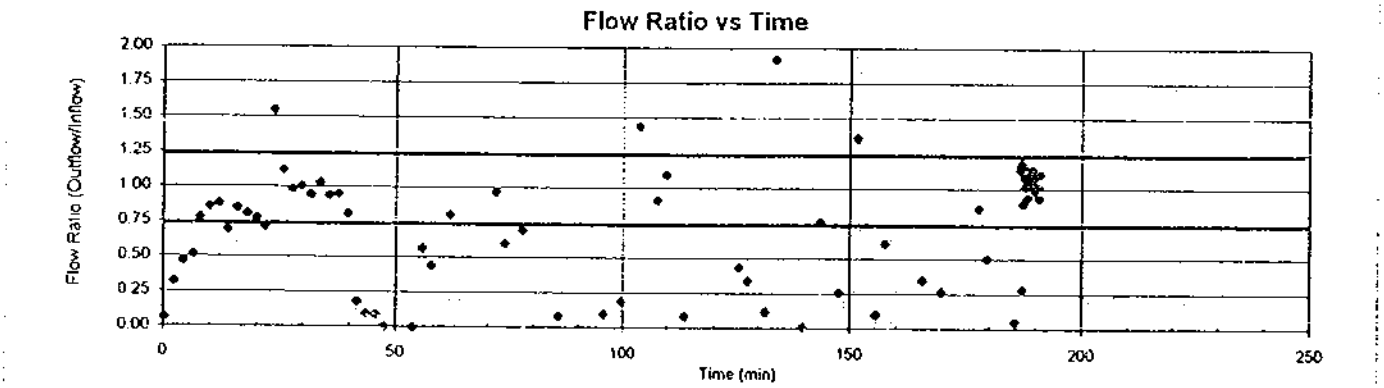
ARDAMAN & ASSOCIATES
Constant Head Permeability Test

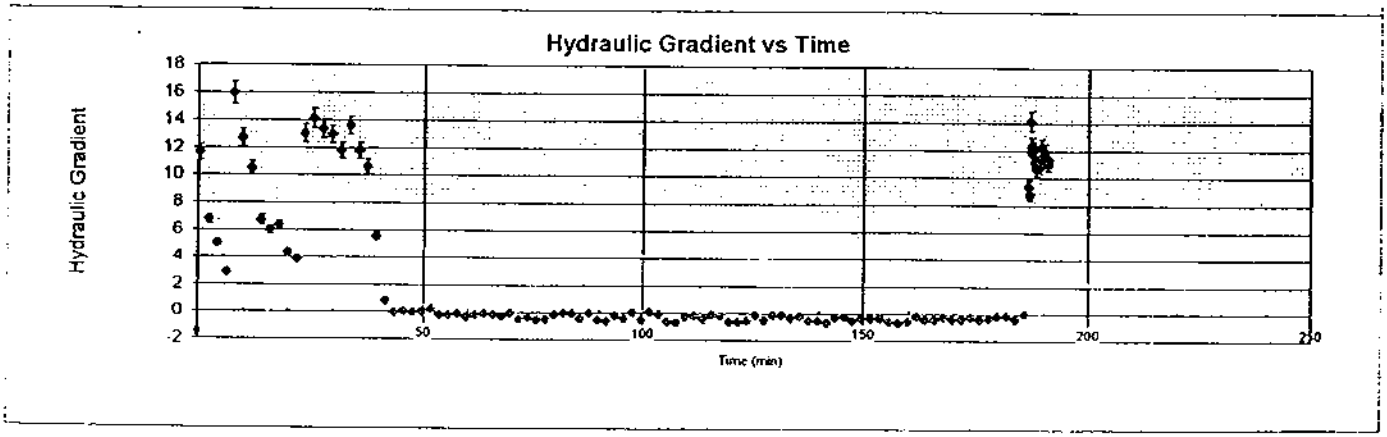
Project Name:	INDIANTOWN
Project Number:	03-2197
Sample Name:	B25 US4 B1
Depth:	7-9.5'
File Name:	C:\Dac-2\K-H-B25 US4 B1.dat
Date Created:	11/13/03 8:21
Sensor Group:	PERM-H
Reading Schedule:	PERM2min
Maximum Readings:	120
Cell Number	T11
Station Number	H
Cell Pressure	190.0 psi
Inflow Pressure	184.0 psi
Outflow Pressure	182.0 psi

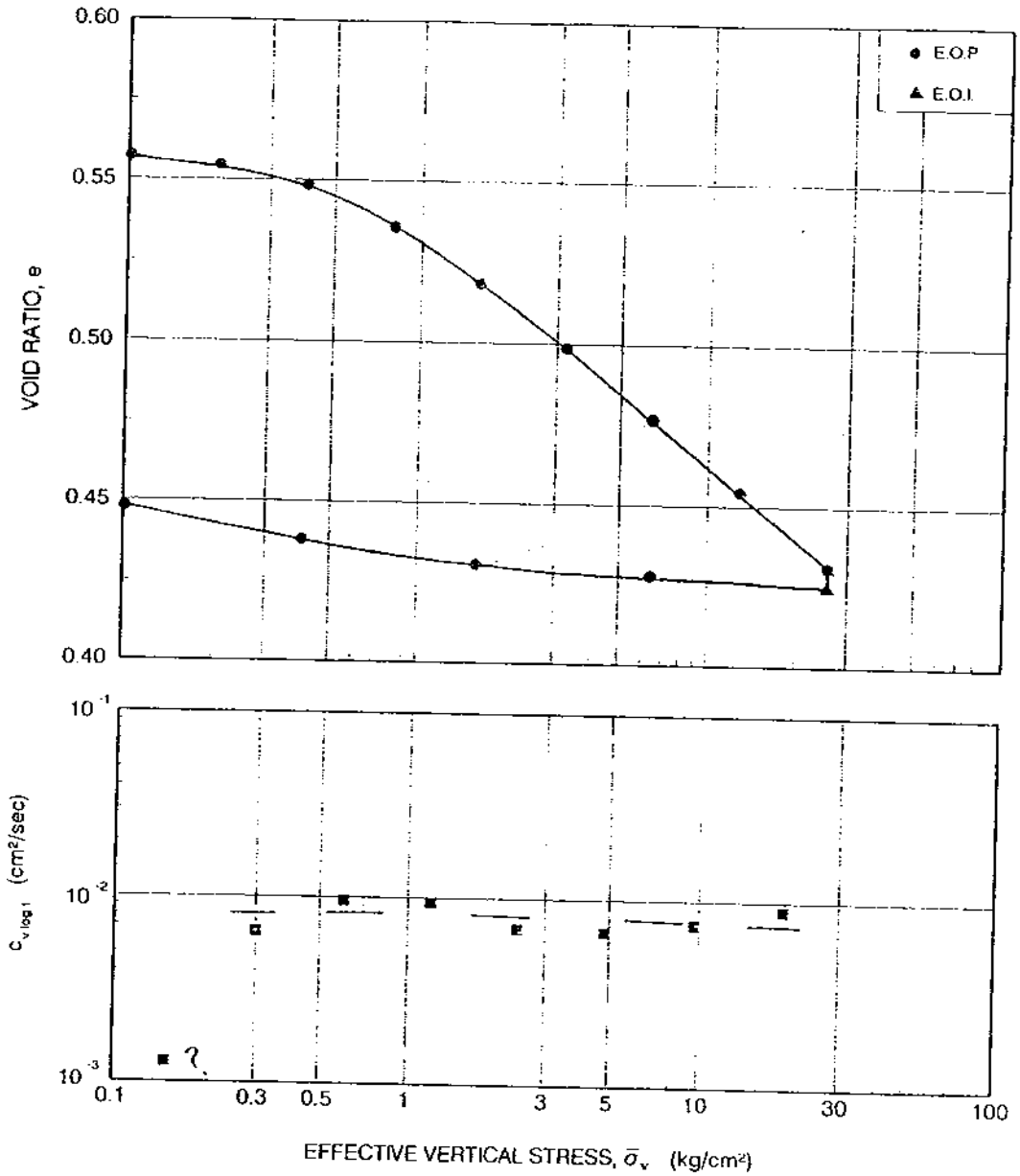
Initial Specimen Conditions

Wt Wet Soil	906.40	gms
Assumed Gs	2.70	
Wc	15.6	%
Yt	134.6	pcf
Yd	116.3	pcf
S	95	%
Vv	130.29	cc
e	0.449	
Sample Area	40.736	square cm
Sample Ht	10.32	cm









SAMPLE DATA

BORING NUMBER:	B-11
SAMPLE NUMBER:	US-1
DEPTH (FEET):	9.0 - 11.5
DESCRIPTION:	GREENISH-GRAY CLAYEY SAND

INDEX PROPERTIES

LIQUID LIMIT (%):	30
PLASTIC LIMIT (%):	28
PLASTICITY INDEX (%):	2
% PASSING NO. 200:	18.0
SPECIFIC GRAVITY:	2.68 (Assumed)

SPECIMEN CONDITIONS	INITIAL	FINAL
HEIGHT (mm):	19.0	17.7
MOISTURE CONTENT (%)	17.8	16.6
DRY DENSITY (lb/ft³):	106.9	115.2
VOID RATIO:	0.56	0.45
SATURATION (%):	85	99

INCREMENTAL LOADING CONSOLIDATION OF SAMPLE B-11, US-1, 9.0 - 11.5 FEET

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

TROUP - INDIAN TOWN

DRAWN BY: SA	CHECKED BY: SA	DATE: 11-24-03
FILE NO: 03-2197	APPROVED BY:	FIGURE:

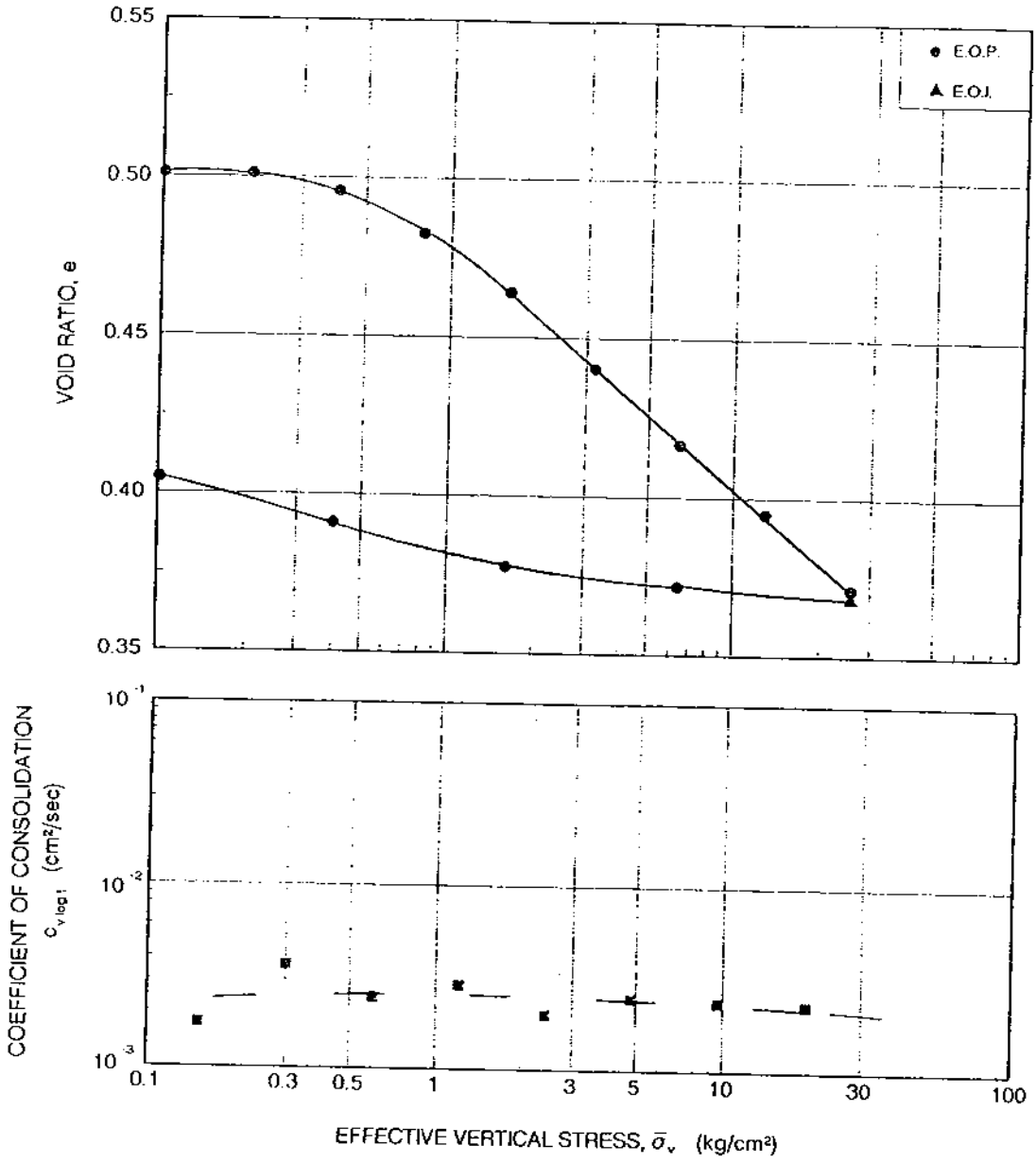
Project Name: Indian Town
File Number: 03-2197
Sample Name: B-11, US-1, 9-11.5 ft

Sample Data		
Specific Gravity	2.68	(Assumed)
Wt. of Dry Soil (gm)	64.07	
Diameter (in)	1.9685	
Area (in²) =	3.0434	
Initial Sample Ht (in)	0.7500	
Height of Solids (in)	0.4794	

Effective Stress (kg/cm²)	Dial Readings Initial (in)	Dial Readings E.O.P. (in)	Dial Readings E.O.I. (in)	Change @ E.O.P (in)	Change @ E.O.I. (in)	Height @ E.O.P (in)	Height @ E.O.I. (in)	Mean Height (in)	Drainage Distance (in)	Height of Voids (in)	Void Ratio @ E.O.P	Void Ratio @ E.O.I	t50 (sec)	cv t50 (cm²/sec)	Strain @ E.O.P (%)	Strain @ E.O.I. (%)
0	0.04	0.04	0.04			0.75	0.75	0.375	0.1875	0.27065	0.5646	0.5646			0.00	0.00
0.101	0.04	0.0435	0.0435	0.0035	0	0.74650	0.74650	0.74825	0.37413	0.26715	0.5573	0.5573		ERR	0.47	0.47
0.202	0.043750	0.04503	0.046	0.00128	0.00097	0.74522	0.74425	0.74586	0.37293	0.26587	0.5546	0.5526	138	1.28E-03	0.64	0.77
0.403	0.047800	0.0498	0.0518	0.002	0.002	0.74225	0.74025	0.74325	0.37163	0.26290	0.5484	0.5443	27	6.50E-03	1.03	1.30
0.806	0.05335	0.0575	0.0598	0.00415	0.0023	0.73610	0.73380	0.73818	0.36909	0.25675	0.5356	0.5308	18	9.62E-03	1.85	2.16
1.613	0.0613	0.0673	0.0696	0.006	0.0023	0.72780	0.72550	0.73080	0.36540	0.24845	0.5183	0.5135	18	9.43E-03	2.96	3.27
3.226	0.0725	0.0795	0.0818	0.007	0.0023	0.71850	0.71620	0.72200	0.36100	0.23915	0.4989	0.4941	24	6.90E-03	4.20	4.51
6.452	0.0844	0.09270	0.095	0.0083	0.0023	0.70790	0.70560	0.71205	0.35603	0.22855	0.4768	0.4720	24	6.71E-03	5.61	5.92
12.903	0.0979	0.10630	0.1087	0.0084	0.0024	0.69720	0.69480	0.70140	0.35070	0.21785	0.4545	0.4494	21	7.44E-03	7.04	7.36
25.806	0.1122	0.12100	0.124	0.0088	0.003	0.68600	0.68300	0.69040	0.34520	0.20665	0.4311	0.4248	17	8.91E-03	8.53	8.93
6.452	0.1201	0.11860	0.1186	-0.0015	0	0.68450	0.68450	0.68375	0.34188	0.20515	0.4280	0.4280	9	1.65E-02	8.73	8.73
1.613	0.1154	0.11400	0.1132	-0.0014	-0.0008	0.68590	0.68670	0.68520	0.34260	0.20655	0.4309	0.4326	10	1.49E-02	8.55	8.44
0.403	0.1106	0.1081	0.10710	-0.00250	-0.00100	0.68920	0.69020	0.6880	0.3440	0.20985	0.4378	0.44	30	5.01E-03	8.11	7.97
0.101	0.1052	0.1013	0.09950	-0.00390	-0.00160	0.69410	0.69590	0.6922	0.3461	0.21475	0.4480	0.45	138	1.10E-03	7.45	7.21

E.O.P = End of Primary Consolidation (Log t Cuve Fitting)

E.O.I. = End of Load Increment (Typically 24 Hours +/-)



SAMPLE DATA

BORING NUMBER:	B-12
SAMPLE NUMBER:	US-2
DEPTH (FEET):	7.0 - 9.5
DESCRIPTION:	GRAY CLAYEY SAND

INDEX PROPERTIES

LIQUID LIMIT (%):	33
PLASTIC LIMIT (%):	16
PLASTICITY INDEX (%):	17
% PASSING NO. 200:	21.7
SPECIFIC GRAVITY:	2.68 (Assumed)

SPECIMEN CONDITIONS

	INITIAL	FINAL
HEIGHT (mm):	19.0	17.8
MOISTURE CONTENT (%):	16.1	15.1
DRY DENSITY (lb/ft³):	111.4	119.0
VOID RATIO:	0.50	0.41
SATURATION (%):	86	100

INCREMENTAL LOADING CONSOLIDATION OF SAMPLE B-12, US-2, 7.0 - 9.5 FEET

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

TROUP - INDIAN TOWN

DRAWN BY: SA	CHECKED BY: SA	DATE: 11-24-03	
FILE NO.: 03-2197	APPROVED BY:	FIGURE:	

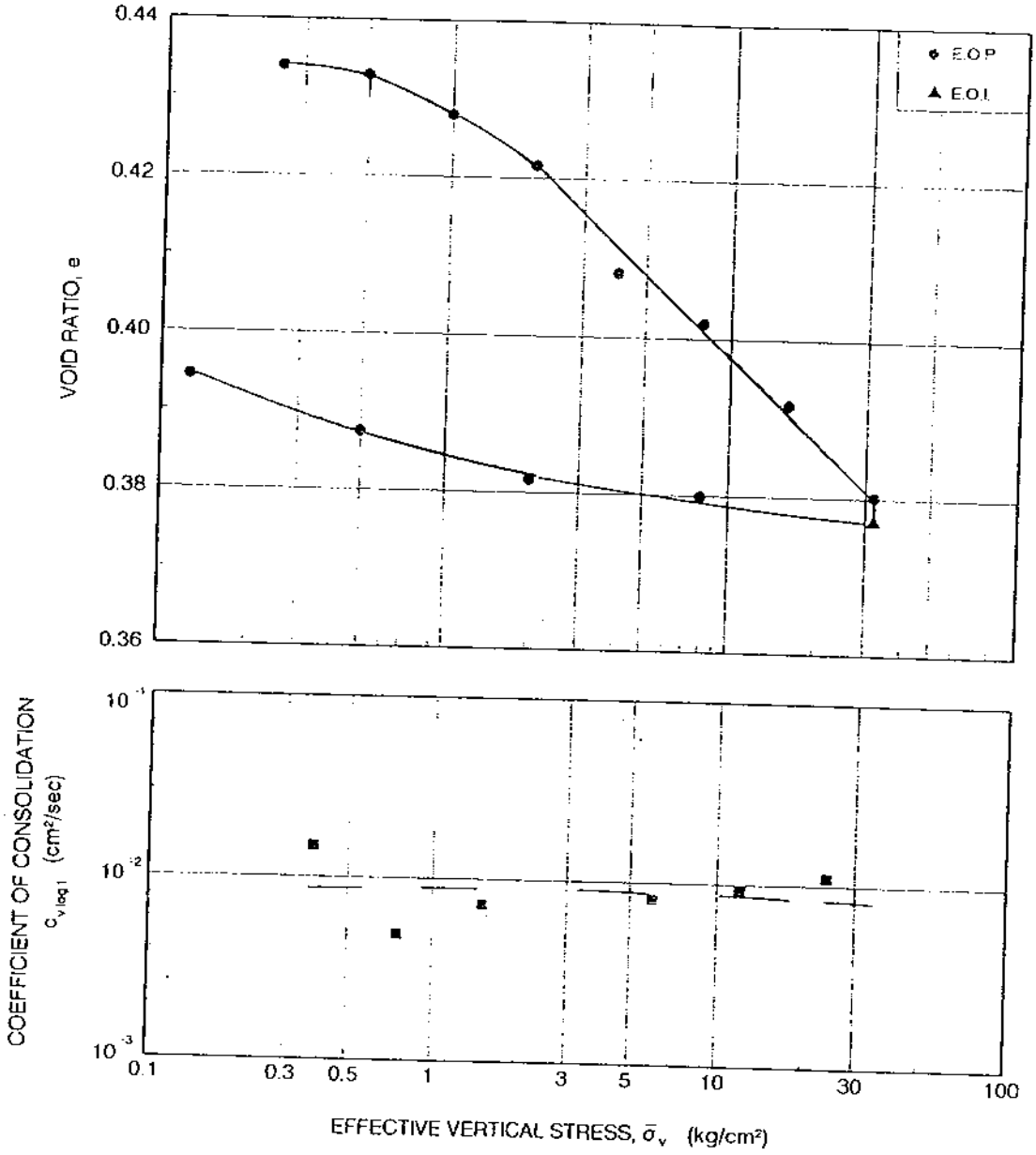
Project Name: Indian Town
File Number: 03-2197
Sample Name: B-12, US-2, 7 - 9.5 ft

Sample Data		
Specific Gravity	2.68	(Assumed)
Wt of Dry Soil (gm)	66.67	
Diameter (in)	1.9685	
Area (in²) =	3.0434	
Initial Sample Ht (in)	0.7500	
Height of Solids (in)	0.4988	

Effective Stress (kg/cm²)	Dial Readings Initial (in)	Dial Readings E.O.P. (in)	Dial Readings E.O.I. (in)	Change @ E.O.P (in)	Change @ E.O.I. (in)	Height @ E.O.P (in)	Height @ E.O.I. (in)	Mean Height (in)	Drainage Distance (in)	Height of Voids (in)	Void Ratio @ E.O.P	Void Ratio @ E.O.I	t50 (sec)	cv t50 (cm²/sec)	Strain @ E.O.P (%)	Strain @ E.O.I. (%)
0	0.04	0.04	0.04			0.75	0.75	0.375	0.1875	0.25119	0.5036	0.5036			0.00	0.00
0.101	0.04	0.0412	0.0412	0.0012	0	0.74880	0.74880	0.74940	0.37470	0.24999	0.5012	0.5012		ERR	0.16	0.16
0.202	0.04133	0.04139	0.0418	6E-05	0.00021	0.74874	0.74853	0.74877	0.37439	0.24993	0.5011	0.5006	102	1.75E-03	0.17	0.20
0.403	0.04240	0.04432	0.0458	0.00192	0.00148	0.74661	0.74513	0.74757	0.37378	0.24780	0.4968	0.4938	49	3.62E-03	0.45	0.65
0.806	0.047	0.0526	0.0537	0.0056	0.0011	0.73953	0.73843	0.74233	0.37116	0.24072	0.4826	0.4804	72	2.43E-03	1.40	1.54
1.613	0.0557	0.0636	0.0657	0.0081	0.0019	0.73033	0.72843	0.73438	0.36719	0.23152	0.4642	0.4603	60	2.86E-03	2.62	2.88
3.226	0.068	0.078	0.0802	0.01	0.0022	0.71843	0.71623	0.72343	0.36171	0.21962	0.4403	0.4359	84	1.98E-03	4.21	4.50
6.452	0.083	0.0926	0.0945	0.0096	0.0019	0.70663	0.70473	0.71143	0.35571	0.20782	0.4166	0.4128	56	2.44E-03	5.78	6.04
12.903	0.0974	0.1063	0.1086	0.0089	0.0023	0.69583	0.69353	0.70028	0.35014	0.19702	0.3950	0.3904	66	2.36E-03	7.22	7.53
25.806	0.112	0.1215	0.123	0.0095	0.0015	0.68403	0.68253	0.68878	0.34439	0.18522	0.3713	0.3683	66	2.28E-03	8.80	9.00
6.452	0.1198	0.11805	0.118	-0.00175	-5E-05	0.68428	0.68433	0.68340	0.34170	0.18547	0.3718	0.3719	90	1.65E-03	8.76	8.76
1.613	0.1152	0.11230	0.1121	-0.0029	-0.0002	0.68723	0.68743	0.68578	0.34289	0.18842	0.3777	0.3781	150	9.96E-04	8.37	8.34
0.403	0.1109	0.1046	0.1042	-0.00630	-0.00040	0.69373	0.69413	0.6906	0.3453	0.19492	0.3908	0.39	1020	1.49E-04	7.50	7.45
0.101	0.1038	0.09703	0.0963	-0.00677	-0.00073	0.70090	0.70163	0.6975	0.3488	0.20209	0.4052	0.41	3300	4.58E-05	6.55	6.45

E.O.P. = End of Primary Consolidation (Log t Curve Fitting)

E.O.I. = End of Load Increment (Typically 24 Hours +/-)



SAMPLE DATA

BORING NUMBER:	B-25
SAMPLE NUMBER:	US-4
DEPTH (FEET):	7.0 - 9.5
DESCRIPTION:	GREENISH-GRAY CLAYEY SAND

INDEX PROPERTIES

LIQUID LIMIT (%):	24
PLASTIC LIMIT (%):	14
PLASTICITY INDEX (%):	10
% PASSING NO. 200:	16.3
SPECIFIC GRAVITY:	2.68 (Assumed)

SPECIMEN CONDITIONS

	INITIAL	FINAL
HEIGHT (mm):	19.0	18.5
MOISTURE CONTENT (%):	13.9	14.5
DRY DENSITY (lb/ft³):	116.3	119.7
VOID RATIO:	0.44	0.38
SATURATION (%):	85	98

INCREMENTAL LOADING CONSOLIDATION OF SAMPLE B-25, US-4, 7.0 - 9.5 FEET

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

TROUP - INDIAN TOWN

DRAWN BY: SA	CHECKED BY: SA	DATE: 12-04-03	
FILE NO.: 03-2197	APPROVED BY:	FIGURE:	

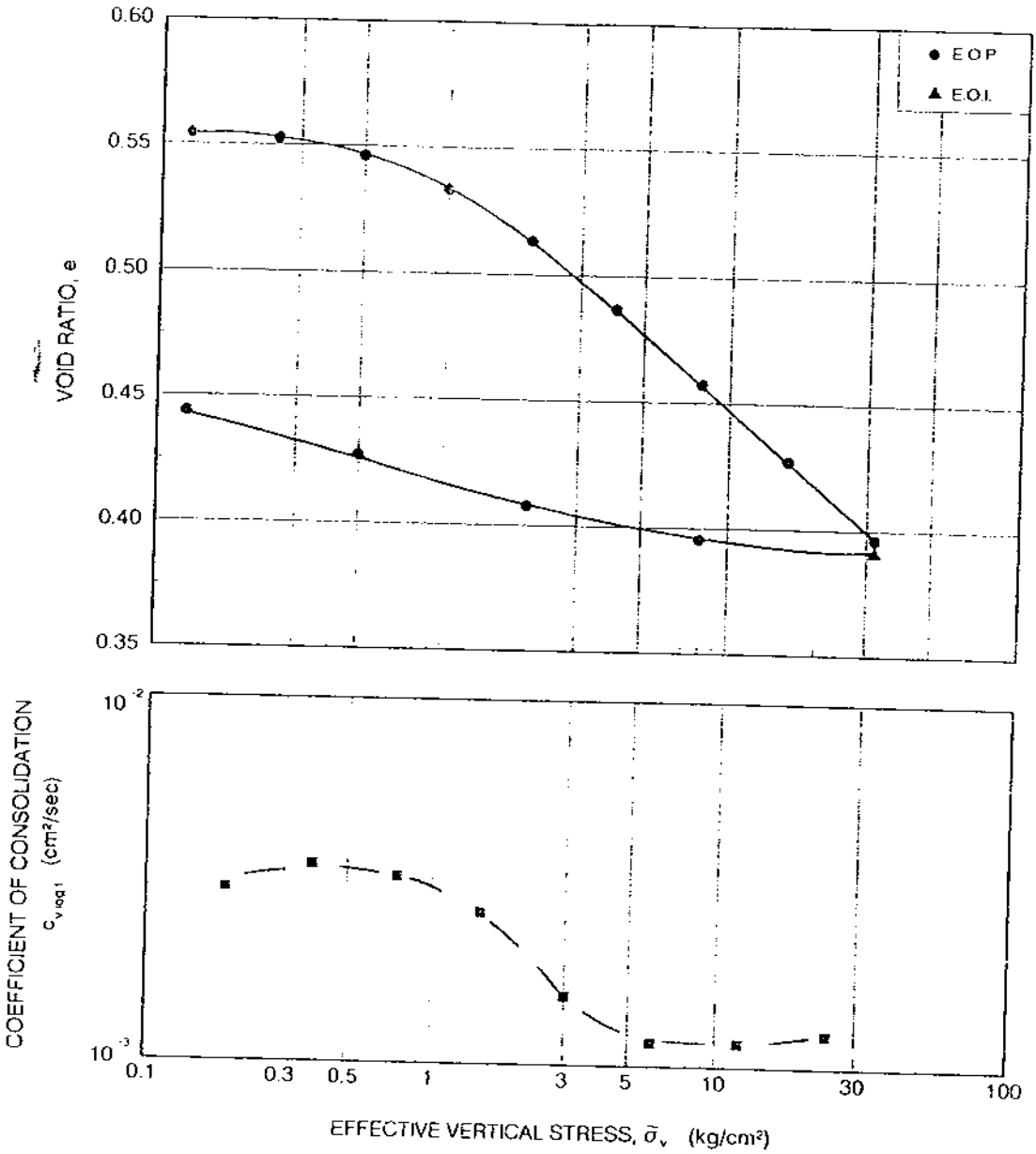
Project Name: Indian Town
File Number: 03-2197
Sample Name: B-25, US-4, 7 - 9.5 ft, B3

Sample Data		
Specific Gravity	2.68	(Assumed)
Wt of Dry Soil (gm)	69.74	
Diameter (in)	1.9685	
Area (in²) =	3.0434	
Initial Sample Ht (in)	0.7500	
Height of Solids (in)	0.5218	

Effective Stress (kg/cm²)	Dial Readings Initial (in)	Dial Readings E.O.P. (in)	Dial Readings E.O.I. (in)	Change @ E.O.P (in)	Change @ E.O.I. (in)	Height @ E.O.P (in)	Height @ E.O.I. (in)	Mean Height (in)	Drainage Distance (in)	Height of Voids (in)	Void Ratio @ E.O.P	Void Ratio @ E.O.I	t50 (sec)	cv t50 (cm²/sec)	Strain @ E.O.P (%)	Strain @ E.O.I. (%)
0	0.0461	0.0461	0.0461			0.75	0.75	0.375	0.1875	0.22822	0.4374	0.4374			0.00	0.00
0.25	0.0461	0.0479	0.0479	0.0018	0	0.74820	0.74820	0.74910	0.37455	0.22642	0.4339	0.4339		ERR	0.24	0.24
0.5	0.04840	0.04893	0.0499	0.00053	0.00097	0.74767	0.74670	0.74794	0.37397	0.22589	0.4329	0.4311	12	1.46E-02	0.31	0.44
1	0.05110	0.05275	0.0536	0.00165	0.00085	0.74505	0.74420	0.74587	0.37294	0.22327	0.4279	0.4263	36	4.91E-03	0.66	0.77
2	0.05505	0.0575	0.0586	0.00245	0.0011	0.74175	0.74065	0.74298	0.37149	0.21997	0.4218	0.4195	24	7.31E-03	1.10	1.25
4	0.0586	0.0645	0.0645	0.0059	0	0.73475	0.73475	0.73770	0.36885	0.21297	0.4082	0.4082		ERR	2.03	2.03
8	0.0663	0.0695	0.071	0.0032	0.0015	0.73155	0.73005	0.73315	0.36658	0.20977	0.4020	0.3992	21	8.13E-03	2.46	2.66
16	0.073	0.0769	0.0785	0.0039	0.0016	0.72615	0.72455	0.72810	0.36405	0.20437	0.3917	0.3886	18	9.36E-03	3.18	3.39
32	0.0806	0.0850	0.0866	0.0044	0.0016	0.72015	0.71855	0.72235	0.36118	0.19837	0.3802	0.3771	15	1.11E-02	3.98	4.19
8	0.08435	0.0829	0.0828	-0.00145	-0.0001	0.72000	0.72010	0.71928	0.35964	0.19822	0.3799	0.3801	12	1.37E-02	4.00	3.99
2.000	0.0805	0.07985	0.0792	-0.00085	-0.00045	0.72095	0.72140	0.72053	0.36026	0.19917	0.3817	0.3826	14	1.18E-02	3.87	3.81
0.500	0.07903	0.07640	0.0755	-0.00263	-0.0009	0.72403	0.72493	0.72272	0.36136	0.20225	0.3876	0.3894	44	3.77E-03	3.46	3.34
0.125	0.0753	0.0726	0.0715	-0.00270	-0.00110	0.72763	0.72873	0.7263	0.3631	0.20585	0.3945	0.3966	144	1.16E-03	2.98	2.84

E.O.P = End of Primary Consolidation (Log t Cuve Fitting)

E.O.I. = End of Load Increment (Typically 24 Hours +/-)



SAMPLE DATA

BORING NUMBER:	B-20
SAMPLE NUMBER	US-3
DEPTH (FEET):	8.0 - 10.5
DESCRIPTION:	GRAY CLAYEY SAND

INDEX PROPERTIES

LIQUID LIMIT (%):	36
PLASTIC LIMIT (%):	12
PLASTICITY INDEX (%):	24
% PASSING NO. 200.	25.5
SPECIFIC GRAVITY:	2.68 (Assumed)

SPECIMEN CONDITIONS

	INITIAL	FINAL
HEIGHT (mm):	19.0	17.8
MOISTURE CONTENT (%)	17.9	16.4
DRY DENSITY (lb/ft³):	107.6	115.5
VOID RATIO:	0.55	0.45
SATURATION (%):	87	98

INCREMENTAL LOADING CONSOLIDATION OF SAMPLE B-20, US-3, 8.0 - 10.5 FEET

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

TROUP - INDIAN TOWN

DRAWN BY: SA	CHECKED BY: SA	DATE: 12-01-03
FILE NO.: 03-2197	APPROVED BY:	FIGURE

Project Name: Indian Town
File Number: 03-2197
Sample Name: B-20, US-3, 8 - 10.5 ft

Sample Data		
Specific Gravity	2.68	(Assumed)
Wt of Dry Soil (gm)	64.50	
Diameter (in)	1.9685	
Area (in²) =	3.0434	
Initial Sample Ht (in)	0.7500	
Height of Solids (in)	0.4826	

Effective Stress (kg/cm²)	Dial Readings Initial (in)	Dial Readings E.O.P. (in)	Dial Readings E.O.I. (in)	Change @ E.O.P (in)	Change @ E.O.I. (in)	Height @ E.O.P (in)	Height @ E.O.I. (in)	Mean Height (in)	Drainage Distance (in)	Height of Voids (in)	Void Ratio @ E.O.P	Void Ratio @ E.O.I	t50 (sec)	cv t50 (cm²/sec)	Strain @ E.O.P (%)	Strain @ E.O.I. (%)
0	0.0492	0.0492	0.0492			0.75	0.75	0.375	0.1875	0.26743	0.5542	0.5542			0.00	0.00
0.125	0.0509	0.0509	0.0509	0	0	0.75000	0.75000	0.75000	0.37500	0.26743	0.5542	0.5542		ERR	0.00	0.00
0.25	0.05130	0.05213	0.0527	0.00083	0.00057	0.74917	0.74860	0.74959	0.37479	0.26660	0.5525	0.5513	60	2.98E-03	0.11	0.19
0.5	0.05355	0.0561	0.0572	0.00255	0.0011	0.74805	0.74495	0.74733	0.37366	0.26348	0.5460	0.5437	51	3.48E-03	0.53	0.67
1	0.05835	0.0634	0.0649	0.00505	0.0015	0.73990	0.73840	0.74243	0.37121	0.25733	0.5332	0.5301	54	3.24E-03	1.35	1.55
2	0.0661	0.0742	0.0759	0.0081	0.0017	0.73030	0.72860	0.73435	0.36718	0.24773	0.5133	0.5098	66	2.60E-03	2.63	2.85
4.000	0.07765	0.0888	0.0905	0.01115	0.0017	0.71745	0.71575	0.72303	0.36151	0.23488	0.4867	0.4832	108	1.54E-03	4.34	4.57
8.000	0.09227	0.1048	0.1066	0.01253	0.0018	0.70322	0.70142	0.70949	0.35474	0.22065	0.4572	0.4535	138	1.16E-03	6.24	6.48
16.000	0.1084	0.1211	0.1232	0.0127	0.0021	0.68872	0.68662	0.69507	0.34754	0.20615	0.4272	0.4228	132	1.16E-03	8.17	8.45
32.000	0.12525	0.1380	0.1406	0.01275	0.0026	0.67387	0.67127	0.68025	0.34012	0.19130	0.3964	0.3910	120	1.23E-03	10.15	10.50
8.000	0.13835	0.13620	0.1358	-0.00215	-0.0004	0.67342	0.67382	0.67235	0.33617	0.19085	0.3955	0.3963	36	3.99E-03	10.21	10.16
2.000	0.1343	0.12870	0.1285	-0.0056	-0.0002	0.67942	0.67962	0.67662	0.33831	0.19685	0.4079	0.4083	420	3.46E-04	9.41	9.38
0.500	0.128	0.1188	0.1179	-0.00920	-0.00090	0.68882	0.68972	0.6842	0.3421	0.20625	0.4274	0.4293	1380	1.08E-04	8.15	8.04
0.125	0.1177	0.1107	0.1095	-0.00700	-0.00120	0.69672	0.69792	0.6932	0.3466	0.21415	0.4438	0.4463	3600	4.24E-05	7.10	6.94

E.O.P. = End of Primary Consolidation (Log t Curve Fitting)

E.O.I. = End of Load Increment (Typically 24 Hours +/-)