FINAL REPORT
GEOTECHNICAL INVESTIGATION
NEIGHBORHOOD STREET RECONSTRUCTION (NSR) PROJECT 467
WBS NO. N-000400-0001-4
HOUSTON, TEXAS

FOR

VAN DE WIELE & VOGLER, INC.
2925 BRIARPARK, SUITE 275
HOUSTON, TEXAS 77042

PREPARED BY
ASSOCIATED TESTING LABORATORIES, INC.
HOUSTON, TEXAS
JULY 2010
REPORT NO. G10-131

ESTABLISHED 1959

ASSOCIATED TESTING LABORATORIES, INC.
3143 Yellowstone Blvd • Houston, Texas 77054
Tel: (713) 748-3717 • Fax: (713) 748-3748
TBPE Firm Reg. No.: 4560

Date: July 1, 2010

ATL Job No: G10-131

Van De Wiele & Vogler, Inc.
2925 Briarpark, Suite 275
Houston, Texas 77042

Attention: Mr. Daniel Simeone, P.E.

Reference: Final Report
Geotechnical Investigation
Neighborhood Street Reconstruction (NSR) Project 467
WBS No. N-000400-0001-4
Houston, Texas

Dear Mr. Simeone:

We have completed the report for the geotechnical investigation at the above referenced location. Our findings, analysis and recommendations are submitted herein.

It has been a pleasure working with you on this project. Should you have any questions concerning this project work, please call us at (713) 748-3717.

Sincerely,

ASSOCIATED TESTING LABORATORIES, INC.

Jay Vaghela, P.E.
Project Manager

7-2-10

Jasbir Singh, P.E. 7/2/10
President

GEOTECHNICAL INVESTIGATION

CONTENTS PAGE

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

0.0 EXECUTIVE SUMMARY

Associated Testing Laboratories, Inc. (ATL) has conducted a Geotechnical Investigation for the proposed improvements in the Montrose area in Houston, Texas. The alignments are located in Key Maps 493S, T, W and X. The project area is bounded by Montrose Boulevard to the west, Richmond Avenue to the south, Spur 527 to the east and West Alabama to the north. The streets proposed for improvement within the above area includes Sul Ross, Branard, West Main, Colquitt, Roseland, Stanford, Greeley, Jack, Grarrott, Bute and Brandt streets. Additionally, a small section along Austin Street between Cleburne to Truxillo will also be improved. The storm sewers will be 15- to 60 inches in diameter and will generally be installed at depths ranging from approximately 3.5- to 13.5 feet. The sanitary sewers will be 8- to 36 inches in diameter and will generally be installed at depths ranging from approximately 2.5- to 12 feet. At the intersection of Austin Street and Cleburne, the sanitary sewers may be 18.5 feet deep. The water lines will be 8- to 12 inches in diameter and generally placed at depths ranging from 3- to 5 feet. The existing streets may be reconstructed. The reconstructed streets will be of concrete.

A total of thirty eight (38) soil borings were drilled in the project areas to depths ranging from 20- to 30 feet. Groundwater was encountered during drilling at boring locations B-1 through B-3, B-5, B-7, B-8, B-13 through B-15, B-17, B-18, B-24 through B-29, B-31 through B-35 and B-38 at depths ranging from 16- to 24 feet. Upon completion of drilling, groundwater was measured at depths ranging from 14- to 23 feet. Groundwater was not encountered during drilling in the remaining borings. Six (6) of these borings (Borings B-1, B-6, B-16, B-26, B-30 and B-36) were converted into piezometers (PZ-1 through PZ-6, respectively) after completion of drilling and sampling and water level measured at approximately 24 to 72 hours after installation, at approximately 5- to 7 days after installation and approximately 27- to 30 days after installation. Groundwater was measured at depths of 17.5-, 17- and 22.5 feet in the piezometers at borings B-1 (PZ-1), B-26 (PZ-4) and B-36 (PZ-5) at approximately 24- to 72 hours after installation. Groundwater was not encountered in the remaining piezometers (B-6, B-16 and B-30).

0.0 EXECUTIVE SUMMARY (Continued)

Groundwater was measured at depths of 16-, 18-, 16-, 23.5 and 10 feet in the piezometers at borings B-1 (PZ-1), B-6 (PZ-2), B-26 (PZ-4), B-30 (PZ-5) and B-36 (PZ-6) at approximately 7 to 10 days after installation. Groundwater was measured at depths of 16-, 19-, 16-, 18.5 and 10 feet in the piezometers at borings B-1 (PZ-1), B-6 (PZ-2), B-26 (PZ-4), B-30 (PZ-5) and B-36 (PZ-6) at approximately 27 to 30 days after installation. Groundwater was not encountered in the peizometer at boring B-16. ATL's subsurface investigation disclosed the following details for the soils:

Stratum No.	*Starting Depth, feet*	*Ending Depth, feet*	*Soil Description*
I	1 – 1.25	10.5 – 12.5	Fill: Fat Clay With Sand (CH), soft to firm, tan and light gray, with shells; in borings B-3 and B-13 only
II	0.25 – 1.1	2 - 9	Fill: Sandy Lean Clay (CL), soft to very stiff, light gray and tan, with calcareous nodules; in borings B-6, B-7, B-10, B-19 and B-35 only
III	0.5 - 23	4 – 30	Fat Clay With Sand (CH), firm to hard, light gray, gray, dark gray and tan, reddish brown, with ferrous and calcareous nodules; in borings B-1,B-2,B-4 through B-7, B-10, B-12 through B-16, B-20 through B-28 and B-30 through B-38
IV	0.5 - 23	2 - 25	Sandy Lean Clay (CL), soft to hard, light gray and tan, reddish brown, with ferrous and calcareous nodules; in borings B-2, B-4 through B-11, B-13 through B-19, B-21, B-23, B-24, B-26, B-27, B-29 through B-35 and B-37 only
V	8 – 16.5	17.5 - 25	Silty Sand (SM), loose to medium dense, light gray and tan, reddish brown; in borings B-1 through B-5, B-7 through B-11, B-17, B-18, B-24, B-25, B-29 and B-35 only

0.0 EXECUTIVE SUMMARY (Continued)

Based on the field investigation, laboratory testing, records and document review, the conclusions and recommendations are summarized below:

- A preliminary fault review based on review of available fault maps does not indicate the project alignment crossing any of the known faults.
- Groundwater control in excavations in cohesive soils (CL, CH) can usually be accomplished by sump and pump arrangements because the seepage should be relatively slow. Dewatering using well points may be required where non-cohesive/granular soils (SM) are encountered or if the groundwater inflow is large.
- Vertical trench excavation may be used for this project. The earth cuts will require a suitably designed trench protection system for trenches deeper than five-feet. Deeper trenches can be made using open slopes, stepped back to stable slope, vertical cuts supported with trench boxes, sheet piles or other suitably designed retaining system. Selection, design, placement and maintenance of the trench protection method should be the contractor's responsibility.
- Retaining system for the trenches for open cut method of installation may be designed by using equivalent fluid pressure approach and the criteria given in the project report.
- The water line, storm sewers and sanitary sewers may be installed using a combination of augering and casing techniques as well as open trench methods. Recommendations for augering and casing are included in this report. Where water lines, storm sewers and sanitary sewers are installed using open trench methods, the bedding and backfill criteria for that case is also given in the report.
- The possible reconstruction of project streets will consist of concrete paving. Based on AASHTO procedure, the recommended concrete paving thickness for project streets is 6.0 inches with a design ESAL of 500,000. The top 6 inches of subgrade should be lime stabilized using 7 % lime by dry weight. More information is in the report.
- The concrete pavement should be suitably reinforced as per City of Houston standards. More information regarding this is given in the report.

I. FACTUAL DATA

1.0 INTRODUCTION

1.1 General

This investigation was authorized by **Van De Wiele & Vogler, Inc.**, with the acceptance of **Associated Testing Laboratories, Inc (ATL);** Proposal No. CP09-0703-R dated December 23, 2009. Project details were provided to ATL, Inc., by Mr. Dan Simeone, P.E, of Van De Wiele & Vogler, Inc (henceforth referred to as Client). This report includes results of the field investigation, laboratory testing, geotechnical engineering analysis, and recommendations for the proposed design and construction of new utilities and concrete streets.

1.2 Location and Description of the Project

The existing streets in the Montrose area in Houston, Texas (Key Map 493S, T, W and X) will be reconstructed along with new utilities. The project area is bounded by Montrose Boulevard to the west, Richmond Avenue to the south, Spur 527 to the east and West Alabama to the north. The streets proposed for improvement within the above area includes Sul Ross, Branard, West Main, Colquitt, Roseland, Stanford, Greeley, Jack, Grarrott, Bute and Brandt streets. Additionally, a small section along Austin Street between Cleburne to Truxillo will also be improved.

The storm sewers will be 15- to 60 inches in diameter and will generally be installed at depths ranging from approximately 3.5- to 13.5 feet. The sanitary sewers will be 8- to 36 inches in diameter and will generally be installed at depths ranging from approximately 2.5- to 12 feet. At the intersection of Austin Street and Cleburne, the sanitary sewers may be 18.5 feet deep. The water lines will be 8- to 12 inches in diameter and generally placed at depths ranging from 3- to 5 feet. The existing streets will be reconstructed. The reconstructed streets will be of concrete.

1.2 Location and Description of the Project (Continued)

The project alignments are generally along existing streets in a residential area. The existing streets are asphalt streets in general with some streets being of asphalt overlying concrete. Photographs of the project site were taken at the time of our site visit. These photographs are presented in Appendix 1.

1.3 Scope of Work

A geotechnical investigation has been conducted to determine subsurface soil and groundwater conditions in the proposed project area and to develop geotechnical engineering recommendations for the design and construction of new utilities and concrete pavement.

Associated Testing Laboratories, Inc. (ATL) has completed a subsurface exploration program which consisted of the following scope:

- Drilling and sampling a total of thirty eight (38) soil borings to depths ranging from twenty (20) to thirty (30) feet below the existing grade.

- Laboratory testing on selected soil samples recovered from the soil borings.

- Developing boring log profiles to assess subsurface soil and groundwater conditions.

- Preliminary review of the proposed project area based on the review of available fault maps. It should be noted that a detailed investigative fault study is beyond the scope of this report.

Based on results from the field investigation, laboratory testing and gathered geological information, ATL performed an engineering analysis to develop geotechnical recommendations for the design and construction of the new utilities and concrete paving.

2.0SUBSURFACE INVESTIGATION PROGRAM

The field investigation initially consisted of drilling and sampling of a total of thirty eight (38) soil borings (B-1 through B-38) in the project area. The borings were generally located at 500 feet spacing along the alignments. The approximate locations of the borings as drilled are shown in Figure 2. Measurements of the paving were performed prior to drilling and sampling. The pavement measurements are shown in Table 1.

Thirty eight (38) soil borings (B-1 through B-38) were drilled to a depth ranging from twenty (20) to thirty (30) feet below the existing grade. One (1) boring was drilled to a depth of 30 feet (B-35). Thirty six (36) borings were drilled to a depth of 25 feet each (B-1 through B-22, B-24 through B-34 and B-36 through B-38). One (1) boring was drilled to a depth of 20 feet (B-23).

Six (6) of these borings (Borings B-1, B-6, B-16, B-26, B-30 and B-36) were converted into piezometers (PZ-1 through PZ-6, respectively) after completion of drilling and sampling. The structure of the piezometers is shown in Figure 3. The total vertical footage drilled and sampled was 950 feet. Upon completion, the borings were backfilled using bentonite cement grout using a tremie. The cored pavement was patched using lean concrete.

In cohesive soils, undisturbed soil samples were collected using a conventional 3-inch O.D. Shelby tube in general accordance with ASTM D1587. Cohesionless soils were sampled using split spoon sampler in general accordance with ASTM D1586. All soil samples were examined, classified and logged in the field. A representative portion of each sample was packed in containers to prevent moisture loss. All soil samples were properly labeled and subsequently transported to the ATL laboratory. All soil samples were classified according to Unified Soil Classification System (ASTM D-2487). A key to soil classifications and symbols used in this report is presented in Appendix 2. The soil information at our boring locations are shown on the respective boring logs presented in Appendix 3. No unusual staining or hydrocarbon odors were noted visually in the soil samples.

3.0 LABORATORY TESTING PROGRAM

Samples obtained from the field were again examined and classified in the lab by the geotechnical technician under the supervision of an engineer. Laboratory testing was performed on selected representative soil samples that were collected during the field investigation. The laboratory testing program included Atterberg Limits (ASTM D-4318), Density, Moisture Content (ASTM D-2216), Unconfined Compressive Strength (ASTM D-2166), Percent Finer Than No. 200 Sieve (ASTM D-1140), California Bearing Ratio (ASTM D-1883) and Proctor Tests (ASTM D-698). The results of laboratory tests are shown in the logs of Borings (Appendix 3) and also presented in summary of test results (Appendix 4). Overall numbers and types of tests performed for this study are presented below:

TYPE OF TEST	NUMBER OF TEST
Visual Classification	306
Dry Density	89
Moisture Content	306
Atterberg Limits	113
Unconfined Compression	89
Percent Finer Than No. 200 Sieve	107
California Bearing Ratio	2
Proctor	2

II. INTERPRETIVE REPORT

4.0 SUBSURFACE AND SITE CONDITIONS

4.1 Geology of Coastal Plain

The proposed project area is located within the Gulf Coast Structural Province, a huge sedimentary basin containing several thousand feet of sediments. In general, these sediments consist of loose sands, silts and clays which slope gently toward the Gulf of Mexico.

The proposed project site is underlain by the Beaumont Formation of the Pleistocene age. This formation consists of over consolidated clays, silts and sands with some shell, calcium carbonate and iron oxides. These formations are quite strong and extend to an approximate depth of 100 feet. The surface materials are often weakened by the weathering process.

The materials of Beaumont Formation were deposited during the last of the interglacial periods. During interglacial periods when water from the melting glaciers flowed back into the ocean, the sea rose, the depended valley backfilled and several Pleistocene formations were deposited. Beaumont Formation may have been deposited during a mid-Wisconsin interglacial interval or during the Sangamon Stage, an interval between the Wisconsin and Illinoian Glaciations. The Sangamon Stage is currently estimated as taking place about 70,000 years ago. The Beaumont formation is the youngest formation of Pleistocene age that crops out in the proposed project area. Its origins are mainly fluvial and deltaic, but probably some small areas originated as coastal marsh and lagoonal deposits.

4.2 Natural Hazards

Among the geologic and geomorphological features in this region are sedimentary deposits broken by structure such as normal faults, salt domes, etc. The sedimentary deposits slope gently toward the Gulf of Mexico. They are broken by normal faults, most of which dip toward the Gulf and extend downward many thousands of feet. The earth movements that caused these faults took place within the last 50,000 years. In general, the regional faults in the Houston area trend parallel to the Gulf Coast. Only the local faults over the salt domes show a radial pattern associated with the upthrust of the salt mass. There are numerous faults and fault systems in the greater Houston area. The movement of many of these faults has been affected in recent history by area subsidence. The subsidence is caused by removal of oil and groundwater. As much as nine (9) feet of subsidence has taken place in the area east of Houston in the last 70 years. Conversion to surface water usage and the limiting of oil production has greatly reduced the subsidence rate in the area east of Houston.

Figure 4 shows the principal active faults in the Houston area. Figure 4A shows the latest active surface faults of the Houston area interpreted on LIDAR Imagery (Khan and Engelkemeir). Based on Figures 4 and 4A there does not appear to be any active surface faults crossing any of the project alignment.

4.3 Site Stratigraphy and Geotechnical Characterization

ATL's subsurface investigation disclosed the following details regarding the subsurface soils:

Stratum No.	*Starting Depth, feet*	*Ending Depth, feet*	*Soil Description*
I	1 – 1.25	10.5 – 12.5	Fill: Fat Clay With Sand (CH), soft to firm, tan and light gray, with shells; in borings B-3 and B-13 only
II	0.25 – 1.1	2 - 9	Fill: Sandy Lean Clay (CL), soft to very stiff, light gray and tan, with calcareous nodules; in borings B-6, B-7, B-10, B-19 and B-35 only
III	0.5 - 23	4 – 30	Fat Clay With Sand (CH), firm to hard, light gray, gray, dark gray and tan, reddish brown, with ferrous and calcareous nodules; in borings B-1,B-2,B-4 through B-7, B-10, B-12 through B-16, B-20 through B-28 and B-30 through B-38
IV	0.5 - 23	2 - 25	Sandy Lean Clay (CL), soft to hard, light gray and tan, reddish brown, with ferrous and calcareous nodules; in borings B-2, B-4 through B-11, B-13 through B-19, B-21, B-23, B-24, B-26, B-27, B-29 through B-35 and B-37 only
V	8 – 16.5	17.5 - 25	Silty Sand (SM), loose to medium dense, light gray and tan, reddish brown; in borings B-1 through B-5, B-7 through B-11, B-17, B-18, B-24, B-25, B-29 and B-35 only

Notes: 1) The following borings were terminated in Stratum III Fat Clay With Sand (CH): - B-4, B-5, B-10, B-12, B-20 through B-22, B-26, B-28 and B-35 through B-38.

2) The following borings were terminated in Stratum IV Sandy Lean Clay (CL):- B-2, B-6, B-13 through B-16, B-19, B-23, B-27 and B-29 through B-34.

3) The following borings were terminated in Stratum V Silty Sand (SM):- B-1, B-3, B-7 through B-9, B-11, B-17, B-18, B-24 and B-25.

4.3 Site Stratigraphy and Geotechnical Characterization (Continued)

The fat clay with sand soils of strata I and III were found to have liquid limits ranging from 50% to 77%, plastic limits ranging from 19% to 23% and plasticity indices ranging from 31 to 54. The sandy lean clay soils of strata II and IV were found to have liquid limits ranging from 24% to 48%, plastic limits ranging from 16% to 18% and plasticity indices ranging from 8 to 30. The expansive fat clay with sand soils and moderately expansive sandy lean clay soils (PI>20) are not suitable for use as select fill in their present condition. These soils once lime stabilized (7% and 4% by dry weight, respectively) may be suitable for use as select fill. The non-expansive sandy lean clay soils (PI<20) are suitable for use as select fill in their present condition. The silty sands of stratum V are not recommended for use as fill material.

Soft soils were encountered at boring B-2 below the depth of 23 feet, at boring B-3 to a depth of 4 feet and at boring B-10 between the depths of 8- to 13 feet. At boring B-2 and B-3, these depths are either below or above the utility invert levels. At boring B-10, the 18 inch diameter storm sewer and 10 inch diameter sanitary sewer pipes may encounter the soft soils at the invert levels. However, considering the diameter of the pipes and no significant net increase in the loading on the underlying soils, we do not anticipate significant settlement due to pipe placement at this location.

It should also be noted that non-cohesive/granular soils may be present at different depths in between our borings or at other non boring locations. The letters in parenthesis indicate soils classification in accordance with Unified Soils Classification System. A more detailed stratigraphy is presented in boring logs, B-1 through B-38 in Appendix 3. Definition of terms and a key to symbols used in the boring logs are presented in Appendix 2. Boring log profiles were developed based on the boring locations and the subsurface soils encountered in the soil borings. The boring log profiles are presented in Figures 5A through 5I.

4.4 Groundwater

Groundwater conditions were observed in open soil borings during the field investigation. Groundwater was encountered during drilling at boring locations B-1 through B-3, B-5, B-7, B-8, B-13 through B-15, B-17, B-18, B-24 through B-29, B-31 through B-35 and B-38 at depths ranging from 16- to 24 feet. Upon completion of drilling, groundwater was measured at depths ranging from 14- to 23 feet. Groundwater was not encountered during drilling in the remaining borings. Six (6) of these borings (Borings B-1, B-6, B-16, B-26, B-30 and B-36) were converted into piezometers (PZ-1 through PZ-6, respectively) after completion of drilling and sampling and water level measured at approximately 24 to 72 hours after installation, at approximately 5- to 7 days after installation and approximately 27- to 30 days after installation. Groundwater was measured at depths of 17.5-, 17- and 22.5 feet in the piezometers at borings B-1 (PZ-1), B-26 (PZ-4) and B-36 (PZ-5) at approximately 24 to 72 hours after installation. Groundwater was not encountered in the remaining piezometers (B-6, B-16 and B-30). Groundwater was measured at depths of 16-, 18-, 16-, 23.5- and 10 feet in the piezometers at borings B-1 (PZ-1), B-6 (PZ-2), B-26 (PZ-4), B-30 (PZ-5) and B-36 (PZ-6) at approximately 7 to 10 days after installation. Groundwater was not encountered in the remaining piezometer (B-16). Groundwater was measured at depths of 16-, 19-, 16-, 18.5 and 10 feet in the piezometers at borings B-1 (PZ-1), B-6 (PZ-2), B-26 (PZ-4), B-30 (PZ-5) and B-36 (PZ-6) at approximately 27- to 30 days after installation. Groundwater was not encountered in the remaining piezometer (B-16).

Generally these fat clay with sand / lean clay with sand soil contains water due to lenses and seams of more permeable soils such as silty sand/sandy silt. The rate of flow of groundwater produced by these layers will depend upon the weather conditions at the time of construction. It should also be noted that the groundwater level is generally influenced by such factors as topography and surface drainage features. It should be noted that a detailed hydrogeological investigation of the proposed project area is beyond the scope of this investigation. Groundwater depths as measured are shown on the respective boring logs and summarized in Table 2.

5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

5.1 OSHA Type Soils

At the federal level, Occupational Safety and Health Act (OSHA) requires protective systems for all trenches exceeding 5 feet in depth. OSHA has developed a soil classification system to be used as a guideline in determining sloping and protective system requirements for trench excavations. This system has set forth a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing amounts of stability.

Stable Rock: Natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Type A: Cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) or greater.

However, no soil is Type A if:

- The soil is fissured; or
- The soil is subject to vibrations from heavy traffic, pile driving, or similar effects; or
- The soil has been previously disturbed; or
- The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four (4) horizontal to one (1) vertical or greater; or
- The material is subject to other factors that would require it to be classified as a less stable material.

5.1 OSHA Type Soils (Continued)

Type B:

- Cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf; or
- Granular Cohesionless soils, including angular gravel, silt, silty loam, and sandy loam, and in some cases, silty clay loam and sandy clay loam; or
- Previously disturbed except those which would otherwise be classified as Type C; or
- Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or
- Dry rock that is not stable; or
- Material that is part of a sloped, layered system where the layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C:

- Cohesive soil with an unconfined compressive strength of 0.5 tsf or less; or
- Granular, including gravel, sand, and loamy sand; or
- Submerged soil or soil from which water is freely seeping; or
- Submerged rock that is not stable;. or
- Material is a sloped, layered system where the layers dip into the excavation on a slope of four (4) horizontal to one (1) vertical or steeper.

5.1 OSHA Type Soils (Continued)

Based upon the soils and groundwater encountered at the boring/piezometer locations, ATL for simplicity recommends the use of OSHA soil classification Type "B" in general for the determination of allowable maximum slope or selection and design of any protective system to a depth of 16 feet and OSHA Type "C" below that depth. In the area of boring B-7, the onsite soils should be classified as OSHA Type "C" below the depth of 8 feet. In the area of borings B-2, B-4, B-9, B-35 and B-36, the onsite soils should be considered as OSHA Type "C" below the depth of 10 feet. In the area of borings B-3, B-5, B-8, B-11, B-17 and B-18, the onsite soils should be considered as OSHA Type "C" below the depth of 12 feet. In the area of borings B-1 and B-10, the onsite soils should be considered as OSHA Type "C" below the depth of 13 feet. The fill fat clay with sand soils encountered in borings B-3 and B-13 to a depth of 12.5- and 10.5 feet, respectively, may be conservatively classified as OSHA soil classification Type "C". The fill sandy lean clay soils encountered in borings B-6, B-7, B-10, B-19 and B-35 to a depth of 2-, 6-, 9-, 4- and 4 feet, respectively may be conservatively classified as OSHA soil Type "C". During construction if groundwater or silty soils or soft soils are encountered at shallower depths, then the soils should be considered as Type "C" below that depth.

5.2 Trench Excavation

The proposed utility alignments in the project area will be constructed using either open trench or auger and casing methods. The storm sewers will be 18- to 60 inches in diameter and will generally be installed at depths ranging from approximately 3.5- to 13.5 feet. The sanitary sewers will be 8- to 36 inches in diameter and will generally be installed at depths ranging from approximately 3- to 12 feet. At the intersection of Austin Street and Cleburne, the sanitary sewers may be 18.5 feet deep. The water lines will be 8- to 12 inches in diameter and installed at depths ranging from 3- to 5 feet.

5.2 Trench Excavation (Continued)

Any open trench excavations that will be deeper than 5 feet will require protective measures. The trench excavations can be made using open slopes, stepped back to stable slope, vertical cuts supported with sheet piles or other suitably designed retaining system. The excavation should be performed in accordance with the current OSHA 29 CFR Part 1926 of OSHA (Trench Safety System) and City of Houston Standard Specification, Section 02317 – Excavation and Backfill for Utilities.

Excavation trenches or pits should be provided with a proper trench support system. For the trench supporting system, the lateral pressures exerted by surrounding soils are presented in Figure 6. Where cohesive soils are underlained by sandy soils, the lateral pressures may be taken as given in Figure 6A. In case that a trench shield is used, the trench shield may be designed for a lateral earth pressure equivalent to a fluid pressure of 102 PCF (example: $\Upsilon' K_a + \Upsilon_w = (120\text{-}62.4)\ 0.7 + 62.4$) for cohesive soils below the water table and 84 PCF (example: $\Upsilon K_a = 120 * 0.7$) for the cohesive soils above the water table. In non-cohesive soils, the trench shield should be designed for a lateral earth pressure equivalent to a fluid pressure of 85 PCF (example: $\Upsilon' K_a + \Upsilon_w = (120\text{-}62.4)\ 0.4 + 62.4$) below the water table and 48 PCF (example: $\Upsilon K_a = 120 * 0.4$) above the water table. In general, a surcharge magnitude of q psf will result in lateral earth pressure of 0.5q in cohesive soils and 0.4q in granular soils. Timber shoring as outlined in 29 CFR Part 1926 of OSHA recommendation may be used in the construction of trench supporting system.

Due to the presence of the roadway adjacent to the likely excavation areas for storm sewers at the project site, the effect of vehicular traffic should be considered while designing the lateral supporting systems. Boussinesq's equation should be used for calculating the loads on the retaining systems due to the vehicular traffic. Boussinesq's equation for both horizontal and vertical stresses are shown in Figure 6B. All surcharge loads to a distance of 0.5 times the wall height should be considered. We recommend that a HS20 vehicle loading be considered adjacent to the pit for design purposes. An impact factor of 1.5 should be used in the design. Surcharge loading due to construction machinery should be considered as applicable.

5.2 Trench Excavation (Continued)

Stockpiling of excavated material should not be allowed near the excavation. Generally, a distance of one half the excavation depth on both sides of the trench should be kept clear of any excavated material. If this is not possible due to space limitations then the retaining system design should take into account the surcharge loads.

Based upon our groundwater investigations from piezometers, groundwater may be encountered in general during excavations deeper than 10- to 16 feet in the project area. Seepage of water may also occur at shallower depths and/or at other locations if fluctuation in groundwater levels takes place. The flow of groundwater may vary depending upon depth of construction and weather conditions. Where groundwater is encountered, a conventional sump and pump arrangement is recommended for the shallow trench excavations up to 15 feet in cohesive soils. For excavations deeper then 15 feet, multi-staged pumps or well points may be required. Where granular soils are encountered or where the water inflow is large, dewatering using well points may be required. In stable cohesive soils, the trench bottom stability can be evaluated in the following manner.

If sheeting terminates at the base of cut:

$$\text{Factor of safety } (F_s) = \frac{(N_c)\,C}{(\Upsilon)\,H+q}$$

- N_c = Bearing Capacity factor which depends on dimensions of the excavation:(width), (length) and (depth) (Use $N_c = 5.7$).
- C = Undrained shear strength of clay in failure zone beneath and surrounding base of cut (may be taken as half the unconfined compressive strength).
- Υ = Unit weight of surrounding soils.
- H = Depth of excavation.
- q = Surface surcharge.

If the factor of safety is less than 1.5, sheeting should be extended below the base of the cut to insure stability. The extended sheeting depth may be taken as 0.5 times the trench width.

5.2 Trench Excavation (Continued)

Soft soils were encountered at boring B-2 below the depth of 23 feet, at boring B-3 to a depth of 4 feet and at boring B-10 between the depths of 8- to 13 feet. At boring B-2 and B-3, these depths are either below or above the utility invert levels. At boring B-10, the 18 inch diameter storm sewer and 10 inch diameter sanitary sewer pipes may encounter the soft soils at the invert levels. However, considering the diameter of the pipes and no significant net increase in the loading on the underlying cohesive soils, we do not anticipate significant settlement due to pipe placement at this location.

5.3 Groundwater Control

Groundwater information is given in Section 4.4. Where groundwater is encountered, precautions should be taken to control the groundwater since the presence of groundwater destroys the cohesion of the soil (thus reducing the angle of repose) and can separate and wash away individual particles. Groundwater control in cohesive and semicohesive soils can usually be accomplished by sump and pump arrangements because the seepage should be relatively slow. In granular soils or if the inflow is large, then dewatering using well points will be required. Recommendations of City of Houston Standard Specification, Section 01578 – Control of Ground Water and Surface Water should be followed.

Seams and pockets of sands, silt, ferrous nodules, and calcareous nodules that exist in the cohesive soil layers may pose a threat if they form a drainage path for the groundwater and as a result, accelerate the rate of seepage. Also in non-cohesive soil layer, the groundwater seepage will occur at a high rate. Hence, during the excavation and construction below groundwater levels, appropriate measures such as proper groundwater control and shoring methods, will have to be implemented under supervision of a Professional Civil/Geotechnical Engineer.

5.4 Bedding Criteria

Where water line is installed using open trench method, the trench bottom for water line placement should be over-excavated to a minimum of 12 inches. For auger pits the over excavation should be to a minimum of 6 inches. The space should be filled with bank sand to a depth of atleast 12-inches above the pipe top and compacted to a minimum of 95 percent of the maximum Standard Proctor density (ASTM D698) with a moisture content of –3 to +5 percent of the optimum moisture content. Over-excavation of trench bottoms will be required for wet soils below the depth of groundwater. The trench bottom should be shaped to receive the water pipe. The bedding details should be in accordance with the latest City of Houston Construction Details. City of Houston Drawing No. 02317-04 should be used for the water main bedding and backfill. The bedding and backfill for auger pit should be in accordance with City of Houston Drawing No. 02447-01.

For sanitary sewers, the trench bottom should be excavated to a minimum of 12 inches below the pipe placement depth. The space should be filled with crushed stone to a depth of atleast 12 inches above the pipe top. The trench bottom should be shaped to receive the pipe. The trench zone backfill should be as per latest City of Houston Specifications. The bedding details should be in accordance with the latest City of Houston Specifications. City of Houston Drawing No. 02317-01 should be used for the sanitary sewer bedding and backfill for dry or wet stable trench conditions. City of Houston Drawing No. 02317-02 may also be used in lieu of above for wet stable trench conditions for the sanitary sewer bedding and backfill. Where dry stable trench conditions are encountered or developed by dewatering, City of Houston Drawing No. 02317-03 may be used.

5.4 Bedding Criteria (Continued)

For storm sewers, in areas where dry subgrade is encountered, the trench bottom should be excavated to a minimum of 12 inches below the pipe placement depth. The space should be filled with cement stabilized sand to a depth of pavement base/subgrade depth if the pipe is under the pavement. For concrete pavement this should be 12-inches below the pavement. If the pipe is outside the pavement area, then the cement stabilized sand should be filled to a depth of 12-inches above the pipe top. The trench bottom should be shaped to receive the pipe. The bedding details should be in accordance with the latest City of Houston Specifications. City of Houston Drawing No. 02317-03 should be used for the storm sewer bedding and backfill for dry stable trench conditions. In areas where wet subgrade is encountered, City of Houston Drawing No. 02317-02 should be used for the storm sewer bedding and backfill.

5.5 Backfill of Trench

The backfill should conform to standard City of Houston Specification, Section 02317 – Excavation and Backfill for Utilities. The backfill materials should conform to standard City of Houston Specification, Section 02320 – Utility Backfill Materials.

The embedment material between the pipe and the trench (bedding, haunching and initial backfill) may consist of bank run sand placed in maximum six-inches compacted lift thickness and compacted to a minimum of 95 percent of the maximum dry density as determined by Standard Proctor test (ASTM D698) at –3 to +5 percent of the optimum moisture content.

5.5 Backfill of Trench (Continued)

In the trench zone within the pavement area, the backfill may consist of bank run sand or select fill. The bank run sand should be placed in maximum 12 inches loose lift thickness and compacted by vibratory equipment to a minimum of 95 percent of the maximum dry density at moisture content within zero percent to +5 percent of optimum as determined by ASTM D698. The select fill may be placed in maximum 6-inches compacted lift thickness and compacted to a minimum of 95 percent of the maximum dry density at moisture contents within 2 percent of optimum as determined according to ASTM D 698. Any cut pavement should be replaced to match the existing pavement type and the thickness should be equal or greater then the existing pavement thickness. The finished pavement surface must be even with existing pavement elevation. In the trench zone outside the pavement area, a random backfill of suitable material (clayey soils) may be used. The random backfill may be placed in maximum 12 inches loose lift thickness for clayey soils and compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D 698 at moisture content necessary to achieve the density.

For sewers, as trench zone backfill in paved areas for streets and to one-feet back of curbs and pavements, cement stabilized sand should be used. Select backfill should be used within one-foot below pavement subgrade for rigid pavements. For trench excavations outside pavement areas, random backfill may be used and compacted as specified in City of Houston Standard Specification Section 02317 -Excavation and Backfill for Utilities. The backfill material should conform to Standard City of Houston specification, Section 02320 – Utility Backfill Materials.

5.6 Loads on Buried Conduits

The pipelines placed at depths under the ground will be subject to loads due to backfill (earth loads) and loads due to vehicular traffic (live loads). These loads can be calculated based on Marston's (Ref: 1 through 3) and Boussinesq (Fig. 6B) formulas. The Marston's equation for trench conduits are generally given as:

$$W_d = C_d \Upsilon B_d^2 \qquad \text{- for rigid pipes}$$

$$W_d = C_d \Upsilon B_d B_c \qquad \text{- for flexible pipes}$$

Where, W_d = fill load, in pounds per linear foot of pipe

C_d = Marstons soil coefficient

Υ = Unit weight of fill material, pcf (use 120 pcf)

B_d = Width of trench at or slightly below top of pipe, in feet

B_c = Width of pipe, in feet

The above equation is valid when the conduit is placed in a trench not wider then 2.0 to 3.0 times its outside breadth. Marstons soil coefficient C_d can be obtained from Table 3. A value of $K\mu$ equal to 0.11 can be used for the design where K is the active earth pressure coefficient and μ is the coefficient of sliding friction between the fill material and the sides of the trench. The height of fill and the horizontal width of trench should be considered from the top of the conduit. For the above equation for flexible pipes, an assumption of equal stiffness of soil and pipe has been used for it's development and the equation generally gives a minimum load value. Hence, for flexible pipes including for ones installed using tunneling, the earth loads may be conservatively calculated using the prism load theory. The prism load (Ref: 1 through 3) determines the weight of the soil column directly above the pipe neglecting factors such as side wall friction and/or the cohesion of the soils. The prism load (in psf) may be calculated by multiplying the total unit weight of soil above the pipe (say 120 pcf) by the height, H (ft) of the soil fill. The prism load generally gives higher loading on the pipe and simulates the long term load imposed on the pipe.

5.6 Loads on Buried Conduits (Continued)

For calculation of live loads, the width of the loaded area should be taken as the outside horizontal width of the pipe. Loading due to HS20 vehicle should be considered for vehicular traffic. We understand that the pipelines will be placed at depths of less then 10 feet in general with deeper depths up to 15 feet at some locations. We estimate that the additional loading on the pipeline due to HS20 vehicle will be about 400, 250, 200, 176 and 100 psf at a depth of 4, 5, 6, 7 and 8 feet, respectively below the existing street level. Additional loading on the pipeline below 8 feet due to HS20 vehicle can be ignored.

5.7 Augering Pipe

We understand that the proposed water line, storm sewers and sanitary sewers may be installed using the auger and casing techniques at some locations. We understand that the water line may be placed at depths of approximately 3- to 5 feet, sanitary sewers will be placed at depths of approximately 2.5- to 18.5 feet and storm sewers will be placed at depths ranging from 3.5- to 13.5 feet. Based on our geotechnical exploration, the augering is generally likely to be performed in fat clay with sands, sandy lean clay and silty sands. The augering method may consist of dry auger or slurry auger method. In the dry auger method, the casing is advanced by jacking while excavating soil at the advancing end of the casing. In the slurry auger method, a small diameter pilot hole is first drilled between the access shafts. This is followed by reaming the pilot hole to full diameter by augering with slurry and installing casing or pipe by pull-back or jacking techniques.

5.7 Augering Pipe (Continued)

In areas where granular soil or soft and caving soils are encountered, colloidal drilling fluid consisting of bentonite slurry may be used. Alternatively, microtunneling or open trench methods may be used in these areas. The selection of an excavation system for use with pipe jacking must take into account the type of soils encountered, groundwater conditions, desired rate of advance and spacing of access shafts. Recommendations given in City of Houston Standard Specification, Section 02447 – Augering Pipe and Conduit, should be followed.

It is essential to maintain continuous jacking operations to avoid 'soil freeze'. If soil freeze does occur it may become necessary to install another jacking station or access shaft. The selection of an efficient augering and casing techniques and construction procedure based on the soil conditions, groundwater and other relevant factors is the responsibility of the contractor.

Temporary augering shaft structures should be designed based on the lateral earth pressures and other considerations discussed in section 5.2. Recommendations for auger pits given in City of Houston Standard Specification, Section 02447 – Augering Pipe and Conduit, should be followed.

Groundwater conditions were observed in open soil borings during the field investigation and that information has been presented in Section 4.4.

Water inflow from the cohesive soils may be removed using a sump and pump arrangement. If the water inflow is large or where granular soils are encountered dewatering using well points may be required to provide a dry working platform and to prevent soil boiling.

5.8 Effect Of Tunnel On Surrounding Structures

A properly designed and controlled augering/tunneling operation can reduce immediate soil movement and subsidence to a tolerable level. Nevertheless, some ground loss should be expected during any tunnel construction operation. With good construction techniques, ground loss can be held to acceptable levels. Tunnels constructed below pavement and buried utilities may lead to some future settlement due to loosening of the subgrade or bedding condition. Large ground loss can result from uncontrolled flowing ground. Such condition may occur wherever water-bearing sands or silts are encountered along the tunnel alignment.

The zone of influence of the tunnel roughly extends to a distance equal to the invert depth on each side of the centerline of the tunnel alignment. The amount of settlement due to tunneling are difficult to estimate. We anticipate that if good construction practices and control are exercised, the amount of ground settlement should be limited. Elevation of the roadway, sidewalk and other important structures along the tunnel alignment should be taken prior to, during and after construction to evaluate the amount of settlement due to tunneling and the effectiveness of the tunneling technique adopted. Existing damages to the surrounding structures should be documented prior to starting of the tunneling operations. Recommendations given in City of Houston Standard Specification, Section 02425 – Tunnel Excavation and Primary Liner should be followed.

5.9 Thrust Restraint

Unbalanced thrust forces result from changes in flow directions and/or velocity in a pressurized pipe system. The force acting on a pipe system are resisted by the bearing area between the pipe and the backfill soils. Adequate restraint may be achieved by using restraint joints, tie rods, or a combination of these systems. The restraint joints are employed to allow thrust and shear forces to be transmitted across the pipe joints to allow a number of pipe sections to act integrally in bearing.

Thrust blocks are commonly used to increase the bearing area to allow the fittings to resist movement. The procedures for thrust block design are given in detail in AWWA M9 (Ref. 1). The magnitude of thrust block force T is defined as follows:

$$T = 2\,PA\,\mathrm{Sin}\,(H/2)$$

where P = internal pressure (psi); A = cross-sectional area of pipe (in^2);
H = deflection angle of bend; and T = thrust force (pounds)

The thrust block size is then calculated based on the bearing capacity of the soil:

$$\text{Area of block} = T/F$$

where T = thrust force (lb); and F = safe bearing value for soil (lb/sq.ft)

A safe bearing value of 1500 psf can be used for thrust block design. This value includes a factor of safety of 3. The blocks must be placed against undisturbed soil and the face of the block must be perpendicular to the direction of and centered on the line of action of the thrust. Proper care must be exercised after construction to prevent failure due to any future excavations behind the blocks.

5.9 Thrust Restraint (Continued)

Restrained joints are typically used to avoid the uncertainties of thrust blocking like future excavations, etc. A detailed procedure for designing restrained joints including example calculations is outlined in the AWWA design manual M9 (Ref. 1). The following soil parameters are recommended for the design of the restrained joint(s):

Average unit weight of soil, γ	= 120 pcf	
Cohesion of soils, C	= 1000 psf	(for clay soils)
Angle of internal friction, ϕ	= 30^0	(for sand backfill)
Coefficient of friction between pipe and soil, f	= 0.3	

5.10 Flexible Pipe Deflection

The deflection of a flexible pipe may be determined using the modified Iowa formula of Watkins and Spangler (Ref. 2) as given below:

$$\Delta x = D_l \{ KWr^3 / (EI + 0.061\ E'\ r^3) \}$$

Here EI is the pipe wall stiffness (in-lb.), r is the radius (in.) and W is the load per unit of pipe length (lb/lin in. of pipe). Where prism loads (i.e. weight of soil above the pipe) are used for pipe earth loads, a deflection lag factor, D_l of 1.0 may be used. Otherwise, deflection lag factor, D_l of 1.5 should be used. The bedding constant, K, may be taken as 0.1. The following soil parameters are recommended in well compacted soils:

Average unit weight of soil, γ	= 120 pcf	
Modulus of Soil Reaction, E'	= 1000 psi	(for sandy lean clay/lean clay with sand - CL soils)
	= 350 psi	(for fat clay with sand - CH soils, may be taken as zero if conservatism is preferred)
	= 1000 psi	(for silty sand – SM soils)
	= 1500 psi	(for coarse soils or crushed rock)

The modulus of soil reaction, E', values given above includes a factor of safety of 2.

5.11 Uplift Pressure

If any buried structure is placed below the water table, then the direct upward hydrostatic pressure of water, called the *uplift pressure,* acts on the base. In general, uplift pressure acts against the weight of a foundation, thus increasing the possibility and danger of sliding as well as overturning of the structure. An uplift pressure diagram for the groundwater at rest is presented as Figure 7. Uplift resistance is contributed by one or more of the following approaches,

(1) weight of the structure (W)
(2) weight of the soil above the base extension beyond the wall(Ws), if applicable, and
(3) the frictional force between the soil and foundation (Fs).

Uplift Resistance = W+Ws+Fs

W and Ws are not known at this stage. The value of allowable skin friction in firm to stiff cohesive soils may be taken as approximately 200 psf. The value of allowable skin friction in silty sands may be taken as approximately 150 psf. The above value includes a factor of safety of about two. If base extension option is used, buoyant unit weight of backfill soil (67.6 pcf) should be used above the base extension when calculating potential uplift resistance. *Uplift resistance should always be greater than uplift pressure.* A minimum factor of safety of 2.0 is suggested for design computations of this feature.

5.12 Street Cut Repair

Any street cut for the inlets or that necessary for this project should be restored to its original condition using material similar in nature and thickness to the adjoining streets. Recommendations outlined in City of Houston Standard Specification, Section 02951 – Pavement Repair and Resurfacing should be followed.

5.13 Pavement Design

The existing project streets may be reconstructed. The reconstructed streets will be of concrete. Our design recommendations for new concrete pavement are given in the following sections.

5.13.1 Traffic Information

No traffic information for the project streets are available to us. However, the subject streets are generally of residential subdivision type and are expected to have a low and light traffic in general. For this project we have assumed a design ESALs of 500,000 for our design purposes. In the event that the actual traffic is to be significantly different from the above, we should be contacted. We will then revise our recommendations based on the actual anticipated traffic information.

5.13.2 Subgrade Preparation

The surficial soils along project alignments consist of Fat Clay With Sand (CH) and Sandy Lean Clay (CL). These soils should provide an acceptable base for pavement construction when properly prepared as following:

- Strip existing ground to remove organics and other unsuitable materials. Proof roll the subgrade to detect any wet, soft, or pumping areas. Treat these areas with drying or stabilizing agents, as necessary, or remove and replace them with a suitable fill material. Lime stabilization of the subgrade with 7 % lime by dry weight extending to a depth of 6 inches is recommended. This percentage should be confirmed by a lime series test at the time of construction.
- Good surface drainage should be provided away from the edges of paved areas to minimize lateral moisture transmission into the subgrade.
- Compact the subgrade to a minimum of ninety-five (95) percent of its maximum dry density at an moisture content within a range of plus or minus 2 percent of optimum, as determined by the Standard Proctor Compaction Test (ASTM D 698).

5.13.3 Subgrade Support

Our field and laboratory exploration indicated that the subgrade soils below the existing pavement consisted of firm to very stiff fat clay with sand and sandy lean clay. The California Bearing Ratio (CBR) tests indicated the tested surface sandy lean clay soils to have CBR value of about 3.7. The optimum moisture of the tested soils ranged from 15.3 to 17.0 percent and the maximum dry density ranged from 110.8 to 111.3 pcf. Additional information can be obtained from the Appendix 4. Currently, an additional sample of fat clay with sand soils is being tested. This test result will be presented in the final report. However based on our experience, the fat clay with sand soils are expected to have a CBR value in the range of about 2 to 4. For this project, we recommend a design CBR value of 2 and resilient modulus M_R. of 3000 psi for use in the pavement design for this project.

5.13.4 Concrete Pavement

The concrete pavement was designed based on the AASHTO procedure. The following design parameters were used in the concrete pavement design for the proposed pavement.

Reliability, R : 90 %

Overall Standard Deviation, So : 0.35

Load Transfer Coefficient, J : 3.2

Drainage Coefficient, Cd : 1.2

Design Serviceability Loss, ΔPSI : 2.0

Loss of Support : 1.0

Traffic : 500,000 ESAL (18-Kips) for design life of 20 years

Concrete Modulus of Rupture : 600 psi

Modulus of Elasticity of Concrete, Ec = 3.2×10^6 psi

Effective Modulus of Subgrade Reaction, k = 70 pci

5.13.4 Concrete Pavement (Continued)

Based on the above design parameters, the recommended concrete pavement section thickness is 6.0 inches for design ESAL of 500,000 for the project area streets. The design chart for concrete pavement is shown in Appendix 6.

The top 6 inches under the pavement should be lime-stabilized using 7 % lime by dry weight. The lime stabilization should be in accordance with City of Houston Standard Specification, Section 02336. It should be noted that the pavement thickness will change as a function of traffic. If the actual traffic is going to be significantly different from that assumed, then we should be contacted for revised recommendation based on the actual traffic.

Concrete should meet the City of Houston standard requirements and/or the requirements of the AASHTO "Guide Specifications for Highway Construction and the Structural Specifications for Transportation Materials".

Longitudinal joints for concrete pavement are generally designed at distances between 40- to 80 feet. A longitudinal spacing of about 80 feet may be used.

5.13.5 Reinforcement Design

The reinforcement design may be in accordance with City of Houston standard specification shown in Drawing No. 02751-01. For a 6-inch thick concrete pavement with longitudinal spacing of 80 feet, pavement width of 28 feet, 28 day concrete compressive strength of 3500 psi and grade 60 steel, the longitudinal spacing may be 20.5 inches for No. 4 bars. The transverse spacing may be 36 inches. The minimum lap lengths should be 22 inches. The minimum lap lengths should be 22 inches for No. 4 bars. For a different pavement width then that given above, the reinforcement details should be taken from the City of Houston Drawing No. 02751-01.

6.0 CONSTRUCTION REVIEW

6.1 Quality Control

Associated Testing Laboratories, Inc. (ATL) recommends implementation of a comprehensive quality control program under the supervision of a Professional Engineer due to the fact that a considerable amount of excavation and back filling is required in the proposed project area. Structural integrity and stability is particularly dependent on quality foundation installation, bedding and subgrade preparations.

An independent testing laboratory should be assigned to test and inspect construction materials during the construction phase.

To ensure that excavation will remain stable, to provide sufficient headroom for working, to provide worker's safety and to protect adjacent structures, the excavations will have to be provided with sufficient side slopes or shored in accordance with OSHA "Trench Safety Systems" (29 CFR Part 1926), as published in the Federal Register, Vol. 52, No.72, Section 1926-650 through 1926-653. Excavation of the trenches and access pits should be carried out under the supervision of an experienced construction supervisor and necessary shoring and/or bracing of the trenches should be properly installed. In temporary braced or shored excavations and in access pits where the sheeting terminates at the base of the trench, lateral earth pressure, surcharge, and seepage pressure caused by a differential hydrostatic head moving upward to the bottom of the trench can cause trench bottom instability. Therefore, it is recommended that, if the bottom stability evaluation yields a factor of safety less than 1.5, the sheeting should be extended below the base of cut.

6.1 Quality Control (Continued)

Before filling operations take place, representative samples of the proposed fill material should be tested by an independent laboratory to determine the compaction and classification characteristics. Additional fill material used for backfilling should meet the City of Houston standard specifications Sections 02317 and 02320. Fill materials should be placed and compacted to the requirements as specified in City of Houston standard specification Section 02317. The moisture content of fill material should be as specified in Section 02317. Proper field inspection and testing should be performed to ensure that proper fill material is used and the compaction and moisture content meets the required specifications.

6.2 Monitoring

Despite the thoroughness of this geotechnical exploration, there is always the possibility that actual subsurface conditions may differ from the predicted conditions because conditions between soil borings can be different from those at specific boring locations.

Any excessive ground movements like settlement and lateral movement should be monitored and controlled. This can be done by performing a preconstruction survey including photography and documentation of existing conditions like elevations, cracks, etc., and by installing ground movement monitoring devices such as inclinometers, crack monitors, and establishing elevation monitor stations along the waterline alignment to monitor the ground movement after commencement of the excavation.

Associated Testing Laboratory, Inc. (ATL) recommends a regular inspection and overall project monitoring by a geotechnical engineer during the construction phase. The purpose of inspection is to provide sound engineering and judgement alternatives during construction, if unanticipated conditions occur.

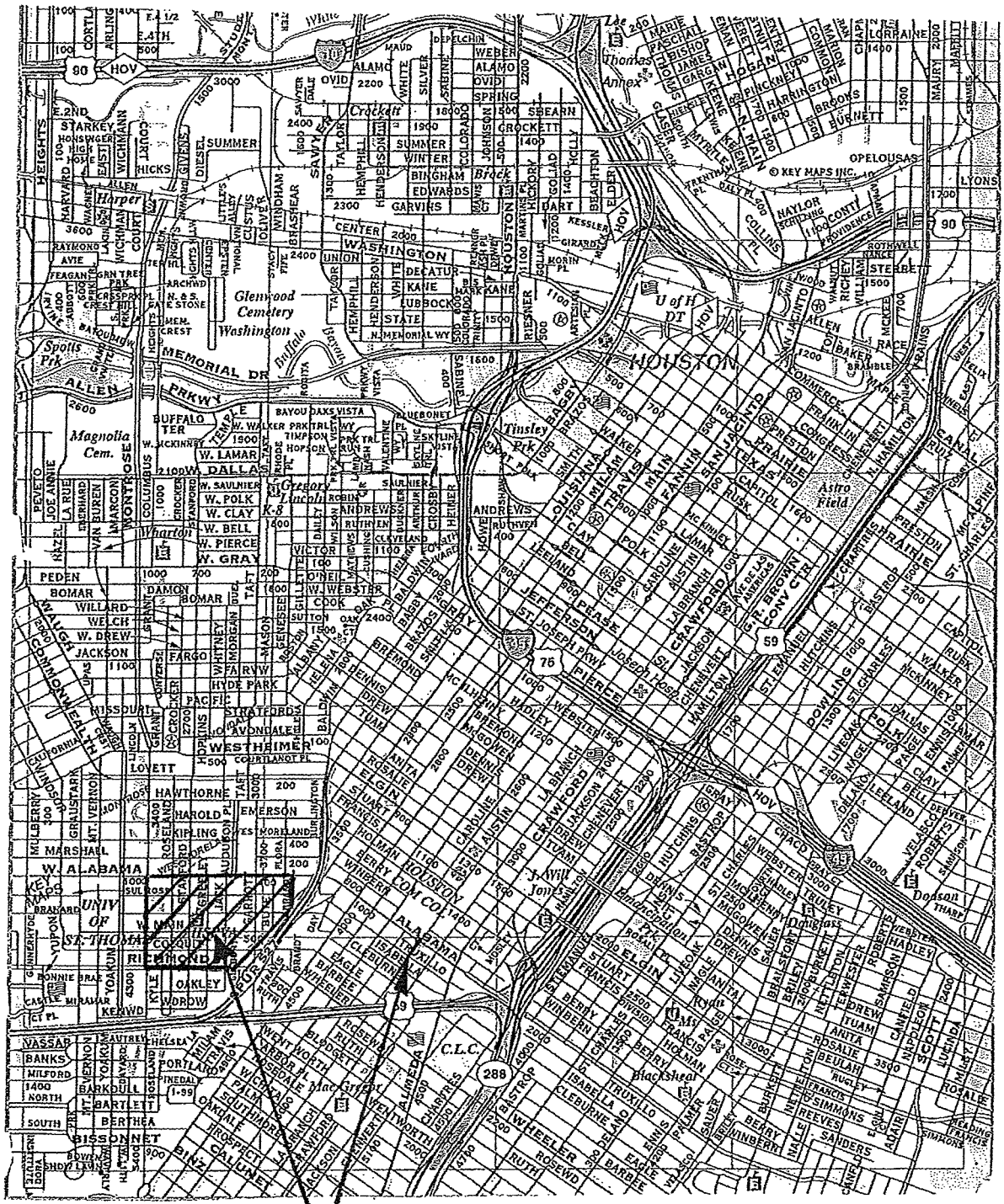
7.0 LIMITATIONS

The recommendations contained in this report are based on data gained from test borings at the locations shown in Figure 2, a reasonable volume of laboratory tests, and professional interpretation and evaluation of such data, from the project information furnished. Should it become apparent during construction that soil conditions differ significantly from those discussed in this report, this office should be notified immediately so that an evaluation, and any necessary adjustments can be made. Any analysis of bulkhead or other buildings or features at the site are not within the scope of this investigation, ATL is not responsible for any problems caused by these features.

8.0REFERENCES

1. "Concrete Pressure Pipe"; Manual of Water Supply Practices – American Water Works Association (AWWA).
2. "Steel Pipe – A Guide For Design And Installation"; Manual of Water Supply Practices – American Water Works Association (AWWA).
3. A. P. Moser (1990), Buried Pipe Design, McGraw-Hill, Inc.
4. Joseph E. Bowles (1982), Foundation Analysis and Design, 3rd ed., McGraw-Hill Book Company.
5. Braja M. Das (1985), Principles of Geotechnical Engineering, PWS Engineering.
6. Merlin G. Spangler and Richard L. Handy (1982), Soil Engineering, Fourth Edition, Harper & Row Publishers.
7. Alfreds R. Jumikis (1971), Foundation Engineering, Intext Educational Publishers.
8. Policy, Criteria and Procedure Manual (PCPM) – Appendix D, HCFCD 2004.
9. Annual Book of ASTM Standards for Soils and Rock; Building Stones.
10. Harris County Soil Survey; USDA Soil Conservation Services.
11. Geologic Atlas of Texas; Bureau of Economic Geology, The University of Texas.
12. Groundwater Quality in Texas; Texas Natural Resources Conservation Commission.
13. CFR PART 1926.

FIGURES



SITE VICINITY MAP

Associated Testing Laboratories, Inc.
3143 Yellowstone Blvd. Houston, Texas
Tel: (713) 748-3717 Fax: (713) 748-3748

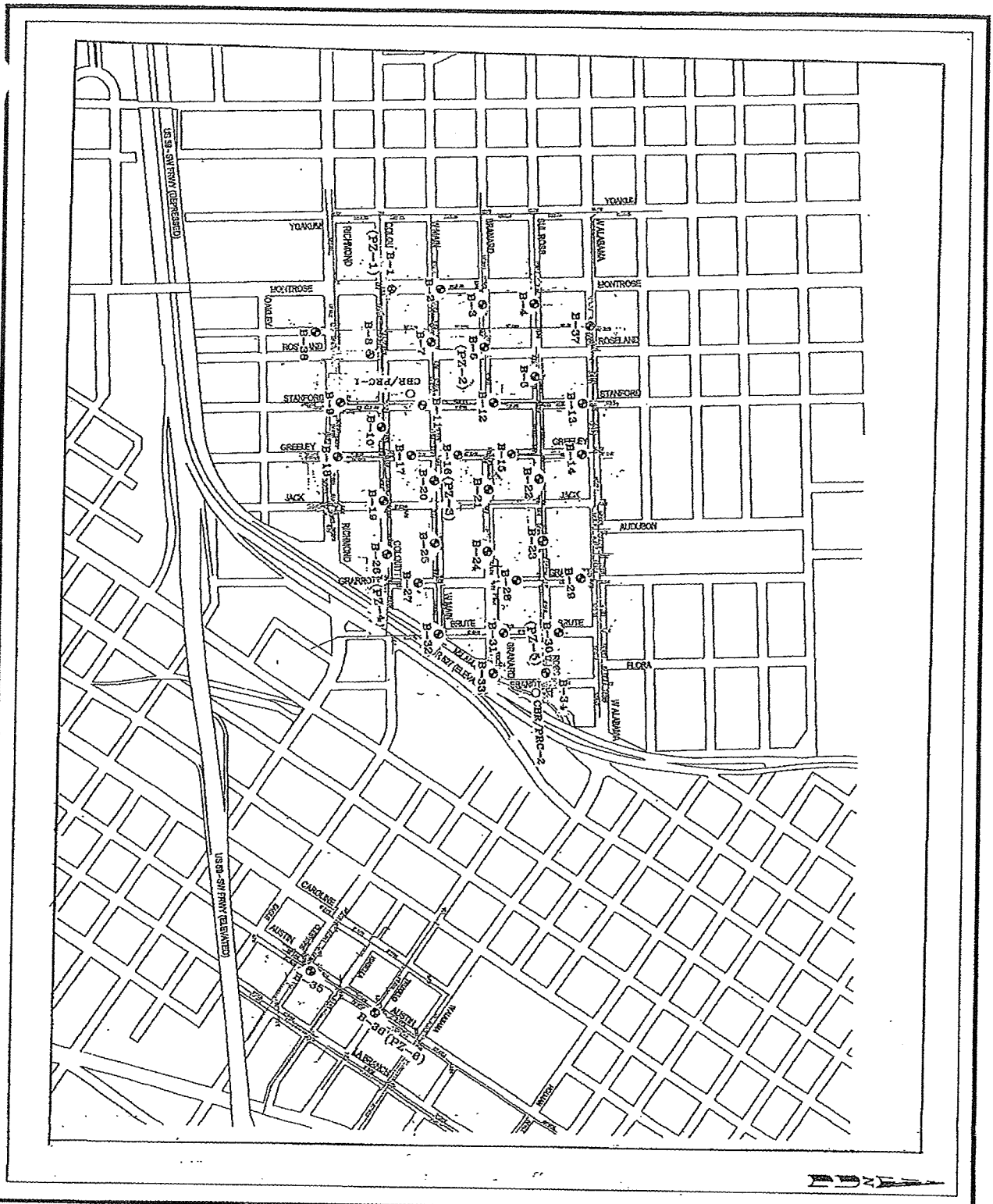
NEIGHBORHOOD STREET RECONSTRUCTION

WBS NO.: N-000400-0001-4

PROJECT NO. 467

PROJECT NO. G10-131

FIGURE. 1



LOCATION OF BORINGS

Associated Testing Laboratories, Inc.
3143 Yellowstone Blvd. Houston, Texas
Tel: (713) 748-3717 Fax: (713) 748-3748

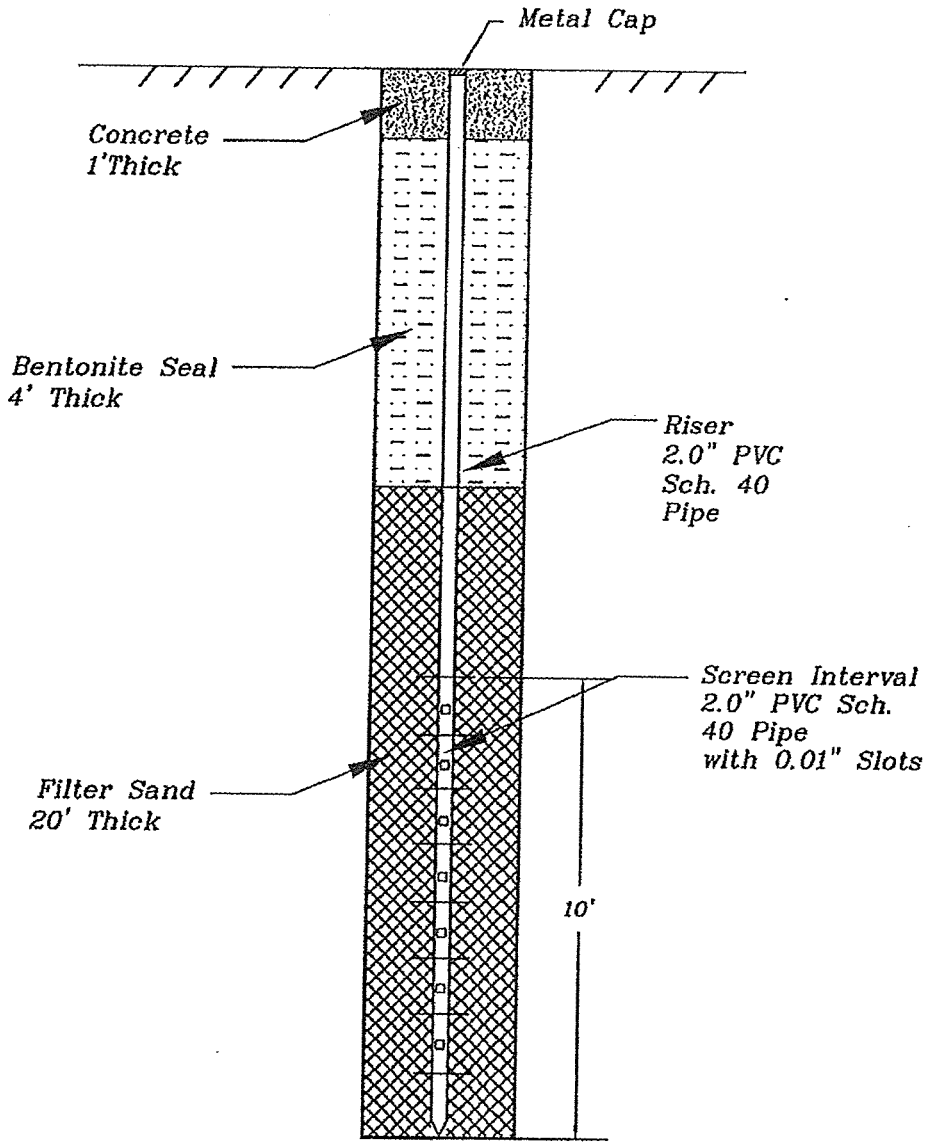
NEIGHBORHOOD STREET RECONSTRUCTION

WBS NO.: N-000400-0001-4

PROJECT NO. 467

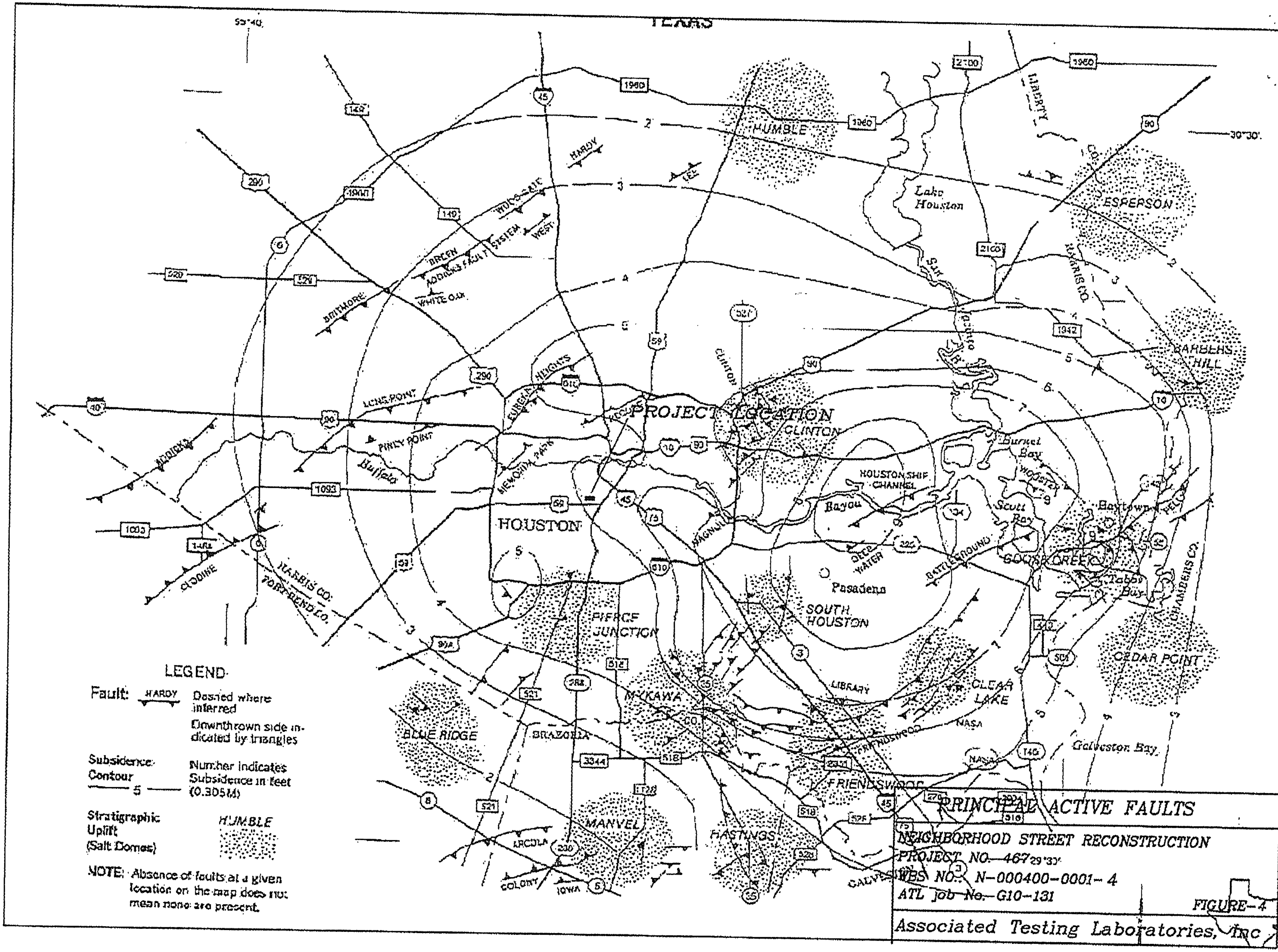
PROJECT NO. G10-131

FIGURE 2



PIEZOMETERS AT B–1, B–6, B–16, B–26, B–30 & B–36

FIG.3 PIEZOMETER WELL STRUCTURE
NEIGHBORHOOD STREET RECONSTRUCTION PROJECT NO. 467 WBS NO.: N–000400–0001–4 ATL job No. G10–131 FIGURE. 3
Associated Testing Laboratories, Inc.



LEGEND

Fault: HARDY — Dashed where inferred. Downthrown side indicated by triangles

Subsidence Contour — 5 — Number indicates Subsidence in feet (0.305M)

Stratigraphic Uplift (Salt Domes) — HUMBLE

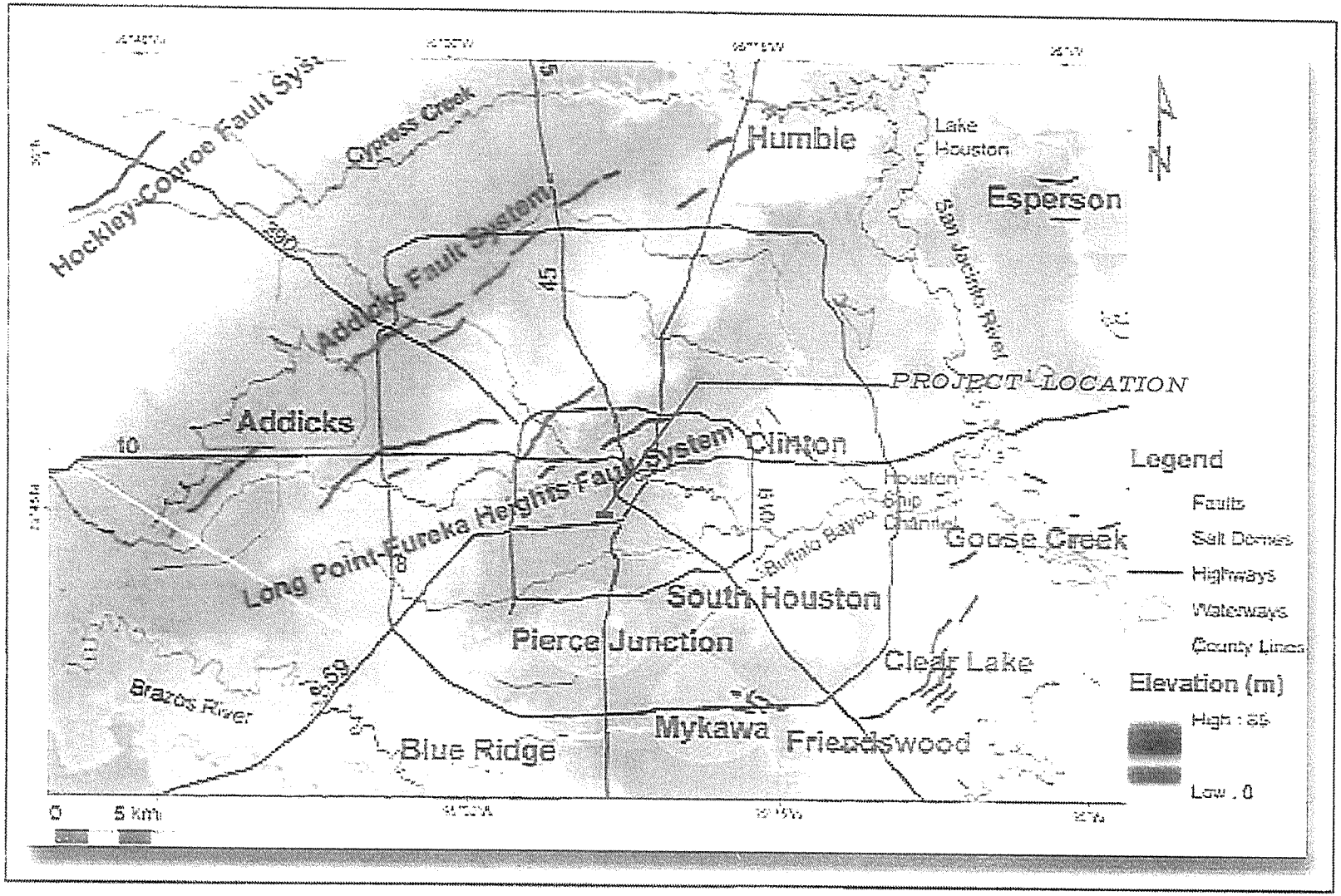
NOTE: Absence of faults at a given location on the map does not mean none are present.

PRINCIPAL ACTIVE FAULTS

NEIGHBORHOOD STREET RECONSTRUCTION
PROJECT NO. 467
WBS NO. N-000400-0001-4
ATL Job No. G10-131

FIGURE-4

Associated Testing Laboratories, Inc



FAULT MAP	Associated Testing Laboratories, Inc. 3143 Yellowstone Blvd. Houston, Texas Tel: (713) 748-3717 Fax: (713) 748-3748
NEIGHBORHOOD STREET RECONSTRUCTION	WBS NO.: N-000400-0001-4
PROJECT NO. 467	PROJECT NO. G10-131 — FIGURE. 4A

ASSOCIATED TESTING LABORATORIES, INC.

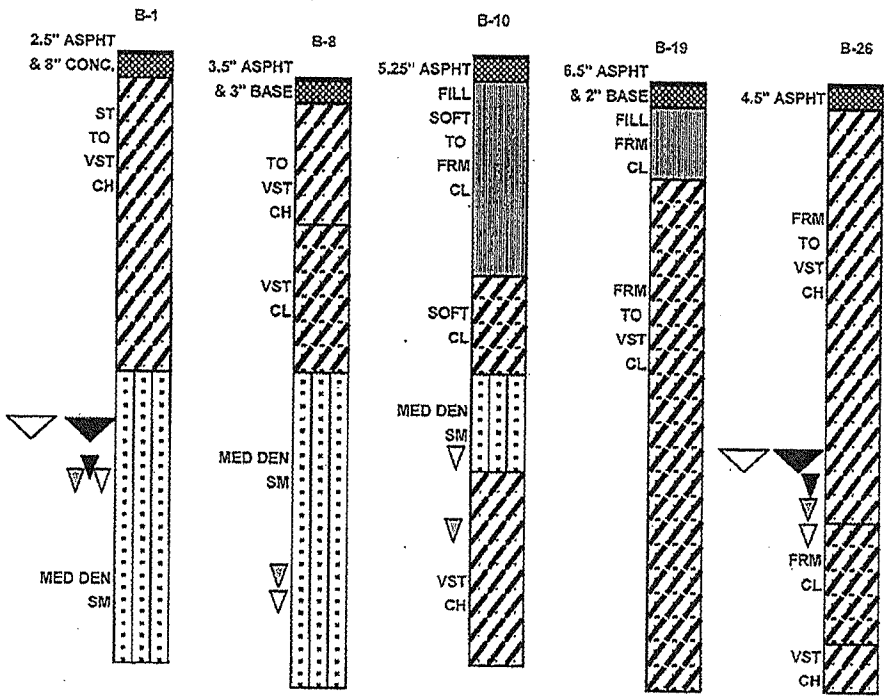
PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT NO. 467

PROJECT NO. G10-131

WBS No.: N-000400-0001-4

Depth (ft)

50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22



PROFILE ALONG COLQUITT

▽	Water First Noticed
▽	Depth To Water At Completion
▼	PZ Water Level (3-24-10)
▼	PZ Water Level (4-01-10)
▽	PZ Water Level (4-23-10)

KEY		ST - Stiff
CH- Fat Clay With Sand		VST - Very Stiff
CL- Lean Clay With sand		FRM - Firm
CL- Sandy Lean Clay		HRD - Hard
SM- Silty Sand		MED DEN - Medium Dense

SCALE
Horizontal: 1"= 500'
Vertical: 1"= 5'

Figure-5A

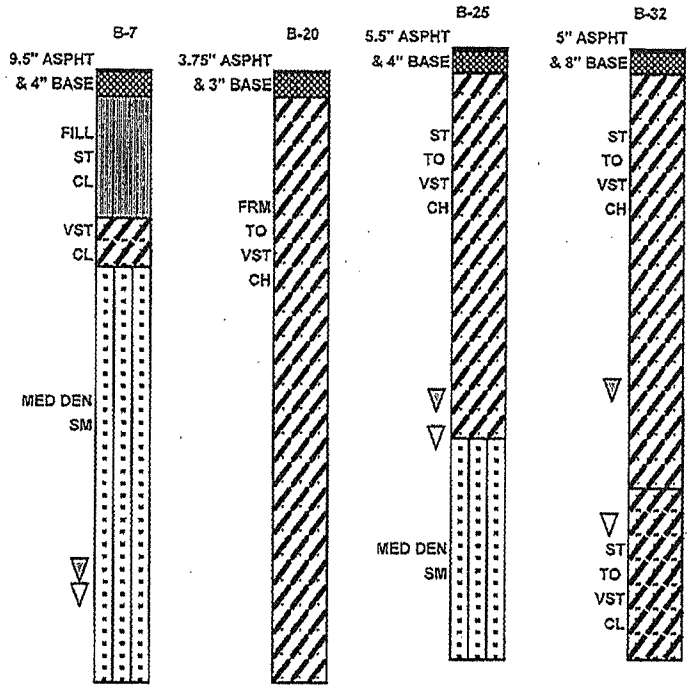
ASSOCIATED TESTING LABORATORIES, INC.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT NO. 467 PROJECT NO. G10-131

WBS No.: N-000400-0001-4

Depth (ft.)

50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22



PROFILE ALONG W.MAIN

▽	Water First Noticed
▽	Depth To Water At Completion

KEY		ST - Stiff
CH- Fat Clay With Sand		VST - Very Stiff
CL- Lean Clay With sand		FRM - Firm
CL- Sandy Lean Clay		HRD - Hard
SM- Silty Sand		MED DEN - Medium Dense

SCALE
Horizontal: 1"= 500'
Vertical: 1"= 5'

Figure-5B

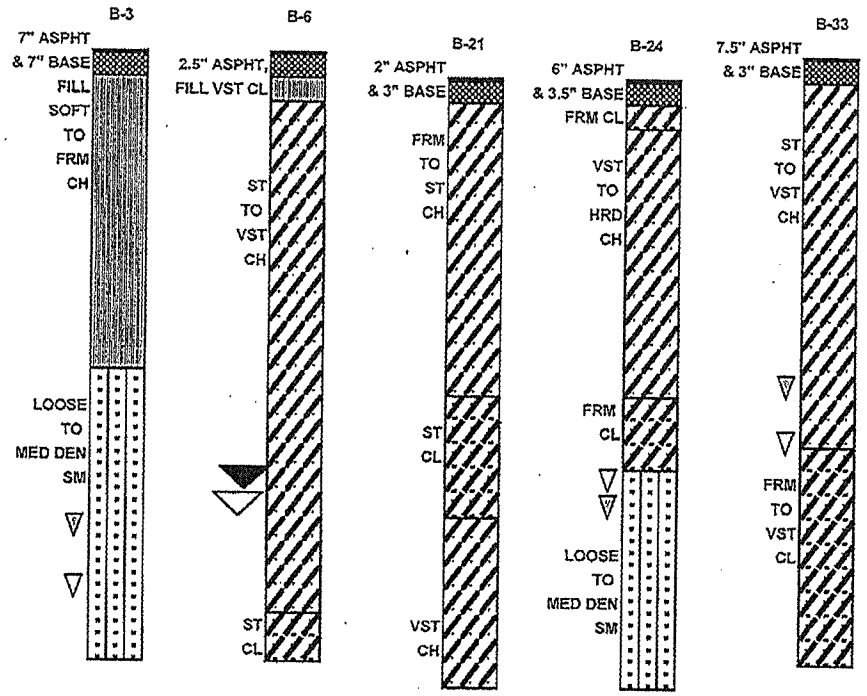
ASSOCIATED TESTING LABORATORIES, INC.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT NO. 467 — PROJECT NO. G10-131

WBS No.: N-000400-0001-4

Depth (ft.)

50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22



PROFILE ALONG BRANARD

KEY	
▽	Water First Noticed
▽	Depth To Water At Completion
▼	PZ Water Level (3-24-10)
▼	PZ Water Level (4-01-10)
▽	PZ Water Level (4-23-10)

CH- Fat Clay With Sand	ST - Stiff
CL- Lean Clay With sand	VST - Very Stiff
CL- Sandy Lean Clay	FRM - Firm
SM- Silty Sand	HRD - Hard
	MED DEN - Medium Dense

SCALE
Horizontal: 1"= 500'
Vertical: 1"= 5'

Figure-5C

ASSOCIATED TESTING LABORATORIES, INC.

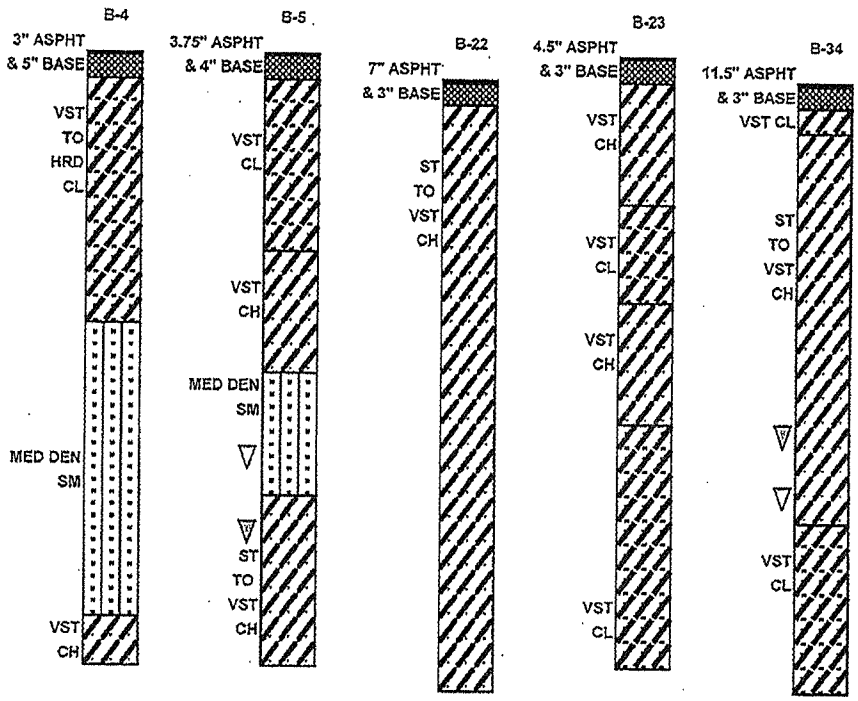
PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT NO. 467

PROJECT NO. G10-131

WBS No.: N-000400-0001-4

Depth (ft.)

50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 26 25 24 23 22



PROFILE ALONG SULROSS

▽	Water First Noticed
▽	Depth To Water At Completion

KEY		
CH- Fat Clay With Sand		ST - Stiff
CL- Lean Clay With sand		VST - Very Stiff
CL- Sandy Lean Clay		FRM - Firm
SM- Silty Sand		HRD - Hard
		MED DEN - Medium Dense

SCALE
Horizontal: 1"= 500'
Vertical: 1"= 5'

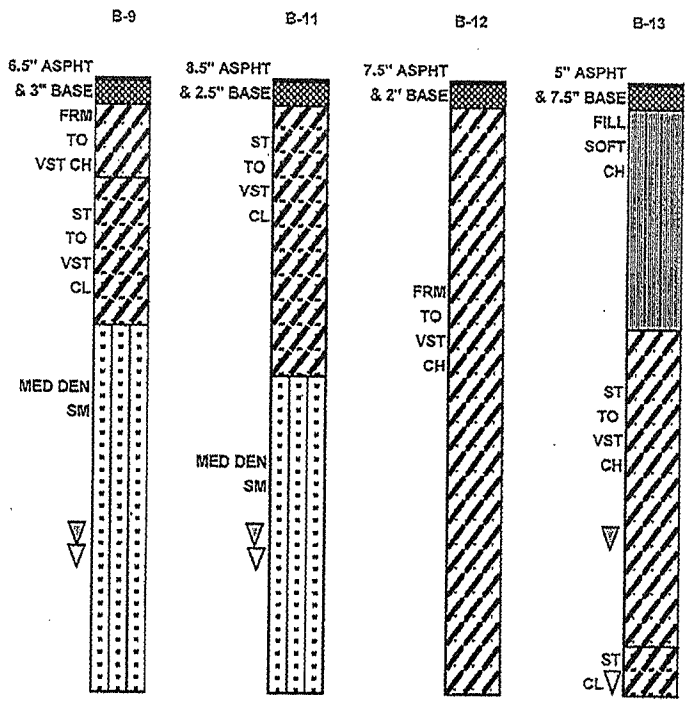
Figure-5D

ASSOCIATED TESTING LABORATORIES, INC.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT NO. 467 PROJECT NO. G10-131

WBS No.: N-000400-0001-4

Depth (ft.)



PROFILE ALONG STANFORD

▽	Water First Noticed
▽	Depth To Water At Completion

KEY		ST - Stiff
CH- Fat Clay With Sand		VST - Very Stiff
CL- Lean Clay With sand		FRM - Firm
CL- Sandy Lean Clay		HRD - Hard
SM- Silty Sand		MED DEN - Medium Dense

SCALE
Horizontal: 1"= 500'
Vertical: 1"= 5'

Figure-5E

ASSOCIATED TESTING LABORATORIES, INC.

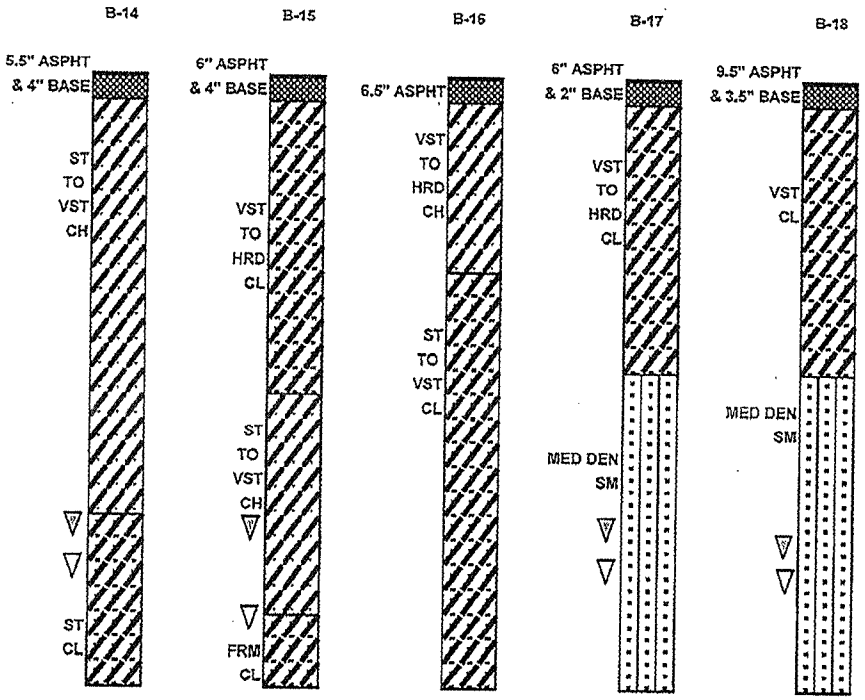
PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT NO. 467

WBS No.: N-000400-0001-4

PROJECT NO. G10-131

Depth (ft.)

48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22



PROFILE ALONG GREELEY

Water First Noticed

Depth To Water At Completion

PZ Water Level (3-24-10)

PZ Water Level (4-01-10)

PZ Water Level (4-23-10)

KEY

CH- Fat Clay With Sand
CL- Lean Clay With sand
CL- Sandy Lean Clay
SM- Silty Sand
ST - Stiff
VST - Very Stiff
FRM - Firm
HRD - Hard
MED DEN - Medium Dense

SCALE
Horizontal: 1"= 500'
Vertical: 1"= 5'

Figure-5F

ASSOCIATED TESTING LABORATORIES, INC.

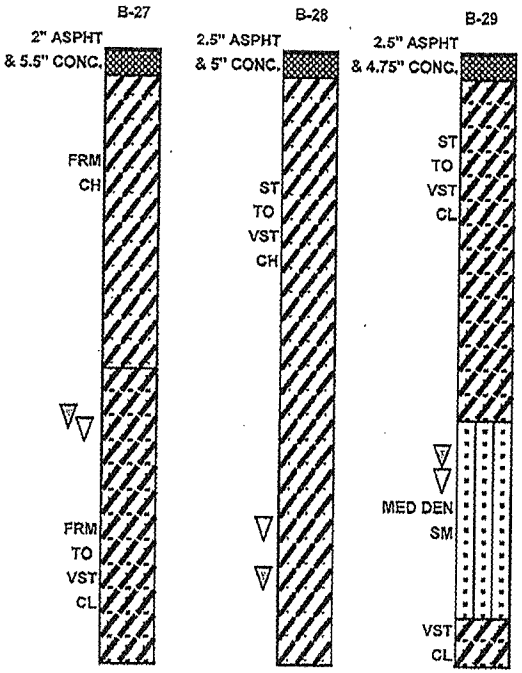
PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT NO. 467

WBS No.: N-000400-0001-4

PROJECT NO. G10-131

Depth (ft.)

50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23



PROFILE ALONG GARROTT

▽	Water First Noticed
▽	Depth To Water At Completion

KEY		
CH- Fat Clay With Sand		ST - Stiff
CL- Lean Clay With sand		VST - Very Stiff
CL- Sandy Lean Clay		FRM - Firm
SM- Silty Sand		HRD - Hard
		MED DEN - Medium Dense

SCALE
Horizontal: 1"= 500'
Vertical: 1"= 5'

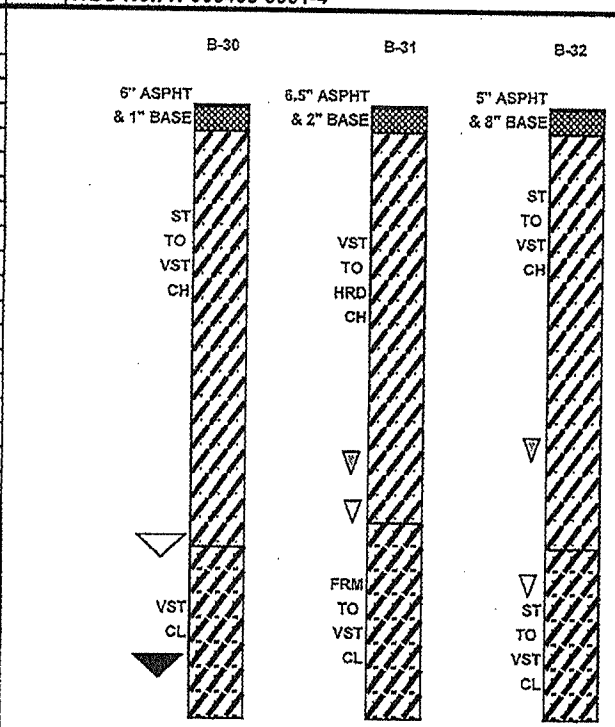
Figure-5G

ASSOCIATED TESTING LABORATORIES, INC.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT NO. 467 — PROJECT NO. G10-131

WBS No.: N-000400-0001-4

Depth (ft.)



PROFILE ALONG BUTE

▽	Water First Noticed
▽	Depth To Water At Completion
▼	PZ Water Level (3-24-10)
▼	PZ Water Level (4-01-10)
▽	PZ Water Level (4-23-10)

KEY		
CH- Fat Clay With Sand		ST - Stiff
CL- Lean Clay With sand		VST - Very Stiff
CL- Sandy Lean Clay		FRM - Firm
SM- Silty Sand		HRD - Hard
		MED DEN - Medium Dense

SCALE
Horizontal: 1"= 500'
Vertical: 1"= 5'

Figure-5H

ASSOCIATED TESTING LABORATORIES, INC.

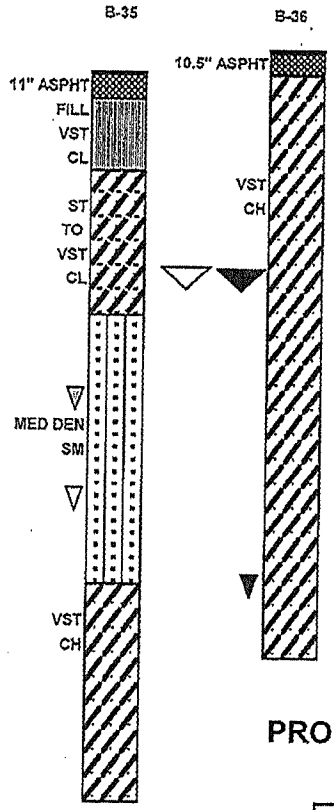
PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT NO. 467

WBS No.: N-000400-0001-4

PROJECT NO. G10-131

Depth (ft.)

45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14



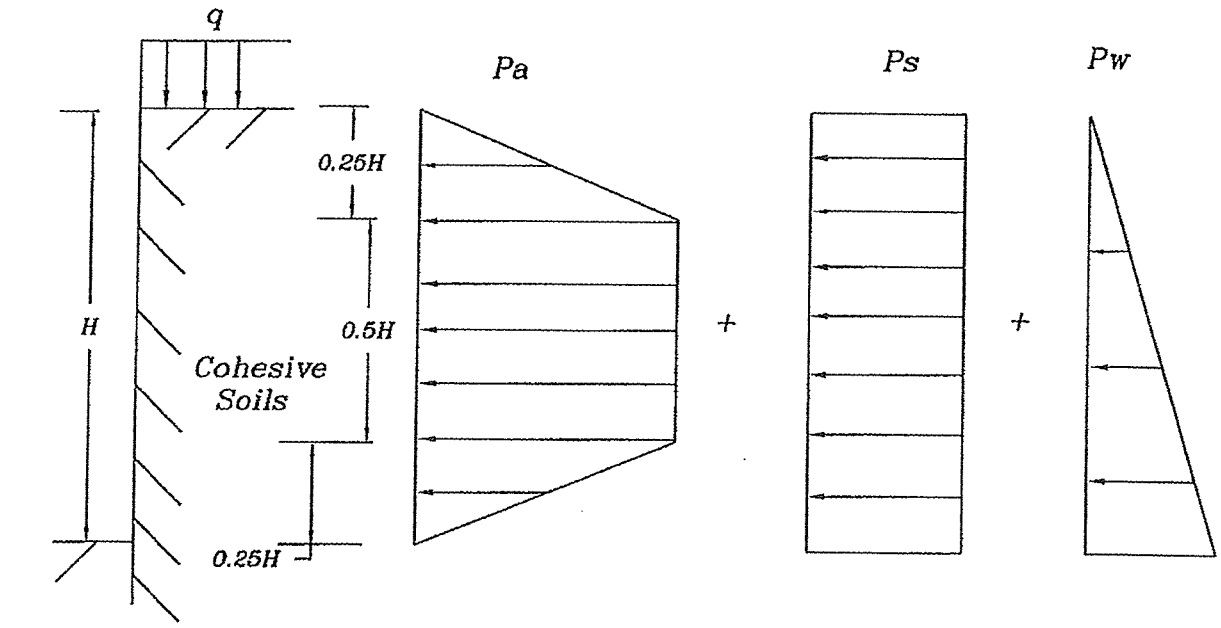
PROFILE ALONG AUSTIN

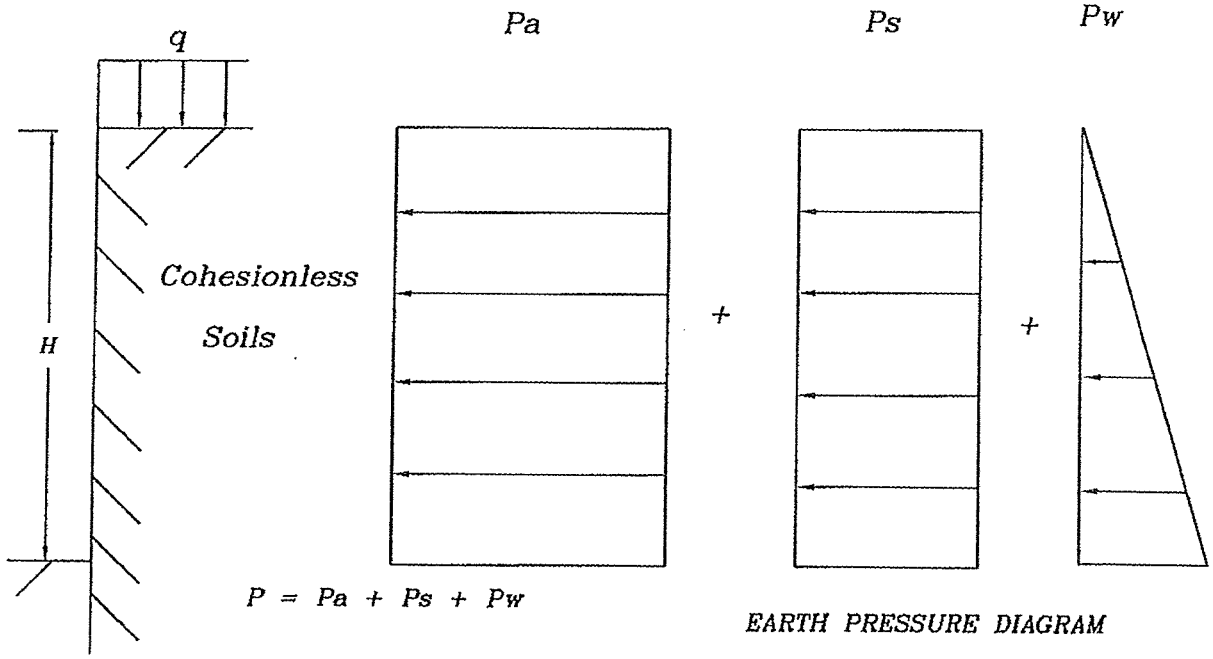
▽	Water First Noticed
▽	Depth To Water At Completion
▼	PZ Water Level (3-29-10)
▼	PZ Water Level (4-01-10)
▽	PZ Water Level (4-23-10)

KEY		
CH- Fat Clay With Sand		ST - Stiff
CL- Lean Clay With sand		VST - Very Stiff
CL- Sandy Lean Clay		FRM - Firm
SM- Silty Sand		HRD - Hard
		MED DEN - Medium Dense

SCALE
Horizontal: 1"= 500'
Vertical: 1"= 5'

Figure-5I





$P = Pa + Ps + Pw$

EARTH PRESSURE DIAGRAM

Where P = Total lateral pressure (psf)

Pa = Active earth pressure(psf) = $K_A \gamma H = 0.4 \gamma H$ for Stiff Clays

= $0.65\ K_A \gamma H = 0.25 \gamma H$ for cohesionless Sands

Ps = Lateral pressure due to surcharge load (psf) = 0.5q for Clays

= 0.4q for Sands

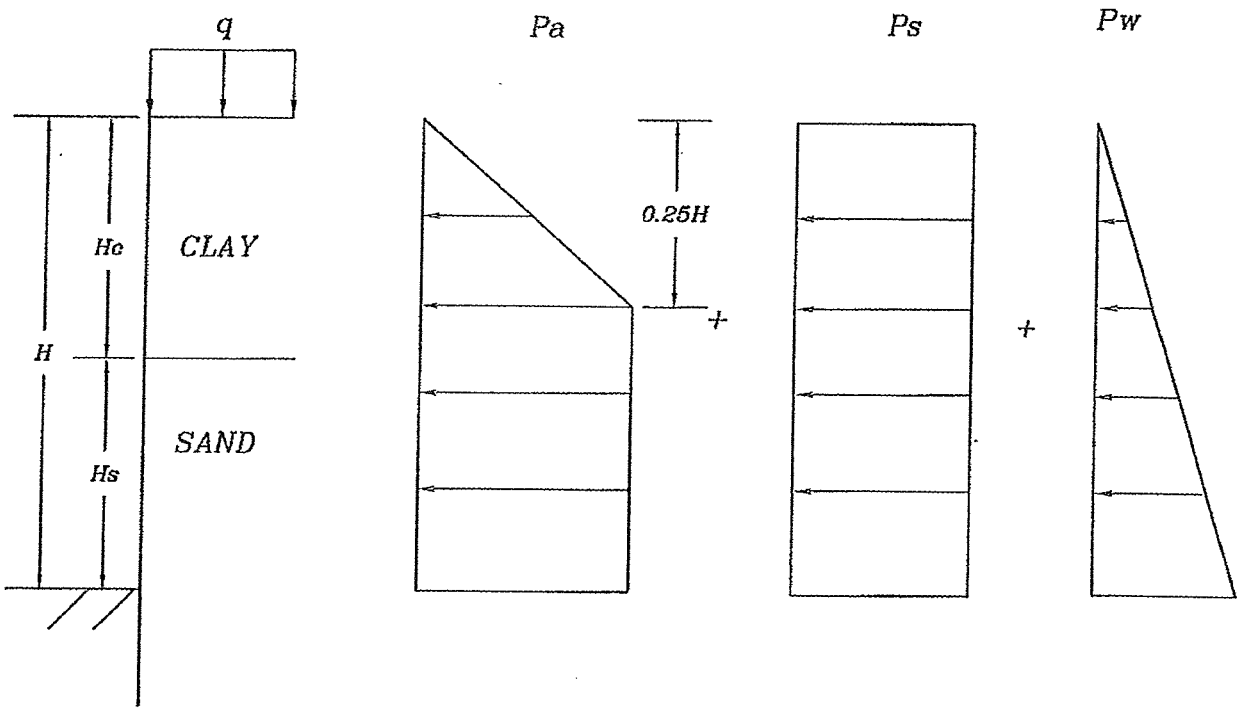
Pw = Hydrostatic pressure (psf) = 62.4* water depth

H = Depth of braced excavation (ft)

q = Surcharge load (psf) usually taken as 500 psf

γ = Submerged density of soils (pcf) = use 60 pcf

EARTH PRESSURE DIAGRAM	Associated Testing Laboratories, Inc. 3143 Yellowstone Blvd. Houston, Texas Tel: (713) 748-3717 Fax: (713) 748-3748
NEIGHBORHOOD STREET RECONSTRUCTION	WBS NO.: N-000400-0001-4
PROJECT NO. 467	PROJECT NO. G10-131 / FIGURE. 6



$$P = Pa + Ps + Pw$$

Where P = Total lateral pressure (psf)

Pa = Active earth pressure(psf) = $K_A \gamma H = 0.4 \gamma H$

Ps = Lateral pressure due to surcharge load (psf) = $0.5q$

Pw = Hydrostatic pressure (psf) = 62.4^{*} water depth

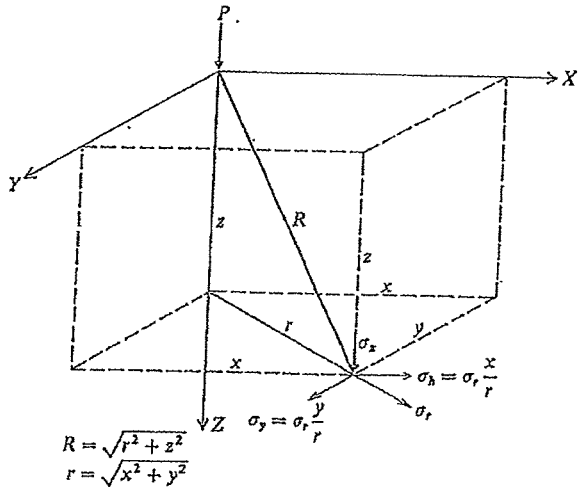
H = Depth of braced excavation (ft)

q = Surcharge load (psf) usually taken as 500 psf

γ = Submerged density of soils (pcf) = use 60 pcf

EARTH PRESSURE DIAGRAM	Associated Testing Laboratories, Inc. 3143 Yellowstone Blvd. Houston, Texas Tel: (713) 748-3717 Fax: (713) 748-3748
NEIGHBORHOOD STREET RECONSTRUCTION	WBS NO.: N-000400-0001-4
PROJECT NO. 467	PROJECT NO. G10-131 / FIGURE. 6A

BOUSSINESQ'S EQUATIONS FOR POINT LOAD SURCHARGE



Lateral Pressure, σ_r :

$\sigma_r = (P/2\pi) \{ (3r^2z/R^5) - ([1-2\mu] / R[R + z]) \}$

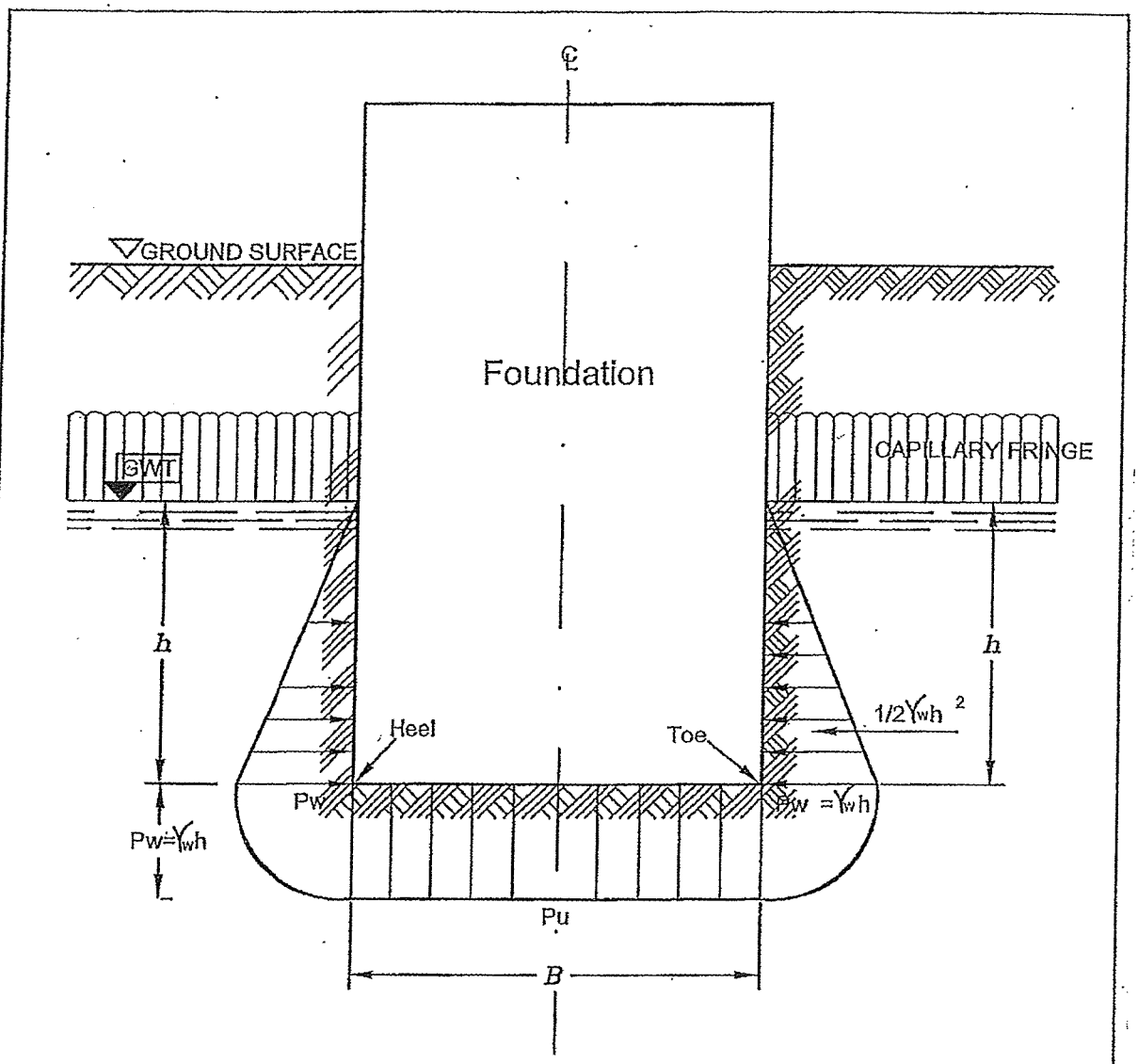
for $\mu = 0.5$,

$\sigma_r = P/2\pi (3r^2z/R^5)$

Vertical Pressure, σ_z :

$\sigma_z = 3Pz^3 / 2\pi R^5$

In the above, P = point load surcharge
μ = poisson's ratio (use 0.5 for design purposes)
x, y, z = respective distances in the x, y and z directions



UPLIFT PRESSUE DIAGRAM FOR
GROUND WATER AT REST

$P_w = \gamma_w h$

$P_u = P_w * B$

Pw= Uplift Pressure (psf)

γ_w = Unit weight of water (62.4 pcf)

h = Depth of water from ground water table to the bottom of foundation (ft)

P = Uplift force per unit length of foundation (lbs/ft)

B = Width of the foundation (ft)

UPLIFT PRESSURE DIAGRAM	*Associated Testing Laboratories, Inc.* *3143 Yellowstone Blvd. Houston, Texas* *Tel: (713) 748-3717 Fax: (713) 748-3748*
NEIGHBORHOOD STREET RECONSTRUCTION	*WBS NO.: N-000400-0001-4*
PROJECT NO. 467	*PROJECT NO. G10-131* / *FIGURE. 7*

TABLES

TABLE 1

SUMMARY OF PAVEMENT MEASUREMENTS

NSR PROJECT 467

CITY OF HOUSTON WBS NO. N-000400-0001-3

ASSOCIATED TESTING LABORATORIES, INC., JOB NUMBER G10-131

Boring Number	Asphalt Paving (inch)	Concrete Paving (inch)
B-1	2.5"	8"
B-2	2.5"	8"
B-3	7"	--
B-4	3" over 5" crushed gravel	--
B-5	3.75" over 4" crushed gravel	--
B-6	2.5"	--
B-7	9.5" over 4" crushed gravel	--
B-8	3.5" over 3" shell	--
B-9	6.5" over 3" crushed gravel	--
B-10	5.25"	--
B-11	8.5" over 2.5" crushed gravel	--
B-12	7.5" over 2" crushed gravel	--
B-13	5" over 7.5" crushed gravel	--
B-14	5.5" over 4" crushed gravel	--
B-15	6" over 4" crushed gravel	--
B-16	6.5"	--
B-17	6" over 2" crushed gravel	--
B-18	9.5" over 3.5" crushed gravel	--
B-19	6.5" over 2" crushed gravel	--
B-20	3.75" over 3" shell	--

(Continued)

TABLE 1 (Continued)

SUMMARY OF PAVEMENT MEASUREMENTS

NSR PROJECT 467

CITY OF HOUSTON WBS NO. N-000400-0001-3

ASSOCIATED TESTING LABORATORIES, INC., JOB NUMBER G10-131

Boring Number	Asphalt Paving (inch)	Concrete Paving (inch)
B-21	2" over 3" crushed gravel	--
B-22	7" over 3" crushed gravel	--
B-23	4.5" over 3" crushed gravel	--
B-24	6" over 3.5" crushed gravel	--
B-25	5.5" over 4" shell	--
B-26	4.5"	--
B-27	2.5"	5.5"
B-28	2.5"	5"
B-29	2.5"	4.75"
B-30	6" over 1" shell	--
B-31	6.5" over 2" shell	--
B-32	5"	--
B-33	7.5"	--
B-34	11.5" over 3" crushed gravel	--
B-35	11"	--
B-36	10.5"	--
B-37	2.5"	5.5"
B-38	2.5" over 4" shell	--

TABLE 2

SUMMARY OF GROUNDWATER MEASUREMENTS

NSR PROJECT 467

WBS NO. N-000400-0001-3

ASSOCIATED TESTING LABORATORIES, INC. JOB NUMBER G10-131

Boring Number	Location	Ground water during drilling	Ground water upon completion of drilling	Ground water in Piezometer at 24 hours	Ground water in Piezometer on 4-1-10	Ground water in Piezometer on 4-23-10
B-1/PZ-1	See Figure 2	18'	18'	17.5'	16'	16'
B-2	"	20'	19'	--	--	--
B-3	"	22.5'	20'	--	--	--
B-4	"	--	--	--	--	--
B-5	"	17''	20'	--	--	--
B-6/PZ-2	"	--	--	--	18'	19'
B-7	"	22'	21'	--	--	--
B-8	"	22'	21'	--	--	--
B-9	"	20'	19'	--	--	--
B-10	"	17'	20'	--	--	--
B-11	"	20'	19'	--	--	--
B-12	"	--	--	--	--	--
B-13	"	25'	19'	--	--	--
B-14	"	20.5'	19'	--	--	--
B-15	"	22.5'	19'	--	--	--
B-16 /PZ-3	"	--	--	--	--	--
B-17	"	20.5'	19'	--	--	--
B-18	"	21'	19.5'	--	--	--
B-19	"	--	--	--	--	--
B-20	"	--	--	--	--	--
B-21	"	--	--	--	--	--
B-22	"	--	--	--	--	--
B-23	"	--	--	--	--	--
B-24	"	17'	18'	--	--	--
B-25	"	16.5'	15'	--	--	--
B-26/PZ-4	"	19'	18'	17'	16'	16'
B-27	"	16'	15.5'	--	--	--
B-28	"	20'	22'	--	--	--

(Continued)

TABLE 2 (Continued)

SUMMARY OF GROUNDWATER MEASUREMENTS

NSR PROJECT 467

WBS NO. N-000400-0001-3

ASSOCIATED TESTING LABORATORIES, INC. JOB NUMBER G10-131

Boring Number	Location	Ground water during drilling	Ground water upon completion of drilling	Ground water in Piezometer at 24 hours	Ground water in Piezometer on 4-1-10	Ground water in Piezometer on 4-23-10
B-29	See Figure 2	18'	17'	--	--	--
B-30/PZ-5	"	--	--	--	23.5'	18.5'
B-31	"	17'	15'	--	--	--
B-32	"	20'	14.5'	--	--	--
B-33	"	16.5'	14'	--	--	--
B-34	"	17.5'	15'	--	--	--
B-35	"	18'	14'	--	--	--
B-36/PZ-6	"	--	--	22.5'	10'	10'
B-37	"	--	--	--	--	--
B-38	"	24'	23'	--	--	--

TABLE 3

Marston Soil Coefficients (C_d) for Trench Conduits

A = $K\mu' = .1924$ Granular materials without cohesion
B = $K\mu' = .165$ Maximum for sand and gravel
C = $K\mu' = .150$ Maximum for saturated top soil
D = $K\mu' = .130$ Ordinary maximum for clay
E = $K\mu' = .110$ Maximum for saturated clay

H/B_d	A	B	C	D	E
0.05	0.050	0.050	0.050	0.050	0.050
0.10	0.098	0.098	0.099	0.099	0.099
0.15	0.146	0.146	0.147	0.147	0.148
0.20	0.192	0.194	0.194	0.195	0.196
0.25	0.238	0.240	0.241	0.242	0.243
0.30	0.283	0.286	0.287	0.289	0.290
0.35	0.327	0.331	0.332	0.335	0.337
0.40	0.371	0.375	0.377	0.380	0.383
0.45	0.413	0.418	0.421	0.425	0.428
0.50	0.455	0.461	0.464	0.469	0.473
0.55	0.496	0.503	0.507	0.512	0.518
0.60	0.536	0.544	0.549	0.555	0.562
0.65	0.575	0.585	0.591	0.598	0.606
0.70	0.614	0.625	0.631	0.640	0.649
0.75	0.651	0.664	0.672	0.681	0.691
0.80	0.689	0.703	0.711	0.722	0.734
0.85	0.725	0.741	0.750	0.763	0.775
0.90	0.761	0.779	0.789	0.802	0.817
0.95	0.796	0.816	0.827	0.842	0.857

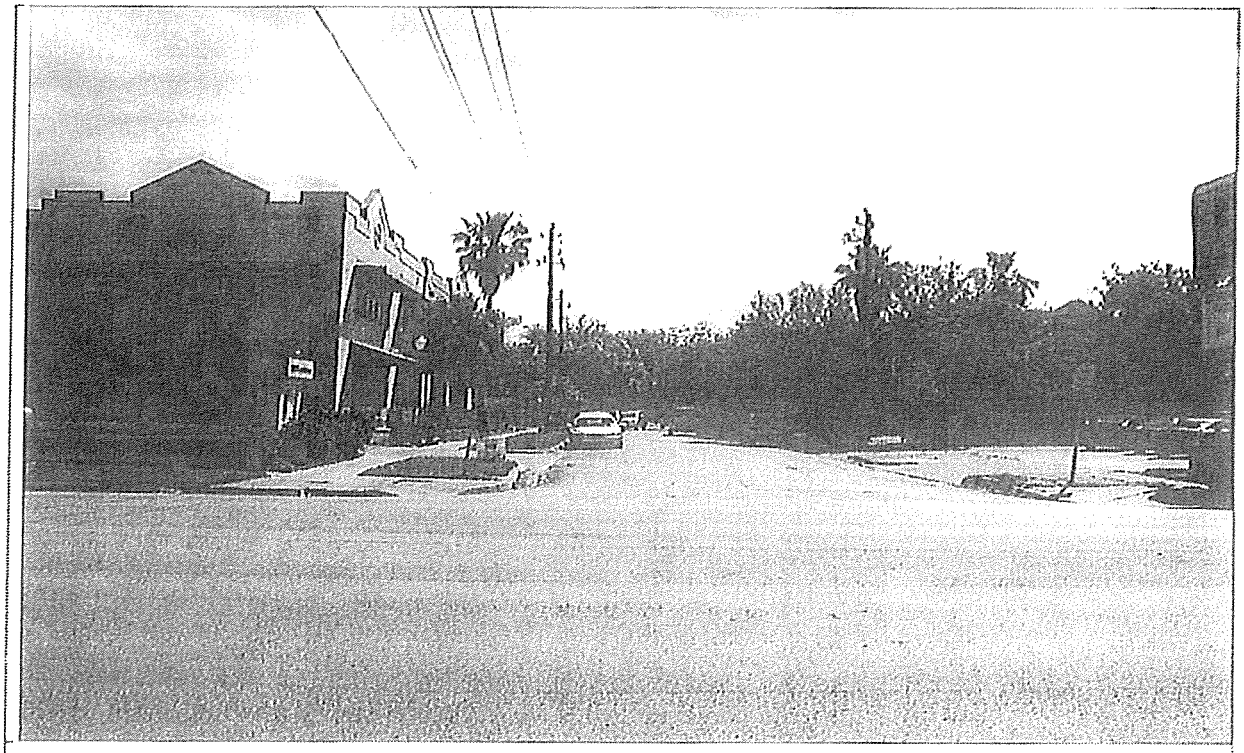
H/B_d	A	B	C	D	E
3.00	1.780	1.904	1.978	2.083	2.196
3.10	1.810	1.941	2.018	2.128	2.247
3.20	1.840	1.976	2.057	2.172	2.297
3.30	1.869	2.010	2.095	2.215	2.346
3.40	1.896	2.044	2.131	2.257	2.394
3.50	1.923	2.076	2.167	2.298	2.441
3.60	1.948	2.107	2.201	2.338	2.487
3.70	1.973	2.137	2.235	2.376	2.531
3.80	1.997	2.166	2.267	2.414	2.575
3.90	2.019	2.194	2.299	2.451	2.618
4.00	2.041	2.221	2.329	2.487	2.660
4.10	2.062	2.247	2.359	2.522	2.701
4.20	2.082	2.273	2.388	2.556	2.741
4.30	2.102	2.297	2.416	2.589	2.780
4.40	2.121	2.321	2.443	2.621	2.819
4.50	2.139	2.344	2.469	2.652	2.856
4.60	2.156	2.366	2.495	2.683	2.893
4.70	2.173	2.388	2.520	2.713	2.929
4.80	2.189	2.409	2.543	2.742	2.964

TABLE 3(cont)

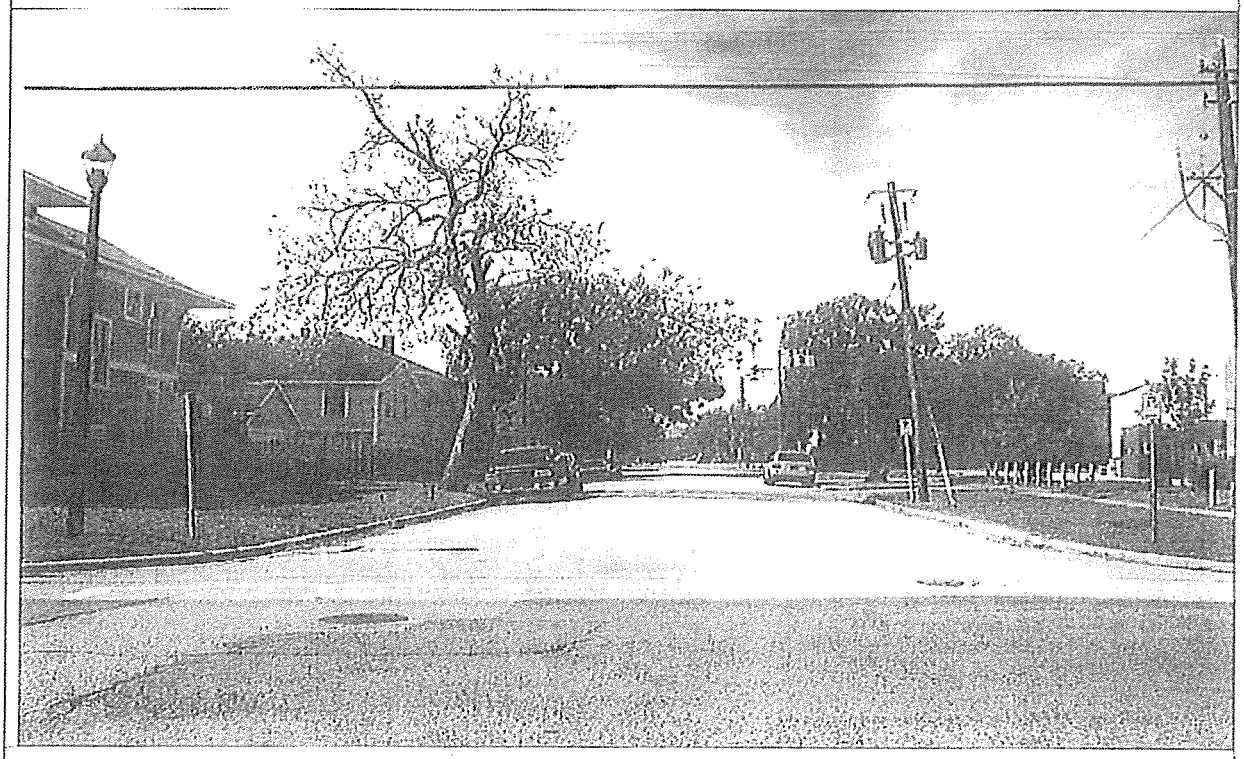
H/B_d	A	B	C	D	E
1.00	0.830	0.852	0.864	0.881	0.898
1.05	0.864	0.887	0.901	0.919	0.938
1.10	0.897	0.922	0.937	0.957	0.977
1.15	0.929	0.957	0.973	0.994	1.016
1.20	0.961	0.991	1.008	1.031	1.055
1.25	0.992	1.024	1.042	1.067	1.093
1.30	1.023	1.057	1.076	1.103	1.131
1.35	1.053	1.089	1.110	1.139	1.168
1.40	1.082	1.121	1.143	1.173	1.205
1.45	1.111	1.152	1.176	1.208	1.241
1.50	1.140	1.183	1.208	1.242	1.278
1.55	1.167	1.213	1.240	1.276	1.313
1.60	1.195	1.243	1.271	1.309	1.349
1.65	1.221	1.272	1.301	1.342	1.384
1.70	1.248	1.301	1.332	1.374	1.418
1.75	1.273	1.329	1.361	1.406	1.452
1.80	1.299	1.357	1.391	1.437	1.486
1.85	1.323	1.385	1.420	1.469	1.520
1.90	1.348	1.412	1.448	1.499	1.553
1.95	1.372	1.438	1.476	1.530	1.586
2.00	1.395	1.464	1.504	1.560	1.618
2.10	1.440	1.515	1.558	1.618	1.682
2.20	1.484	1.564	1.610	1.675	1.744
2.30	1.526	1.612	1.661	1.731	1.805
2.40	1.567	1.658	1.711	1.785	1.865
2.50	1.606	1.702	1.759	1.838	1.923
2.60	1.643	1.745	1.805	1.890	1.980
2.70	1.679	1.787	1.850	1.940	2.036
2.80	1.714	1.827	1.894	1.989	2.090
2.90	1.747	1.867	1.937	2.037	2.144

H/B_d	A	B	C	D	E
4.90	2.204	2.429	2.567	2.770	2.999
5.00	2.219	2.448	2.590	2.798	3.032
5.10	2.234	2.467	2.612	2.825	3.065
5.20	2.247	2.486	2.633	2.851	3.098
5.30	2.261	2.503	2.654	2.877	3.129
5.40	2.273	2.520	2.674	2.901	3.160
5.50	2.286	2.537	2.693	2.926	3.190
5.60	2.298	2.553	2.712	2.949	3.220
5.70	2.309	2.568	2.730	2.972	3.248
5.80	2.320	2.583	2.748	2.995	3.277
5.90	2.330	2.598	2.766	3.017	3.304
6.00	2.340	2.612	2.782	3.038	3.331
6.20	2.360	2.639	2.814	3.079	3.383
6.40	2.377	2.664	2.845	3.118	3.433
6.60	2.394	2.687	2.873	3.155	3.481
6.80	2.409	2.709	2.900	3.190	3.527
7.00	2.423	2.730	2.925	3.223	3.571
7.20	2.436	2.749	2.949	3.255	3.613
7.40	2.448	2.767	2.971	3.285	3.653
7.60	2.459	2.784	2.992	3.313	3.691
7.80	2.470	2.799	3.012	3.340	3.728
8.00	2.479	2.814	3.031	3.366	3.763
8.50	2.500	2.847	3.073	3.424	3.845
9.00	2.517	2.875	3.109	3.476	3.918
9.50	2.532	2.898	3.141	3.521	3.983
10.0	2.543	2.919	3.167	3.560	4.042
15.0	2.591	3.009	3.296	3.768	4.378
20.0	2.598	3.026	3.325	3.825	4.490
30.0	2.599	3.030	3.333	3.845	4.539
40.0	2.599	3.030	3.333	3.846	4.545

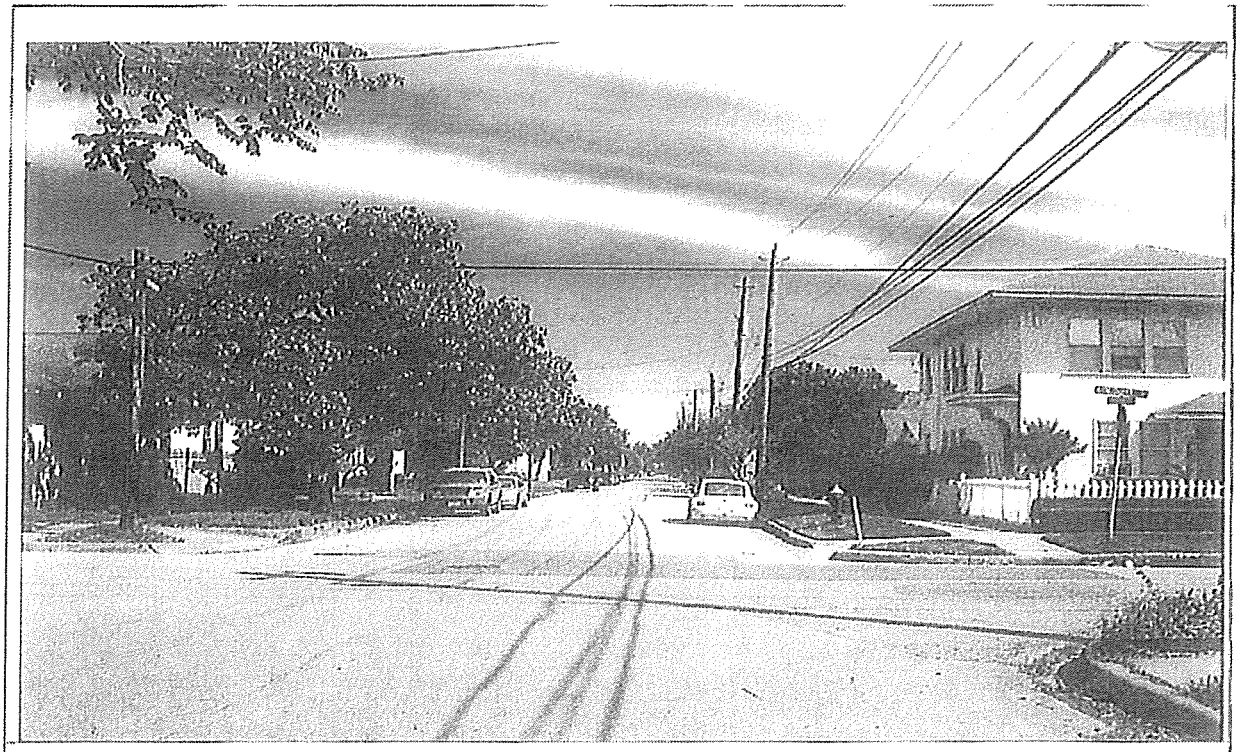
APPENDIX 1
PHOTOGRAPHS OF THE PROJECT SITE



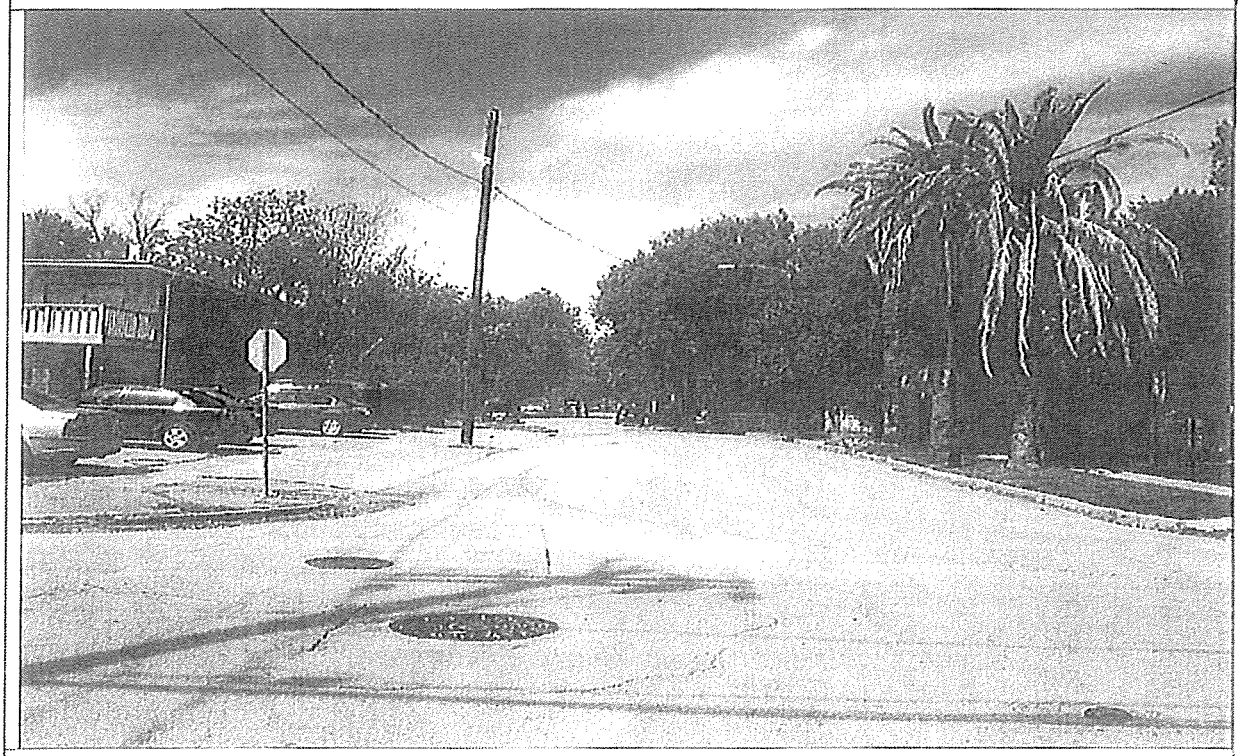
Looking East On Branard From Montrose



Looking South West On Austin From W. Alabama



Looking North On Stanford From Colquitt

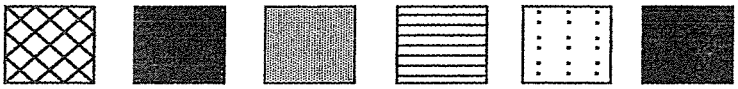


Looking West On Sul Ross From Garrott

APPENDIX 2
DEFINITION OF TERMS AND KEY TO SYMBOLS

KEY TO LOG TERMS AND SYMBOLS

SOIL TYPE



CONC. ASPHLT FILL GRAVELY P.GRADED SAND WITH SILT PEAT

FAT CLAY | FAT CLAY WITH SAND | LEAN CLAY | SANDY LEAN CLAY | LEAN CLAY WITH SAND | SILTY SAND

SAMPLER TYPE

NO SAMPLE | AUGER SAMPLE | SHELBY TUBE | SPLIT SPOON

NO RECOVERY | ROCK CORE | 2" SHELBY TUBE | TXDOT CONE

UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D 2487

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS LESS THAN 50% PASSING No. 200 SIEVE	GRAVEL & GRAVELY SOILS LESS THAN 50% PASSING No.4 SIEVE	CLEAN GRAVELS LITTLE OR NO FINES	GW	WELL GRADEED GRAVELS,GRAVELSAND MIXTURES WITH LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS,GRAVEL SAND MIXTURES WITH LITTLE OR NO FINES
		W/ APPRECIATEBLE FINES	GM	SILTY GRAVELS,GRAVEL SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS,GRAVEL SAND-CLAY MIXTURES
	SANDS MORE THAN 50% PASSING No.4 SIEVE	CLEAN SANDS LITTLE FINES	SW	WELL GRADED SAND,GRAVELY SAND (LITTLE FINES)
			SP	POORLY GRADED SANDS,GRAVELY SAND(L. FINES)
		SANDS WITH APPREA FINES	SM	SILTY SANDS,SAND-SILT MIXTURES
			SC	CLAYEY SANDS,SAND-CLAY MIXTURES
FINE GRAINED SOILS LESS THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS & VERY FINE SANDS,ROCK FLOUR SILTY OR CLAYEY FINE SANDS OR CLAYEY SILT W/PI
			CL	INORGANIC CLAY OF LOW TO MEDIUM PI LEAN CLAY, GRAVELY LEAN CLAYS,SANDY LEAN CLAYS,LEAN CLAYS WITH SAND
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PI
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS,MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY FAT CLAYS, FAT CLAYS WITH SAND, SANDY FAT CLAYS, FAT CLAYS WITH GRAVEL
			OH	ORGANIC CLAYS OF MED TO HIGH PI, ORGANIC SILT
HIGHLY ORGANIC SOIL			FT	PEAT AND OTHER HIGHLY ORGANIC SOILS
UNCLASSIFIED FILL MATERIALS			ARTIFICIALLY DEPOSITED AND OTHER UNCLASSIFIED SOILS FILL MATERIALS	

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMP. STRENGTH IN TSF
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.5
FIRM	0.5 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	GREATER THAN 4.0

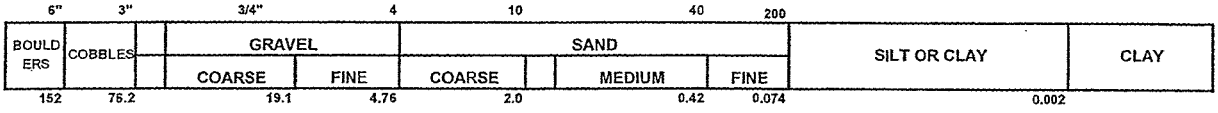
RELATIVE DENSITY - GRANULAR SOILS

CONSISTENCY	N-VALUE (BLOWS PER FT)
VERY LOOSE	0-4
LOOSE	5-10
MEDIUM DENSE	11-30
DENSE	31-50
VERY DENSE	>50 OR 50+

CONSISTENCY	THD-VALUE (BLOWS PER FT)
VERY LOOSE	0-8
LOOSE	8-20
SLIGHTLY COMPACT	20-40
COMPACT	40-80
DENSE	80-5"/100
VERY DENSE	5"/100 - 0"/100

CLASSIFICATION OF GRANULAR SOILS

U.S.STANDARD SIEVE SIZE(S)



GRAIN SIZE IN MM

APPENDIX 3

BORING LOGS

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

WBS No. N-000400-0001-4

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

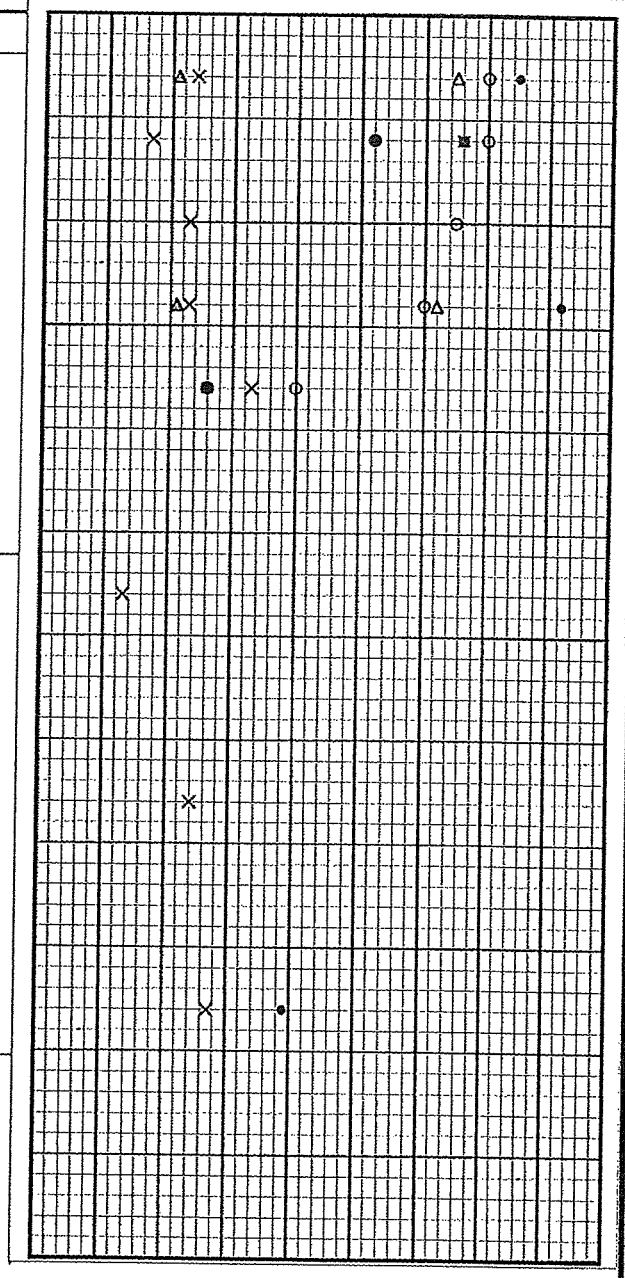
BORING LOG

PROJECT NUMBER: G10-131

BORING NUMBER: B-1(PZ-1)

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					2.5" Asphalt & 8" Concrete
2.0		1			Very stiff, light gray & tan Fat Clay With Sand (CH)
		2			.. with ferrous nodules below 2'
4.0					
		3			
6.0					
		4			.. reddish brown below 6'
8.0					
		5			.. stiff below 8' (Slickensided)
10.0					
		6	20		Medium dense, reddish brown Silty Sand (SM)
15.0					
		7	20		
20.0					
		8	23		.. wet below 23'
25.0					
					Boring terminated at 25'



Water First Noticed: 18'	DRILLED & LOGGED BY: Van & Sons	STARTED: 3-23-2010	Northing: 13834146.27 Easting: 3113972.40
Final Water Reading: 18'			Elevation (ft): 47.60
24 hr.Water Level: 17.5' (3-24-10)	PREPARED BY: Pankaj	COMPLETED: 3-23-2010	NOTE: For Scales Above
PZ WATER LEVEL: 16' (4-01-10)			Scale-A-For Dry Density
PZ WATER LEVEL: 16' (4-23-10)	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
HOLE CAVED AT: 18'			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131

BORING NUMBER: B-2

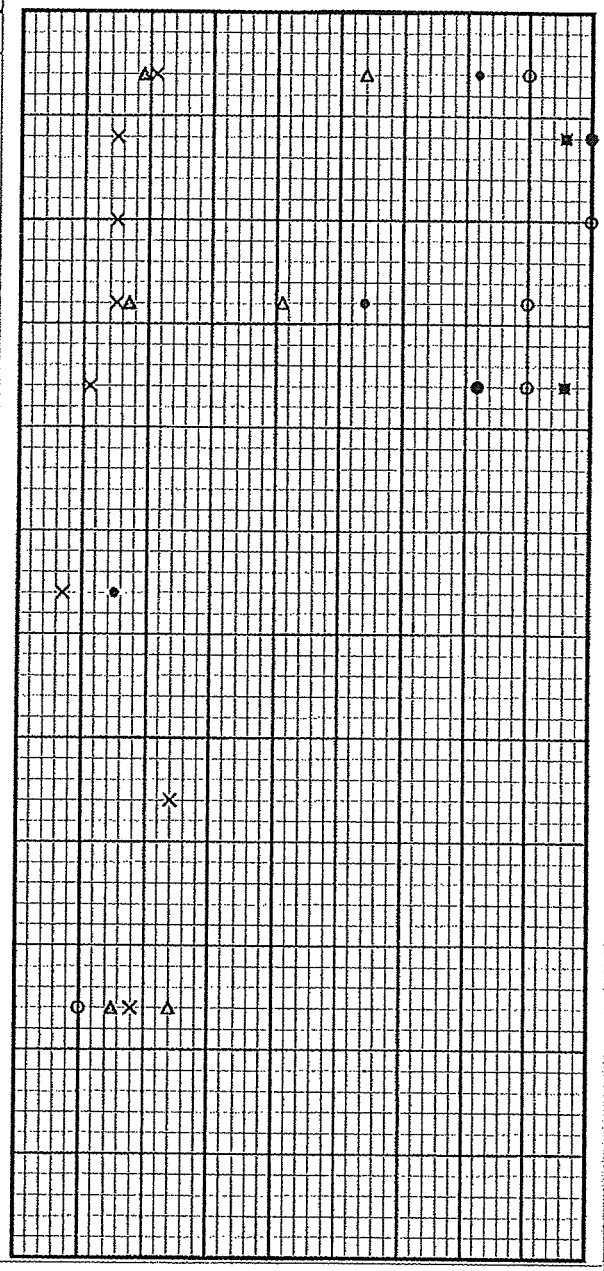
GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					2.5" Asphalt & 8" Concrete
2.0		1			Very stiff, light gray & tan Fat Clay With Sand (CH)
		2			.. hard below 2'
4.0		3			
6.0		4			Very stiff, light gray & tan Sandy Lean Clay (CL)
8.0		5			.. with ferrous nodules below 8'
10.0					
		6	15		Medium dense, light gray & tan Silty Sand (SM)
15.0					
		7	21		
20.0					
		8			Soft, light gray & tan Sandy Lean Clay (CL)
25.0					Boring terminated at 25'

O PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
✕ MOIST.(%) ● #200 (%)
▣ DRY DENSITY (PCF)

A	75	80	85	90	95	100	105	110	115	120
B	0	10	20	30	40	50	60	70	80	90
C	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5



Water First Noticed: 20'	DRILLED & LOGGED BY: Brian	STARTED: 3-30-2010	Northing: 13834412.23 Easting: 3113961.64
Final Water Reading: 19'			Elevation (ft): 47.10
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-30-2010	NOTE: For Scales Above
HOLE CAVED AT: 23.5'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

WBS No. N-000400-0001-4

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

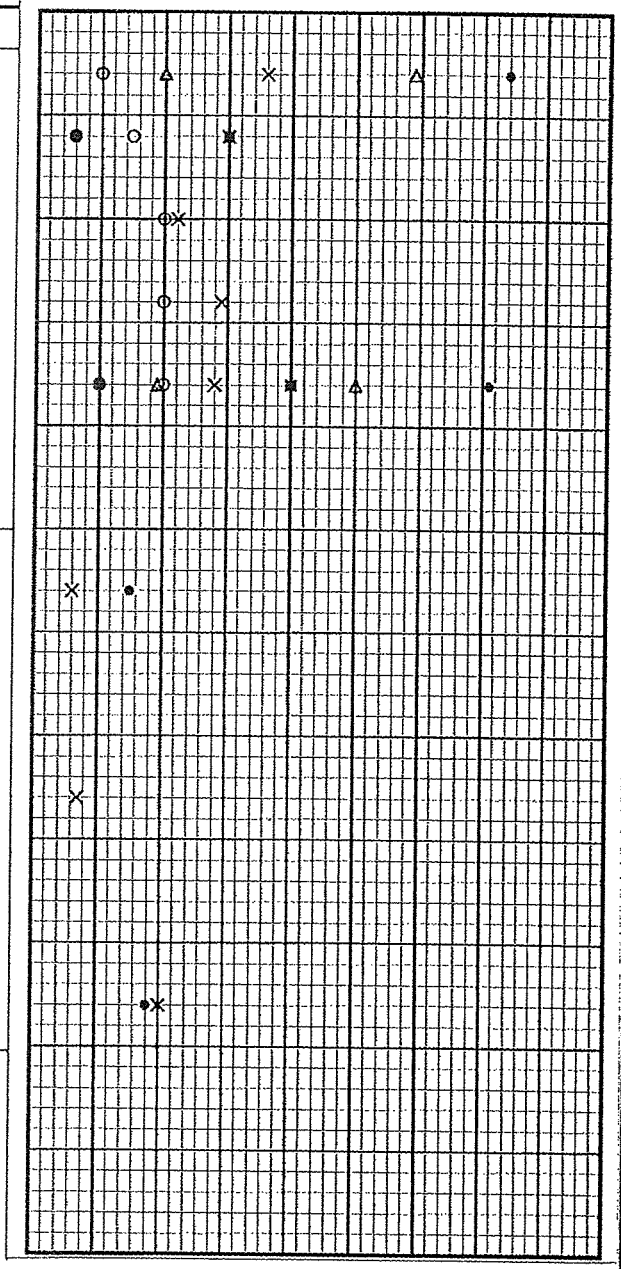
BORING LOG

PROJECT NUMBER: G10-131

BORING NUMBER: B-3

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					7" Asphalt & 7" Lime stabilized base
2.0		1			Soft, light gray & tan Fat Clay With Sand (CH) (12.5' Fill)
		2			
4.0					
		3			.. firm below 4'
6.0					
		4			
8.0					
		5			.. with shells below 8'
10.0					
		6	15		Medium dense, tan Silty Sand (SM)
15.0					
		7	19		
20.0					
		8	7		.. loose below 23' (wet)
25.0					
					Boring terminated at 25'



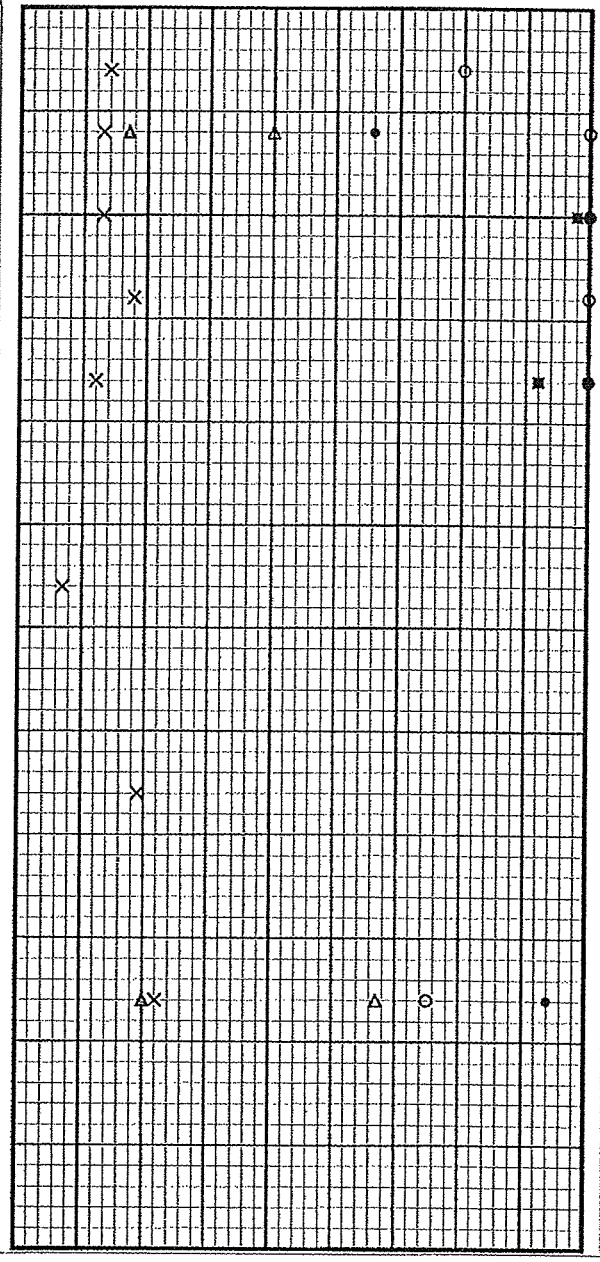
Water First Noticed: 22.5'	DRILLED & LOGGED BY: Brian	STARTED: 3-17-2010	Northing: 13834716.17 Easting: 3114068.41
Final Water Reading: 20'			Elevation (ft): 47.60
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-17-2010	NOTE: For Scales Above
HOLE CAVED AT: 21'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467	BORING LOG	
WBS No. N-000400-0001-4	PROJECT NUMBER: G10-131	BORING NUMBER: B-4
GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.	DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.	

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					3" Asphalt & 5" Crushed gravel base
2.0		1			Very stiff, light gray & tan Sandy Lean Clay (CL)
		2			.. hard below 2'
4.0					
		3			
6.0					
		4			.. with ferrous nodules below 6'
8.0					
		5			
10.0					
		6	15		Medium dense, tan & light gray Silty Sand (SM)
15.0					
		7	13		
20.0					
		8			Very stiff, light gray & tan Fat Clay With Sand (CH)
25.0					
					Boring terminated at 25'

O PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
X MOIST.(%) ● #200 (%)
▣ DRY DENSITY (PCF)

A	75	80	85	90	95	100	105	110	115	120
B	0	10	20	30	40	50	60	70	80	90
C	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5



Water First Noticed: No	DRILLED & LOGGED BY: Brian	STARTED: 3-30-2010	Northing: 13836007.80 Easting: 3114040.91
Final Water Reading: No			Elevation (ft): 48.03
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-30-2010	NOTE: For Scales Above
HOLE CAVED AT: No			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

WBS No. N-000400-0001-4

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

BORING LOG

PROJECT NUMBER: G10-131

BORING NUMBER: B-5

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

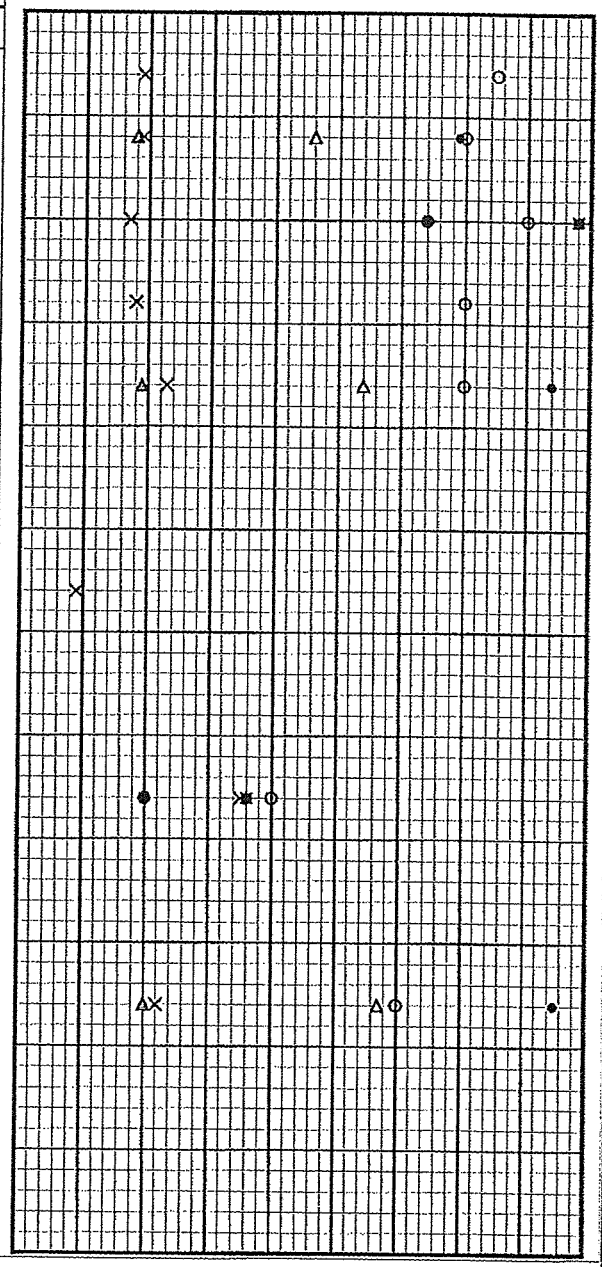
DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					3.75" Asphalt & 4" Crushed gravel base
2.0		1			Very stiff, light gray & tan Sandy Lean Clay (CL)
		2			.. with sand seams below 2'
4.0					
		3			
6.0					
		4			.. with ferrous nodules below 6'
8.0					
		5			Very stiff, reddish brown Fat Clay With Sand (CH) with calcareous nodules
10.0					
15.0		6	19		Medium dense, light gray & tan Silty Sand (SM)
		7			Stiff, reddish brown Fat Clay With Sand (CH)
20.0					
		8			.. very stiff, light gray & tan, with ferrous nodules below 23'
25.0					
					Boring terminated at 25'

O PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
X MOIST.(%) ● #200 (%)
▣ DRY DENSITY (PCF)

A 75 80 85 90 95 100 105 110 115 120

B 0 10 20 30 40 50 60 70 80 90

C 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5



Water First Noticed: 17'	DRILLED & LOGGED BY: Brian	STARTED: 4-02-2010	Northing: 13835027.51 Easting: 3114532.12
Final Water Reading: 20'			Elevation (ft): 47.72
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 4-02-2010	NOTE: For Scales Above
HOLE CAVED AT: 23'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.487

BORING LOG

WBS No. N-000400-0001-4

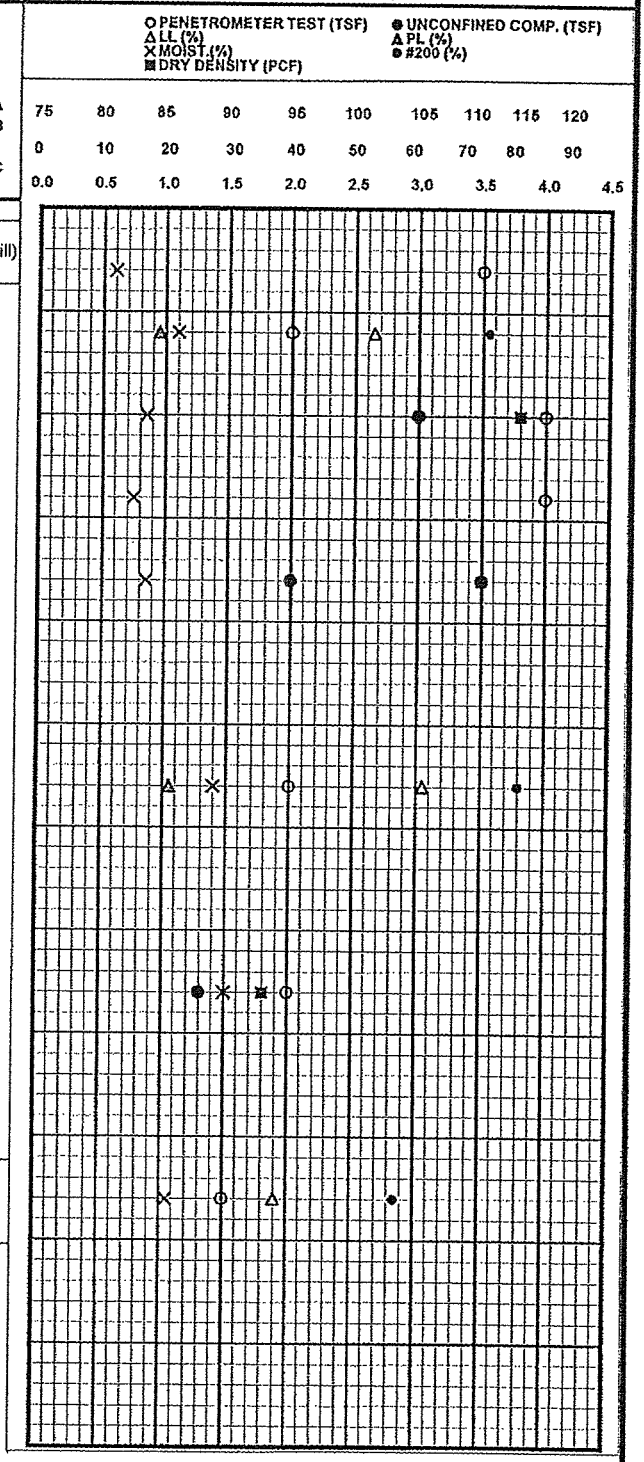
PROJECT NUMBER: G10-131

BORING NUMBER: B-6(PZ-2)

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					2.5" Asphalt
2.0		1			Very stiff, light gray & tan Sandy Lean Clay (CL) (Fill)
4.0		2			Stiff, light gray & tan Fat Clay With Sand (CH)
6.0		3			.. very stiff below 4'
8.0		4			.. with ferrous nodules below 6'
10.0		5			
15.0		6			.. stiff, tan & light gray below 13'
20.0		7			
25.0		8			Stiff, light gray & tan Sandy Lean Clay (CL)
					Boring terminated at 25'



Water First Noticed: No	DRILLED & LOGGED BY: Van & Sons	STARTED: 3-23-2010	Northing: 13834723.30 Easting: 3114283.01
Final Water Reading: No			Elevation (ft): 47.60
24 hr.Water Level: No Water(3-24-10)	PREPARED BY: Pankaj	COMPLETED: 3-23-2010	NOTE: For Scales Above
PZ WATER LEVEL: 18' (4-01-10)			Scale-A-For Dry Density
PZ WATER LEVEL: 19' (4-23-10)	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
COMPLETION DEPTH: 25'			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131 | BORING NUMBER: B-7

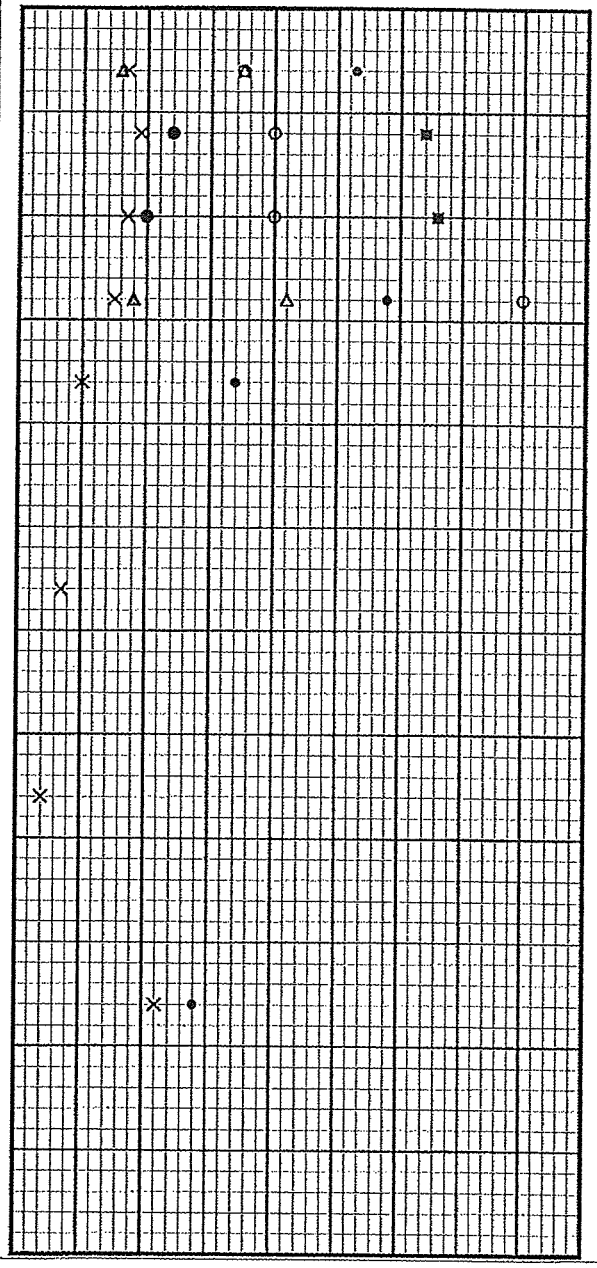
GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					9.5" Asphalt & 4" Crushed gravel base
2.0		1			Stiff, light gray & tan Sandy Lean Clay (CL) (6' Fill)
4.0		2			
6.0		3			
8.0		4			Very stiff, light gray & tan Sandy Lean Clay (CL) with calcareous nodules
10.0		5	11		Medium dense, tan & light gray Silty Sand (SM)
15.0		6	15		
20.0		7	16		.. reddish brown below 18'
25.0		8	22		.. wet below 23'
					Boring terminated at 25'

O PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
X MOIST.(%) ● #200 (%)
▣ DRY DENSITY (PCF)

A	75	80	85	90	95	100	105	110	115	120
B	0	10	20	30	40	50	60	70	80	90
C	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5



Water First Noticed: 22'	DRILLED & LOGGED BY: Brian	STARTED: 4-01-2010	Northing: 13834397.58 Easting: 3114290.75
Final Water Reading: 21'			Elevation (ft): 47.19
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 4-01-2010	NOTE: For Scales Above
HOLE CAVED AT: 22'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

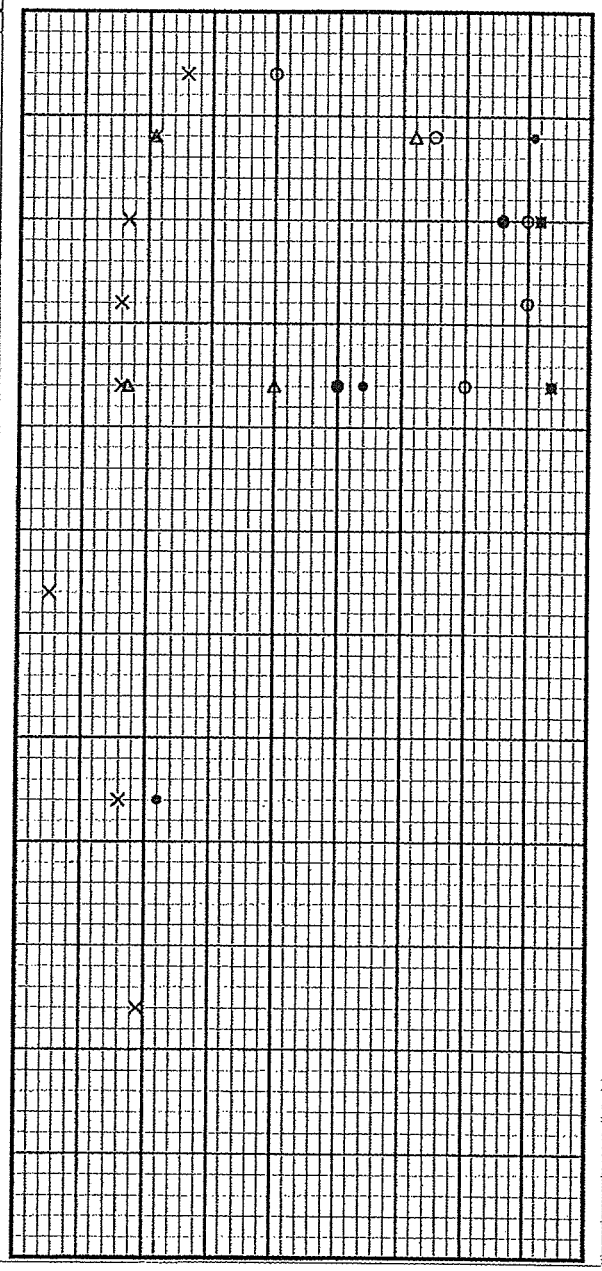
PROJECT NUMBER: G10-131

BORING NUMBER: B-8

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					3.5" Asphalt & 3" Shell fragment base
2.0		1			Stiff, light gray & tan **Fat Clay With Sand (CH)**
4.0		2			.. very stiff below 2'
6.0		3			.. with ferrous nodules below 4'
8.0		4			Very stiff, light gray & tan **Sandy Lean Clay (CL)** with ferrous nodules
10.0		5			
15.0		6	20		Medium dense, tan & light gray **Silty Sand (SM)**
20.0		7	13		
25.0		8	16		
					Boring terminated at 25'



Water First Noticed: 22'	DRILLED & LOGGED BY: Brian	STARTED: 4-01-2010	Northing: 13834075.89 Easting: 3114357.29
Final Water Reading: 21'			Elevation (ft): 47.41
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 4-01-2010	NOTE: For Scales Above
HOLE CAVED AT: 21.5'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

WBS No. N-000400-0001-4

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

BORING LOG

PROJECT NUMBER: G10-131

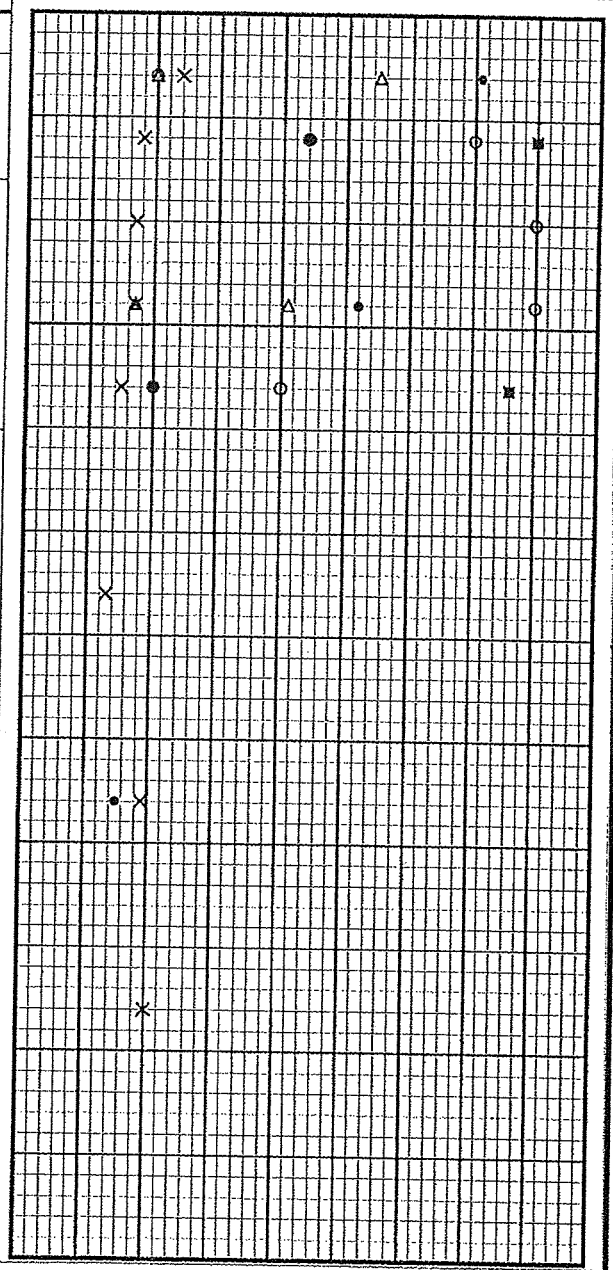
BORING NUMBER: B-9

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					6.5" Asphalt & 3" Crushed gravel base
2.0		1			Firm, light gray & tan Fat Clay With Sand (CH)
		2			.. very stiff below 2'
4.0					
6.0		3			Very stiff, light gray & tan Sandy Lean Clay (CL) with calcareous nodules
8.0		4			
10.0		5			.. stiff below 8'
		6	15		Medium dense, tan & light gray Silty Sand (SM)
15.0					
20.0		7	18		
25.0		8	14		
					Boring terminated at 25'

PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
LL (%) △ PL (%)
MOIST.(%) ● #200 (%)
DRY DENSITY (PCF)

A	75	80	85	90	95	100	105	110	115	120
B	0	10	20	30	40	50	60	70	80	90
C	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5



Water First Noticed: 20'
Final Water Reading: 19'
PZ WATER LEVEL: N/A
HOLE CAVED AT: 19'
COMPLETION DEPTH: 25'
GROUT: YES

DRILLED & LOGGED BY: Brian
PREPARED BY: Pankaj
CHECKED BY: JITU

STARTED: 3-24-2010
COMPLETED: 3-24-2010
APPROVED BY: JAY

Northing: 13833876.96 Easting: 3114675.00
Elevation (ft): 46.81
NOTE: For Scales Above
Scale-A-For Dry Density
Scale-B-For Moist.,LL,PL and #200
Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

WBS No. N-000400-0001-4

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

BORING LOG

PROJECT NUMBER: G10-131

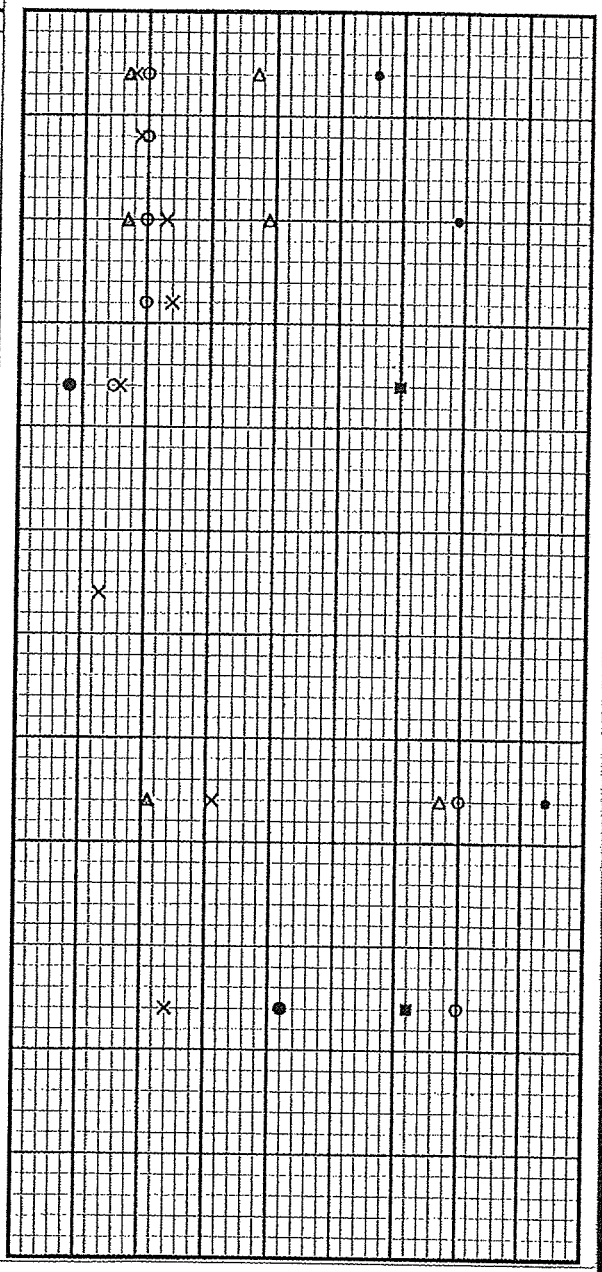
BORING NUMBER: B-10

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					5.25" Asphalt
2.0		1			Firm, light gray & tan Sandy Lean Clay (CL) (9' Fill)
4.0		2			.. with calcareous nodules below 2'
6.0		3			
8.0		4			
10.0		5			.. soft below 8'
15.0		6	15		Soft, light gray & tan Sandy Lean Clay (CL)
20.0		7			Medium dense, reddish brown Silty Sand (SM)
25.0		8			Very stiff, reddish brown Fat Clay With Sand (CH) .. light gray & tan below 23' (Slickensided)
					Boring terminated at 25'

O PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
X MOIST.(%) ● #200 (%)
■ DRY DENSITY (PCF)

A	75	80	85	90	95	100	105	110	115	120
B	0	10	20	30	40	50	60	70	80	90
C	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5



Water First Noticed: 17'	DRILLED & LOGGED BY: Brian	STARTED: 4-02-2010	Northing: 13834113.27 Easting: 3114811.39
Final Water Reading: 20'			Elevation (ft): 47.50
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 4-02-2010	NOTE: For Scales Above
HOLE CAVED AT: 23.5'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

WBS No. N-000400-0001-4

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

BORING LOG

PROJECT NUMBER: G10-131

BORING NUMBER: B-11

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

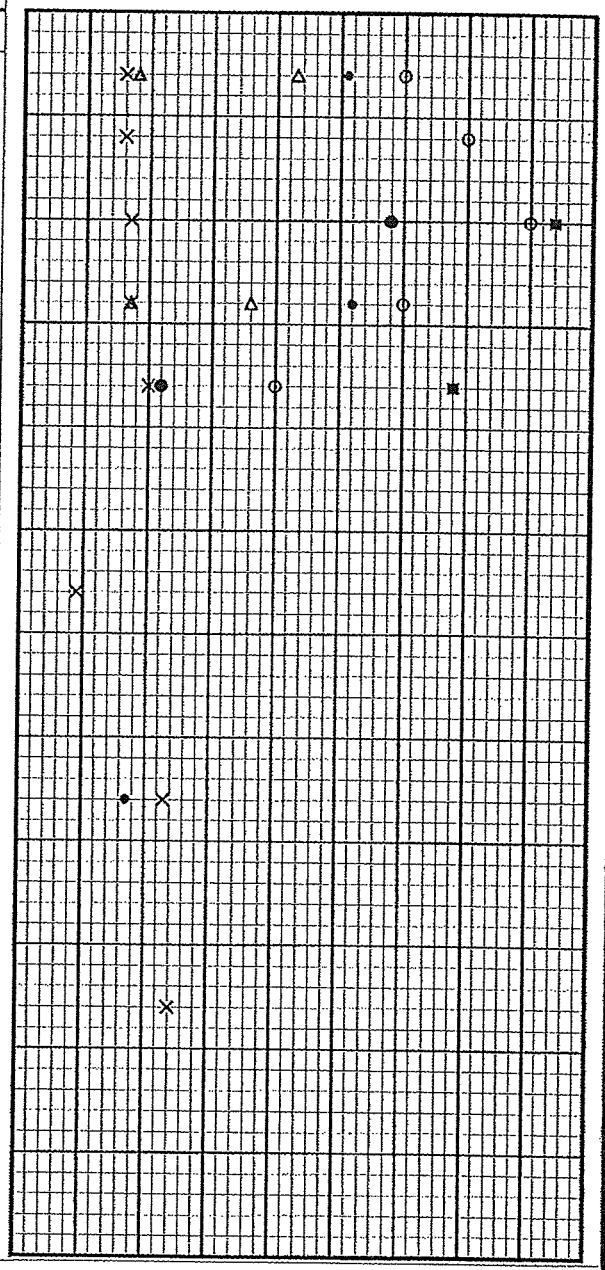
DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					8.5" Asphalt & 2.5" Crushed gravel base
2.0		1			Very stiff, light gray & tan Sandy Lean Clay (CL)
4.0		2			.. with sand seams below 2'
6.0		3			
8.0		4			
10.0		5			.. stiff below 8'
15.0		6	16		Medium dense, light gray & tan Silty Sand (SM)
20.0		7	15		.. reddish brown below 18'
25.0		8	14		.. wet below 23'
					Boring terminated at 25'

○ PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
△ LL (%) ▲ PL (%)
✕ MOIST.(%) ● #200 (%)
▣ DRY DENSITY (PCF)

A: 75 80 85 90 95 100 105 110 115 120

B: 0 10 20 30 40 50 60 70 80 90

C: 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5



Water First Noticed: 20'	DRILLED & LOGGED BY: Brian	STARTED: 3-29-2010	Northing: 13834343.67 Easting: 3114659.40
Final Water Reading: 19'			Elevation (ft): 46.82
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-29-2010	NOTE: For Scales Above
HOLE CAVED AT: 17'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

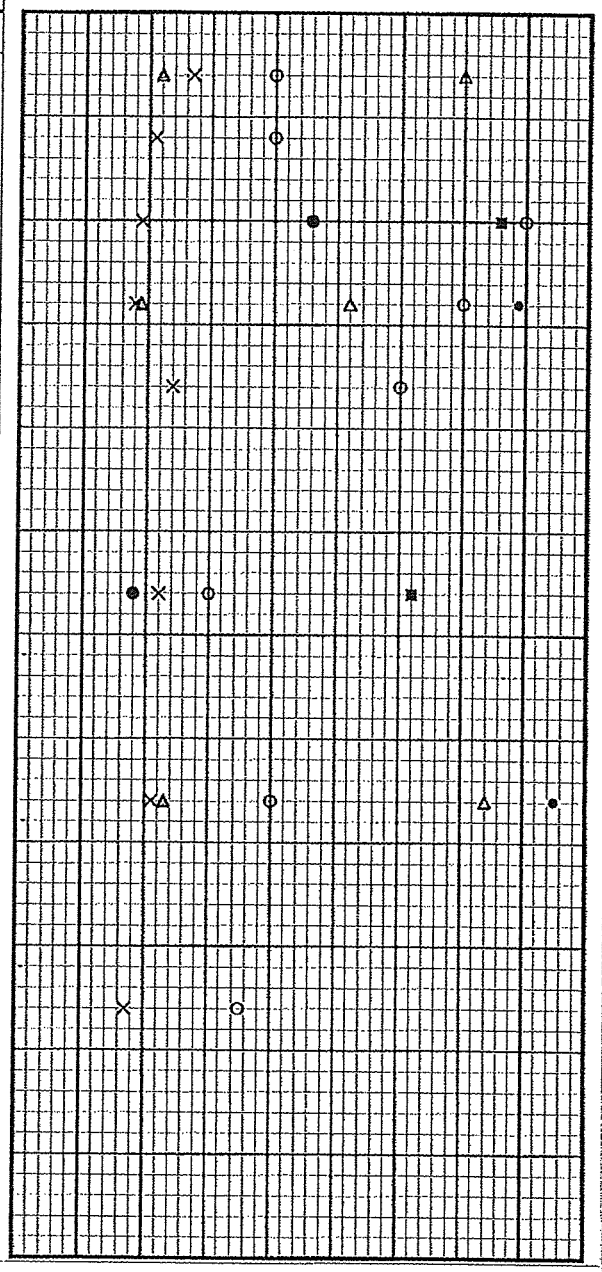
WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131 | BORING NUMBER: B-12

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					7.5" Asphalt & 2" Crushed gravel base
2.0		1			Stiff, gray & tan Fat Clay With Sand (CH)
4.0		2			
6.0		3			.. very stiff, light gray & tan, with calcareous nodules below 4'
8.0		4			.. with ferrous nodules below 6'
10.0		5			.. with reddish brown below 8'
15.0		6			.. firm, with sand layers at 15'
20.0		7			.. stiff, light gray & tan below 18'
25.0		8			.. sandy lean clay layers below 23'
					Boring terminated at 25'



Water First Noticed: No	DRILLED & LOGGED BY: Brian	STARTED: 3-29-2010	Northing: 13834773.48 Easting: 3114638.41
Final Water Reading: No			Elevation (ft): 47.47
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-29-2010	NOTE: For Scales Above
HOLE CAVED AT: No			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131 | BORING NUMBER: B-13

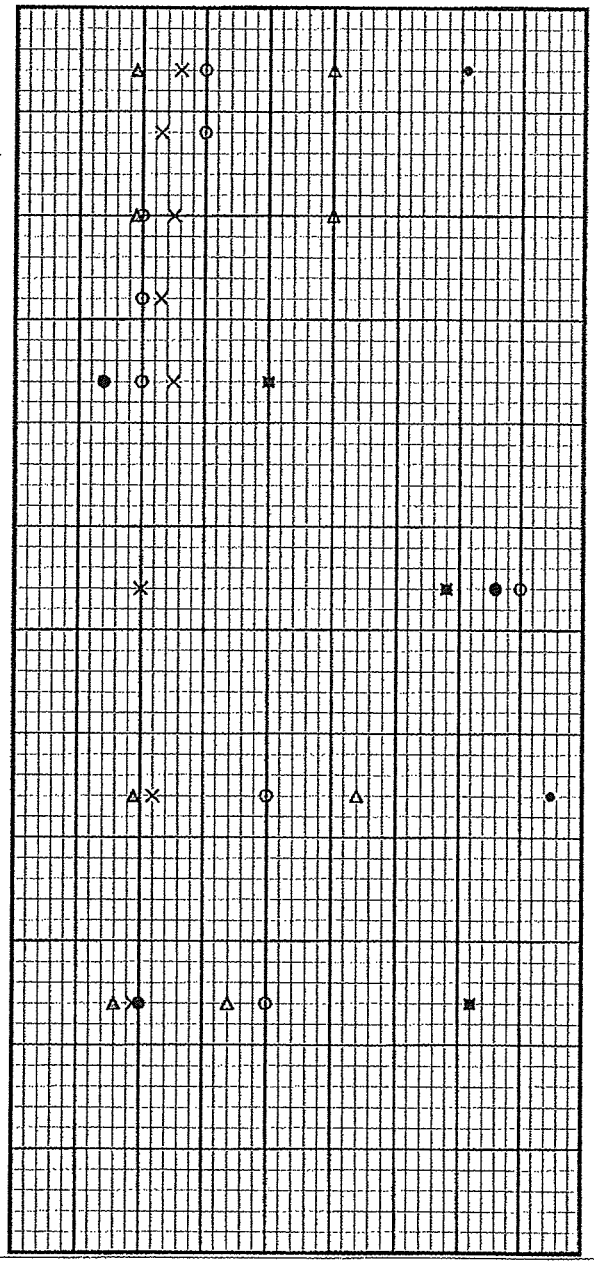
GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

O PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
X MOIST.(%) ● #200 (%)
▣ DRY DENSITY (PCF)

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					5" Asphalt & 7.5" Crushed gravel base
2.0		1			Stiff, tan & light gray Fat Clay With Sand (CH) (10.5' Fill)
		2			
4.0					
		3			
6.0					
		4			.. with, calcareous nodules below 6'
8.0					
		5			
10.0					
		6	15		Very stiff, reddish brown Fat Clay With Sand (CH) with calcareous nodules
15.0					
		7			.. stiff below 18'
20.0					
		8			Stiff, light gray & tan Sandy Lean Clay (CL)
25.0					Boring terminated at 25'

A: 75 80 85 90 95 100 105 110 115 120
B: 0 10 20 30 40 50 60 70 80 90
C: 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5



Water First Noticed: 25'	DRILLED & LOGGED BY: Brian	STARTED: 3-18-2010	Northing: 13835309.14 Easting: 3114622.70
Final Water Reading: 19'			Elevation (ft): 46.89
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-18-2010	NOTE: For Scales Above
HOLE CAVED AT: 22.5'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131

BORING NUMBER: B-14

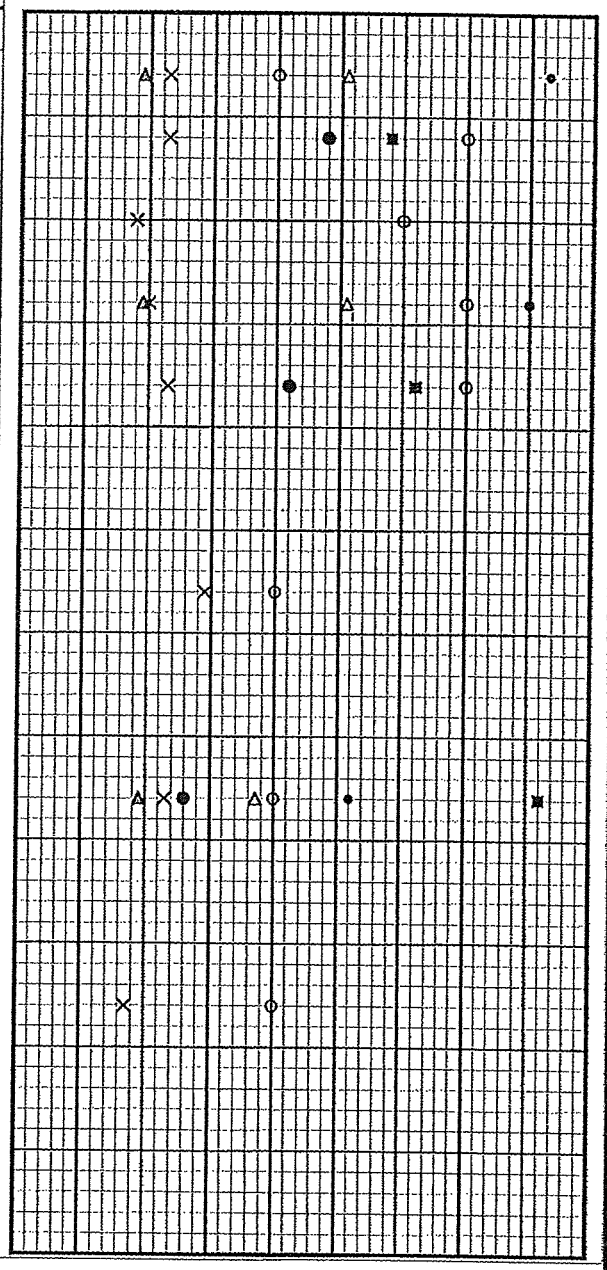
GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					5.5" Asphalt & 4" Crushed gravel base
2.0		1			Stiff, dark gray Fat Clay With Sand (CH)
		2			.. very stiff, light gray & tan below 2'
4.0		3			
6.0		4			.. with ferrous nodules below 6'
8.0		5			
10.0					
15.0		6			.. stiff, reddish brown below 13'
20.0		7			Stiff, light gray & tan Sandy Lean Clay (CL)
					.. sand layers from 20.5' to 22.5'
25.0		8			
					Boring terminated at 25'

O PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
X MOIST.(%) ● #200 (%)
■ DRY DENSITY (PCF)

A	75	80	85	90	95	100	105	110	115	120
B	0	10	20	30	40	50	60	70	80	90
C	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5



Water First Noticed: 20.5'
Final Water Reading: 19'
PZ WATER LEVEL: N/A
HOLE CAVED AT: 21'
COMPLETION DEPTH: 25'
GROUT: YES

DRILLED & LOGGED BY: Brian
PREPARED BY: Pankaj
CHECKED BY: JITU

STARTED: 3-18-2010
COMPLETED: 3-18-2010
APPROVED BY: JAY

Northing: 13835292.57 Easting: 3114926.44
Elevation (ft): 46.85
NOTE: For Scales Above
Scale-A-For Dry Density
Scale-B-For Moist.,LL,PL and #200
Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

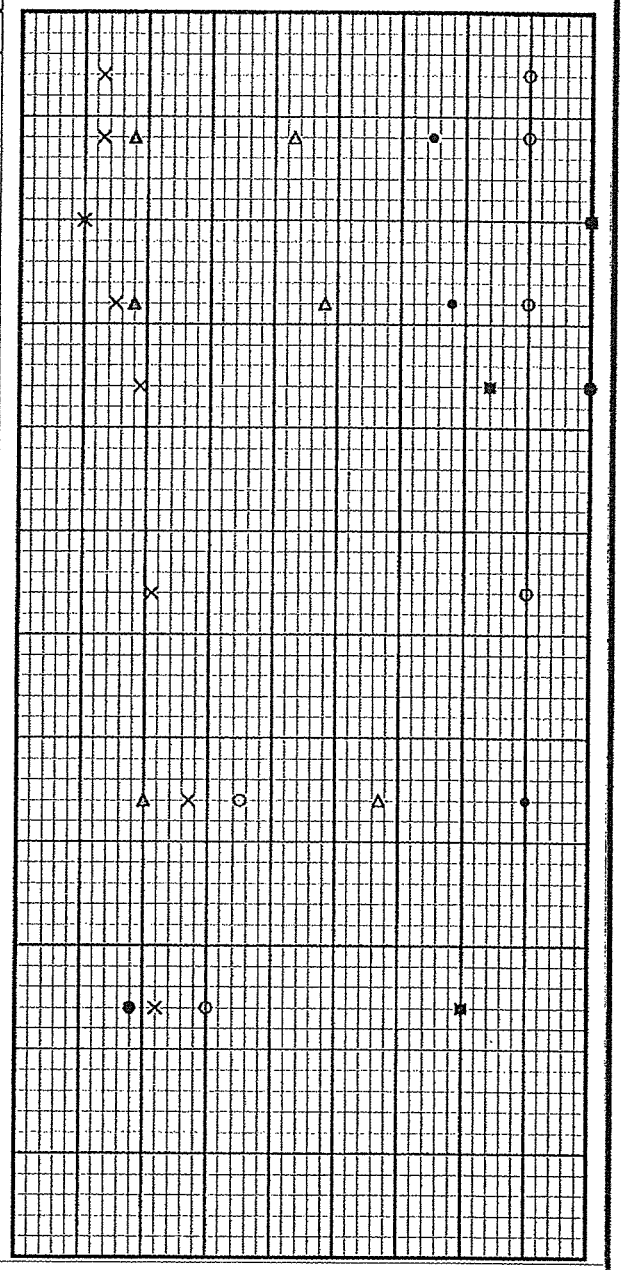
PROJECT NUMBER: G10-131

BORING NUMBER: B-15

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					6" Asphalt & 4" Crushed gravel base
2.0		1			Very stiff, light gray & tan Sandy Lean Clay (CL)
		2			
4.0					
		3			.. hard, with calcareous nodules below 4'
6.0					
		4			.. very stiff, with ferrous nodules below 6'
8.0					
		5			.. hard below 8'
10.0					
		6			Very stiff, reddish brown Fat Clay With Sand (CH)
15.0					
		7			.. stiff, light gray & tan below 18'
20.0					
		8			Firm, light gray & tan Sandy Lean Clay (CL)
25.0					
					Boring terminated at 25'



Water First Noticed: 22.5'	DRILLED & LOGGED BY: Brian	STARTED: 3-18-2010	Northing: 13834899.59 Easting: 3114946.55
Final Water Reading: 19'			Elevation (ft): 47.27
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-18-2010	NOTE: For Scales Above
HOLE CAVED AT: 22'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131

BORING NUMBER: B-16(PZ-3)

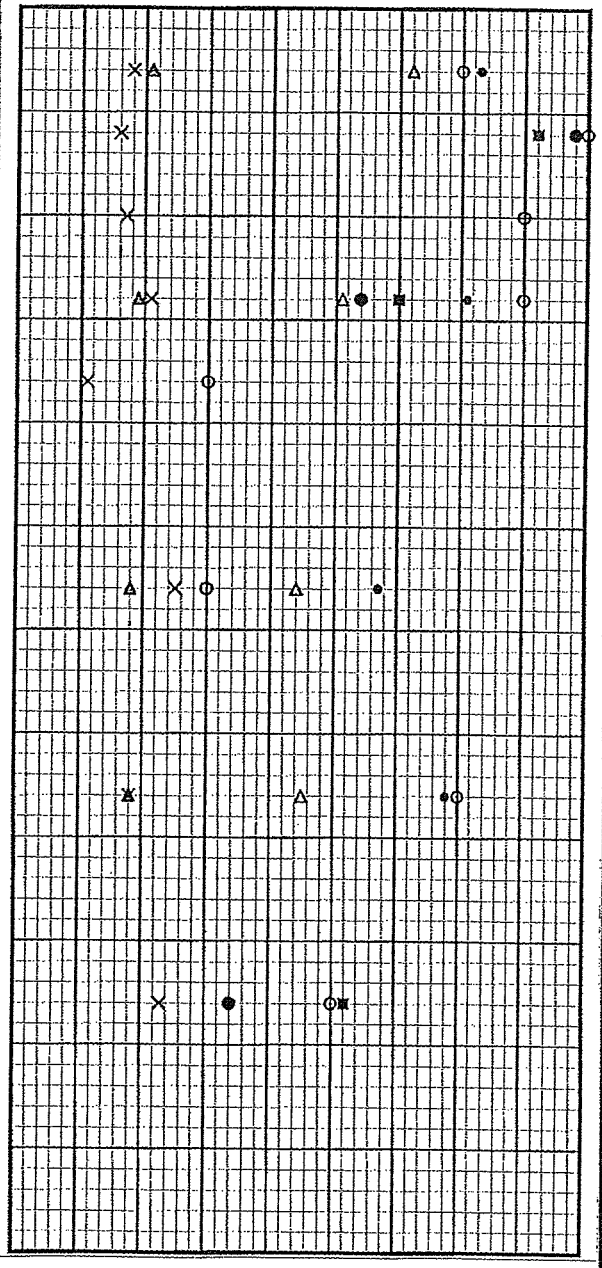
GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					6.5" Asphalt
2.0		1			Very stiff, light gray & tan Fat Clay With Sand (CH)
		2			.. hard, with ferrous nodules below 2'
4.0		3			.. very stiff below 4'
6.0		4			.. with calcareous nodules below 6'
8.0		5			Stiff, light gray & tan Sandy Lean Clay (CL)
10.0					.. sand layers at 10'
		6			.. reddish brown below 13'
15.0					
		7			.. very stiff below 18'
20.0					
		8			.. stiff below 23'
25.0					
					Boring terminated at 25'

O PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
× MOIST.(%) ● #200 (%)
■ DRY DENSITY (PCF)

A 75 80 85 90 95 100 105 110 115 120
B 0 10 20 30 40 50 60 70 80 90
C 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5



Water First Noticed: No	DRILLED & LOGGED BY: Van & Son	STARTED: 3-23-2010	Northing: 13834583.85 Easting: 3114957.22
Final Water Reading: No			Elevation (ft): 46.62
24 hr.Water Level: No Water(3-24-10)	PREPARED BY: Pankaj	COMPLETED: 3-23-2010	NOTE: For Scales Above
PZ WATER LEVEL: No Water(4-01-10)			Scale-A-For Dry Density
PZ WATER LEVEL: No Water(4-23-10)	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist,LL,PL and #200
COMPLETION DEPTH: 25'			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

WBS No. N-000400-0001-4

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

BORING LOG

PROJECT NUMBER: G10-131

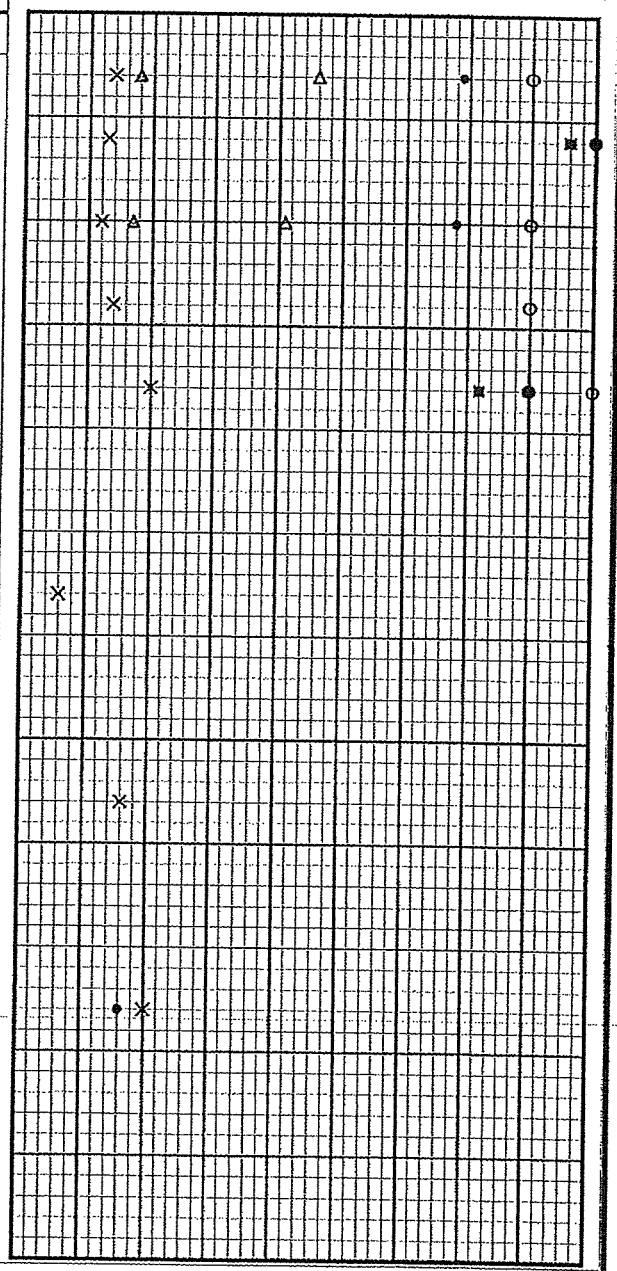
BORING NUMBER: B-17

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					6" Asphalt & 2" Crushed gravel base
2.0		1			Very stiff, light gray & tan Sandy Lean Clay (CL)
		2			.. hard below 2'
4.0		3			.. very stiff below 4'
6.0		4			.. with ferrous nodules below 6'
8.0		5			.. hard below 8'
10.0					
15.0		6	19		Medium dense, tan & light gray Silty Sand (SM)
20.0		7	13		
25.0		8	13		.. wet below 23'
					Boring terminated at 25'

O PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
X MOIST.(%) ● #200 (%)
▣ DRY DENSITY (PCF)

A	75	80	85	90	95	100	105	110	115	120
B	0	10	20	30	40	50	60	70	80	90
C	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5



Water First Noticed: 20.5'	DRILLED & LOGGED BY: Brian	STARTED: 4-01-2010	Northing: 13834255.76 Easting: 3114990.67
Final Water Reading: 19'			Elevation (ft): 47.01
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 4-01-2010	NOTE: For Scales Above
HOLE CAVED AT: 21.5'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131 | BORING NUMBER: B-18

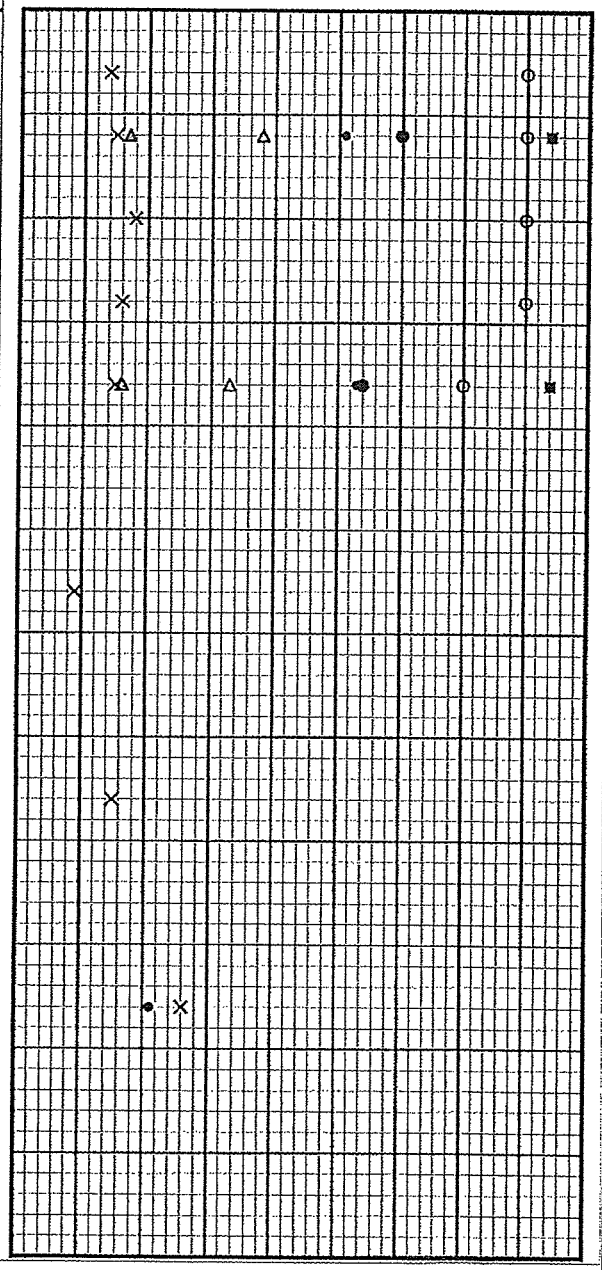
GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					9.5" Asphalt & 3.5" Crushed gravel base
2.0		1			Very stiff, light gray & tan Sandy Lean Clay (CL)
4.0		2			
6.0		3			.. with ferrous nodules below 4'
8.0		4			.. with calcareous nodules below 6'
10.0		5			
15.0		6	20		Medium dense, reddish brown Silty Sand (SM)
20.0		7	15		.. light gray & tan below 18'
25.0		8	15		.. wet below 23'
					Boring terminated at 25'

O PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
✕ MOIST.(%) ● #200 (%)
▣ DRY DENSITY (PCF)

A	75	80	85	90	95	100	105	110	115	120
B	0	10	20	30	40	50	60	70	80	90
C	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5



Water First Noticed: 21'	DRILLED & LOGGED BY: Brian	STARTED: 3-29-2010	Northing: 13833892.12 Easting: 3114991.24
Final Water Reading: 19.5'			Elevation (ft): 47.16
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-29-2010	NOTE: For Scales Above
HOLE CAVED AT: 20'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

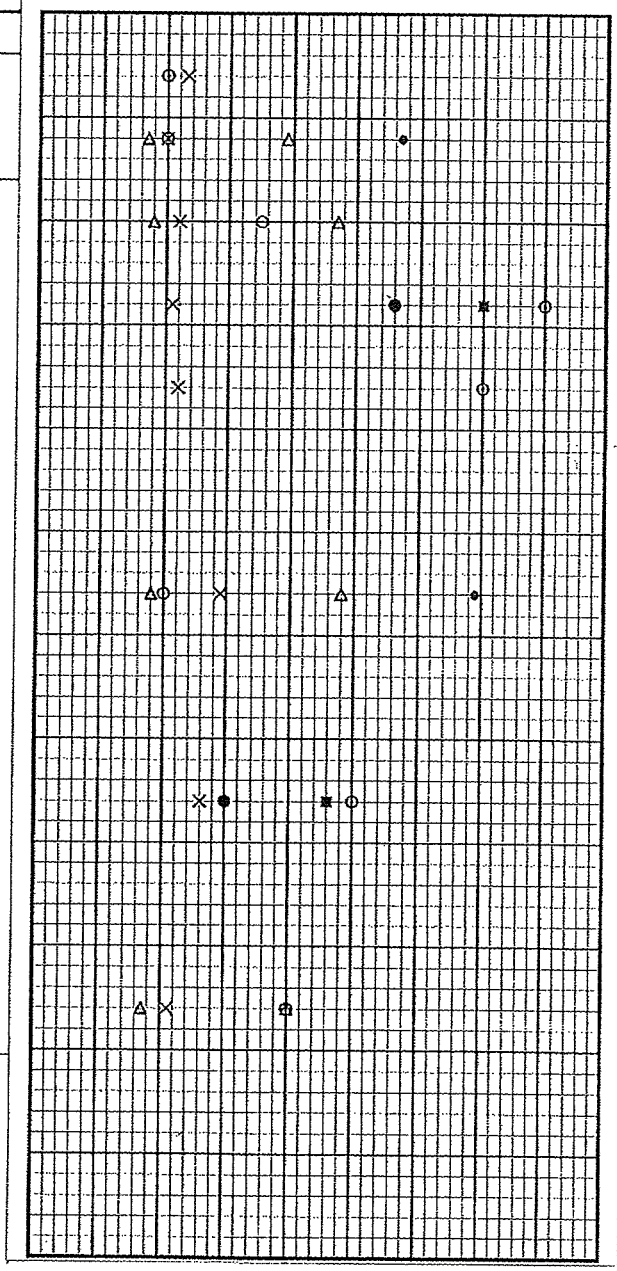
WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131 | BORING NUMBER: B-19

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					6.5" Asphalt & 2" Crushed gravel base
2.0		1			Firm, light gray & tan Sandy Lean Clay (CL) (4' Fill)
4.0		2			.. with calcareous nodules below 2'
6.0		3			Stiff, light gray & tan Sandy Lean Clay (CL) with calcareous nodules
8.0		4			.. very stiff below 6'
10.0		5			
15.0		6			.. firm, reddish brown, with sand layers below 13'
20.0		7			.. stiff below 18'
25.0		8			.. light gray & tan below 23'
					Boring terminated at 25'



Water First Noticed: No	DRILLED & LOGGED BY: Brian	STARTED: 3-24-2010	Northing: 13834126.73 Easting: 3115247.09
Final Water Reading: No			Elevation (ft): 47.34
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-24-2010	NOTE: For Scales Above
HOLE CAVED AT: No			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

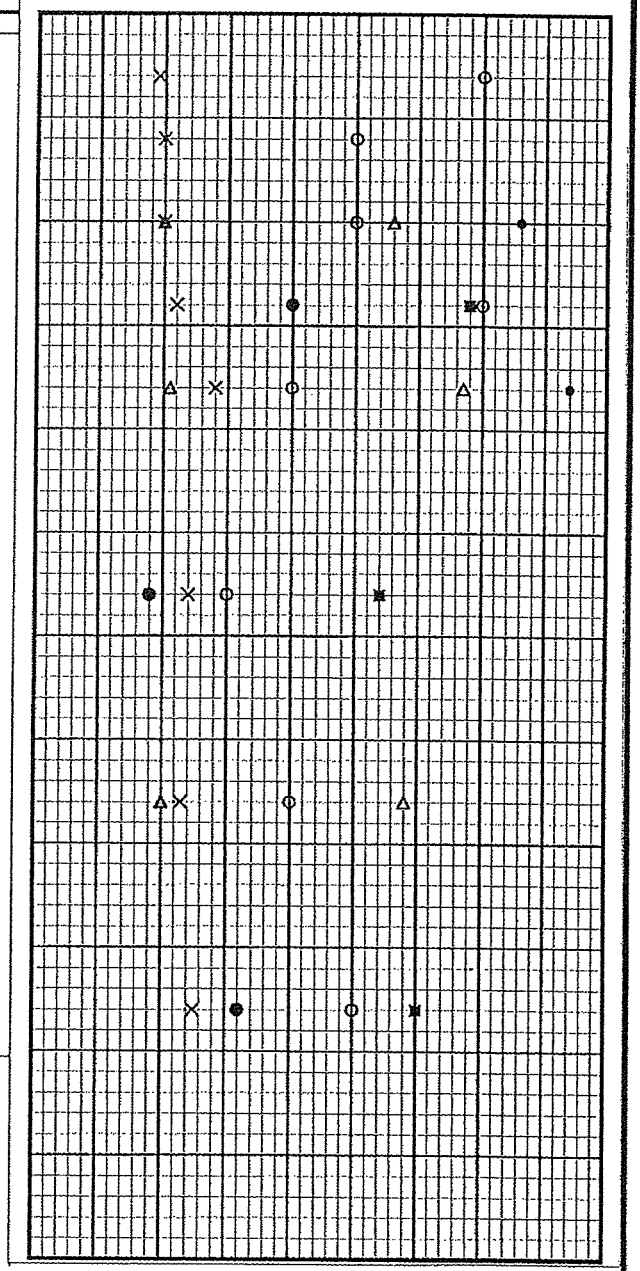
PROJECT NUMBER: G10-131

BORING NUMBER: B-20

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					3.75" Asphalt & 3" loose shell base
2.0		1			Very stiff, light gray & tan Fat Clay With Sand (CH)
4.0		2			.. with ferrous nodules below 2'
6.0		3			.. with calcareous nodules below 4'
8.0		4			.. with slickensided layers below 6'
10.0		5			.. stiff, reddish brown below 8'
15.0		6			.. firm, with sand layers at 15'
20.0		7			.. light gray & tan below 18'
25.0		8			.. with slickensided layers below 23'
					Boring terminated at 25'



Water First Noticed: No	DRILLED & LOGGED BY: Brian	STARTED: 3-24-2010	Northing: 13834431.45 Easting: 3115127.84
Final Water Reading: No			Elevation (ft): 46.66
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-24-2010	NOTE: For Scales Above
HOLE CAVED AT: No			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131 | BORING NUMBER: B-21

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

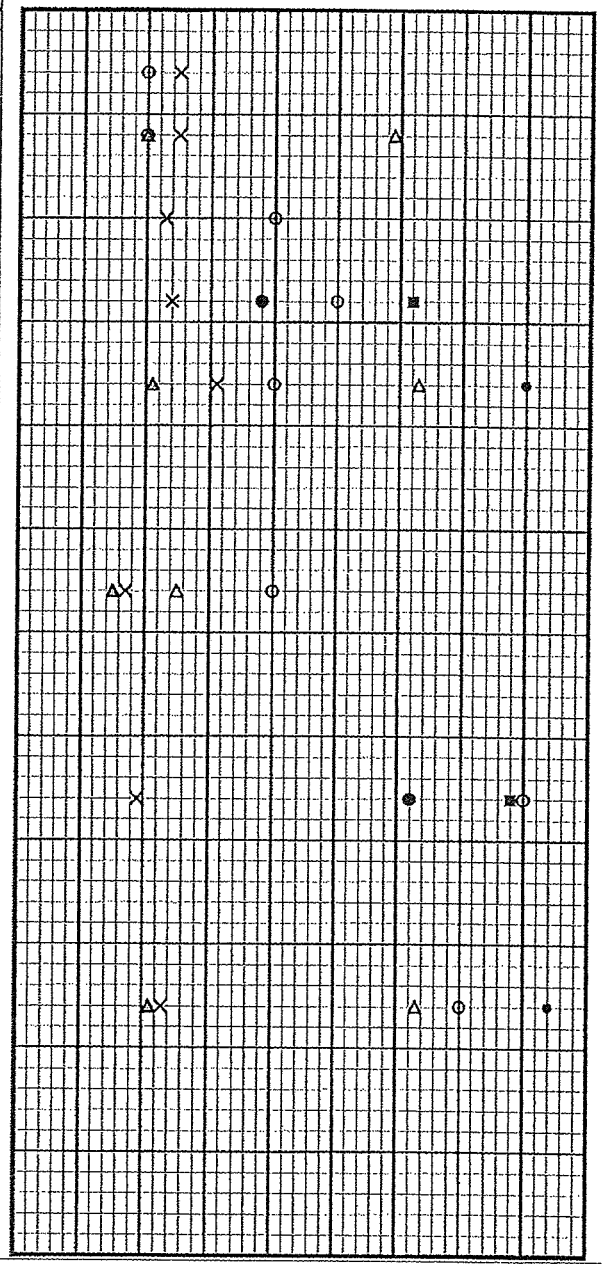
DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					2" Asphalt & 3" Crushed gravel base
2.0		1			Firm, light gray & tan Fat Clay With Sand (CH)
4.0		2			
6.0		3			.. stiff below 4'
8.0		4			.. with calcareous nodules below 6'
10.0		5			.. reddish brown, with ferrous nodules below 8'
15.0		6			Stiff, light gray & tan Sandy Lean Clay (CL)
20.0		7			Very stiff, light gray & tan Fat Clay With Sand (CH) with ferrous nodules
25.0		8			
					Boring terminated at 25'

◇ PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
△ LL (%) ▲ PL (%)
✕ MOIST.(%) ■ #200 (%)
▣ DRY DENSITY (PCF)

A: 75 80 85 90 95 100 105 110 115 120

B: 0 10 20 30 40 50 60 70 80 90

C: 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5



Water First Noticed: No	DRILLED & LOGGED BY: Brian	STARTED: 3-29-2010	Northing: 13834771.11 Easting: 3115207.47
Final Water Reading: No			Elevation (ft): 47.25
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-29-2010	NOTE: For Scales Above
HOLE CAVED AT: No			Scale-A-For Dry Density
COMPLETION DEPTH: 26'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

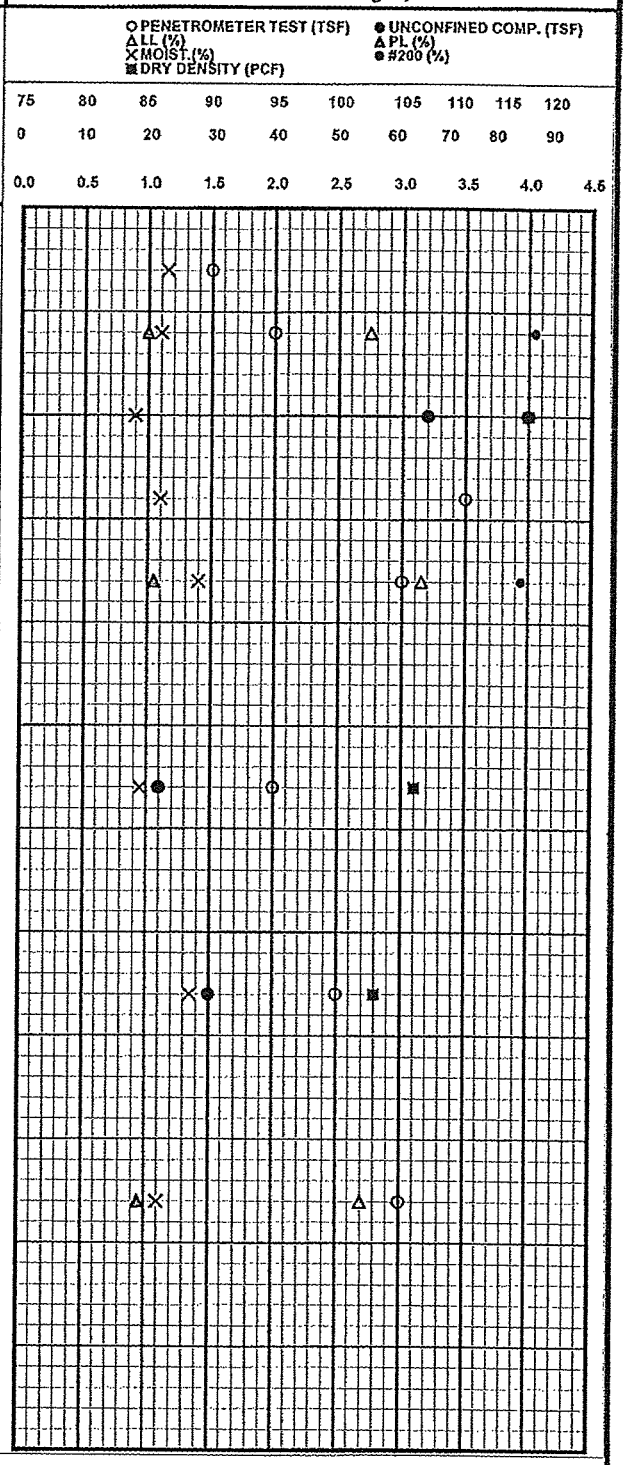
WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131 | BORING NUMBER: B-22

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					7" Asphalt & 3" Crushed gravel base
2.0		1			Stiff, dark gray Fat Clay With Sand (CH)
4.0		2			.. light gray & tan below 2'
6.0		3			.. very stiff, with calcareous nodules below 4'
8.0		4			.. reddish brown below 6'
10.0		5			.. with ferrous nodules below 8'
15.0		6			.. stiff below 13'
20.0		7			
25.0		8			.. very stiff, tan & light gray below 23'
					Boring terminated at 25'



Water First Noticed: No	DRILLED & LOGGED BY: Brian	STARTED: 3-18-2010	Northing: 13835070.71 Easting: 3116063.62
Final Water Reading: No			Elevation (ft): 47.08
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-18-2010	NOTE: For Scales Above
HOLE CAVED AT: No			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

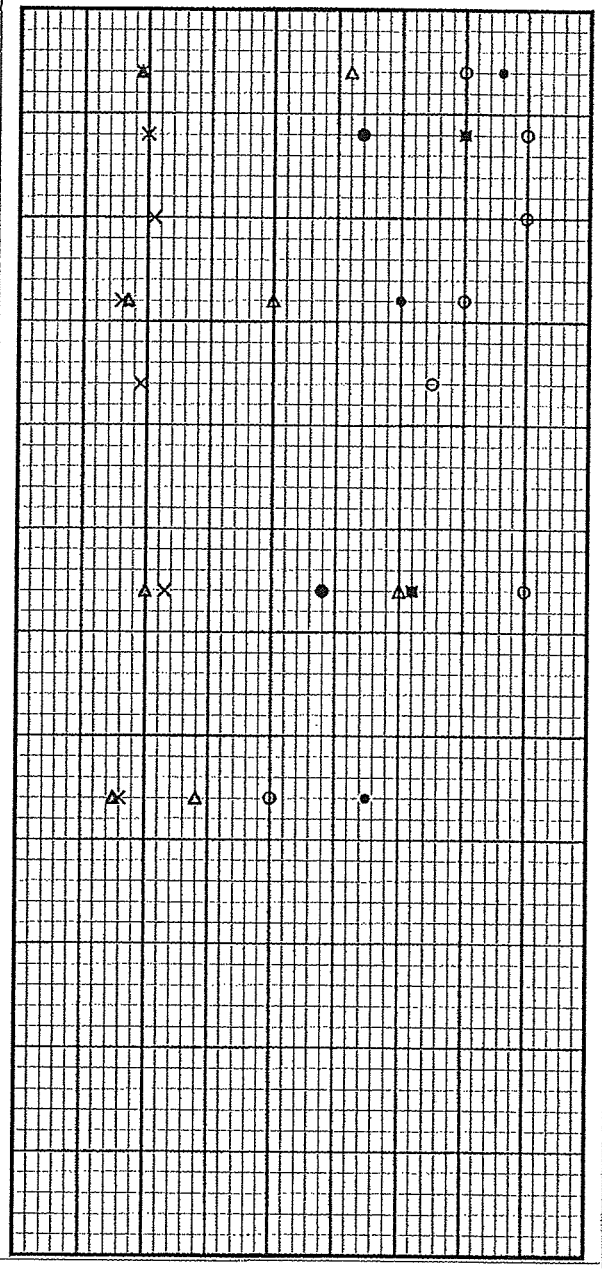
PROJECT NUMBER: G10-131

BORING NUMBER: B-23

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					4.5" Asphalt & 3" Crushed gravel base
2.0		1			Very stiff, light gray & tan Fat Clay With Sand (CH)
4.0		2			
6.0		3			.. with calcareous nodules below 4'
8.0		4			Very stiff, light gray & tan Sandy Lean Clay (CL) with calcareous nodules
10.0		5			.. reddish brown below 8'
15.0		6			Very stiff, reddish brown Fat Clay With Sand (CH)
20.0		7			Very stiff, light gray & tan Sandy Lean Clay (CL)
					Boring terminated at 20'



Water First Noticed: No	DRILLED & LOGGED BY: Brian	STARTED: 3-18-2010	Northing: 13835,070.88 Easting: 3115492.79
Final Water Reading: No			Elevation (ft): 47.80
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-18-2010	NOTE: For Scales Above
HOLE CAVED AT: No			Scale-A-For Dry Density
COMPLETION DEPTH: 20'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131

BORING NUMBER: B-24

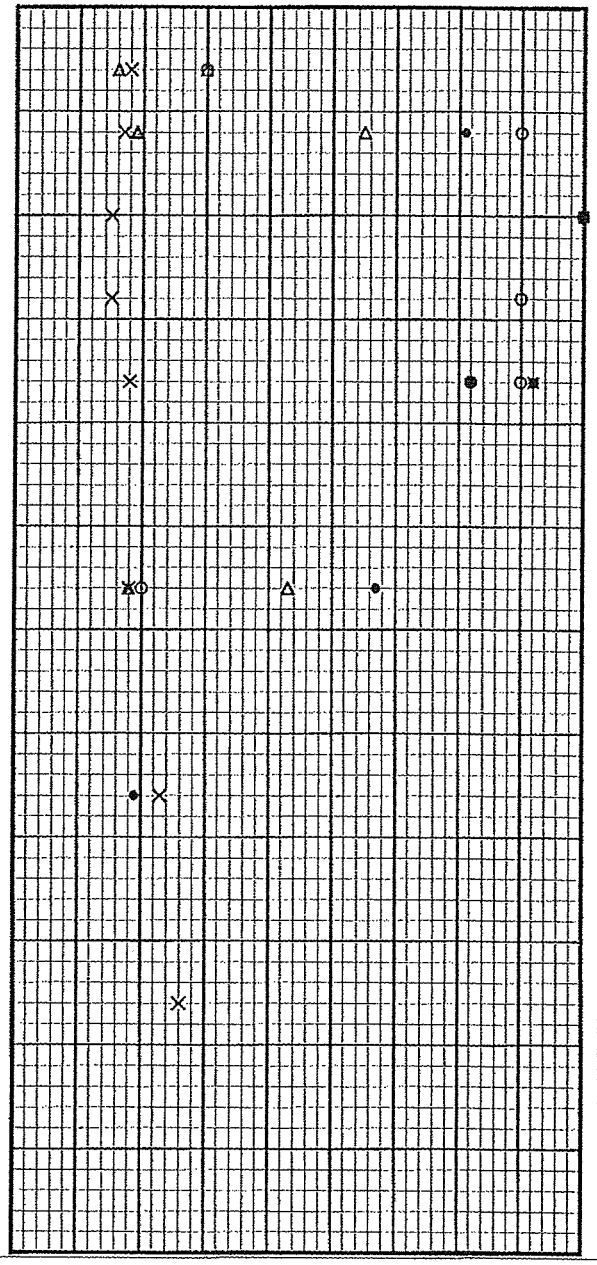
GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					6" Asphalt & 3.5" Crushed gravel base
2.0		1			Firm, light gray & tan Sandy Lean Clay (CL)
4.0		2			Very stiff, light gray & tan Fat Clay With Sand (CH)
6.0		3			.. hard, with ferrous nodules below 4'
8.0		4			.. very stiff below 6'
10.0		5			
15.0		6			Firm, tan & light gray Sandy Lean Clay (CL) with calcareous nodules
20.0		7	13		Medium dense, tan Silty Sand (SM)
25.0		8	5		.. loose below 23' (wet)
					Boring terminated at 25'

○ PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
X MOIST.(%) ● #200 (%)
▣ DRY DENSITY (PCF)

A	75	80	85	90	95	100	105	110	115	120
B	0	10	20	30	40	50	60	70	80	90
C	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5



Water First Noticed: 17'	DRILLED & LOGGED BY: Brian	STARTED: 3-18-2010	Northing: 13834773.87 Easting: 3115547.13
Final Water Reading: 18'			Elevation (ft): 47.48
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-18-2010	NOTE: For Scales Above
HOLE CAVED AT: 19'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131

BORING NUMBER: B-25

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

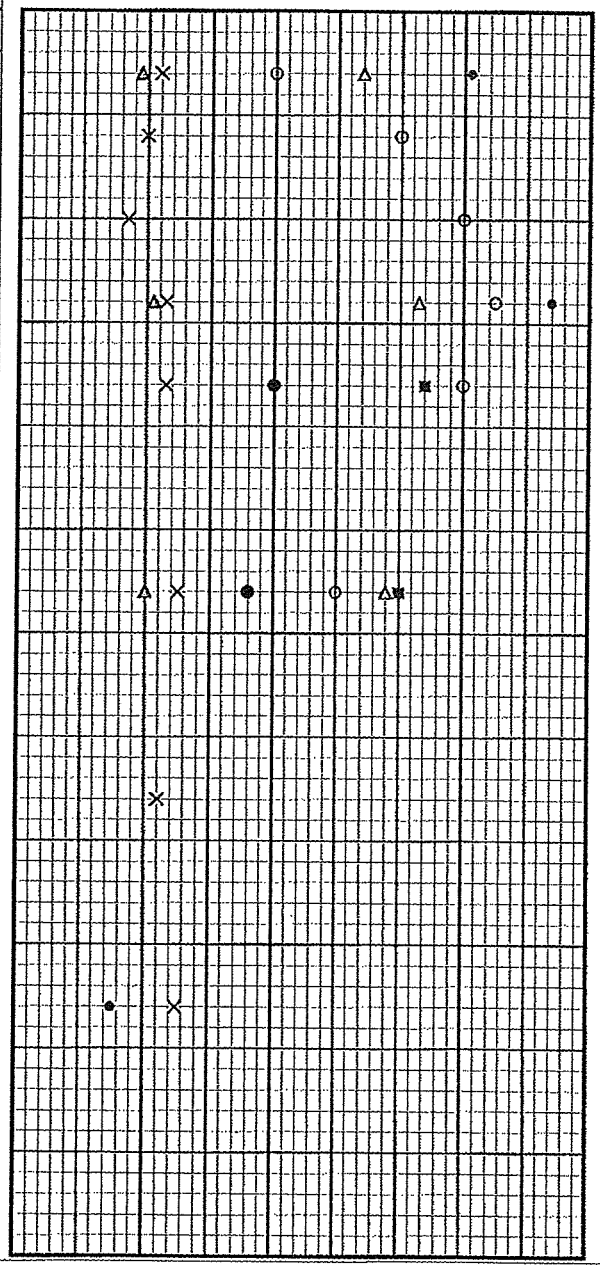
DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					5.5" Asphalt & 4" Shell fragment base
2.0		1			Stiff, dark gray Fat Clay With Sand (CH)
		2			.. very stiff, light gray & tan below 2'
4.0					
		3			.. with, calcareous nodules below 4'
6.0					
		4			.. with, ferrous nodules below 6'
8.0					
		5			
10.0					
		6			.. stiff, reddish brown below 13' (Slickensided)
15.0					
		7	20		Medium dense, tan Silty Sand (SM)
20.0					
		8	8		.. loose below 23' (wet)
25.0					Boring terminated at 25'

A: O PENETROMETER TEST (TSF); △ LL (%); X MOIST.(%); ■ DRY DENSITY (PCF)

B: 75 80 85 90 95 100 105 110 115 120 / 0 10 20 30 40 50 60 70 80 90

C: ● UNCONFINED COMP. (TSF); △ PL (%); ● #200 (%)

0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5



Water First Noticed: 16.5'
Final Water Reading: 15'
PZ WATER LEVEL: N/A
HOLE CAVED AT: 19'
COMPLETION DEPTH: 25'
GROUT: YES

DRILLED & LOGGED BY: Brian
PREPARED BY: Pankaj
CHECKED BY: JITU

STARTED: 3-17-2010
COMPLETED: 3-17-2010
APPROVED BY: JAY

Northing: 13834453.67 Easting: 3116572.53
Elevation (ft): 47.71
NOTE: For Scales Above
Scale-A-For Dry Density
Scale-B-For Moist.,LL,PL and #200
Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

WBS No. N-000400-0001-4

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

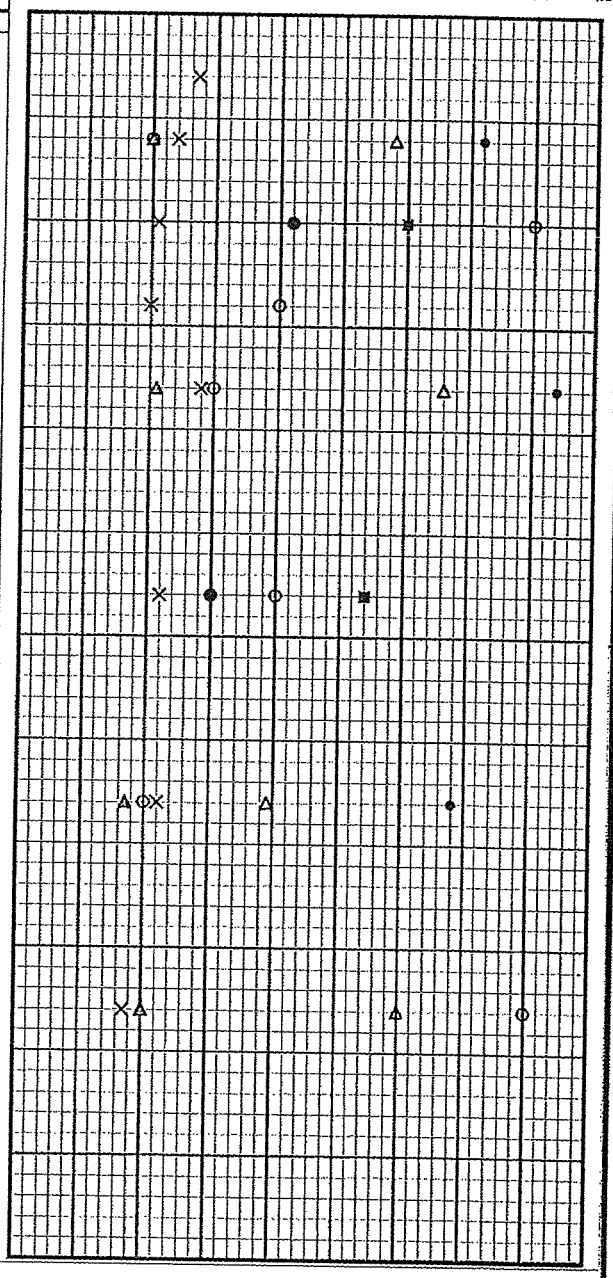
BORING LOG

PROJECT NUMBER: G10-131

BORING NUMBER:B-26(PZ-4)

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					4.5" Asphalt
2.0		1			Gray & tan Fat Clay With Sand (CH)
4.0		2			.. firm below 2'
6.0		3			.. very stiff, with calcareous nodules below 4'
8.0		4			.. stiff, with ferrous nodules below 6'
10.0		5			
15.0		6			
20.0		7			Firm, reddish brown Sandy Lean Clay (CL)
25.0		8			Very stiff, light gray & tan Fat Clay With Sand (CH) with ferrous nodules
					Boring terminated at 25'



Water First Noticed: 19'	DRILLED & LOGGED BY: Van & Sons	STARTED: 3-23-2010	Northing: 13834162.13 Easting: 3115693.83
Final Water Reading: 18'			Elevation (ft): 46.9
24 hr.Water Level: 17' (3-24-10)	PREPARED BY: Pankaj	COMPLETED: 3-23-2010	NOTE: For Scales Above
PZ WATER LEVEL: 16' (4-01-10)			Scale-A-For Dry Density
PZ WATER LEVEL: 16' (4-23-10)	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
HOLE CAVED AT: 19'			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

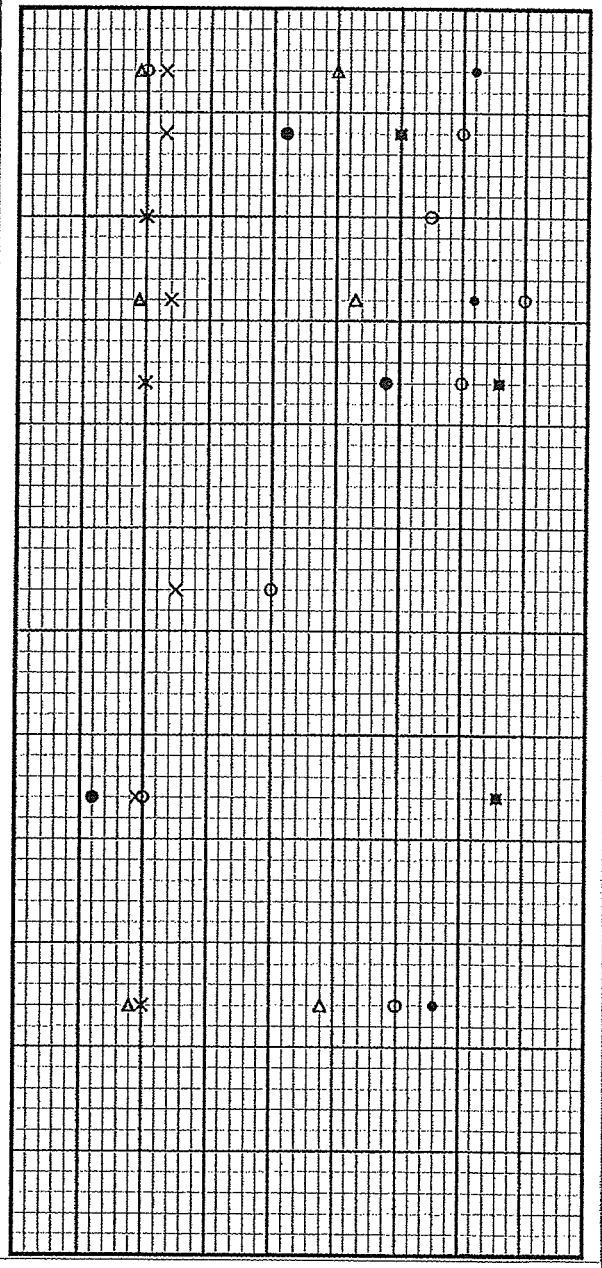
PROJECT NUMBER: G10-131

BORING NUMBER: B-27

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					2" Asphalt & 5.5" Concrete
2.0		1			Firm, dark gray Fat Clay With Sand (CH)
		2			.. light gray & tan below 2'
4.0		3			.. with calcareous nodules below 4'
6.0		4			.. with ferrous nodules below 6'
8.0		5			
10.0					
		6			Stiff, tan & light gray Sandy Lean Clay (CL) with sand layers
15.0					
		7			.. firm, with calcareous nodules below 18'
20.0					
		8			.. very stiff, with calcareous nodules below 23'
25.0					
					Boring terminated at 25'



Water First Noticed: 16'	DRILLED & LOGGED BY: Brian	STARTED: 3-24-2010	Northing: 13834354.92 Easting: 3115760.51
Final Water Reading: 15.5'			Elevation (ft): 47.94
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-24-2010	NOTE: For Scales Above
HOLE CAVED AT: 21'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

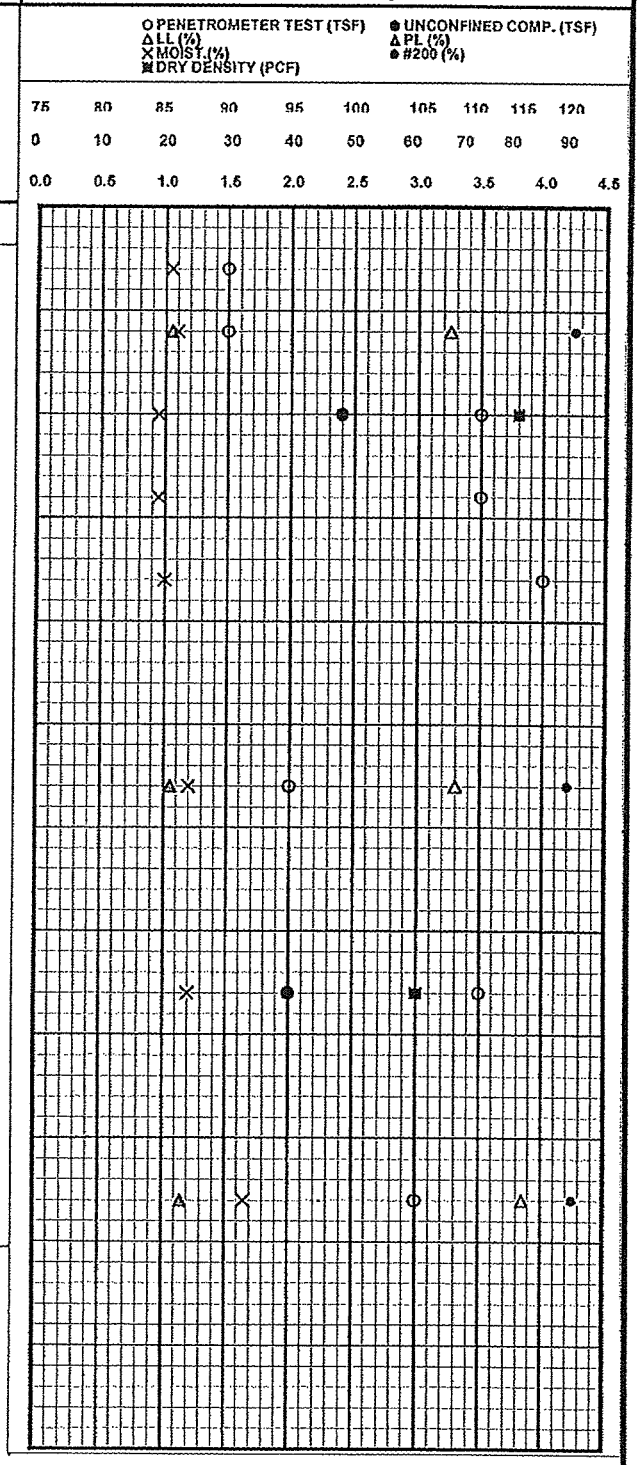
PROJECT NUMBER: G10-131

BORING NUMBER: B-28

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					2.5" Asphalt & 5" Concrete
2.0		1			Stiff, light gray & tan Fat Clay With Sand (CH)
4.0		2			
6.0		3			.. very stiff below 4'
8.0		4			
10.0		5			
15.0		6			.. stiff below 13'
20.0		7			.. very stiff below 18'
25.0		8			
					Boring terminated at 25'



Water First Noticed: 20'	DRILLED & LOGGED BY: Brian	STARTED: 4-01-2010	Northing: 13835010.37 Easting: 3116748.11
Final Water Reading: 22'			Elevation (ft): 47.74
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 4-01-2010	NOTE: For Scales Above
HOLE CAVED AT: 24.6'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.487

BORING LOG

WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131

BORING NUMBER: B-29

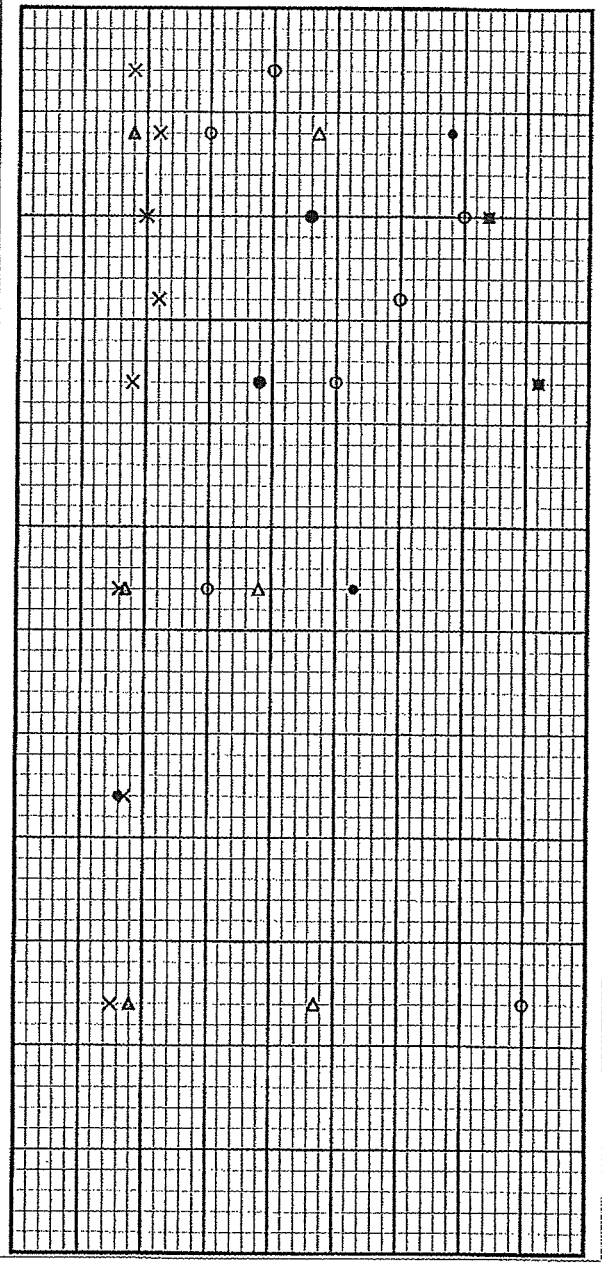
GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

O PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
X MOIST.(%) ● #200 (%)
▣ DRY DENSITY (PCF)

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					2.5" Asphalt & 4.75" Concrete
2.0		1			Stiff, light gray & tan Sandy Lean Clay (CL)
4.0		2			
6.0		3			.. very stiff below 2'
8.0		4			
10.0		5			.. stiff below 8'
15.0		6			.. with calcareous nodules below 13'
20.0		7	25		Medium dense, light gray & tan Silty Sand (SM)
25.0		8			Very stiff, light gray & tan Sandy Lean Clay (CL)
					Boring terminated at 25'

A	75	80	85	90	95	100	105	110	115	120
B	0	10	20	30	40	50	60	70	80	90
C	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5



Water First Noticed: 18'
Final Water Reading: 17'
PZ WATER LEVEL: N/A
HOLE CAVED AT: 22'
COMPLETION DEPTH: 25'
GROUT: YES

DRILLED & LOGGED BY: Brian
PREPARED BY: Panka)
CHECKED BY: JITU

STARTED: 3-24-2010
COMPLETED: 3-24-2010
APPROVED BY: JAY

Northing: 13835382.86 Easting: 3115729.86
Elevation (ft): 47.55
NOTE: For Scales Above
Scale-A-For Dry Density
Scale-B-For Moist.,LL,PL and #200
Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

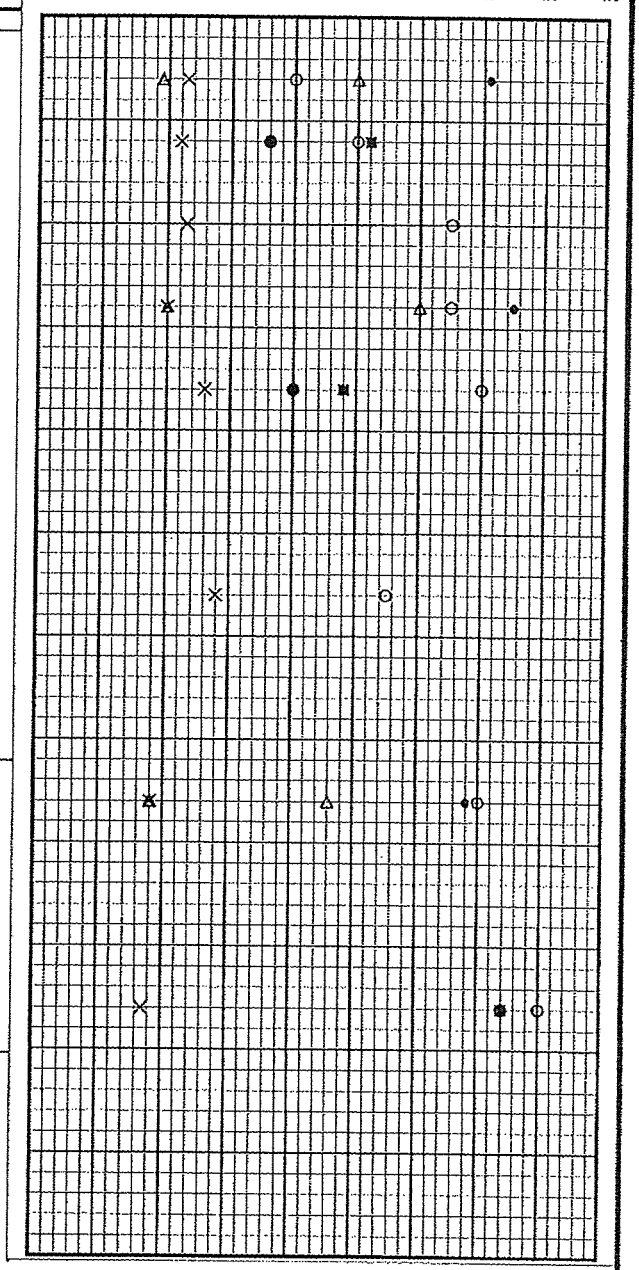
WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131 | BORING NUMBER:B-30(PZ-5)

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					6" Asphalt & 1" Loose shell base
2.0		1			Stiff, dark gray Fat Clay With Sand (CH)
4.0		2			.. gray & tan below 2'
6.0		3			.. very stiff below 4'
8.0		4			.. with calcareous nodules below 6'
10.0		5			.. reddish brown below 8'
15.0		6			.. with ferrous nodules below 13'
20.0		7			Very stiff, tan & light gray Sandy Lean Clay (CL) with ferrous nodules
25.0		8			.. with calcareous nodules below 23'
					Boring terminated at 25'



Water First Noticed: No	DRILLED & LOGGED BY: Van & Sons	STARTED: 3-23-2010	Northing: 13835129.03 Easting: 3116010.35
Final Water Reading: No			Elevation (ft): 47.84
24 hr.Water Level: No Water (3-24-10)	PREPARED BY: Pankaj	COMPLETED: 3-23-2010	NOTE: For Scales Above
PZ WATER LEVEL: 23.5' (4-01-10)			Scale-A-For Dry Density
PZ WATER LEVEL: 18.5' (4-23-10)	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
COMPLETION DEPTH: 25'			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

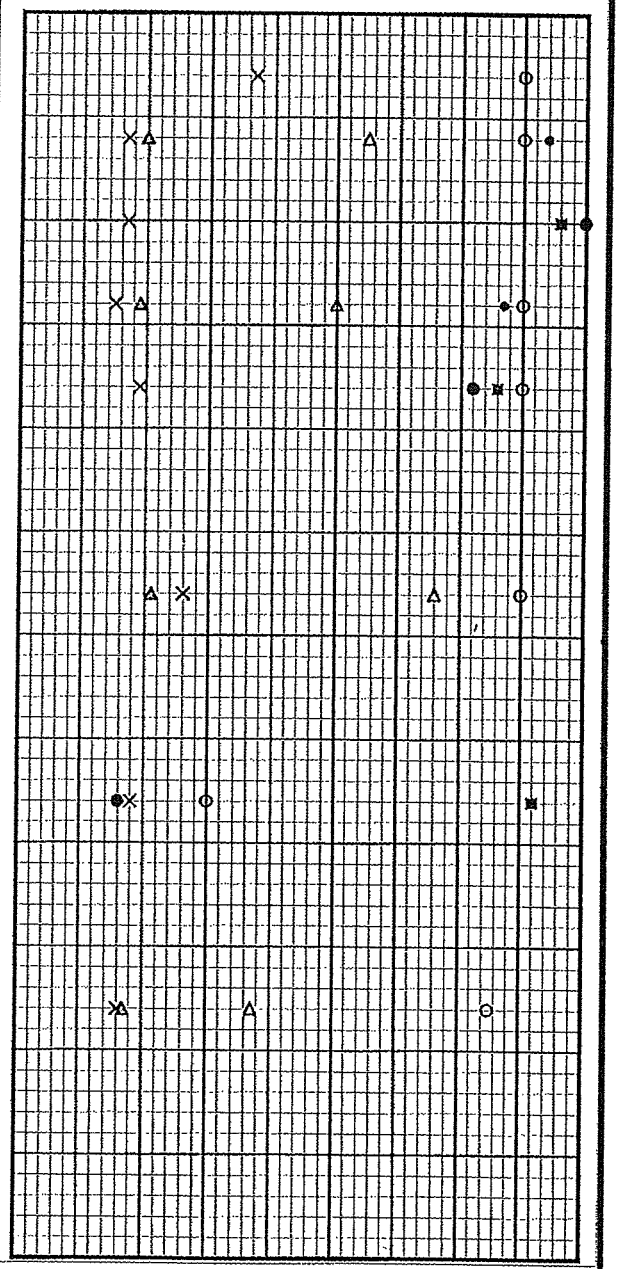
PROJECT NUMBER: G10-131

BORING NUMBER: B-31

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					6.5" Asphalt & 2" Shell fragment with soil
2.0		1			Very stiff, dark gray Fat Clay With Sand (CH)
4.0		2			
6.0		3			.. hard, light gray & tan, with ferrous nodules below 4'
8.0		4			.. very stiff, with calcareous nodules below 6'
10.0		5			.. tan & light gray below 8'
15.0		6			.. reddish brown below 13'
20.0		7			Firm, light gray & tan Sandy Lean Clay (CL)
25.0		8			.. very stiff below 23'
					Boring terminated at 25'



Water First Noticed: 17'	DRILLED & LOGGED BY: Brian	STARTED: 3-17-2010	Northing: 13834851.95 Easting: 3116059.71
Final Water Reading: 15'			Elevation (ft): 48.07
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-17-2010	NOTE: For Scales Above
HOLE CAVED AT: 19.5'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131

BORING NUMBER: B-32

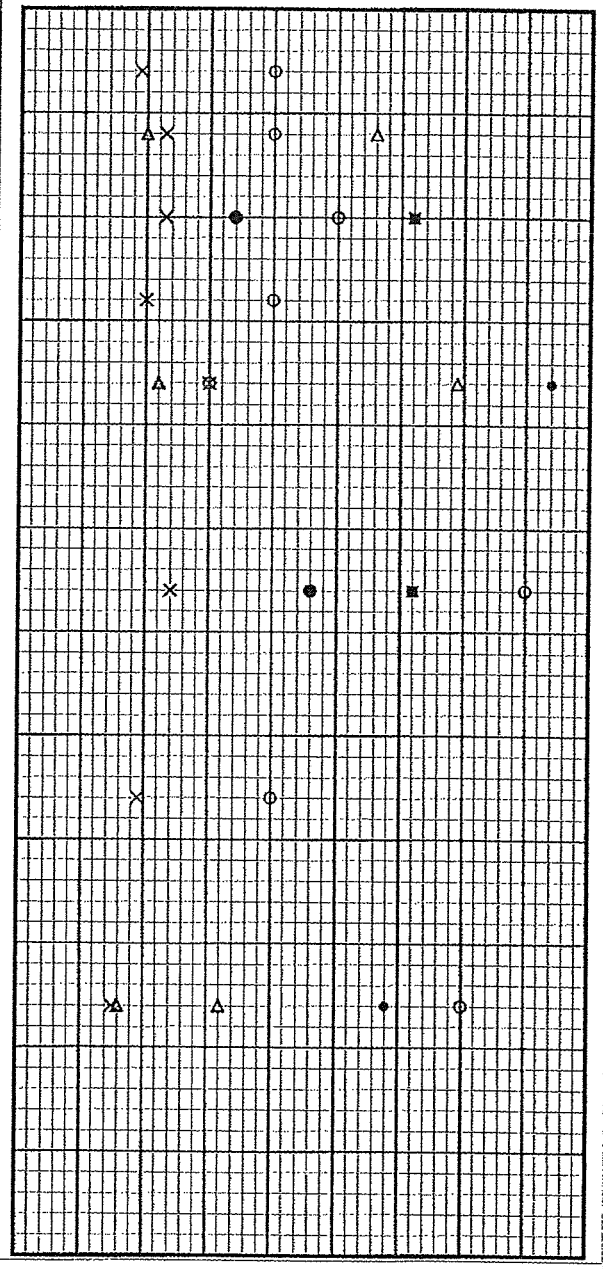
GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

O PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
X MOIST.(%) ● #200 (%)
▣ DRY DENSITY (PCF)

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					5" Asphalt & 8" Lime stabilized base
2.0		1			Stiff, dark gray Fat Clay With Sand (CH)
4.0		2			
6.0		3			.. light gray & tan below 4'
8.0		4			.. with calcareous & ferrous nodules below 6'
10.0		5			
15.0		6			.. very stiff, reddish brown below 13'
20.0		7			Stiff, light gray & tan Sandy Lean Clay (CL)
25.0		8			.. very stiff, with calcareous & ferrous nodules below 23'
					Boring terminated at 25'

A: 75 80 85 90 95 100 105 110 115 120
B: 0 10 20 30 40 50 60 70 80 90
C: 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5



Water First Noticed: 20'	DRILLED & LOGGED BY: Brian	STARTED: 3-17-2010	Northing: 13834522.28 Easting: 3116074.54
Final Water Reading: 14.5'			Elevation (ft): 48.45
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-17-2010	NOTE: For Scales Above
HOLE CAVED AT: 22'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

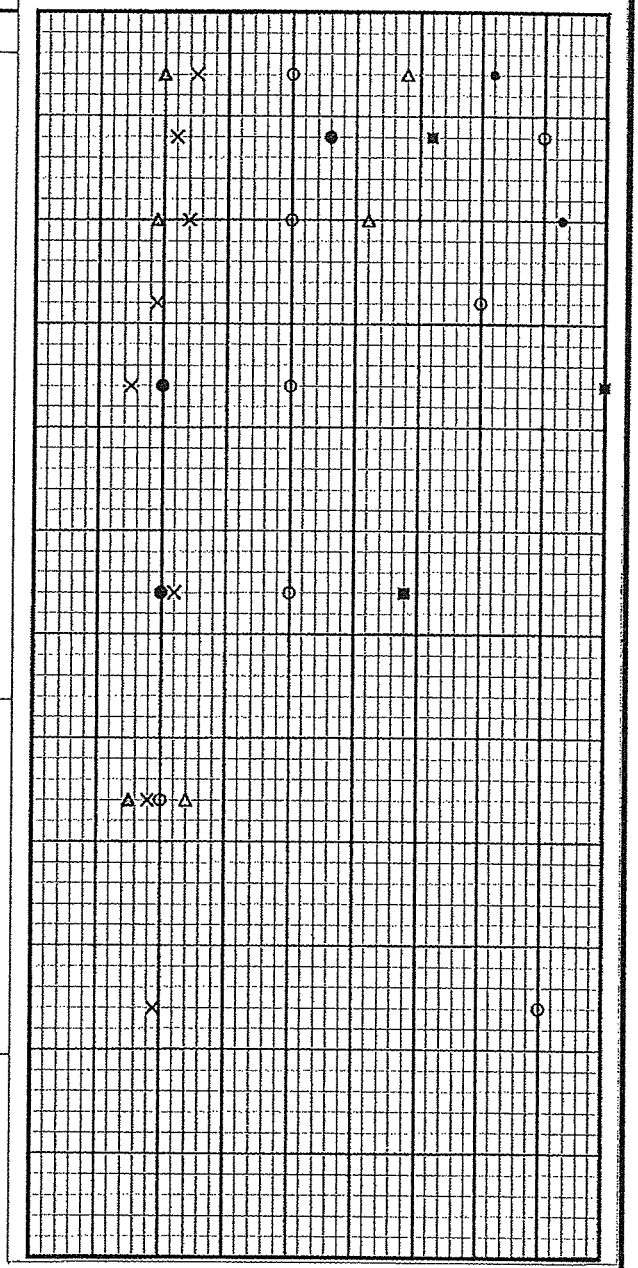
PROJECT NUMBER: G10-131

BORING NUMBER: B-33

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					7.5" Asphalt & 3" Lime stabilized base
2.0		1			Stiff, light gray & tan Fat Clay With Sand (CH)
		2			.. very stiff below 2'
4.0					
		3			.. stiff, with calcareous nodules below 4'
6.0					
		4			.. very stiff below 6'
8.0					
		5			..stiff below 8' (Slickensided)
10.0					
		6			.. reddish brown below 13'
15.0					
		7			Firm, light gray & tan Sandy Lean Clay (CL)
20.0					
		8			.. very stiff, with ferrous nodules below 23'
25.0					
					Boring terminated at 25'



Water First Noticed: 16.5'	DRILLED & LOGGED BY: Brian	STARTED: 3-17-2010	Northing: 13834810.02 Easting: 3116215.76
Final Water Reading: 14'			Elevation (ft): 48.04
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-17-2010	NOTE: For Scales Above
HOLE CAVED AT: 22'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

WBS No. N-000400-0001-4

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

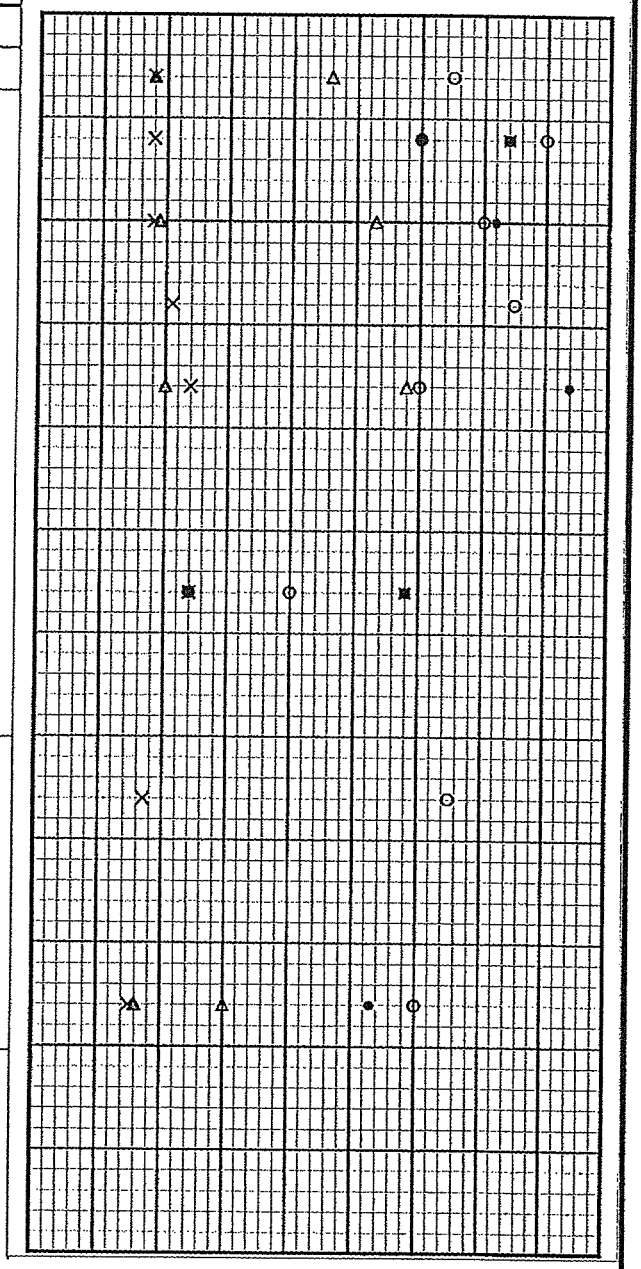
BORING LOG

PROJECT NUMBER: G10-131

BORING NUMBER: B-34

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					11.5" Asphalt & 3" Crushed gravel base
2.0		1			Very stiff, dark gray Sandy Lean Clay (CL)
4.0		2			Very stiff, dark gray Fat Clay With sand (CH)
6.0		3			.. light gray & tan below 4'
8.0		4			.. with calcareous nodules below 6'
10.0		5			
15.0		6			.. stiff below 13'
20.0		7			Very stiff, light gray & tan Sandy Lean Clay (CL)
25.0		8			.. with calcareous nodules below 23'
					Boring terminated at 25'



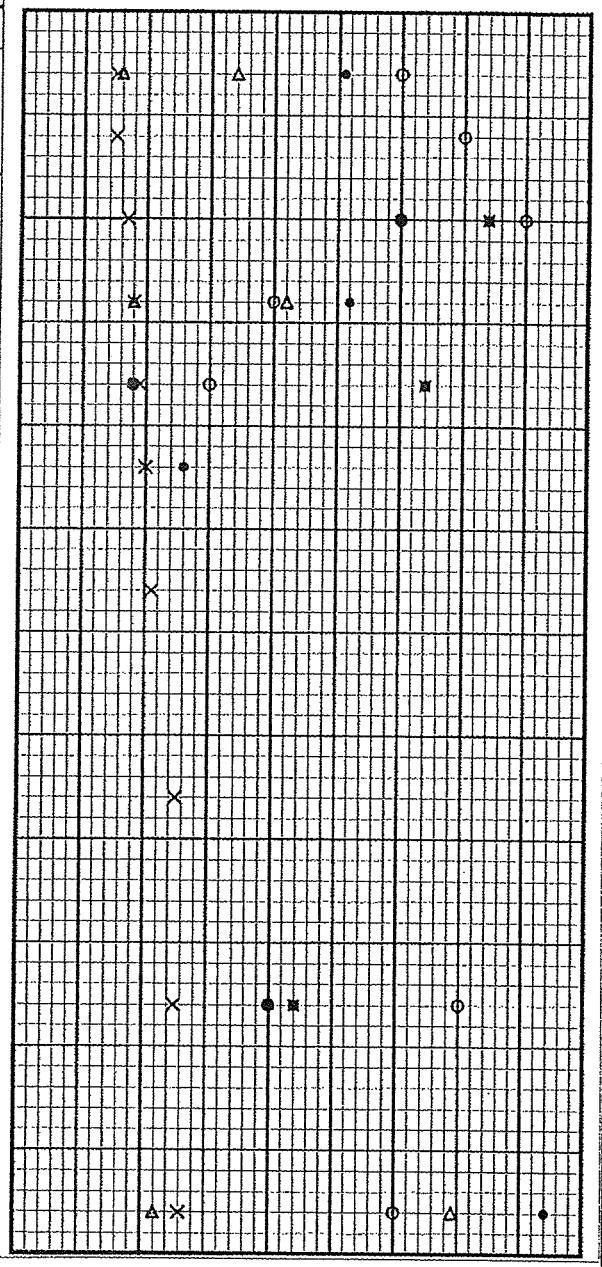
Water First Noticed: 17.5'	DRILLED & LOGGED BY: Brian	STARTED: 3-29-2010	Northing: 13835147.20 Easting: 3116325.79
Final Water Reading: 15'			Elevation (ft): 47.49
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-29-2010	NOTE: For Scales Above
HOLE CAVED AT: 18'			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467	BORING LOG	
WBS No. N-000400-0001-4	PROJECT NUMBER: G10-131	BORING NUMBER: B-35
GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.	DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.	

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					11' Asphalt
2.0		1			Very stiff, light gray & tan Sandy Lean Clay (CL) (4' Fill)
		2			.. with calcareous nodules below 2'
4.0					
		3			Very stiff, light gray & tan Sandy Lean Clay (CL)
6.0					
		4			.. stiff, with calcareous nodules below 6'
8.0					
		5			
10.0					
		6	11		Medium dense, light gray & tan Silty Sand (SM)
12.0					
		7	25		
15.0					
		8	25		.. reddish brown below 18'
20.0					
		9			Very stiff, light gray & tan Fat Clay With Sand (CH)
25.0					
		10			.. reddish brown below 28'
30.0					
					Boring terminated at 30'

O PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
X MOIST.(%) ● #200 (%)
■ DRY DENSITY (PCF)

A	75	80	85	90	95	100	105	110	115	120
B	0	10	20	30	40	50	60	70	80	90
C	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5



Water First Noticed: 18'	DRILLED & LOGGED BY: Van & Sons	STARTED: 3-26-2010	Northing: 13833767.34 Easting: 3118161.99
Final Water Reading: 14'			Elevation (ft): 44.41
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 3-26-2010	NOTE: For Scales Above
HOLE CAVED AT: No			Scale-A-For Dry Density
COMPLETION DEPTH: 20'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

BORING LOG

WBS No. N-000400-0001-4

PROJECT NUMBER: G10-131 | BORING NUMBER:B-36(PZ-6)

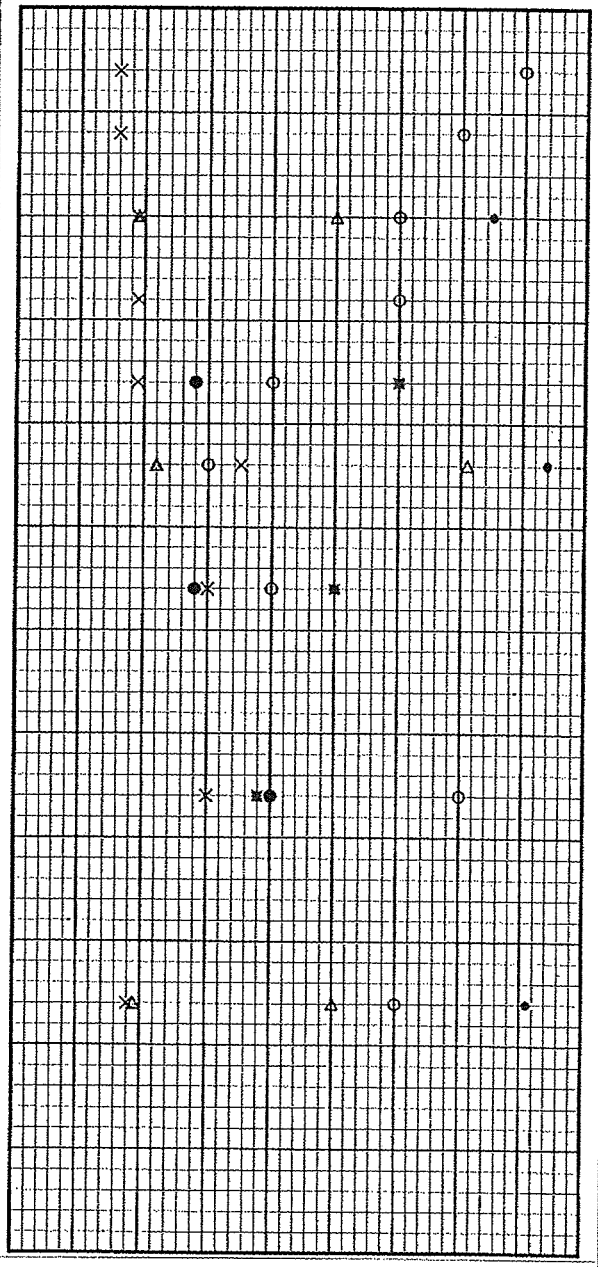
GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					10.5" Asphalt
2.0		1			Very stiff, dark gray Fat Clay With Sand (CH)
4.0		2			.. light gray & tan, with calcareous nodules below 2'
6.0		3			.. with ferrous nodules below 4'
8.0		4			
10.0		5			
12.0		6			.. reddish brown below 10'
15.0		7			
20.0		8			
25.0		9			
					Boring terminated at 25'

○ PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
× MOIST.(%) ● #200 (%)
■ DRY DENSITY (PCF)

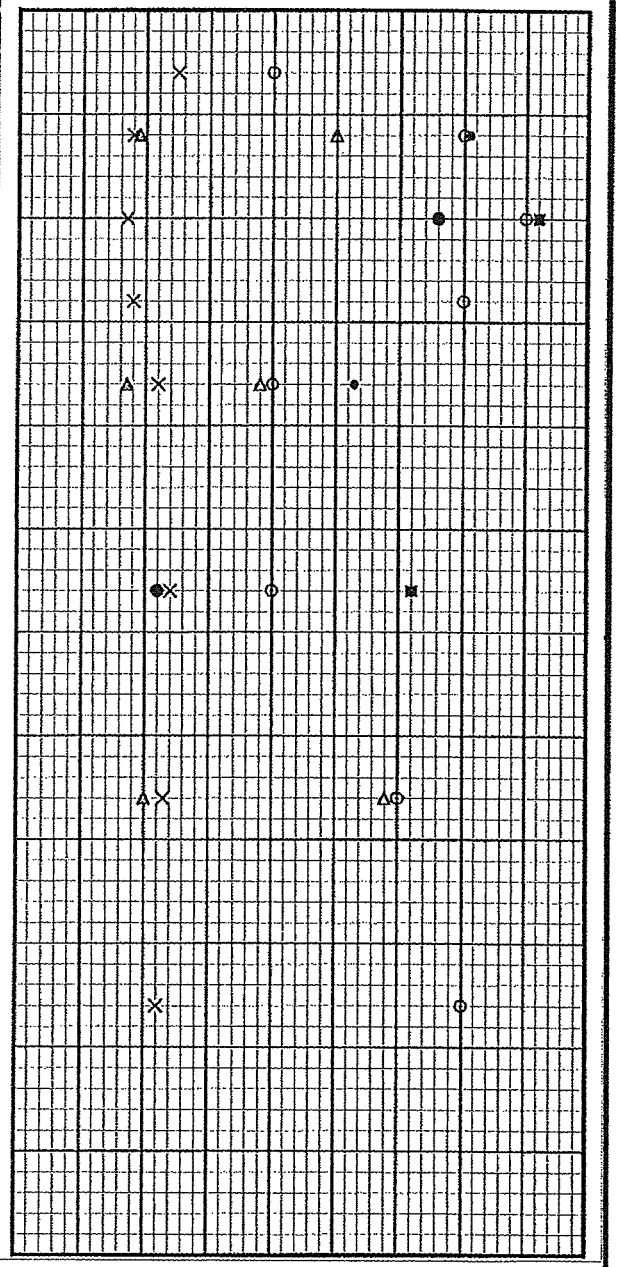
A	75	80	85	90	95	100	105	110	115	120
B	0	10	20	30	40	50	60	70	80	90
C	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5



Water First Noticed: No	DRILLED & LOGGED BY: Van & Sons	STARTED: 3-26-2010	Northing: 13834191.98 Easting: 3118425.48
Final Water Reading: No			Elevation (ft): 45.14
PZ WATER LEVEL: 22.5' (3-29-10)	PREPARED BY: Pankaj	COMPLETED: 3-26-2010	NOTE: For Scales Above
PZ WATER LEVEL: 10' (4-01-10)			Scale-A-For Dry Density
PZ WATER LEVEL: 10' (4-23-10)	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
COMPLETION DEPTH: 25'			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467	BORING LOG	
WBS No. N-000400-0001-4	PROJECT NUMBER: G10-131	BORING NUMBER:B-37
GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.	DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.	

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION
					2.5" Asphalt, 5.5" Concrete & 2" Loose shell base
2.0		1			Stiff, light gray & tan Fat Clay With Sand (CH)
		2			.. with ferrous nodules below 2'
4.0		3			.. with calcareous nodules below 4'
6.0		4			
8.0		5			Stiff, tan & light gray Sandy Lean Clay (CL)
10.0					
		7			Stiff, reddish brown Fat Clay With Sand (CH)
15.0					
		8			.. very stiff, with calcareous nodules below 18'
20.0					
		9			.. light gray & tan below 23'
25.0					
					Boring terminated at 25'



Water First Noticed: No	DRILLED & LOGGED BY: Brian	STARTED: 4-09-2010	Northing: 13835339.01 Easting: 3114188.75
Final Water Reading: No			Elevation (ft): 47.30
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 4-09-2010	NOTE: For Scales Above
HOLE CAVED AT: No			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

PROJECT NAME: NEIGHBORHOOD STREET RECONSTRUCTION PROJECT No.467

WBS No. N-000400-0001-4

GEOTECHNICAL CONSULTANT: ASSOCIATED TESTING LABORATORIES, INC.

BORING LOG

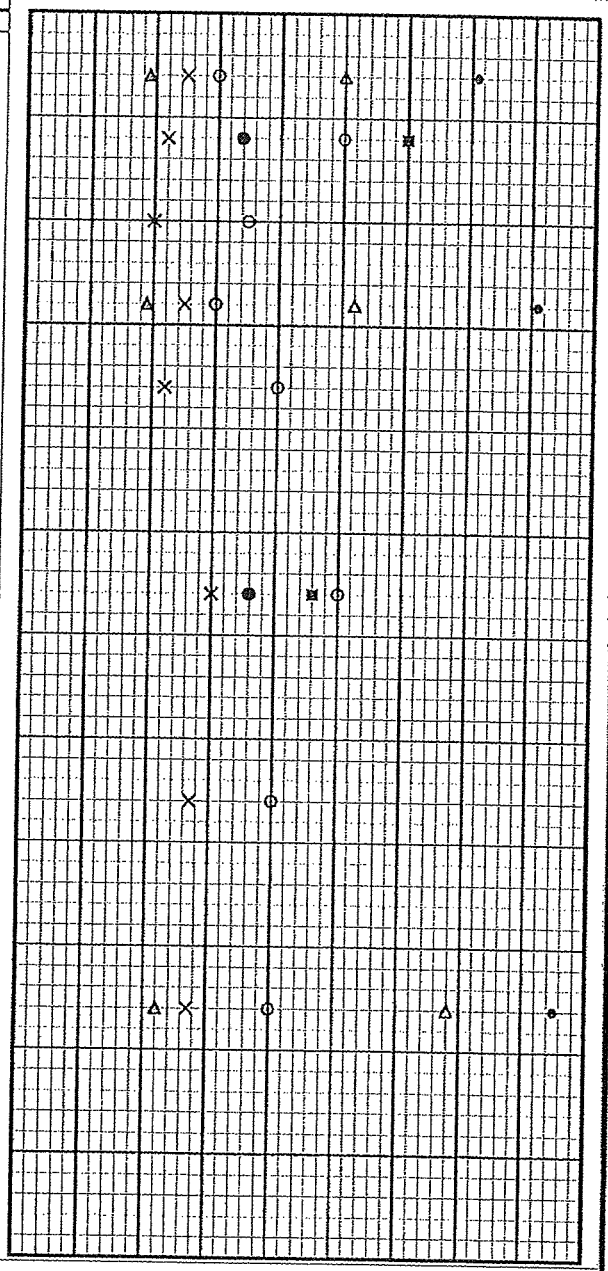
PROJECT NUMBER: G10-131 | BORING NUMBER:B-38

DESIGN CONSULTANT: Van De Wiele & Vogler, Inc.

DEPTH, FEET	SAMPLE TYPE	SAMPLE NUMBER	SPT	LEGEND	MATERIAL DESCRIPTION	A B C
					2.5" Asphalt & 4" Shell fragment base	
2.0		1			Stiff, dark gray Fat Clay With Sand (CH)	
4.0		2			.. light gray & tan below 2'	
6.0		3			.. with ferrous nodules below 4'	
8.0		4				
10.0		5			.. reddish brown & light gray below 8'	
15.0		6			.. with calcareous nodules below 13'	
20.0		7			.. sand layers at 20'	
25.0		8			.. light gray & tan below 23'	
					Boring terminated at 25'	

O PENETROMETER TEST (TSF) ● UNCONFINED COMP. (TSF)
Δ LL (%) Δ PL (%)
✕ MOIST.(%) ● #200 (%)
▣ DRY DENSITY (PCF)

A	75	80	85	90	95	100	105	110	115	120
B	0	10	20	30	40	50	60	70	80	90
C	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5



Water First Noticed: 24'	DRILLED & LOGGED BY: Brian	STARTED: 4-09-2010	Northing: 13833727.40 Easting: 3114238.12
Final Water Reading: 23'			Elevation (ft): 44.62
PZ WATER LEVEL: N/A	PREPARED BY: Pankaj	COMPLETED: 4-09-2010	NOTE: For Scales Above
HOLE CAVED AT: No			Scale-A-For Dry Density
COMPLETION DEPTH: 25'	CHECKED BY: JITU	APPROVED BY: JAY	Scale-B-For Moist.,LL,PL and #200
GROUT: YES			Scale-C-For Penetrometer and Unconfined Comp.

APPENDIX 4

SUMMARY OF TEST RESULTS

ASSOCIATED TESTING LABORATORIES, INC.
3143 YELLOWSTONE BLVD., HOUSTON, TEXAS 77052
TEL: (713) 748-3717 FAX: (713) 748-3748

PROJECT NAME: NEIGHBOURHOOD STREET RECONSTRUCTION PROJECT No. 467
WBS No. N-000400-0001-4
PROJECT NUMBER: G10- 131

Boring No.	Sample			Water Content (%)	Dry Density (pcf)	Atterberg Limits			Particle Size					Unconfined Comp. (TSF)	Triaxial Comp. Strength			Consolidation	Corrosion			
	No.	Depth (ft)	Type			LL	PL	PI	Grv. (%)	Sand (%)	Silt (%)	Clay (%)	#200 (%)		Figure No.	Max. Deviator Stress (ksf)	Conf. Press PSI		pH	R (ohm-cm)	SO4 (%)	Cl (%)
B-1	1	0-2	UD	24		65	21	44					75									
	2	2-4	UD	17	108									2.6								
	3	4-6	UD	23																		
	4	6-8	UD	23		62	21	41					82									
	5	8-10	UD	33	88									1.3								
	6	13-15	SS	13																		
	7	18-20	SS	24																		
	8	23-25	SS	27									39									
B-2	1	0-2	UD	21		54	19	35					72									
	2	2-4	UD	15	118									4.5								
	3	4-6	UD	15																		
	4	6-8	UD	15		41	17	24					54									
	5	8-10	UD	11	118									3.6								
	6	13-15	SS	7									15									
	7	18-20	SS	24																		
	8	23-25	UD	18		24	15	9														
B-3	1	0-2	UD	36		59	20	39					74									
	2	2-4	UD	30	90									0.3								
	3	4-6	UD	22																		
	4	6-8	UD	29																		
	5	8-10	UD	28	95	50	19	31					71	0.5								
	6	13-15	SS	6									15									
	7	18-20	SS	7																		
	8	23-25	SS	20									18									

Legend: UD - Undisturbed Sample Extruded in Field
UL - Undisturbed Sample Extruded in Lab
Designates consolidation test Performed
AU - Auger Cutting in Field
SS - Split Spoon Sample

ASSOCIATED TESTING LABORATORIES, INC.
3143 YELLOWSTONE BLVD., HOUSTON, TEXAS 77052
TEL: (713) 748-3717 FAX: (713) 748-3748

PROJECT NAME: NEIGHBOURHOOD STREET RECONSTRUCTION PROJECT No. 467
WBS No. N-000400-0001-4
PROJECT NUMBER: G10- 131

Boring No.	Sample			Water Content (%)	Dry Density (pcf)	Atterberg Limits			Particle Size					Unconfined Comp. (TSF)	Triaxial Comp. Strength			Consolidation	Corrosion			
	No.	Depth (ft)	Type			LL	PL	PI	Grv. (%)	Sand (%)	Silt (%)	Clay (%)	#200 (%)		Figure No.	Max. Deviator Stress (ksf)	Conf. Press PSI		pH	R (ohm-cm)	SO4 (%)	Cl (%)
B-4	1	0-2	UD	14																		
	2	2-4	UD	13		40	17	23					56									
	3	4-6	UD	13	119									4.5								
	4	6-8	UD	18																		
	5	8-10	UD	12	116									4.5								
	6	13-15	SS	7																		
	7	18-20	SS	19																		
	8	23-25	UD	22		57	20	37					84									
B-5	1	0-2	UD	19																		
	2	2-4	UD	19		46	18	28					69									
	3	4-6	UD	17	119									3.2								
	4	6-8	UD	18																		
	5	8-10	UD	23		54	19	35					84									
	6	13-15	SS	9																		
	7	18-20	UD	35	93									1.0								
	8	23-25	UD	22		57	20	37					85									
B-6	1	0-2	UD	12		25	15	10														
	2	2-4	UD	22		53	19	34					71									
	3	4-6	UD	17	113									3.0								
	4	6-8	UD	15																		
	5	8-10	UD	17	110									2.0								
	6	13-15	UD	28		61	21	40					76									
	7	18-20	UD	30	93									1.3								
	8	23-25	UD	21		38	17	21					57									

Legend:
UD - Undisturbed Sample Extruded in Field
UL - Undisturbed Sample Extruded in Lab
Designates consolidation test Performed
AU - Auger Cutting in Field
SS - Split Spoon Sample

ASSOCIATED TESTING LABORATORIES, INC.
3143 YELLOWSTONE BLVD., HOUSTON, TEXAS 77052
TEL: (713) 748-3717 FAX: (713) 748-3748

PROJECT NAME: NEIGHBOURHOOD STREET RECONSTRUCTION PROJECT No. 467
WBS No. N-000400-0001-4
PROJECT NUMBER: G10- 131

Boring No.	Sample No.	Sample Depth (ft)	Sample Type	Water Content (%)	Dry Density (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Particle Size Grv. (%)	Particle Size Sand (%)	Particle Size Silt (%)	Particle Size Clay (%)	Particle Size #200 (%)	Unconfined Comp. (TSF)	Triaxial Comp. Strength Figure No.	Triaxial Comp. Strength Max. Deviator Stress (ksf)	Triaxial Comp. Strength Conf. Press PSI	Consolidation	Corrosion pH	Corrosion R (ohm-cm)	Corrosion SO4 (%)	Corrosion Cl (%)
B-7	1	0-2	UD	17		35	16	19					53									
	2	2-4	UD	19	107									1.2								
	3	4-6	UD	17	108									1.0								
	4	6-8	UD	15		42	18	24					58									
	5	8-10	SS	10									34									
	6	13-15	SS	7																		
	7	18-20	SS	4																		
	8	23-25	SS	22									28									
B-8	1	0-2	UD	26																		
	2	2-4	UD	21		62	21	41					81									
	3	4-6	UD	17	116									3.8								
	4	6-8	UD	16																		
	5	8-10	UD	16	117	40	17	23					54	2.5								
	6	13-15	SS	5																		
	7	18-20	SS	16									22									
	8	23-25	SS	19																		
B-9	1	0-2	UD	24		55	20	35					71									
	2	2-4	UD	18	115									2.2								
	3	4-6	UD	17																		
	4	6-8	UD	17		41	17	24					52									
	5	8-10	UD	15	113									1.0								
	6	13-15	SS	13																		
	7	18-20	SS	19									15									
	8	23-25	SS	20																		

Legend:
UD - Undisturbed Sample Extruded in Field
UL - Undisturbed Sample Extruded in Lab
Designates consolidation test Performed
AU - Auger Cutting in Field
SS - Split Spoon Sample

ASSOCIATED TESTING LABORATORIES, INC.
3143 YELLOWSTONE BLVD., HOUSTON, TEXAS 77052
TEL: (713) 748-3717 FAX: (713) 748-3748

PROJECT NAME: NEIGHBOURHOOD STREET RECONSTRUCTION PROJECT No. 467
WBS No. N-000400-0001-4
PROJECT NUMBER: G10- 131

Boring No.	Sample			Water Content (%)	Dry Density (pcf)	Atterberg Limits			Particle Size					Unconfined Comp. (TSF)	Triaxial Comp. Strength			Consolidation	Corrosion			
	No.	Depth (ft)	Type			LL	PL	PI	Grv. (%)	Sand (%)	Silt (%)	Clay (%)	#200 (%)		Figure No.	Max. Deviator Stress (ksf)	Conf. Press PSI		pH	R (ohm-cm)	SO4 (%)	Cl (%)
B-10	1	0-2	UD	18		37	17	20					56									
	2	2-4	UD	19																		
	3	4-6	UD	23		39	17	22					69									
	4	6-8	UD	24																		
	5	8-10	UD	16	105									0.4								
	6	13-15	SS	13																		
	7	18-20	UD	31		67	21	46					84									
	8	23-25	UD	24	106									2.1								
B-11	1	0-2	UD	16		43	18	25					51									
	2	2-4	UD	16																		
	3	4-6	UD	17	117									2.9								
	4	6-8	UD	17		36	17	19					52									
	5	8-10	UD	20	109									1.1								
	6	13-15	SS	9																		
	7	18-20	SS	23									17									
	8	23-25	SS	24																		
B-12	1	0-2	UD	27		70	22	48														
	2	2-4	UD	21																		
	3	4-6	UD	19	113									2.3								
	4	6-8	UD	18		52	19	33					79									
	5	8-10	UD	24																		
	6	13-15	UD	22	106									0.9								
	7	18-20	UD	21		74	23	51					85									
	8	23-25	UD	17																		

Legend: UD - Undisturbed Sample Extruded in Field
UL - Undisturbed Sample Extruded in Lab
Designates consolidation test Performed
AU - Auger Cutting in Field
SS - Split Spoon Sample

ASSOCIATED TESTING LABORATORIES, INC.
3143 YELLOWSTONE BLVD., HOUSTON, TEXAS 77052
TEL: (713) 748-3717 FAX: (713) 748-3748

PROJECT NAME: NEIGHBOURHOOD STREET RECONSTRUCTION PROJECT No. 467
WBS No. N-000400-0001-4
PROJECT NUMBER: G10- 131

Boring No.	Sample No.	Sample Depth (ft)	Sample Type	Water Content (%)	Dry Density (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Particle Size Grv. (%)	Particle Size Sand (%)	Particle Size Silt (%)	Particle Size Clay (%)	Particle Size #200 (%)	Unconfined Comp. (TSF)	Triaxial Comp. Strength Figure No.	Triaxial Comp. Strength Max. Deviator Stress (ksf)	Triaxial Comp. Strength Conf. Press PSI	Consolidation	Corrosion pH	Corrosion R (ohm-cm)	Corrosion SO4 (%)	Corrosion Cl (%)
B-13	1	0-2	UD	26		50	19	31					71									
	2	2-4	UD	23																		
	3	4-6	UD	25		50	19	31														
	4	6-8	UD	23																		
	5	8-10	UD	25	95									0.7								
	6	13-15	UD	20	109									3.8								
	7	18-20	UD	22		54	19	35					85									
	8	23-25	UD	19	111	34	16	18						1.0								
B-14	1	0-2	UD	23		51	19	32					83									
	2	2-4	UD	23	104									2.4								
	3	4-6	UD	18																		
	4	6-8	UD	20		51	19	32					80									
	5	8-10	UD	23	106									2.1								
	6	13-15	UD	29																		
	7	18-20	UD	23	116	37	17	20					52	1.3								
	8	23-25	UD	17																		
B-15	1	0-2	UD	13																		
	2	2-4	UD	13		43	18	25					65									
	3	4-6	UD	10	120									4.5								
	4	6-8	UD	15		48	18	30					68									
	5	8-10	UD	19	112									4.5								
	6	13-15	UD	21																		
	7	18-20	UD	27		57	20	37					80									
	8	23-25	UD	22	110									0.9								

Legend:
UD - Undisturbed Sample Extruded in Field
UL - Undisturbed Sample Extruded in Lab
Designates consolidation test Performed
AU - Auger Cutting in Field
SS - Split Spoon Sample

ASSOCIATED TESTING LABORATORIES, INC.
3143 YELLOWSTONE BLVD., HOUSTON, TEXAS 77052
TEL: (713) 748-3717 FAX: (713) 748-3748

PROJECT NAME: NEIGHBOURHOOD STREET RECONSTRUCTION PROJECT No. 467
WBS No. N-000400-0001-4
PROJECT NUMBER: G10- 131

Boring No.	Sample No.	Sample Depth (ft)	Sample Type	Water Content (%)	Dry Density (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Particle Size Grv. (%)	Particle Size Sand (%)	Particle Size Silt (%)	Particle Size Clay (%)	Particle Size #200 (%)	Unconfined Comp. (TSF)	Triaxial Comp. Strength Figure No.	Triaxial Comp. Strength Max. Deviator Stress (ksf)	Triaxial Comp. Strength Conf. Press PSI	Consolidation	Corrosion pH	Corrosion R (ohm-cm)	Corrosion SO4 (%)	Corrosion Cl (%)
B-16	1	0-2	UD	18		62	21	41					73									
	2	2-4	UD	16	116									4.4								
	3	4-6	UD	17																		
	4	6-8	UD	21	105	51	19	32					71	2.7								
	5	8-10	UD	11																		
	6	13-15	UD	25		44	18	26					57									
	7	18-20	UD	18		45	18	27					68									
	8	23-25	UD	23	101									1.7								
B-17	1	0-2	UD	14		46	18	28					69									
	2	2-4	UD	13	118									4.5								
	3	4-6	UD	12		41	17	24					68									
	4	6-8	UD	14																		
	5	8-10	UD	20	111									4.0								
	6	13-15	SS	6																		
	7	18-20	SS	16																		
	8	23-25	SS	20									16									
B-18	1	0-2	UD	14																		
	2	2-4	UD	15	117	38	17	21					51	3.0								
	3	4-6	UD	18																		
	4	6-8	UD	16																		
	5	8-10	UD	15	117	33	16	17					53	2.7								
	6	13-15	SS	9																		
	7	18-20	SS	15																		
	8	23-25	SS	26									21									

Legend:
UD - Undisturbed Sample Extruded in Field
UL - Undisturbed Sample Extruded in Lab
Designates consolidation test Performed
AU - Auger Cutting in Field
SS - Split Spoon Sample

ASSOCIATED TESTING LABORATORIES, INC.
3143 YELLOWSTONE BLVD., HOUSTON, TEXAS 77052
TEL: (713) 748-3717 FAX: (713) 748-3748

PROJECT NAME: NEIGHBOURHOOD STREET RECONSTRUCTION PROJECT No. 467
WBS No. N-000400-0001-4
PROJECT NUMBER: G10- 131

Boring No.	Sample No.	Sample Depth (ft)	Sample Type	Water Content (%)	Dry Density (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Particle Size Grv. (%)	Particle Size Sand (%)	Particle Size Silt (%)	Particle Size Clay (%)	Particle Size #200 (%)	Unconfined Comp. (TSF)	Triaxial Comp. Strength Figure No.	Triaxial Comp. Strength Max. Deviator Stress (ksf)	Triaxial Comp. Strength Conf. Press PSI	Consolidation	Corrosion pH	Corrosion R (ohm-cm)	Corrosion SO4 (%)	Corrosion Cl (%)
B-19	1	0-2	UD	23																		
	2	2-4	UD	20		39	17	22					57									
	3	4-6	UD	22		47	18	29														
	4	6-8	UD	21	110									2.8								
	5	8-10	UD	22																		
	6	13-15	UD	29		48	18	30					69									
	7	18-20	UD	26	98									1.5								
	8	23-25	UD	21		40	17	23														
B-20	1	0-2	UD	19																		
	2	2-4	UD	20																		
	3	4-6	UD	20		56	20	36					76									
	4	6-8	UD	22	109									2.0								
	5	8-10	UD	28		67	21	46					84									
	6	13-15	UD	24	102									0.9								
	7	18-20	UD	23		58	20	38														
	8	23-25	UD	25	105									1.6								
B-21	1	0-2	UD	25																		
	2	2-4	UD	25		59	20	39														
	3	4-6	UD	23																		
	4	6-8	UD	24	106									1.9								
	5	8-10	UD	31		63	21	42					80									
	6	13-15	UD	17		25	15	10														
	7	18-20	UD	19	114									3.1								
	8	23-25	UD	23		63	21	42					84									

Legend:
UD - Undisturbed Sample Extruded in Field
UL - Undisturbed Sample Extruded in Lab
Designates consolidation test Performed
AU - Auger Cutting in Field
SS - Split Spoon Sample

ASSOCIATED TESTING LABORATORIES, INC.
3143 YELLOWSTONE BLVD., HOUSTON, TEXAS 77052
TEL: (713) 748-3717 FAX: (713) 748-3748

PROJECT NAME: NEIGHBOURHOOD STREET RECONSTRUCTION PROJECT No. 467
WBS No. N-000400-0001-4
PROJECT NUMBER: G10- 131

Boring No.	Sample			Water Content (%)	Dry Density (pcf)	Atterberg Limits			Particle Size					Unconfined Comp. (TSF)	Triaxial Comp. Strength			Consolidation	Corrosion			
	No.	Depth (ft)	Type			LL	PL	PI	Grv. (%)	Sand (%)	Silt (%)	Clay (%)	#200 (%)		Figure No.	Max. Deviator Stress (ksf)	Conf. Press PSI		pH	R (ohm-cm)	SO4 (%)	Cl (%)
B-22	1	0-2	UD	23																		
	2	2-4	UD	22		55	20	35					81									
	3	4-6	UD	18	115									3.2								
	4	6-8	UD	22																		
	5	8-10	UD	28		63	21	42					79									
	6	13-15	UD	19	106									1.1								
	7	18-20	UD	27	103									1.5								
	8	23-25	UD	22		54	19	35														
B-23	1	0-2	UD	19		52	19	33					76									
	2	2-4	UD	20	110									2.7								
	3	4-6	UD	21																		
	4	6-8	UD	16		40	17	23					60									
	5	8-10	UD	19																		
	6	13-15	UD	23	106	60	20	40						2.4								
	7	18-20	UD	16		28	15	13					55									
B-24	1	0-2	UD	18		30	16	14														
	2	2-4	UD	17		55	19	36					71									
	3	4-6	UD	15	120									4.5								
	4	6-8	UD	15																		
	5	8-10	UD	18	116									3.6								
	6	13-15	UD	18		43	18	25					57									
	7	18-20	SS	23									19									
	8	23-25	SS	26																		

Legend: UD - Undisturbed Sample Extruded in Field
UL - Undisturbed Sample Extruded in Lab
Designates consolidation test Performed
AU - Auger Cutting in Field
SS - Split Spoon Sample

ASSOCIATED TESTING LABORATORIES, INC.
3143 YELLOWSTONE BLVD., HOUSTON, TEXAS 77052
TEL: (713) 748-3717 FAX: (713) 748-3748

PROJECT NAME: NEIGHBOURHOOD STREET RECONSTRUCTION PROJECT No. 467
WBS No. N-000400-0001-4
PROJECT NUMBER: G10- 131

Boring No.	Sample			Water Content (%)	Dry Density (pcf)	Atterberg Limits			Particle Size					Unconfined Comp. (TSF)	Triaxial Comp. Strength			Consolidation	Corrosion			
	No.	Depth (ft)	Type			LL	PL	PI	Grv. (%)	Sand (%)	Silt (%)	Clay (%)	#200 (%)		Figure No.	Max. Deviator Stress (ksf)	Conf. Press PSI		pH	R (ohm-cm)	SO4 (%)	Cl (%)
B-25	1	0-2	UD	22		54	19	35					71									
	2	2-4	UD	20																		
	3	4-6	UD	17																		
	4	6-8	UD	23		63	21	42					84									
	5	8-10	UD	23	107									2.0								
	6	13-15	UD	25	105	58	20	38						1.8								
	7	18-20	SS	22																		
	8	23-25	SS	25									15									
B-26	1	0-2	AU	27																		
	2	2-4	UD	24		58	20	38					72									
	3	4-6	UD	21	105									2.1								
	4	6-8	UD	20																		
	5	8-10	UD	28		66	21	45					84									
	6	13-15	UD	22	102									1.5								
	7	18-20	UD	22		39	17	22					68									
	8	23-25	UD	17		60	20	40														
B-27	1	0-2	UD	23		50	19	31					72									
	2	2-4	UD	23	105									2.1								
	3	4-6	UD	20																		
	4	6-8	UD	24		53	19	34					72									
	5	8-10	UD	20	113									2.9								
	6	13-15	UD	25																		
	7	18-20	UD	19	113									0.6								
	8	23-25	UD	20		48	18	30					66									

Legend:
UD - Undisturbed Sample Extruded in Field
UL - Undisturbed Sample Extruded in Lab
Designates consolidation test Performed
AU - Auger Cutting in Field
SS - Split Spoon Sample

ASSOCIATED TESTING LABORATORIES, INC.
3143 YELLOWSTONE BLVD., HOUSTON, TEXAS 77052
TEL: (713) 748-3717 FAX: (713) 748-3748

PROJECT NAME: NEIGHBOURHOOD STREET RECONSTRUCTION PROJECT No. 467
WBS No. N-000400-0001-4
PROJECT NUMBER: G10- 131

Boring No.	Sample No.	Sample Depth (ft)	Sample Type	Water Content (%)	Dry Density (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Particle Size Grv. (%)	Particle Size Sand (%)	Particle Size Silt (%)	Particle Size Clay (%)	Particle Size #200 (%)	Unconfined Comp. (TSF)	Triaxial Comp. Strength Figure No.	Triaxial Comp. Strength Max. Deviator Stress (ksf)	Triaxial Comp. Strength Conf. Press PSI	Consolidation	Corrosion pH	Corrosion R (ohm-cm)	Corrosion SO4 (%)	Corrosion Cl (%)
B-28	1	0-2	UD	21																		
	2	2-4	UD	22		65	21	44					85									
	3	4-6	UD	19	113									2.4								
	4	6-8	UD	19																		
	5	8-10	UD	20																		
	6	13-15	UD	24		66	21	45					84									
	7	18-20	UD	24	105									2.0								
	8	23-25	UD	33		77	23	54					85									
B-29	1	0-2	UD	18																		
	2	2-4	UD	22		47	18	29					68									
	3	4-6	UD	20	112									2.3								
	4	6-8	UD	22																		
	5	8-10	UD	18	116									1.9								
	6	13-15	UD	16		38	17	21					53									
	7	18-20	SS	17									16									
	8	23-25	SS	15		47	18	29														
B-30	1	0-2	UD	23		50	19	31					71									
	2	2-4	UD	22	101									1.8								
	3	4-6	UD	23																		
	4	6-8	UD	20		60	20	40					75									
	5	8-10	UD	26	99									2.0								
	6	13-15	UD	28																		
	7	18-20	UD	18		46	18	28					68									
	8	23-25	UD	17	112									3.7								

Legend: UD - Undisturbed Sample Extruded in Field
UL - Undisturbed Sample Extruded in Lab
Designates consolidation test Performed
AU - Auger Cutting in Field
SS - Split Spoon Sample

ASSOCIATED TESTING LABORATORIES, INC.

3143 YELLOWSTONE BLVD., HOUSTON, TEXAS 77052

TEL: (713) 748-3717 FAX: (713) 748-3748

PROJECT NAME: NEIGHBOURHOOD STREET RECONSTRUCTION PROJECT No. 467

WBS No. N-000400-0001-4

PROJECT NUMBER: G10- 131

Boring No.	Sample			Water Content (%)	Dry Density (pcf)	Atterberg Limits			Particle Size					Unconfined Comp. (TSF)	Triaxial Comp. Strength			Consolidation	Corrosion			
	No.	Depth (ft)	Type			LL	PL	PI	Grv. (%)	Sand (%)	Silt (%)	Clay (%)	#200 (%)		Figure No.	Max. Deviator Stress (ksf)	Conf. Press PSI		pH	R (ohm-cm)	SO4 (%)	Cl (%)
B-31	1	0-2	UD	37																		
	2	2-4	UD	17		55	20	35					84									
	3	4-6	UD	17	118									4.5								
	4	6-8	UD	15		50	19	31					77									
	5	8-10	UD	19	113									3.6								
	6	13-15	UD	26		66	21	45														
	7	18-20	UD	18	116									0.8								
	8	23-25	UD	16		37	17	20														
B-32	1	0-2	UD	19																		
	2	2-4	UD	23		56	20	36														
	3	4-6	UD	23	106									1.7								
	4	6-8	UD	20																		
	5	8-10	UD	30		69	22	47					84									
	6	13-15	UD	24	106									2.3								
	7	18-20	UD	19																		
	8	23-25	UD	15		32	16	16					58									
B-33	1	0-2	UD	25		58	20	38					72									
	2	2-4	UD	22	106									2.3								
	3	4-6	UD	24		52	19	33					83									
	4	6-8	UD	19																		
	5	8-10	UD	15	120									1.0								
	6	13-15	UD	22	104									1.0								
	7	18-20	UD	18		24	16	8														
	8	23-25	UD	19																		

Legend: UD - Undisturbed Sample Extruded in Field
UL - Undisturbed Sample Extruded in Lab
Designates consolidation test Performed

AU - Auger Cutting in Field
SS - Split Spoon Sample

ASSOCIATED TESTING LABORATORIES, INC.
3143 YELLOWSTONE BLVD., HOUSTON, TEXAS 77052
TEL: (713) 748-3717 FAX: (713) 748-3748

PROJECT NAME: NEIGHBOURHOOD STREET RECONSTRUCTION PROJECT No. 467
WBS No. N-000400-0001-4
PROJECT NUMBER: G10- 131

Boring No.	Sample			Water Content (%)	Dry Density (pcf)	Atterberg Limits			Particle Size					Unconfined Comp. (TSF)	Triaxial Comp. Strength			Consolidation	Corrosion			
	No.	Depth (ft)	Type			LL	PL	PI	Grv. (%)	Sand (%)	Silt (%)	Clay (%)	#200 (%)		Figure No.	Max. Deviator Stress (ksf)	Conf. Press PSI		pH	R (ohm-cm)	SO4 (%)	Cl (%)
B-34	1	0-2	UD	18		46	18	28														
	2	2-4	UD	18	112									3.0								
	3	4-6	UD	18		53	19	34					72									
	4	6-8	UD	21																		
	5	8-10	UD	24		58	20	38					84									
	6	13-15	UD	24	104									1.2								
	7	18-20	UD	17																		
	8	23-25	UD	15		30	16	14					53									
B-35	1	0-2	UD	15		34	16	18					51									
	2	2-4	UD	15																		
	3	4-6	UD	17	112									3.0								
	4	6-8	UD	18		42	18	24					52									
	5	8-10	UD	19	107									0.9								
	6	10-12	SS	20									26									
	7	13-15	SS	21																		
	8	18-20	SS	25																		
	9	23-25	UD	25	97									2.0								
	10	28-30	UD	26		69	22	47					84									

Legend:
UD - Undisturbed Sample Extruded in Field
UL - Undisturbed Sample Extruded in Lab
Designates consolidation test Performed
AU - Auger Cutting in Field
SS - Split Spoon Sample

ASSOCIATED TESTING LABORATORIES, INC.
3143 YELLOWSTONE BLVD., HOUSTON, TEXAS 77052
TEL: (713) 748-3717 FAX: (713) 748-3748

PROJECT NAME: NEIGHBOURHOOD STREET RECONSTRUCTION PROJECT No. 467
WBS No. N-000400-0001-4
PROJECT NUMBER: G10- 131

Boring No.	Sample No.	Sample Depth (ft)	Sample Type	Water Content (%)	Dry Density (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Particle Size Grv. (%)	Particle Size Sand (%)	Particle Size Silt (%)	Particle Size Clay (%)	Particle Size #200 (%)	Unconfined Comp. (TSF)	Triaxial Comp. Strength Figure No.	Triaxial Comp. Strength Max. Deviator Stress (ksf)	Triaxial Comp. Strength Conf. Press PSI	Consolidation	Corrosion pH	Corrosion R (ohm-cm)	Corrosion SO4 (%)	Corrosion Cl (%)
B-36	1	0-2	UD	16																		
	2	2-4	UD	16																		
	3	4-6	UD	19		50	19	31					75									
	4	6-8	UD	19																		
	5	8-10	UD	19	105									1.4								
	6	10-12	UD	35		71	22	49					84									
	7	13-15	UD	25	100									1.4								
	8	18-20	UD	30	94									2.0								
	9	23-25	UD	18		50	19	31					81									
B-37	1	0-2	UD	25																		
	2	2-4	UD	18		50	19	31					71									
	3	4-6	UD	17	116									3.3								
	4	6-8	UD	18																		
	5	8-10	UD	22		38	17	21					53									
	6	13-15	UD	24	106									1.1								
	7	18-20	UD	23		58	20	38														
	8	23-25	UD	22																		
B-38	1	0-2	UD	25		50	19	31					71									
	2	2-4	UD	22	105									1.7								
	3	4-6	UD	20																		
	4	6-8	UD	25		52	19	33					81									
	5	8-10	UD	22																		
	6	13-15	UD	30	98									1.8								
	7	18-20	UD	27																		
	8	23-25	UD	27		68	22	46					85									

Legend:
UD - Undisturbed Sample Extruded in Field
UL - Undisturbed Sample Extruded in Lab
Designates consolidation test Performed
AU - Auger Cutting in Field
SS - Split Spoon Sample

California Bearing Ratio
(CBR) Test

ASTM D 1883

Project:	Neighbourhood Street Reconstruction Project 467	Project Number:	G10-131
Location:	Boring B-11	Report Date:	4/2/2010
Client:	VanDeWiele Engineering,Inc	Engineer:	Jay
Stabilization:	N/A	Senior Reviewer:	Chris Vila
		Report #:	NA

Date:	4/2/2010	Mold No.	C
Sample No.:	1	Surcharge (lbs):	10
Sample Location:	Boring B-11	No. of Blows:	56
Sample Description:	Gray Sandy Clay (CL)	Area of penetration piston = 3 inch^2	

SAMPLE DENSITY

	Molded	Soaked
Sample & Mold Wt. (gms)	11508.20	11546.80
Mold Wt. (gms)	7200.10	7200.10
Sample Wt. (gms)	4308.10	4346.70
Wet Density (pcf)	126.64	127.78
Moisture Content (%)	16.69	16.57
Dry Density (pcf)	108.53	109.61

MOISTURE DETERMINATION

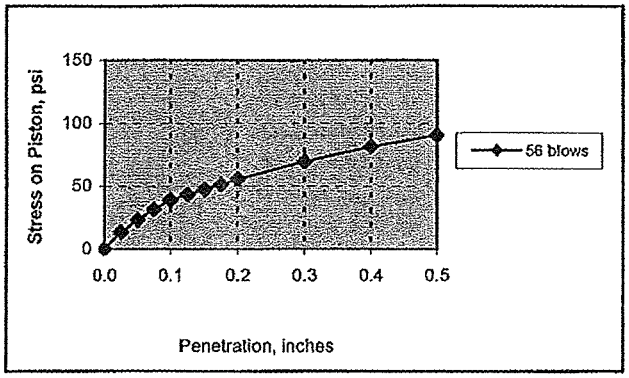
	Before Comp.	After Comp.
Can No.	RK	B
Wet Soil & Can Wt. (gms	286.60	402.30
Dry Soil & Can Wt. (gms)	247.60	347.10
Water Lost Wt. (gms)	39.00	55.20
Can Wt. (gms)	13.90	14.00
Dry Wt. of Soil (gms)	233.70	333.10
Moisture Content (%)	16.69	16.57

BEARING RATIO DATA

Pen. (in.)	Load (lbs)	Pressure (psi)	Bearing Ratio
0.000	0.0	0.00	0.0
0.025	41.0	13.67	
0.050	70.0	23.33	
0.075	95.0	31.67	
0.100	118.0	39.33	3.9
0.125	131.0	43.67	
0.150	143.0	47.67	
0.175	155.0	51.67	
0.200	167.0	55.67	3.7
0.300	209.0	69.67	3.7
0.400	245.0	81.67	3.6
0.500	271.0	90.33	3.5

SWELL DATA

Days	Reading	Swell (%)
0	0.000	0.00
1	0.020	0.41
2	0.030	0.62
3	0.050	1.03
4	0.060	1.24



Chris Vila, SET

California Bearing Ratio
(CBR) Test

ASTM D 1883

Project:	Neighbourhood Street Reconstruction Project 467		
Location:	Boring B-11	Project Number:	G10-131
Client:	VanDeWiele Engineering,Inc	Report Date:	4/2/2010
Stabilization:	N/A	Engineer:	Jay
		Senior Reviewer:	Chris Vila

Date:	4/2/2010	Mold No.	B
Sample No.:	2	Surcharge (lbs):	10
Sample Location:	Boring B-11	No. of Blows:	25
Sample Description:	Gray Sandy Clay (CL)	Area of penetration piston = 3 inch^2	

SAMPLE DENSITY

	Molded	Soaked
Sample & Mold Wt. (gms)	11545.80	11595.80
Mold Wt. (gms)	7290.50	7290.50
Sample Wt. (gms)	4255.30	4305.30
Wet Density (pcf)	125.09	126.56
Moisture Content (%)	16.73	16.63
Dry Density (pcf)	107.16	108.52

MOISTURE DETERMINATION

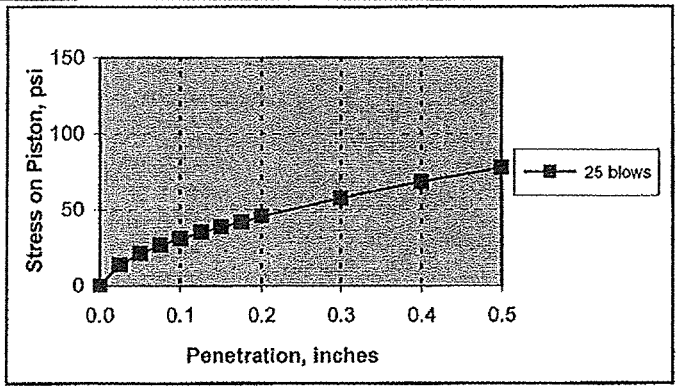
	Before Comp.	After Comp.
Can No.	A	B
Wet Soil & Can Wt. (gms)	255.90	411.10
Dry Soil & Can Wt. (gms)	221.20	354.50
Water Lost Wt. (gms)	34.70	56.60
Can Wt. (gms)	13.80	14.10
Dry Wt. of Soil (gms)	207.40	340.40
Moisture Content (%)	16.73	16.63

BEARING RATIO DATA

Pen. (in.)	Load (lbs)	Pressure (psi)	Bearing Ratio
0.000	0.0	0.00	0.0
0.025	42.0	14.00	
0.050	63.0	21.00	
0.075	80.0	26.67	
0.100	93.0	31.00	3.1
0.125	105.0	35.00	
0.150	116.0	38.67	
0.175	126.0	42.00	
0.200	137.0	45.67	3.0
0.300	173.0	57.67	3.0
0.400	205.0	68.33	3.0
0.500	233.0	77.67	3.0

SWELL DATA

Days	Reading	Swell (%)
0	0.000	0.00
1	0.030	0.62
2	0.060	1.24
3	0.095	1.96
4	0.101	2.08



California Bearing Ratio
(CBR) Test

ASTM D 1883

Project:	Neighbourhood Street Reconstruction Project 467	Project Number:	G10-131
Location:	Boring B-11	Report Date:	4/2/2010
Client:	VanDeWiele Engineering,Inc	Engineer:	Jay
Stabilization:	N/A	Senior Reviewer:	Chris Vila

Date:	4/2/2010	Mold No.	A
Sample No.:	3	Surcharge (lbs):	10
Sample Location:	Boring B-11	No. of Blows:	10
Sample Description:	Gray Sandy Clay (CL)	Area of penetration piston = 3 inch^2	

SAMPLE DENSITY

	Molded	Soaked
Sample & Mold Wt. (gms)	11325.00	11397.30
Mold Wt. (gms)	7164.60	7164.60
Sample Wt. (gms)	4160.40	4232.70
Wet Density (pcf)	122.30	124.43
Moisture Content (%)	17.00	17.56
Dry Density (pcf)	104.53	105.84

MOISTURE DETERMINATION

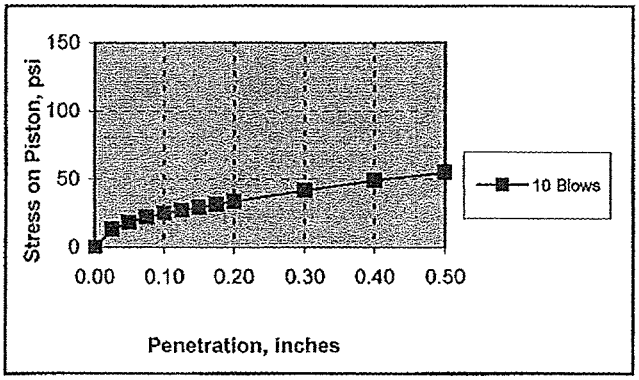
	Before Comp.	After Comp.
Can No.	A	B
Wet Soil & Can Wt. (gms	361.30	405.60
Dry Soil & Can Wt. (gms)	310.80	347.10
Water Lost Wt. (gms)	50.50	58.50
Can Wt. (gms)	13.80	14.00
Dry Wt. of Soil (gms)	297.00	333.10
Moisture Content (%)	17.00	17.56

BEARING RATIO DATA

Pen. (in.)	Load (lbs)	Pressure (psi)	Bearing Ratio
0.000	0.00	0.00	0.0
0.025	39	13.00	
0.050	55	18.33	
0.075	67	22.33	
0.100	75	25.00	2.5
0.125	81	27.00	
0.150	88	29.33	
0.175	95	31.67	
0.200	101	33.67	2.2
0.300	125	41.67	2.2
0.400	147	49.00	2.1
0.500	165	55.00	2.1

SWELL DATA

Days	Reading	Swell (%)
0	0.000	0.00
1	0.090	1.86
2	0.100	2.06
3	0.100	2.06
4	0.110	2.27



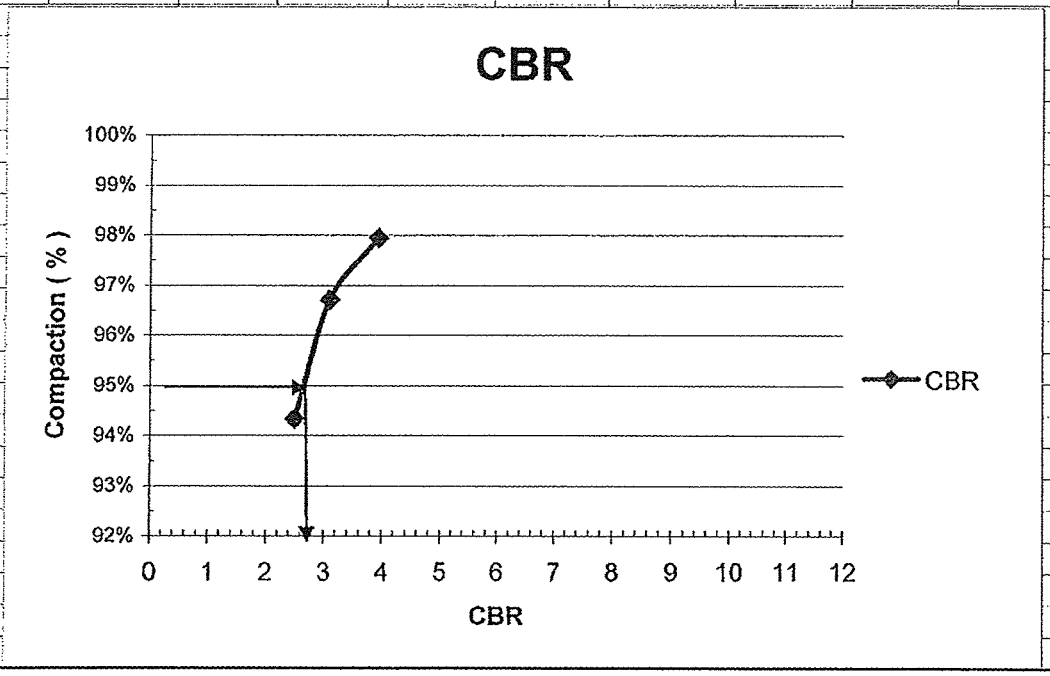
Compactive Effort vs CBR Value

ASTM D 1883

Project:	Neighbourhood Street Reconstruction Project 467	Project No.:	G10-131
Location:	Boring B-11	Date:	4/2/2010
Client:	VanDeWiele Engineering,Inc	Engineer:	Jay
		Sr. Reviewer	Chris Vila
Sample Description:	Boring B-11	Report #	NA

Blows	Dry Density	% Density	CBR	Structural Number
56	108.53	98.0%	3.9	
25	107.16	96.7%	3.1	
10	104.53	94.3%	2.5	

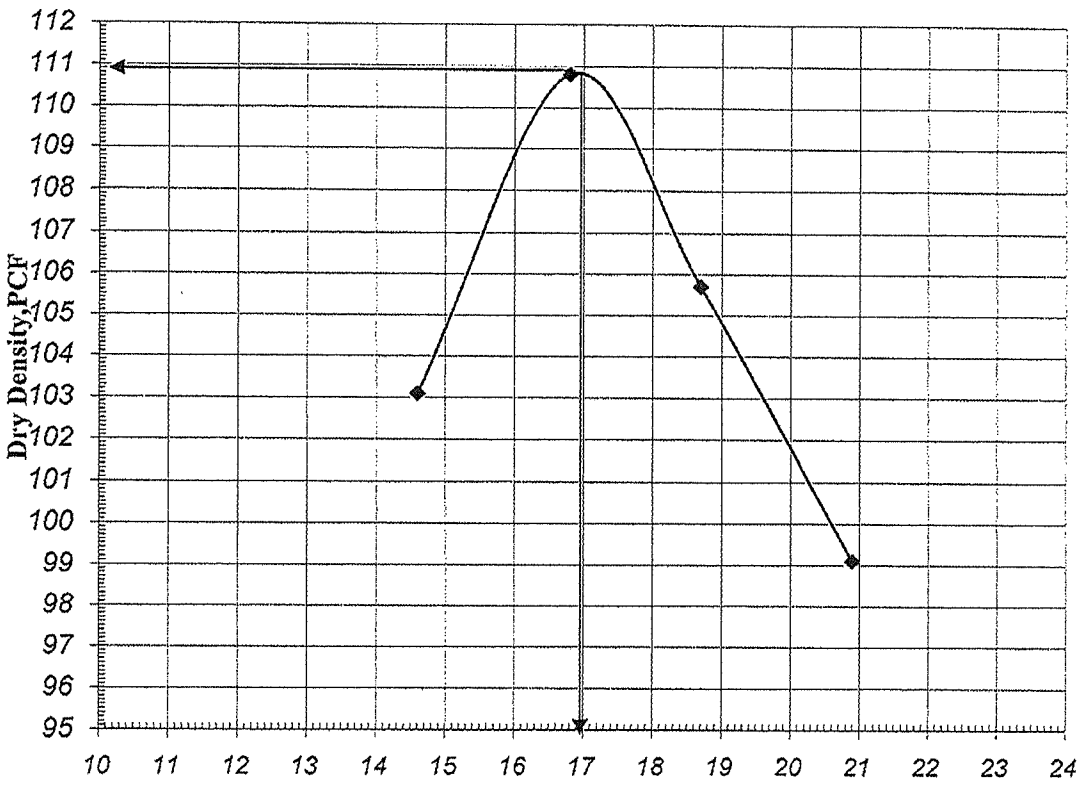
CBR at 95% Compaction = 2.75 | Max Dry Density = 110.80



Associated Testing Laboratories, Inc

PROCTOR TEST (ASTM 698)

Moisture Density Relation Curve



Project Name :	*Neighbourhood street Reconstruction PROJECT No. 467*
Classification :	*Gray, Sandy Clay (CL)*
Reported To :	*VanDeWiele Engineering, Inc*

Sample Picked Up By :	*Brian*	
Maximum Dry Density :	*110.8*	*PCF*
Opt. Moisture Content :	*17.00*	*%*
Atterberg Limits :	*LL 36 , PL 17 , PI 16*	

Sample Location : Near B-11

Sample : PCR # 1	
Date :	*4/13/2010*
Project No.	G10-131

Associated Testing Labs Inc.
3143 Yellowstone Blvd
Houston, Texas - 77054
(713)748-3717

Figure 2

California Bearing Ratio
(CBR) Test

ASTM D 1883

Project:	Neighbourhood Street Reconstruction Project 467	Project Number:	G10-131
Location:	Boring B-34	Report Date:	4/2/2010
Client:	VanDeWiele Engineering,Inc	Engineer:	Jay
Stabilization:	N/A	Senior Reviewer:	Chris Vila
		Report #:	NA

Date:	4/2/2010	Mold No.	D
Sample No.:	1	Surcharge (lbs):	10
Sample Location:	Boring B-34	No. of Blows:	56
Sample Description:	D.Gray Sandy Clay (CL)	Area of penetration piston = 3 inch^2	

SAMPLE DENSITY

	Molded	Soaked
Sample & Mold Wt. (gms)	11491.50	11578.70
Mold Wt. (gms)	7181.40	7181.40
Sample Wt. (gms)	4310.10	4397.30
Wet Density (pcf)	126.70	129.26
Moisture Content (%)	15.31	16.67
Dry Density (pcf)	109.88	110.79

MOISTURE DETERMINATION

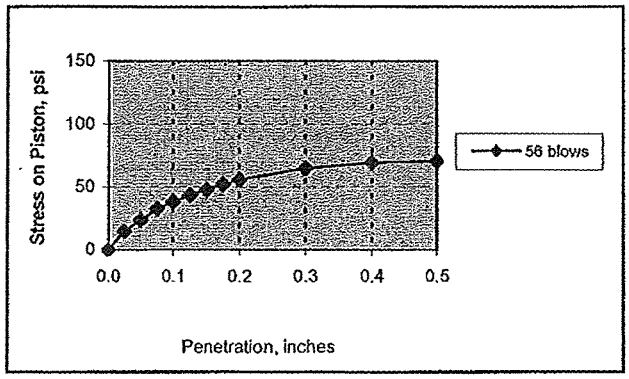
	Before Comp.	After Comp.
Can No.	RK	B
Wet Soil & Can Wt. (gms	323.50	286.20
Dry Soil & Can Wt. (gms)	282.40	247.30
Water Lost Wt. (gms)	41.10	38.90
Can Wt. (gms)	13.90	14.00
Dry Wt. of Soil (gms)	268.50	233.30
Moisture Content (%)	15.31	16.67

BEARING RATIO DATA

Pen. (in.)	Load (lbs)	Pressure (psi)	Bearing Ratio
0.000	0.0	0.00	0.0
0.025	45.0	15.00	
0.050	72.0	24.00	
0.075	98.0	32.67	
0.100	115.0	38.33	3.8
0.125	131.0	43.67	
0.150	144.0	48.00	
0.175	157.0	52.33	
0.200	168.0	56.00	3.7
0.300	195.0	65.00	3.4
0.400	208.0	69.33	3.0
0.500	212.0	70.67	2.7

SWELL DATA

Days	Reading	Swell (%)
0	0.000	0.00
1	0.048	0.99
2	0.050	1.03
3	0.059	1.22
4	0.060	1.24



Chris Vila, SET

California Bearing Ratio
(CBR) Test

ASTM D 1883

Project:	Neighbourhood Street Reconstruction Project 467	Project Number:	G10-131
Location:	Boring B-34	Report Date:	4/2/2010
Client:	VanDeWiele Engineering,Inc	Engineer:	Jay
Stabilization:	N/A	Senior Reviewer:	Chris Vila

Date:	4/2/2010	Mold No.	E
Sample No.:	2	Surcharge (lbs):	10
Sample Location:	Boring B-34	No. of Blows:	25
Sample Description:	D.Gray Sandy Clay (CL)	Area of penetration piston = 3 inch^2	

SAMPLE DENSITY

	Molded	Soaked
Sample & Mold Wt. (gms)	11228.20	11429.50
Mold Wt. (gms)	7239.20	7239.20
Sample Wt. (gms)	3989.00	4190.30
Wet Density (pcf)	117.26	123.18
Moisture Content (%)	15.24	18.88
Dry Density (pcf)	101.76	103.62

MOISTURE DETERMINATION

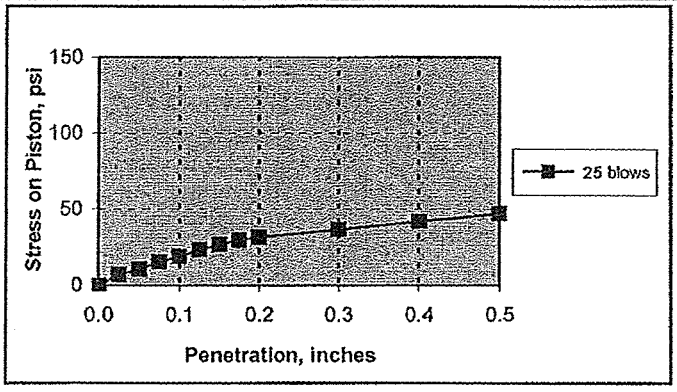
	Before Comp.	After Comp.
Can No.	A	B
Wet Soil & Can Wt. (gms	321.70	363.60
Dry Soil & Can Wt. (gms)	281.00	308.10
Water Lost Wt. (gms)	40.70	55.50
Can Wt. (gms)	13.90	14.10
Dry Wt. of Soil (gms)	267.10	294.00
Moisture Content (%)	15.24	18.88

BEARING RATIO DATA

Pen. (in.)	Load (lbs)	Pressure (psi)	Bearing Ratio
0.000	0.0	0.00	0.0
0.025	21.0	7.00	
0.050	32.0	10.67	
0.075	46.0	15.33	
0.100	57.0	19.00	1.9
0.125	70.0	23.33	
0.150	80.0	26.67	
0.175	89.0	29.67	
0.200	95.0	31.67	2.1
0.300	110.0	36.67	1.9
0.400	126.0	42.00	1.8
0.500	141.0	47.00	1.8

SWELL DATA

Days	Reading	Swell (%)
0	0.000	0.00
1	0.073	1.51
2	0.081	1.67
3	0.082	1.69
4	0.083	1.71



California Bearing Ratio
(CBR) Test

ASTM D 1883

Project:	Neighbourhood Street Reconstruction Project 467	Project Number:	G10-131
Location:	Boring B-34	Report Date:	4/2/2010
Client:	VanDeWiele Engineering,Inc	Engineer:	Jay
Stabilization:	N/A	Senior Reviewer:	Chris Vila

Date:	4/2/2010	Mold No.	F
Sample No.:	3	Surcharge (lbs):	10
Sample Location:	Boring B-34	No. of Blows:	10
Sample Description:	D.Gray Sandy Clay (CL)	Area of penetration piston = 3 inch^2	

SAMPLE DENSITY

	Molded	Soaked
Sample & Mold Wt. (gms)	10854.00	11135.20
Mold Wt. (gms)	7195.60	7195.60
Sample Wt. (gms)	3658.40	3939.60
Wet Density (pcf)	107.54	115.81
Moisture Content (%)	15.14	21.93
Dry Density (pcf)	93.40	94.98

MOISTURE DETERMINATION

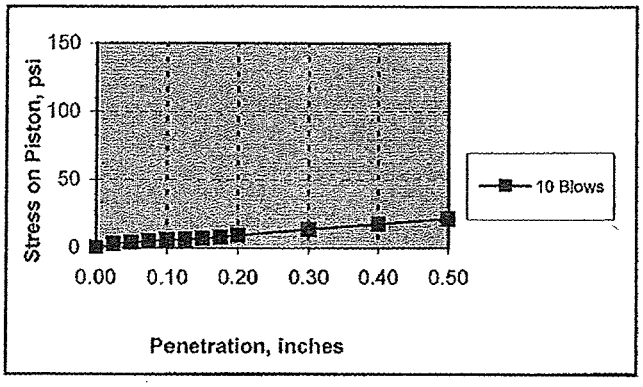
	Before Comp.	After Comp.
Can No.	A	B
Wet Soil & Can Wt. (gms	226.10	375.90
Dry Soil & Can Wt. (gms)	198.20	310.80
Water Lost Wt. (gms)	27.90	65.10
Can Wt. (gms)	13.90	14.00
Dry Wt. of Soil (gms)	184.30	296.80
Moisture Content (%)	15.14	21.93

BEARING RATIO DATA

Pen. (in.)	Load (lbs)	Pressure (psi)	Bearing Ratio
0.000	0.00	0.00	0.0
0.025	9	3.00	
0.050	12	4.00	
0.075	15	5.00	
0.100	18	6.00	0.6
0.125	19	6.33	
0.150	21	7.00	
0.175	24	8.00	
0.200	28	9.33	0.6
0.300	41	13.67	0.7
0.400	53	17.67	0.8
0.500	64	21.33	0.8

SWELL DATA

Days	Reading	Swell (%)
0	0.000	0.00
1	0.060	1.24
2	0.082	1.69
3	0.084	1.73
4	0.086	1.77



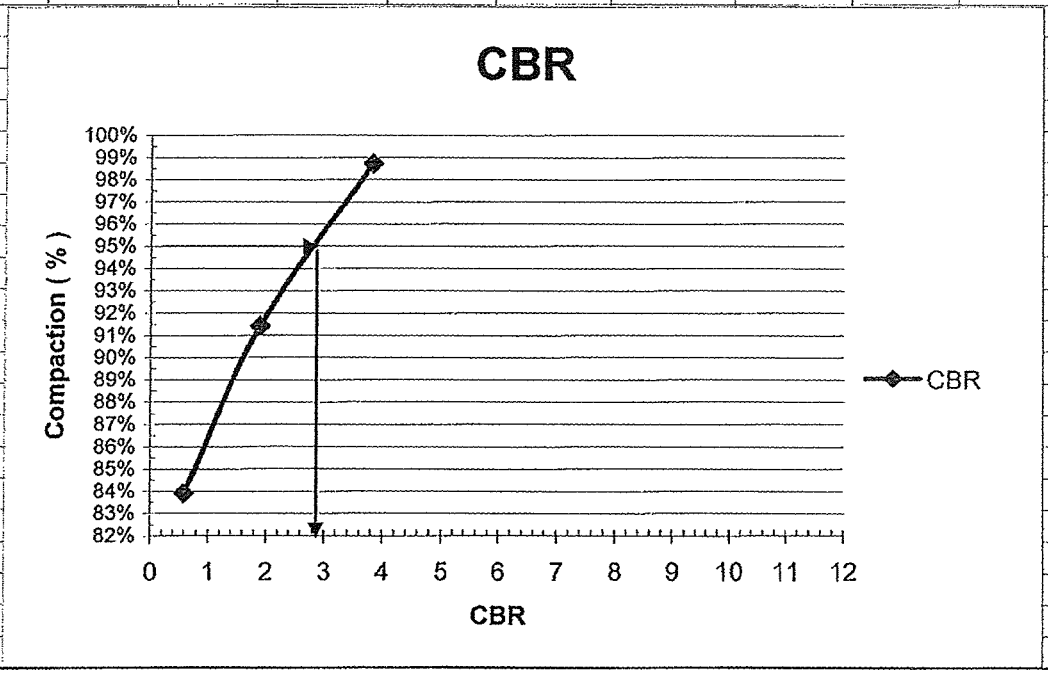
Compactive Effort vs CBR Value

ASTM D 1883

Project:	Neighbourhood Street Reconstruction Project 467	Project No.:	G10-131
Location:	Boring B-34	Date:	4/2/2010
Client:	VanDeWiele Engineering,Inc	Engineer:	Jay
		Sr. Reviewer	Chris Vila
Sample Description:	Boring B-34	Report #	NA

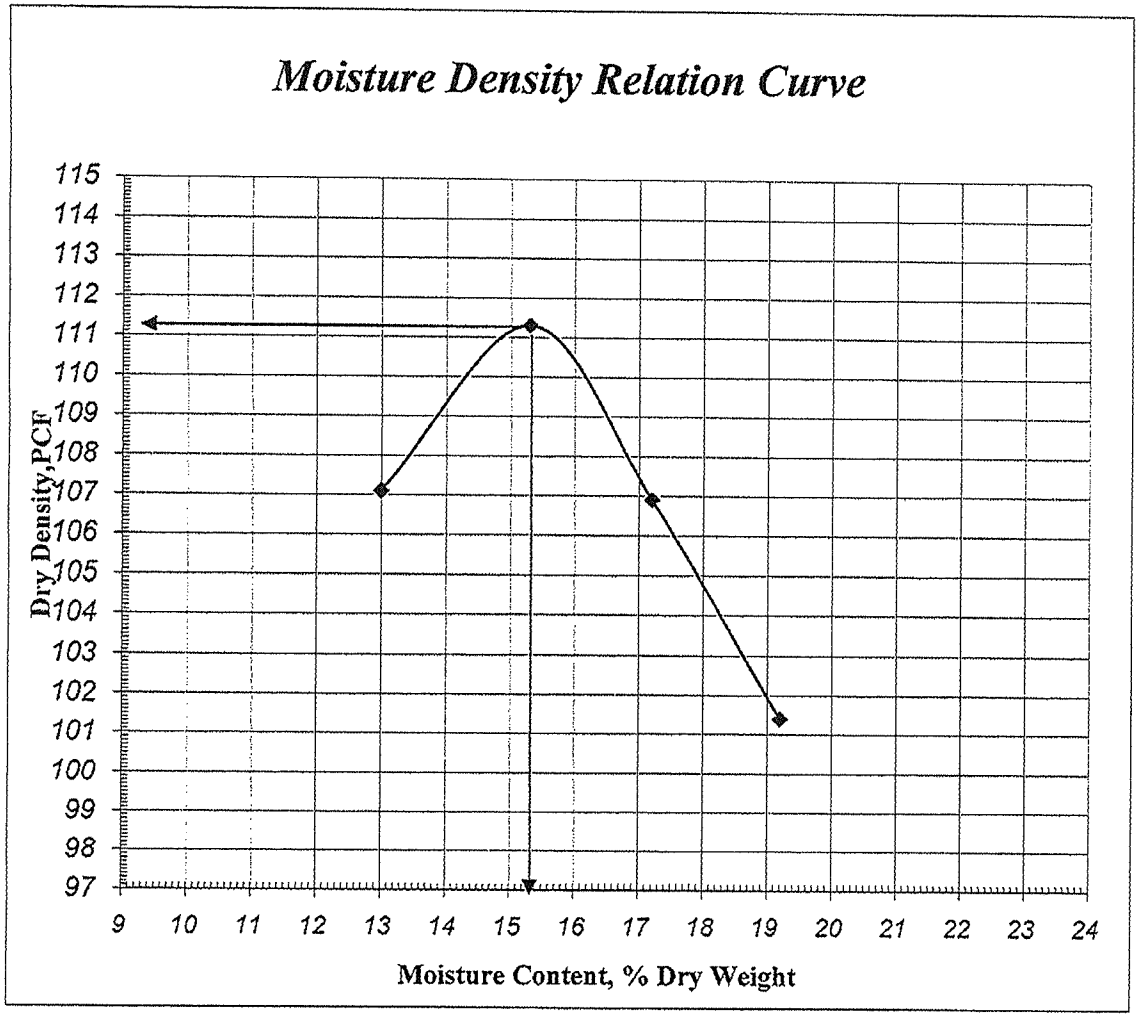
Blows	Dry Density	% Density	CBR	Structural Number
56	109.88	98.7%	3.8	
25	101.76	91.4%	1.9	
10	93.40	83.9%	0.6	

CBR at 95% Compaction = 2.8 | Max Dry Density = 111.30



Associated Testing Laboratories, Inc

PROCTOR TEST (ASTM 698)



Project Name :	Neighbourhood street Reconstruction PROJECT No. 467
Classification :	Dark Gray, Sandy Clay
Reported To :	VanDeWiele Engineering, Inc

Sample Picked Up By :	Brian	
Maximum Dry Density :	111.3	PCF
Opt. Moisture Content :	15.30	%
Atterberg Limits :	LL 42 , PL 18 , PI 24	

Sample Location :	Site (Near B-34)

Sample : PCR # 2	
Date :	4/13/2010
Project No.	G10-131

Associated Testing Labs Inc.
3143 Yellowstone Blvd
Houston, Texas - 77054
(713)748-3717

Figure 2

APPENDIX 5

RIGID PAVEMENT DESIGN CHARTS

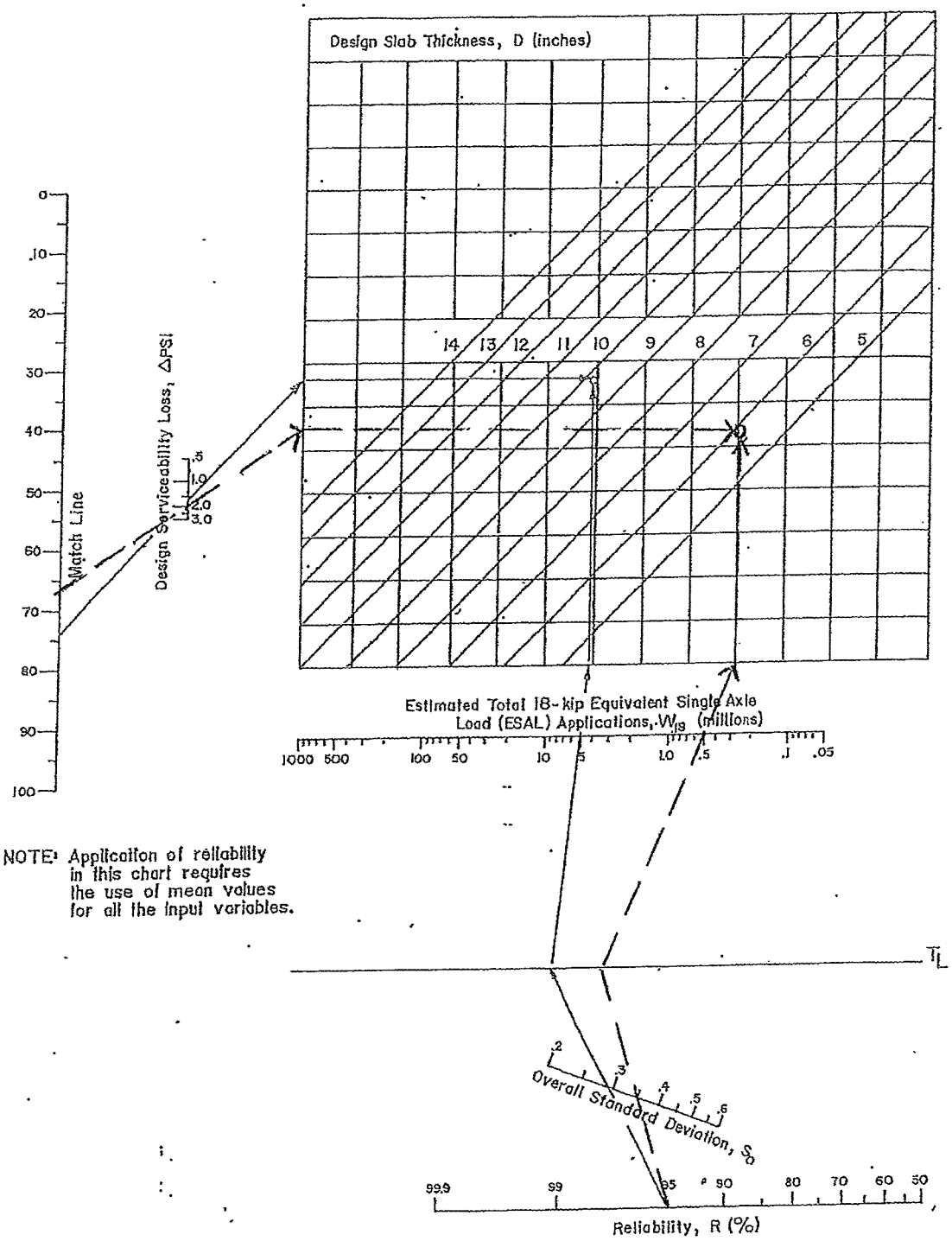


Figure 3.7. Continued–Design Chart for Rigid Pavements Based on Using Mean Values for Each Input Variable (Segment 2)

RIGID PAVEMENTS	*Associated Testing Laboratories, Inc.* *3143 Yellowstone Blvd. Houston, Texas* *Tel: (713) 748-3717 Fax: (713) 748-3748*
NEIGHBORHOOD STREET RECONSTRUCTION	*WBS NO.: N-000400-0001-4*
PROJECT NO. 467	*PROJECT NO. G10-131*

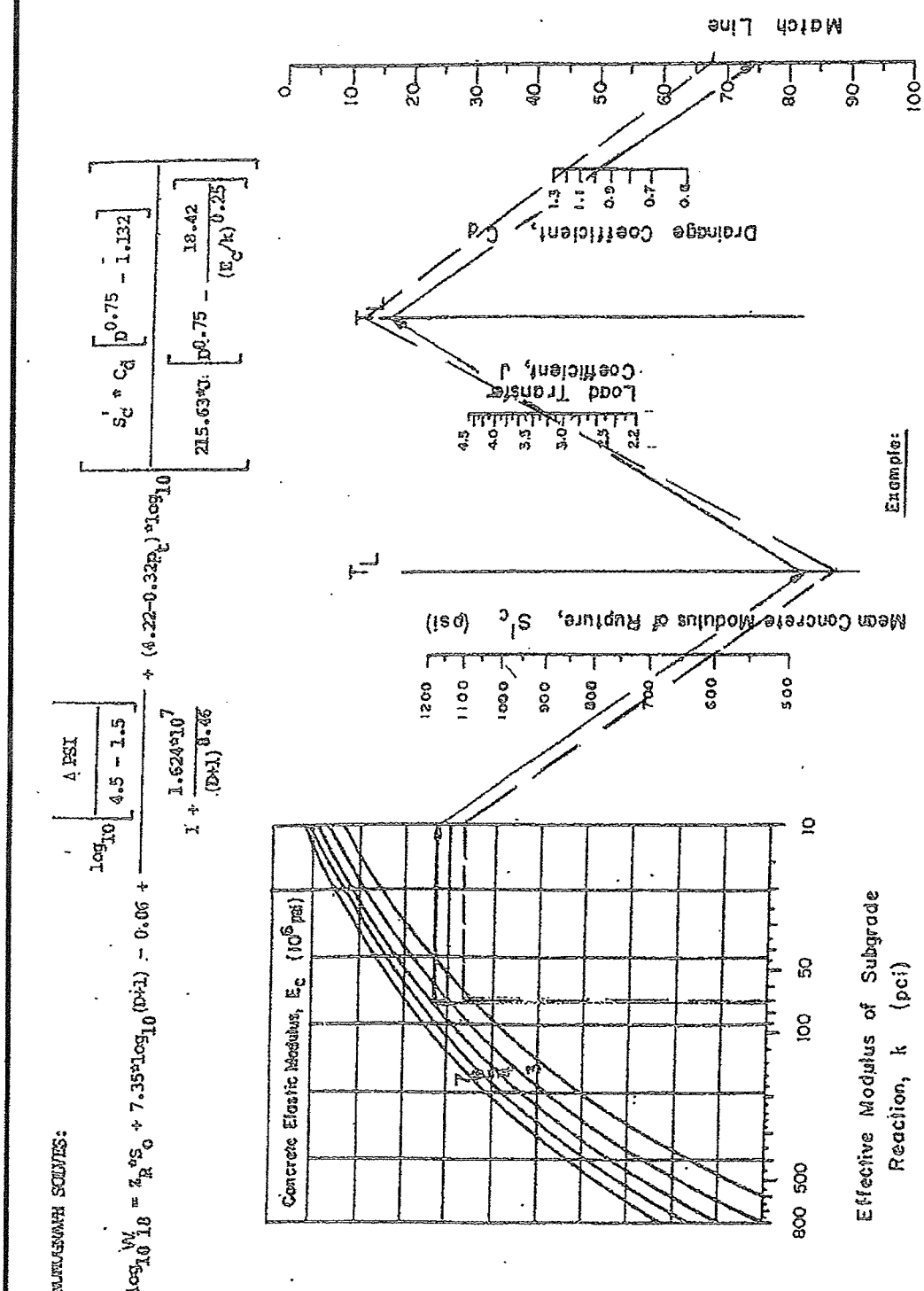


Figure 3.7. Design Chart for Rigid Pavement Based on Using Mean Values for Each Input Variable (Segment 1)

RIGID PAVEMENTS	*Associated Testing Laboratories, Inc.* *3143 Yellowstone Blvd. Houston, Texas* *Tel: (713) 748-3717 Fax: (713) 748-3748*
NEIGHBORHOOD STREET RECONSTRUCTION	*WBS NO.: N-000400-0001-4*
PROJECT NO. 467	*PROJECT NO. G10-131*

ESTABLISHED 1959

ASSOCIATED TESTING LABORATORIES, INC.
3143 Yellowstone Blvd • Houston, Texas 77054
Tel: (713) 748-3717 • Fax: (713) 748-3748
TBPE Firm Reg. No.: 4560

DATE: April 30, 2010
Report No: G10-131-LR

Van De Wiele & Vogler, Inc.
2925 Briarpark, Suite 275
Houston, Texas 77042

Attention: Mr. Dan Simeone, P.E.

Reference: Trench Safety Report
Geotechnical Investigation
Neighborhood Street Reconstruction (NSR) Project 467
WBS No. N-000400-0001-3
Houston, Texas

Dear Mr. Simeone:

Submitted herein are our recommendations for the trench safety for the proposed open cut trenches for the proposed utilities. Improvements to existing storm sewer, sanitary sewers, water lines and streets are planned along Sul Ross, Branard, West Main, Colquitt, Roseland, Stanford, Greeley, Jack, Grarrott, Bute and Brandt streets. Additionally, a small section along Austin Street between Cleburne to Truxillo will also be improved. The storm sewers will be 15- to 60 inches in diameter and will generally be installed at depths ranging from approximately 3.5- to 13.5 feet. The sanitary sewers will be 8- to 36 inches in diameter and will generally be installed at depths ranging from approximately 2.5- to 12 feet. At the intersection of Austin Street and Cleburne, the sanitary sewers may be 18.5 feet deep. The water lines will be 8- to 12 inches in diameter and generally placed at depths ranging from 3- to 5 feet. The existing streets may be reconstructed. The reconstructed streets will be of concrete.

(Cont'd)

OSHA Classification

Maintaining stability of trench sides and base is necessary for the safety of the construction crew working in or near the trenches and to prevent damage to adjacent facilities due to lateral or vertical movements.

At the federal level, Occupational Safety and Health Act (OSHA) requires protective systems for all trenches exceeding 5 feet in depth. Protective systems may be required for trenches shallower then 5 feet in depth if there are indications of potential ground movements. OSHA has developed a soil classification system to be used as a guideline in determining sloping and protective system requirements for trench excavations. This system has set forth a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing amounts of stability. Based upon the soils and groundwater encountered at the boring/piezometer locations, ATL for simplicity recommends the use of OSHA soil classification Type "B" in general for the determination of allowable maximum slope or selection and design of any protective system to a depth of 16 feet and OSHA Type "C" below that depth. In the area of boring B-7, the onsite soils should be classified as OSHA Type "C" below the depth of 8 feet. In the area of borings B-2, B-4, B-9, B-35 and B-36, the onsite soils should be considered as OSHA Type "C" below the depth of 10 feet. In the area of borings B-3, B-5, B-8, B-11, B-17 and B-18, the onsite soils should be considered as OSHA Type "C" below the depth of 12 feet. In the area of borings B-1 and B-10, the onsite soils should be considered as OSHA Type "C" below the depth of 13 feet. The fill fat clay with sand soils encountered in borings B-3 and B-13 to a depth of 12.5- and 10.5 feet, respectively, may be conservatively classified as OSHA soil classification Type "C". The fill sandy lean clay soils encountered in borings B-6, B-7, B-10, B-19 and B-35 to a depth of 2-, 6-, 9-, 4- and 4 feet, respectively may be conservatively classified as OSHA soil Type "C". During construction if groundwater or silty soils or soft soils are encountered at shallower depths, then the soils should be considered as Type "C" below that depth.

(Cont'd)

Excavations

Open slopes should not be steeper than 1(V): 1.5(H) for short term exposure during construction for OSHA Type "C" soils. For long term exposure (greater than 72 hours), these slopes should not be steeper than 1(V): 2(H) for OSHA Type "C" soils. For Type "B" soils, the recommended side slopes is no steeper than 1(V): 1(H). We do not recommend using unsupported vertical cuts.

The excavations can be made using open slopes, stepped back to stable slope, vertical cuts supported with sheet piles or other suitably designed retaining system. The excavation should be performed in accordance with the current OSHA 29 CFR Part 1926 of OSHA (Trench Safety System).

Earth Pressures

For the trench supporting system, the lateral pressures exerted by surrounding soils are presented in Figures 6 and 6A of ATL Geotechnical Report G10-131.

In case that a trench shield is used, the trench shield may be designed for a lateral earth pressure equivalent to a fluid pressure of 102 PCF for cohesive soils below the watertable and 84 PCF for the cohesive soils above the watertable. This pressure may be taken as 85 PCF below the water table for sandy soils and about 48 PCF for sandy soils above the water table. In general, a surcharge magnitude of q psf will result in lateral earth pressure of 0.5q in cohesive soils and 0.4q in sandy soils. Timber shoring as outlined in 29 CFR Part 1926 of OSHA recommendation may be used in the construction of trench supporting system.

(Cont'd)

Due to the presence of the roadway adjacent to the likely excavation areas at portions of the project site, the effect of vehicular traffic may be considered while designing the lateral supporting systems. Boussinesq's equation should be used for calculating the loads on the retaining systems due to the vehicular traffic. We recommend that a HS20 vehicle loading be considered adjacent to the pit for design purposes. An impact factor of 1.5 should be used in the design. Surcharge loading due to construction machinery should be considered as applicable.

Stockpiling of excavated material may not be allowed near the excavation. Generally, a distance of one half the excavation depth on both sides of the trench should be kept clear of any excavated material. If this is not possible due to space limitations then the retaining system design should take into account the surcharge loads.

Bottom Stability

Where granular soils are encountered, dewatering should be performed to lower the groundwater to a depth of atleast 3-feet below the excavation bottom. In cohesive soils, the trench bottom stability can be evaluated using the procedure outlined in Section 5.2 of ATL Report No., G10-131.

(Cont'd)

Groundwater Control

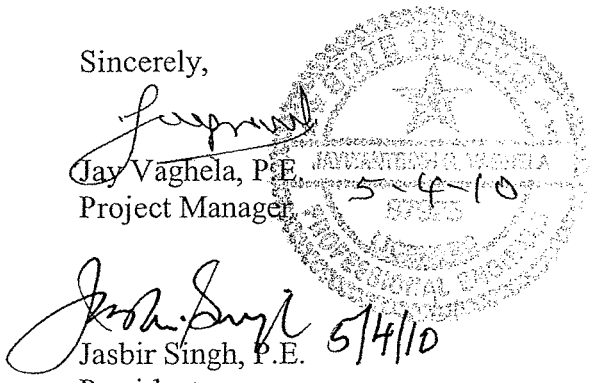
Groundwater was encountered during drilling at boring locations B-1 through B-3, B-5, B-7, B-8, B-13 through B-15, B-17, B-18, B-24 through B-29, B-31 through B-35 and B-38 at depths ranging from 16- to 24 feet. Upon completion of drilling, groundwater was measured at depths ranging from 14- to 23 feet. Groundwater was not encountered during drilling in the remaining borings. Six (6) of these borings (Borings B-1, B-6, B-16, B-26, B-30 and B-36) were converted into piezometers (PZ-1 through PZ-6, respectively) after completion of drilling and sampling and water level measured at approximately 24 to 72 hours after installation, at approximately 5- to 7 days after installation and approximately 27- to 30 days after installation. Groundwater was measured at depths of 17.5-, 17- and 22.5 feet in the piezometers at borings B-1 (PZ-1), B-26 (PZ-4) and B-36 (PZ-5) at approximately 24 to 72 hours after installation. Groundwater was not encountered in the remaining piezometers (B-6, B-16 and B-30). Groundwater was measured at depths of 16-, 18-, 16-, 23.5 and 10 feet in the piezometers at borings B-1 (PZ-1), B-6 (PZ-2), B-26 (PZ-4), B-30 (PZ-5) and B-36 (PZ-6) at approximately 7 to 10 days after installation. Groundwater was not encountered in the remaining piezometer (B-16). Groundwater was measured at depths of 16-, 19-, 16-, 18.5 and 10 feet in the piezometers at borings B-1 (PZ-1), B-6 (PZ-2), B-26 (PZ-4), B-30 (PZ-5) and B-36 (PZ-6) at approximately 27 to 30 days after installation. Groundwater was not encountered in the remaining piezometer (B-16).

(Cont'd)

Based upon our groundwater investigations from piezometers, groundwater may be encountered in general during excavations deeper than 10- to 16 feet in the project area. Seepage of water may also occur at shallower depths and/or at other locations if fluctuation in groundwater levels takes place. The flow of groundwater may vary depending upon depth of construction and weather conditions. Where groundwater is encountered, a conventional sump and pump arrangement is recommended for the shallow trench excavations up to 15 feet in cohesive soils. For depths deeper then 15 feet, multi-staged pumps or well points may be needed. Where granular soils are encountered or where the water inflow is large, dewatering using well points may be required. Groundwater control should be in general accordance with the City of Houston Standard Specifications, Section 01578.

More detailed information regarding the soils and groundwater at individual locations can be obtained from our geotechnical report G10-131. We appreciate the opportunity to work with you on this project. Please call should you have any questions or need additional information.

Sincerely,



Jay Vaghela, P.E. 5-4-10
Project Manager

Jasbir Singh, P.E. 5/4/10
President