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25 November 2008

YMCA of Greater New Orleans
Suite 103
1215 Prytania Street
New Orleans, Louisiana 70130

Attention Mr. Darrell E. Johnson

Gentlemen:

Geotechnical Investigation
YMCA of Greater New Orleans
LA Highway 23 at Eve Street
Belle Chasse, Louisiana
Eustis Engineering Project No. 20234

Transmitted is one bound copy of our engineering report covering a geotechnical investigation for the subject project. Two copies (one bound and one unbound) are being forwarded to MSH Architects, LLC, Covington, Louisiana, to the attention of Ms. Shiloh Moates. Electronic copies are also being forwarded to you and Ms. Moates.

Thank you for asking us to perform these services.

Yours very truly,

EUSTIS ENGINEERING SERVICES, L.L.C.

STATE OF LOUISIANA
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GEOTECHNICAL INVESTIGATION

YMCA OF GREATER NEW ORLEANS

LA HIGHWAY 23 AT EVE STREET

BELLE CHASSE, LOUISIANA

EUSTIS ENGINEERING PROJECT NO. 20234

FOR
YMCA OF GREATER NEW ORLEANS
NEW ORLEANS, LOUISIANA

MSH ARCHITECTS, LLC
COVINGTON, LOUISIANA

By
Eustis Engineering Services, L.L.C.
Metairie, Louisiana

25 NOVEMBER 2008

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INTRODUCTION

1. This report contains the results of a geotechnical investigation performed for the YMCA's new facility to be located on LA Highway 23 at Eve Street in Belle Chasse, Louisiana. The investigation was performed in general accordance with Eustis Engineering Services, L.L.C.'s revised proposal dated 29 April 2008, which was accepted by Mr. Darrell Johnson representing the YMCA of Greater New Orleans, on 6 August 2008. MSH Architects, LLC, is the project architect. The structural engineer for the project is John C. Bose Consulting Engineer, LLC. The civil engineer for the project is Scalfano Engineering, Inc.

2. This report has been prepared in accordance with generally accepted geotechnical engineering practice for the exclusive use of the YMCA of Greater New Orleans, MSH Architects, and their designated representatives for specific application to the subject site. In the event any changes in the nature, design, or location of the proposed structures occur after the issuance of this report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report are modified and verified in writing. Should these data be used by anyone other than the YMCA of Greater New Orleans, MSH Architects, or their designated representatives, they should contact Eustis Engineering for interpretation of data and to secure any other information pertinent to this project.

3. The analyses and recommendations contained in this report are based, in part, on data obtained from the soil borings. The nature and extent of variations in subsoil conditions between and away from the boring locations may not become evident until construction. If variations then appear, it will be necessary to reevaluate the recommendations contained in this report.

4. Recommendations and conclusions contained in this report are to some degree subjective and should be used only for design purposes. This report should not be included in the contract plans and specifications. However, the results of the soil borings and laboratory tests contained in the Appendix of this report may be included in the plans and specifications.

SCOPE

5. The investigation included the drilling of soil test borings to determine subsurface conditions and stratification, and to obtain samples of the various substrata. Soil mechanics laboratory tests, performed on samples obtained from the borings, were used to evaluate the physical properties of the subsoils. Engineering analyses, based on the soil borings and laboratory test results, were made to determine recommendations regarding site preparation and drainage, estimates of allowable pile load capacities, and estimates of settlement. We have also evaluated a surcharge to minimize post construction settlement. Recommendations for rigid and flexible pavements have also been provided.

6. Eustis Engineering's scope of work does not include the investigation or detection of the presence of any biological pollutants in or around the subject site. The term "biological pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, viruses, and the byproducts of any such biological organisms.

SOIL BORINGS

7. Prior to drilling at the site, a permit was obtained from the Plaquemines Parish Government. Our 16 April 2008 request was formerly approved by Permit No. 2008-112, transmitted in a letter dated 19 August 2008. Attempts were made to access the site on 27 June 2008 (after verbal approval); however, clearing operations had not yet been performed. On 28 August and 11 September, a representative of Eustis Engineering met the representatives of YMCA and their subcontractor to indicate where access was needed for clearing operations.

8. Four undisturbed sample type soil test borings were drilled at the site on 23 through 30 September 2008. The locations were accessed by our ATV rig assisted by a bulldozer provided by the owner. The borings, designated as B-1 and B-3, were each drilled to a depth of 100 feet below the existing ground surface. The borings, designated as B-2 and B-4, were each drilled to a depth of 80 feet below the existing ground surface. Five auger type soil test borings were also made at the site on 22 through 26 September 2008. The auger borings were each made to a depth of 6 feet below the existing ground surface. The borings were located in the field using a preliminary site plan dated 24 July 2008 provided by MSH Architects. The approximate boring locations are shown on Figure 1. The coordinates of the boring locations (latitude and longitude) were obtained with a handheld GPS unit and are shown on the boring logs. Upon completion of the drilling operations, the borings were backfilled in accordance with current regulatory requirements. Detailed descriptive logs of the borings are shown in both tabular and graphical form in the Appendix.

Undisturbed Borings

9. Cohesive or semi-cohesive subsoils were sampled at close intervals or changes in strata using a 3-in. diameter thinwall Shelby tube sampling barrel. The undisturbed

samples were immediately extruded from the sampling barrel in the field. All samples were inspected and visually classified by Eustis Engineering's soil technician. Pocket penetrometer tests were performed on the soil samples to give a general indication of their shear strength or consistency. The results of these tests are shown on the undisturbed boring logs under the column heading "PP." Representative portions of the samples were placed in moisture proof containers and returned to Eustis Engineering's laboratory for additional testing.

10. Samples of cohesionless and semi-cohesive materials were obtained during the performance of in situ Standard Penetration Tests. This test consists of driving a 2-in. diameter sampler 1 foot into the soil after first seating it 6 inches. A 140-lb weight dropped 30 inches is used to advance the sampler. The number of blows required to drive the sampler is indicative of the relative density of cohesionless soils and the consistency of cohesive soils. The samples were retained in moisture proof containers for preservation of their natural moisture content. The results of the Standard Penetration Tests are shown on the undisturbed boring logs under the column heading "SPT."

Auger Borings

11. The auger borings were also made with our ATV mounted rotary type drill rig. The subsoils were sampled directly from the auger blades at close intervals or changes in strata. The samples were sealed in plastic bags to preserve their natural moisture content.

LABORATORY TESTS

12. Soil mechanics laboratory tests on samples obtained from the undisturbed borings generally consisted of natural water content, unit weight, and either unconfined compression shear (UC) or unconsolidated undrained triaxial compression shear

(OB). Natural moisture content determinations were made on samples obtained in the auger borings. The results of these laboratory tests are tabulated on the boring logs in the Appendix.

DESCRIPTION OF SUBSOIL CONDITIONS

Stratigraphy

13. The undisturbed borings are generally characterized by layers of soft to stiff tan, gray, and brown clay and silty clay with silt pockets, roots, and decayed wood to depths of 8 to 13 feet below the ground surface. Layers of soft to medium stiff tan and gray organic clay with decayed wood and medium stiff to soft gray, brown, and dark brown humus with roots continue to depths of 23 to 26 feet. Beneath these materials, extremely soft to soft gray and brown silty clay and clay extend to the approximate 38 to 43-ft depths. Layers of loose to medium dense gray silty sand and clayey sand are encountered to depths of 38 to 48 feet below the ground surface. Soft to medium stiff gray sandy clay and clay was found to depths of 66 to 78 feet. At the locations of Borings 2 and 4, medium dense gray clayey sand and silty sand extend to the final boring depths of 80 feet. At the locations of Borings 1 and 3, layers of medium dense to very dense gray and brown silty sand with shell fragments and medium stiff to stiff gray and tan silty clay and clay with silt pockets, decayed wood, and concretions were found to the final boring depths at 100 feet. A graphical representation of the stratigraphy can be found on the individual boring logs in the Appendix of this report.

Ground Water Conditions

14. In order to determine the ground water conditions at the time of the field investigation, observations were made in the auger boring designated as A-1. The auger boring was made without the addition of water to a depth of 6 feet. Free water

was initially encountered at a depth of 4 feet. Further observations over a period of 72 hours indicated the ground water to be at the approximate depth of 2 feet. The depth to ground water will vary with climatic conditions, drainage improvements, water levels in the existing ditch that runs along the Eve Street side of the property, and other factors. The depth to ground water should be determined by those persons responsible for construction immediately prior to beginning work.

FOUNDATION ANALYSES

Furnished Information

15. Information furnished by MSH Architects indicates the new YMCA facility will consist of a main building, pavilion, and pool. Future additions are planned but are not part of this investigation. The main building will generally be 70' x 170' in plan dimensions. A portion of the main building will be two stories high. The pool deck and pavilion are anticipated to be constructed to the same level as the main building although specific details were not available (these features are not included in MSH Architects' services). The maximum depth of the pool is 5.5 feet. The proposed buildings will be lightly loaded and are anticipated to be supported on timber or timber composite piles.

16. A topographic survey of the site performed prior to site clearing indicates existing site grades vary from el -0.5 NGVD to el -2.6. The average existing grade beneath the main building is at el -2. The proposed finished floor elevation (FFE) is at el 2.0. Thus, approximately 4 feet of fill is planned at the structures. Grades in the adjacent parking areas require an average of 2 to 3 feet of fill. A settlement tolerance of approximately 1 inch was furnished by the structural engineer for the main building.

Foundation Recommendations

17. We recommend the main building, pool deck, and pavilion be supported on a deep foundation comprising driven timber piles. Considering the proposed fill heights and limited excavation depth, as well as potential uplift loads due to hydrostatic pressure, support of the pool will also require piles. All structural loads (floors, walls, and columns) for each feature should be supported on piles having approximately the same tip embedments in order to minimize differential settlement. Selection of pile embedments for adjacent features should also consider total and differential settlement tolerances. Pile caps should be structurally integrated with grade beams.

18. We recommend fill heights be limited to a maximum of 2 feet to limit drag loads on piles and settlement of grade supported features. However, you have indicated your desire to fill to a height of approximately 4 feet. Considering placement of 4 feet of fill at the site, we recommend a controlled earth surcharge be implemented to limit the post construction settlement. In this regard, we estimate a 6-ft high surcharge will be sufficient to reduce settlement of piles. Any fill required to reach finished grade beneath the proposed structures should be placed as far in advance as possible of construction operations. Our recommendations assume no more than 4 feet of fill will be required to reach design grade. Should additional fill be required at the structures, Eustis Engineering should be contacted to evaluate potential settlement of this fill and its effects on the pile foundations. Once site grading plans are finalized, Eustis Engineering should be contacted to verify our recommendations.

19. Slabs. A Visqueen vapor barrier should be provided beneath the concrete floor slab to prevent capillary migration of moisture. The slab should be cast monolithically with grade beams which, in turn, are structurally connected to the pile caps to provide rigidity and minimize the potential for differential settlement. The slab,

including the reinforcing and anchor connection details, should be designed by a structural engineer.

20. Utilities. We recommend flexible type connections be specified for all piping and utilities going to and from the proposed pile supported structures. These connections should be designed to accommodate the settlement due to fill placement.

Ground Water Management

21. Drainage During Construction. The initial step to prepare the site for construction should be to establish adequate drainage to prevent ponding of water and ensure immediate runoff of all rainfall. This may be accomplished by grading the site to drain water away from all the paved areas and foundations. Sumps and pumps may be required to remove rainwater from low lying areas and excavations.

22. Permanent Drainage. The near surface soils supporting capacity will be reduced if they become inundated or saturated. Therefore, permanent drainage should be provided to collect all rainfall away from the proposed foundations and pavement areas after completion of construction. Particular attention should be given to areas of surface founded structures such as pavements. Permanent drainage should be installed to discharge rainwater away from these foundations. Permanent drainage would include collection of water from the roof of pile supported structures with gutters and downspouts, and directing this water into underground piping or channelization of the water away from the site. Saturation of base and subbase course materials for pavements will cause reduction in the pavement service life.

Site Preparation

23. Clearing and Stripping. The existing ground surface beneath the proposed structure should be stripped of all trees, vegetation, loose topsoil, organic matter, or other deleterious materials to the minimum depth necessary to reach firm undisturbed soil. While this depth may be substantial in localized areas (e.g., within previously existing ditches or excavations, or at stumps), a depth of less than 1 foot should be adequate over areas of the site where tree removal was not required. Actual requirements should be determined during construction. Excavated soils may be stockpiled for later use in landscaping, if applicable, but these soils should not be used beneath the footprints of the proposed foundations or pavements. Clearing and grubbing should also comply with Section 201 of the Louisiana Standard Specifications for Roads and Bridges, 2000 edition (LSSRB). If applicable, any existing features should be demolished in accordance with Section 202 of the LSSRB.

24. Select Fill. All depressions or areas excavated to remove debris, fill, and old foundations should be backfilled and the site should be graded to provide drainage away from the foundations. A select granular fill material should be used as backfill and/or fill required to reach the final design grade. This material may also be used for base and/or subbase beneath pavements. Fill materials should be non-plastic and free of roots, clay lumps, and other deleterious materials with no more than 10% by weight of material passing a U.S. Standard No. 200 mesh sieve. The select fill should be compacted to a minimum requirement outlined in the following paragraphs.

25. General Fill. Onsite material excavated during construction that does not meet the requirements of select fill may be used for topsoil or other general grading, but should not be used as select structural backfill beneath foundations or as base or subbase for paved areas. General fill used as topsoil and for general grading

purposes should be compacted in loose lifts of 8 to 12 inches. It should be compacted with three passes of a D6 dozer or equivalent.

26. Structural Fill. A select structural fill located beneath pavement areas and new foundations should be spread in loose lifts of 6 to 8 inches and compacted to at least 95% of its maximum dry density in accordance with ASTM D 698 at or near optimum water content. All clearing, filling, and compaction operations should be accomplished only during periods of dry weather.

27. Pool Excavation. Construction of the pool may require an excavation within the site fill or subgrade. In accordance with OSHA Standard No. 1926, Subpart P, Appendix A, the subsoils should be considered as Type C Soils. Excavation in excess of 4 feet should be supported by sheeting or open cut with a slope. We recommend an excavation slope no steeper than 1 vertical to 3 horizontal for excavations no deeper than 6 feet. All sheeting should be designed by a licensed civil engineer.

Fill Settlement

28. Consolidation of the subsoils can be expected due to placement of fill to reach finished grade. Fill placement may result in differential settlement between grade supported structures, such as pavements, and pile supported structures. Your design should recognize this potential. Fill placement will also affect pile foundations as discussed subsequently.

29. Analyses were made to determine the estimated settlement near the center of a 545' x 650' filled area for the entire site. Several smaller areas were also evaluated based on the grading plan. The results of these analyses were similar. Based on a uniform dead load pressure intensity of 480 psf from 4 feet of fill (at 120 pcf), the results of the analyses indicate grade settlement near the center of the main building may range from approximately 15 to 23 inches. This estimate is the total settlement

due to placement of the fill. This estimate does not take into account settlement of the fill itself due to poor compaction or due to improper site preparation or drainage. Settlement at the corners and midpoint of the sides is estimated to be one-quarter and one-half of these values, respectively. We have assumed site grades will be raised no more than 4 feet. If our assumptions are not valid, Eustis Engineering should be contacted to reevaluate settlement potential.

Surcharge Program

30. General. Settlement will be a design consideration because of the compressibility of the upper deposits as well as the proposed fill heights. However, the thickness of the highly compressible organic deposits as well as the presence of sand deposits at the site should allow for a relatively short duration preload and provide acceptable residual settlements. For our estimated time-rate of settlement and total estimated settlement, we recommend surcharge fill to el 4 be installed for the project. This elevation assumes an average existing grade at el -2 and 6 feet of fill being placed to surcharge the site. We recommend fill be placed as soon as possible to initiate consolidation of the upper deposits and minimize post construction settlement and drag loads. Placement of fill prior to construction will be beneficial and should be required by the specifications. However, the earth surcharge may be limited in height and proximity to existing drainage features. The limits of the surcharge should include all future additions as future filling could result in differential settlement and/or additional settlement of adjacent features.

31. Duration. We have estimated the anticipated time-rate of settlement within the foundation deposits. These were estimated based on the laboratory and boring data as well as available field data in similar geologic conditions. Because of natural variations within the foundation deposits between and away from the boring locations, it is difficult to precisely quantify the actual time-rate of settlement. Our estimates indicate that a six-month surcharge should be sufficient to reduce the

residual pile settlements to a tolerable level. Our estimates indicate that a three-month surcharge would likely be too short to adequately consolidate the foundation deposits, although durations between three and six months may be achievable. A duration in excess of six months may also be necessary. For scheduling and planning purposes, we recommend a six-month duration be considered. If pile embedments greater than 80 feet (requiring other than the proposed timber or composite piles) can be implemented, it may be feasible to limit the duration of the surcharge. Differential settlement should still be anticipated between the pavements and pile supported structures and between features supported on different pile embedments.

32. Slope Stability. Surcharge fill may be placed to el 4 (approximately 6 feet of fill above existing site grades). Based on the furnished site grading plan, we have assumed the limits of the 6-ft high surcharge are approximately a 200' x 200' area for the main facility and adjacent structures. Actual limits should extend a minimum of 10 feet beyond each structures' limits, including future additions. We have also assumed the full fill height is not closer than 100 feet from existing or new drainage features extending to a maximum invert at el -4. Fill slopes beyond the full surcharge height at el 4 should be no steeper than 1 vertical on 3 horizontal to extend to existing grade. Shallower slopes may be necessary for drainage or access. Once a surcharge plan is developed, Eustis Engineering should confirm our assumptions.

33. Surcharge Monitoring. During construction, we recommend monitoring be performed in conjunction with the fill placement. Settlement should be monitored at several points of concern to determine the actual rate of consolidation, verify our estimates of the settlement magnitude, and further evaluate potential differential settlements after construction. We recommend the monitoring through the use of settlement plates and an elevation survey as described below. Based on the proposed configuration of the buildings, we recommend a minimum of three

settlement plates be utilized to monitor the proposed surcharge for the main facility. Similarly, we recommend at least two settlement plates at both the pool deck and pavilion. Once a surcharge plan is finalized, Eustis Engineering may be consulted to suggest the actual number and locations of the settlement plates.

34. Settlement Plates. Once the subgrade is prepared as described above, settlement plates should be installed prior to the placement of the fill materials. A typical settlement plate detail is provided as Figure 2. The elevation of the settlement plate and riser should be determined ***prior to any fill placement*** using a benchmark sufficiently removed from the surcharge area so as not to be influenced by the fill. Once this initial elevation is determined, the plate should not be disturbed during fill placement and compaction. Hand compaction techniques may be required in the vicinity of the settlement plates to achieve this goal.

35. As fill is placed to achieve the desired site elevation, additional risers may be required to maintain the visibility of the settlement plate. The length of each additional riser should be accurately recorded for proper data evaluation. The frequency of monitoring will depend on the duration of the surcharge as well as observed settlements. However, we anticipate weekly readings to be sufficient during the initial surcharge stages and biweekly readings after the rate of settlement is established.

Deep Foundations

36. Allowable Pile Load Capacities. Analyses have been made to determine the estimated allowable single pile load capacities in compression for various sizes of treated ASTM D 25 quality timber piles and timber composite piles for support of the proposed features. Estimates of tensile capacities have also been provided for piles supporting the pool. The allowable pile load capacities provide for a 2-ft cutoff below the existing ground surface and assume the piles are driven vertically. The results

of these analyses are tabulated on Figure 3. Selection of the pile tip embedment should consider total and differential potential, not just capacity.

37. <u>Factors of Safety.</u> The allowable pile load capacities tabulated on Figure 3 contain an estimated factor of safety of 2 against failure of a single pile through the soil. To utilize the estimated capacities based on a factor of safety of 2, a pile load test should be performed.

38. <u>Timber Piles.</u> We recommend the treatment of timber piles meet the current American Wood Preservers Association's Standards as outlined in Section 1014 of the LSSRB for both preservative and quality assurance. Treatment should also follow Section 812.06 where applicable. Furthermore, we recommend the timber piles meet the quality (clean peeled, straightness, etc.) requirements outlined in ASTM D 25 and size requirements outlined in Table X1.5 of ASTM D 25 for specified tip circumferences. The pile dimensions assumed in our analyses are tabulated on Figure 3.

39. <u>Timber Composite Piles.</u> Composite piles should consist of an untreated ASTM D 25 quality timber pile having a minimum 7-in. tip and 12-in. butt lower section and a 12-in. diameter concrete filled metal can upper section. The upper section should extend a minimum distance of 10 feet below the currently ***existing ground surface*** to protect the untreated timber section. The upper section should be of sufficient thickness to withstand handling stresses and soil and water pressures. We recommend a maximum upper section length of 15 feet. ***A mandrel impacting the timber pile butt should be used to install the upper section***. Prior to placing concrete, the upper section should be inspected to ensure it is free of water. Concrete placed in the upper section should have a minimum compressive strength of 2,500 psi or as dictated by structural requirements. ***Timber composite piles should not be used to resist lateral or tensile loads.*** Alternate timber composite pile configurations should be forwarded to Eustis Engineering to verify our capacity

estimates. Installation requirements, such as predrilling or pile refusal, should be considered when selecting composite section lengths.

40. Structural Capacity. Analyses for pile capacities are based only on a soil-pile relationship. Therefore, the structural capacity of the piles and their connections to transmit these loads should be determined by a structural engineer. ***Composite piles should not be used beneath the pool to resist uplift.***

41. Group Capacity. Piles driven to the recommended tip embedments will derive a majority of their supporting capacity from skin friction; therefore, it is necessary to consider the effect of group action. In this regard, the supporting value of the friction piles installed in groups should be investigated on the basis of group perimeter shear by the formula shown on Figure 4.

42. Pile Spacing. The minimum spacing between individual timber piles should be in accordance with the pile spacing formula also shown on Figure 4. The minimum spacing between rows or groups of piles should also meet the requirements discussed below.

43. Estimated Settlement due to Structural Loads. We recommend grade beams be rigidly connected to pile caps to minimize the potential for differential settlements. We estimate settlement of piles with a minimum tip embedment of 80 feet below the existing ground surface to be ¼ to ½ inch due to structural loads. These estimates do not include elastic deformation of the piles which should be added to the settlement estimates. Elastic deformation of the piles may be estimated as 67% to 75% of the static column strain of a pile acting as a column. These estimates of settlement also do not include settlement due to filling as addressed below.

44. Our estimates of settlement are based on the assumption piles will be driven in small groups or widely spaced rows. We have assumed the center to center

spacing between groups will be no closer than twice the largest group dimension and the center to center spacing between rows of single piles will be no closer than 8 feet. In the event any of our assumptions are not met, Eustis Engineering should be contacted to evaluate the potential settlement of the pile foundations.

45. <u>Effects of Fill Placement on Piles.</u> As the fill settles from consolidation of the underlying subsoils, negative skin friction (drag loads) are induced on the piles as the soil settles along the pile. These drag loads may result in additional pile settlement and/or an increase in the load applied to the pile. Assuming the piles supporting the building will be embedded a minimum of 80 feet below the existing ground surface, we estimate settlement of the piles due to the placement of 4 feet of fill beneath the structure to be 2 to 3 inches if a surcharge is not implemented. Considering a 6-ft high surcharge for a duration of approximately six months, we estimate shallower pile embedments may be feasible. Our estimates of residual pile settlements for surcharge duration of three months and six months are tabulated below.

PILE EMBEDMENT BELOW EXISTING GRADE IN FEET	ESTIMATED SETTLEMENT IN INCHES DUE TO FILL PLACEMENT		
	NO SURCHARGE	THREE MONTHS	SIX MONTHS
40	Not Recommended	Not Recommended	½ to 1
50	Not Recommended	1¼ to 2	¼ to ½
60	Not Recommended	1 to 1¾	¼ to ½
70	3 to 4½	1 to 1¾	¼ to ½
80	2 to 3	1 to 1½	¼ to ½

Note that settlement due to fill placement of the interim of the pool may be negligible and settlement at the edges may range between the values given above to approximately 50% of those values. Settlement at the pool is highly dependent on the pool dimension and should be evaluated by Eustis Engineering once these are determined.

46. These estimates of settlement are only due to fill placement and should be added to settlements due to structural loads. These estimates represent settlements at the center of the filled area. Differential settlements between the interior of the filled area and edges may be taken as approximately one-half of the values given above. This differential settlement will not be linear between the center of the filled area and the edges, and may occur in relatively short horizontal dimensions from the edge to the filled area's interior. Thus, settlement tolerances between adjacent features must be considered when selecting the surcharge duration and pile embedments. Eustis Engineering should be further consulted if the selected pile lengths result in unacceptable differential settlements. ***Piles should not be installed within the surcharge fill until construction of the superstructure is ready to proceed. Otherwise, piles may experience additional settlements or loads above the estimates provided in this report.***

47. Differential Settlement. Your design should recognize the potential for differential settlement between pile supported features and grade supported features. A joint considering these movements should be provided between any grade supported and pile supported features to accommodate potential differential settlement. In addition, the structures should be designed as rigidly as possible to minimize the potential for differential settlements. Utilities beneath the pile supported structures should be supported by hangers. Flexible connections should be used at the building line.

Installation of Driven Piles

48. Quality Control. All pile driving operations should be supervised by experienced personnel to ensure proper procedures are followed and accurate records are kept during all pile driving operations. The driving records should include the date, type of pile, tip and butt diameters, depth of predrill (if required), overall pile length, hammer model, driving energy, and number of blows per foot of penetration for the

full embedment of the pile. An accurate driving record is especially important to verify piles are installed to the required tip embedment and to give an indication of any unusual driving characteristics which may include pile breakage. We recommend Eustis Engineering be retained to observe, record, and evaluate all pile driving operations with respect to the recommendations presented in this report.

49. Hammers. Treated ASTM D 25 quality timber piles having tip diameters of 7 inches or greater and butt diameters of 12 inches or more may be driven with a single acting air hammer with a manufacturer's rated energy of 15,000 ft-lbs per blow. For these piles, the ram weight should not exceed 5,000 pounds and the maximum drop height should also be limited to 3 feet. Using these driving energies, timber piles should be driven no harder than 25 blows per foot (refusal) to minimize structural damage to the piles.

50. Predrilling. Predrilling may be necessary to assist piles in penetrating sand fill or sand layers which may densify during driving or for variations in the relatively density in the sand layers away from the boring locations. A pilot hole has the potential of minimizing vibrations resulting from pile driving operations and reducing the potential damage to timber piles. The predrill bit should be no larger than the pile ***tip*** diameter for timber piles. Actual requirements should be determined during the test pile program. Based on the boring logs, we would not anticipate the need for predrilling, other than to penetrate surficial sand fill to the 4-ft depth. For this depth, predrilling may be wet rotary or dry auger methods. For deeper depths, predrilling should be accomplished by wet rotary drilling methods.

Vibrations

51. Pile driving, as well as other construction activities, has the potential to generate vibrations that may affect nearby structures, pavements, and underground utilities. Eustis Engineering recommends vibrations be monitored during the test pile

program and during subsequent construction activities of concern. This monitoring should evaluate peak particle velocities during pile driving at critical structures with a seismograph, as well as other construction activities generating vibrations (hauling of fill, moving heavy equipment, etc.). The record of peak particle velocities will provide information in assessing potential damage and the need for changes in construction operations.

52. Peak particle velocities (measured at a structure) exceeding 0.5 in./sec may induce damage to the structure, particularly when this structure has been previously stressed by settlement or other movements. Peak particle velocities between 0.25 and 0.5 in./sec may be sensed as being detrimental by human perception. Peak particle velocities of 0.25 in./sec have been documented to cause densification of cohesionless materials such as those encountered at the site. Densification of these materials could result in settlement and subsequent damage to pavements, structures, or utilities founded in or above these materials. If sustained vibration levels of 0.25 in./sec are measured at a structure, pavement, or utility of concern, Eustis Engineering should be notified, the construction operations generating these vibrations terminated, and consideration given to altering these procedures.

Test Pile and Load Test

53. Eustis Engineering considers a test pile program and load test as an extension of our geotechnical investigation. Therefore, Eustis Engineering should be retained to perform these services. We recommend at least three probe piles be installed at the site. Eustis Engineering, in conjunction with the project's structural engineer, should evaluate the probe pile data and choose which one of the probe piles should be used for the pile load test. The probe piles may be installed at job pile locations. The probe piles should be the same type and embedment anticipated for the job piles and installed with the same equipment and techniques proposed for the job piles. These probe piles can be used to evaluate installation methods. Driven probe

piles will provide more definitive information regarding the anticipated driving resistance, requirements for predrilling, and vibrations from pile driving.

54. The test pile should be allowed to set for at least 14 days subsequent to the installation of the reaction system. Shorter set times may be considered once the probe piles have been driven and the penetration resistances are reviewed by Eustis Engineering. The test pile should then be load tested to failure in accordance with ASTM D 1143. The results should be evaluated by Eustis Engineering to verify the estimated pile load capacities presented in this report.

Pavement Recommendations

55. Traffic. Based on the furnished information, we have assumed the parking area will experience 165 automobiles per day with a 2-kip front axle and 2-kip rear axle load, and 165 vans and pickup trucks per day with a 2-kip front axle and 5-kip rear axle load. We estimate driveways and serviceways will experience two times this amount of traffic with additional applications of two sanitation trucks per week and two delivery trucks per day. We have assumed the sanitation trucks will have a 24-kip single front axle load and 30-kip dual tandem rear axle load, and the delivery trucks will have a 12-kip single front axle load, and a 20-kip dual tandem rear axle load. A 20-year design life and a terminal serviceability index (P_t) of 2.0 were used for the analyses.

56. The assumed traffic was converted to equivalent 18-kip single axle loads (E_{18}) using AASHTO equivalency factors for flexible and rigid pavements. Assumed traffic loadings and applications should be verified prior to implementation of design. If traffic conditions are significantly different than those presented, Eustis Engineering should be contacted to reevaluate the pavement recommendations contained in this report.

57. Method of Analysis. The pavement components and thicknesses were determined using methods presented in the 1986 AASHTO Guide for Design of Pavement Structures. In addition, the resilient soil modulus (M_r) of the subgrade was estimated based on the type of soil, probable drainage conditions, and engineering experience. For these estimates, we have assumed the subgrade is prepared as recommended in this report. In particular, proper drainage during construction and adequate permanent drainage should be provided so the subgrade is not allowed to become saturated. Prolonged saturation of the pavement components will result in a reduced service life.

58. Flexible Pavement. Our analyses assume all paving materials will conform to the LSSRB. For the parking areas, we recommend 3 inches of hot mix asphaltic surface course consisting of at least 1.5 inches of Type 3 wearing course and 1.5 inches of Type 3 binder course. In addition, we recommend 6 inches of stone base course and 12 inches of sand subbase. For the driveways and serviceways, we recommend 4 inches of hot mix asphaltic surface course consisting of at least 1.5 inches of Type 3 wearing course and 2.5 inches of Type 3 binder course. In addition, we recommend 8 inches of stone base course and 18 inches of sand subbase. Installation of the sand subbase will likely not be required once the site grading fill is placed.

59. The asphaltic surface course should conform with Section 501 of the LSSRB. The material for the crushed stone base course should conform to the material requirements of Section 1003.03(d) of the LSSRB. The stone base course should be placed and compacted in accordance with Section 302 of the LSSRB for a Class II base course. Sand subbase should meet the material requirements given in "Structural Fill" of this report. Structural fill used as subbase should be placed in 6 to 8-in. loose lifts and compacted to at least 95% of its maximum dry density in accordance with ASTM D 1557.

60. Grades should provide for adequate drainage to prevent saturation of the subgrade and base course materials. If the type and thickness for pavement components are changed, Eustis Engineering should be consulted to determine the suitability of these materials and the structural number of the pavement.

61. Rigid Pavement. Using the same soil and traffic conditions, Eustis Engineering recommends rigid pavement for the parking lot comprise 5 inches of Portland Cement Concrete. The driveways and serviceways should comprise 7 inches of Portland Cement Concrete. We recommend trash container pads be at least 8 inches in thickness. Portland Cement Concrete should conform to the material requirements for pavement Type B concrete as specified in Section 901 of the LSSRB. The concrete should have a specified 28-day compressive strength of 4,000 psi to give the pavement adequate flexural strength. The concrete pavement design should consider the need for reinforcement against temperature and shrinkage. The pavement should be constructed in accordance with the provisions of the LSSRB, Section 601. The concrete should be underlain by at least 8 inches of a compacted new sand fill or scarified and recompacted existing sand fill. The new or existing sand fill should conform to the material requirements given in "Structural Fill." The sand subbase should be compacted to at least 95% of its maximum dry density near optimum water content using ASTM D 1557.

62. Grades should provide for adequate drainage to prevent saturation of sand fill beneath the pavement. All joints should be sealed to prevent infiltration of water. All pavement details, such as wire mesh, reinforcement, dowels, joints, curbs, etc., should be designed by a pavement design engineer.

Other Considerations

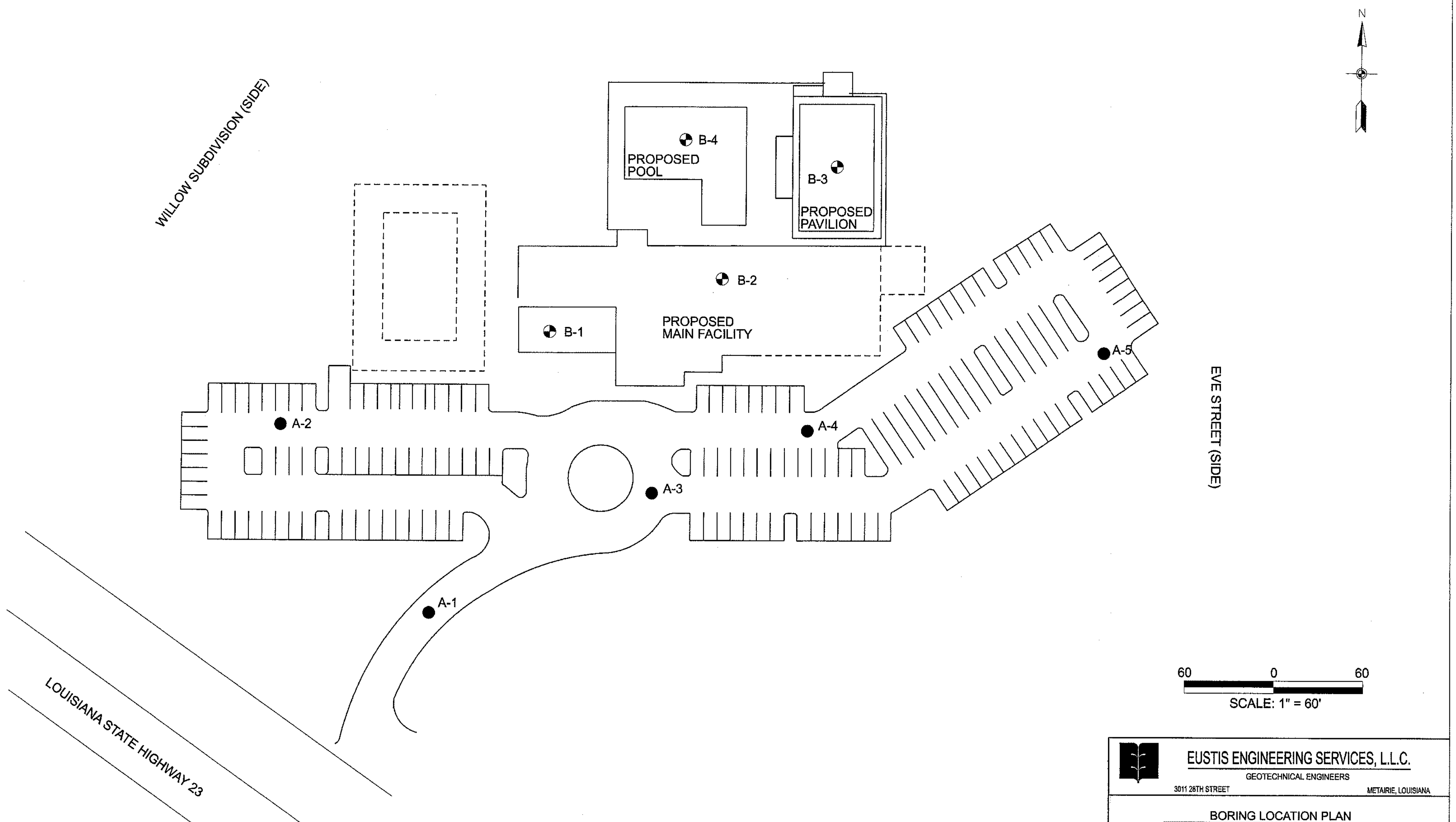
63. Areal Subsidence. The project area is being affected by ongoing areal subsidence that is the result of past filling, drawdown of ground water levels due to drainage

improvements, and biodegradation of near surface organic soils subsequent to ground water drawdown. The amount of future subsidence cannot be estimated from information developed for our report. Settlement of surface founded structures and pavements due to subsidence can be several inches and differential over short lengths with respect to pile supported structures.

GEOTECHNICAL SERVICES DURING CONSTRUCTION

64. In order to provide continuity between the investigation, design, and construction phases, Eustis Engineering should be retained to review plans and specifications developed for the project and all contractor submittals related to geotechnical issues and foundations. Eustis Engineering can also provide additional geotechnical services which may include consultation during design and construction. We can also provide steel, concrete, and asphalt inspection services, and compaction and inplace density determinations on fill materials. We can perform appropriate laboratory tests to determine the gradation and quality of material proposed as structural fill or backfill. Eustis Engineering can also log the installation of test piles and job piles, perform and evaluate pile load tests, and monitor vibrations.

65. Eustis Engineering should be retained to monitor the geotechnical related work performed by the contractor. This permits the geotechnical engineer that prepared the report to be on hand and quickly evaluate unanticipated conditions, conduct additional tests if required, and, when necessary, recommend alternative solutions to problems. This is recommended to avoid major construction cost overruns or contractual disputes on the project.



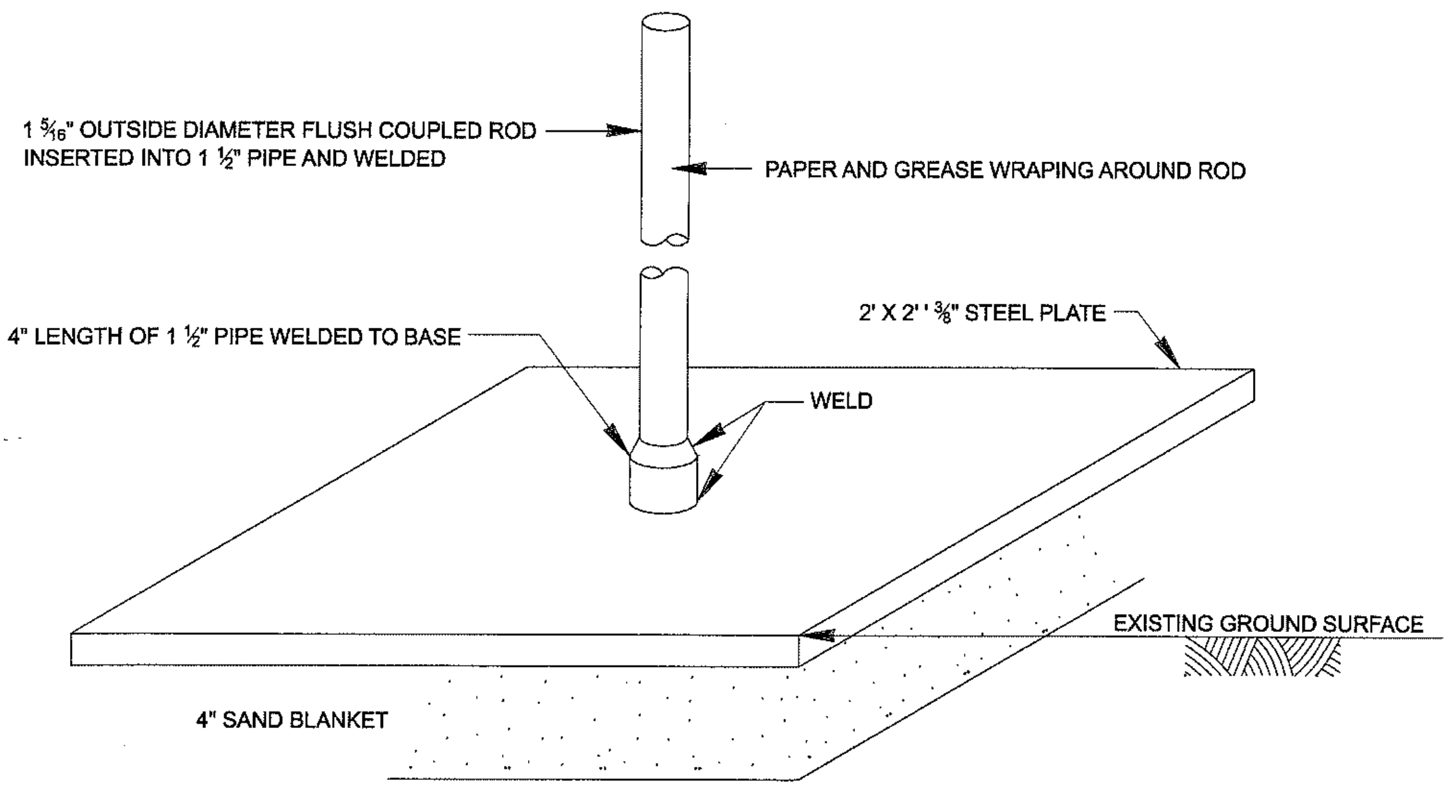
● DENOTES LOCATION OF AUGER SOIL BORINGS DRILLED: 22 THROUGH 26 SEPTEMBER 2008

◒ DENOTES LOCATION OF UNDISTURBED SOIL BORINGS DRILLED: 23 THROUGH 30 SEPTEMBER 2008

EUSTIS ENGINEERING SERVICES, L.L.C.
GEOTECHNICAL ENGINEERS
3011 28TH STREET METAIRIE, LOUISIANA

BORING LOCATION PLAN
YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

DRAWN BY: J.L.S.	PLOT DATE: 17 NOV 08	CADD FILE: FIGURE1.DGN
CHECKED BY: R.E.S.	JOB NO.: 20234	FIGURE 1



TYPICAL SETTLEMENT PLATE

EUSTIS ENGINEERING SERVICES, L.L.C.

GEOTECHNICAL ENGINEERS

3011 28TH STREET METAIRIE, LOUISIANA

SETTLEMENT PLATE

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

DRAWN BY: J.L.S.	PLOT DATE: 17 NOV 08	CADD FILE: SETTLEMENT PLATE.DGN
CHECKED BY: R.E.S.	JOB NO.: 20234	FIGURE 2

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA
EUSTIS ENGINEERING PROJECT NO. 20234

ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITIES

SIZE OF TREATED ASTM D 25 QUALITY TIMBER PILE	PILE TIP EMBEDMENT BELOW EXISTING GROUND SURFACE IN FEET	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITIES IN TONS[1] FACTOR OF SAFETY ≈ 2[2]	
		COMPRESSION	TENSION[4]
7-In. Tip 12-In. Butt	40	10	7
	45	12	8
	50	14	9
	55	15	10
	60	17	12
7-In. Tip 13-In. Butt Or Composite[4]	70	20	13
	75	25	15
	80	30	17

Notes:

(1) These estimated capacities do not include limitations on structural capacity or imposed by some building codes.

(2) Use of a factor of safety 2 assumes a pile load test will be performed.

(3) Selection of the pile tip embedment should also consider total and differential potential and settlement tolerances. Pile embedment under 80 feet should not be utilized without a surcharge.

(4) Composite timber piles should not be used in tension. Tension capacities are provided for support of uplift loads at the pool.

CAPACITY OF PILE GROUPS

The maximum allowable load carrying capacity of a pile group is no greater than the sum of the single pile load capacities, but may be limited to a lower value if so indicated by the result of the following formula.

$$Q_a = \frac{P \ x \ L \ x \ c}{(FSF)} + \frac{2.6 \ q_u \ (1 + 0.2 \ \frac{w}{b}) \ A}{(FSB)}$$

In Which:

Q_a	=	Allowable load carrying capacity of pile group, lb
P	=	Perimeter distance of pile group, ft
L	=	Length of pile, ft
c	=	Average (weighted) cohesion or shear strength of material between surface and depth of pile tip, psf
q_u	=	Average unconfined compressive strength of material in the zone immediately below pile tips, psf (unconfined compressive strength = cohesion x 2)
w	=	Width of base of pile group, ft
b	=	Length of base of pile group, ft
A	=	Base area of pile group, sq ft
(FSF)	=	Factor of safety for the friction area = 2
(FSB)	=	Factor of safety for the base area = 3

The values of c and q_u used in this formula should be based on applicable soil data shown on the Log of Boring and Test Results for this report. In the application of this formula, the weight of the piles, pile caps and mats, considering the effect of buoyancy, should be included.

SPACING WITHIN PILE GROUPS

SPAC = $0.05 (L_1) + 0.025 (L_2) + 0.0125 (L_3)$

In Which

SPAC	=	Center to center of piles, feet
L_1	=	Pile penetration up to 100 feet
L_2	=	Pile penetration from 101 to 200 feet
L_3	=	Pile penetration beyond 200 feet

NOTE: Minimum pile spacing = 3 feet or 3 pile diameters, whichever is greater

APPENDIX

LEGEND AND NOTES FOR LOG OF BORING AND TEST RESULTS

PP Pocket penetrometer: Resistance in tons per square foot

SPT Standard Penetration Test: Number of blows of a 140-lb hammer dropped 30 inches required to drive 2-in. O.D., 1.4-in. I.D. sampler a distance of 1 foot into the soil after first seating it 6 inches

SPLR Type of Sampling — Shelby — SPT — Auger — No sample

SYMBOL Clay — Silt — Sand — Peat/Humus — Shells — Stone/Gravel

Predominant type shown heavy; Modifying type shown light

USC Unified Soil Classification

DENSITY Unit weight in pounds per cubic foot

SHEAR TESTS

TYPE

- UC Unconfined compression shear
- OB Unconsolidated undrained triaxial compression shear on one specimen confined at the approximate overburden pressure
- UU Unconsolidated undrained triaxial compression shear
- CU Consolidated undrained triaxial compression shear
- DS Direct shear

Ø Angle of internal friction in degrees

c Cohesion in pounds per square foot

ATTERBERG LIMITS

- LL Liquid Limit
- PL Plastic Limit
- PI Plasticity Index

OTHER TESTS

- CON Consolidation
- PD Particle size distribution (sieve and/or hydrometer)
- k Coefficient of permeability in centimeters per second
- SP Swelling pressure in pounds per square foot

Other laboratory test results reported on separate figures

GENERAL NOTES

(1) If a ground water depth is shown on the boring log, these observations were made at the time of drilling and were measured below the existing ground surface. These observations are shown on the boring logs. However, ground water levels may vary due to seasonal fluctuations and other factors. If important to construction, the depth to ground water should be determined by those persons responsible for construction immediately prior to beginning work.

(2) While the individual logs of borings are considered to be representative of subsurface conditions at their respective locations on the dates shown, it is not warranted that they are representative of subsurface conditions at other locations and times.

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 20234 **Date Drilled:** 9/23-24/08 **Boring:** 1 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	ø	C	LL	PL	PI		
0					Medium stiff gray clay w/roots & silt pockets	CH	1	0-0.5	59										
	1.50				Stiff tan & gray silty clay	CL	2	2-3											
	1.50						3	5-6	36	85	115	UC	--	1115					
	1.50				Stiff gray clay w/roots	CH	4	8-9											
10																			
	1.00				Soft gray clay w/decayed wood & silt pockets	CH	5	11-12	65	61	101	UC	--	495					
	0.25				w/organic matter		6	14-15											
					Very soft gray clay w/silt pockets	CH													
20							7	19-20	88	51	97	UC	--	160					
							8	24-25											
					Very soft to soft gray silty clay	CL													
30	0.50						9	29-30	41	82	115	UC	--	245					
	0.25						10	34-35											
					Loose gray clayey sand	SC													
40	0.50						11	39-40	32										
					Medium stiff gray clay	CH													
	0.50						12	44-45											
					Soft gray clay w/silt pockets	CH													
50	0.25						13	49-50	64	61	100	UC	--	350					

Comments: Latitude: 29° 51.578' N
Longitude: 89° 59.362' W

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 20234 **Date Drilled:** 9/23-24/08 **Boring:** 1

Refer to "Legends & Notes"

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	ø	C	LL	PL	PI		
50					Soft gray clay w/silt pockets	CH													
	0.50						14	54-55											
60	0.50						15	59-60	58	65	103	UC	--	470					
	0.50						16	64-65											
70	0.50				Medium dense gray silty sand w/shell fragments	SM	17	69-70	27										
	0.75						18	74-75											
					Very dense gray fine sand	SP													
80	0.50						19	79-80	28	97	124	OB	0	1830					
					Medium stiff gray clay w/silt pockets & decayed wood	CH													
	0.75						20	84-85											
90	1.00						21	89-90	37	84	115	UC	--	815					
	1.50						22	94-95											
					Very dense gray silty sand w/shell fragments	SM													
100		50=4"					23	98-99.5	26										

Comments: Latitude: 29° 51.578' N
Longitude: 89° 59.362' W

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 20234 **Date Drilled:** 9/24-25/08 **Boring:** 2

Refer to "Legends & Notes"

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	ø	C	LL	PL	PI		
0					Medium stiff gray clay w/silt pockets	CH	1	0-0.5	57										
	1.50				Medium stiff brown & gray clay w/roots & silt pockets	CH	2	2-3	45	74	107	UC	--	630					
	0.50				Medium stiff gray & tan clay	CH	3	5-6											
	1.00				Soft gray clay w/decayed wood	CH	4	8-9	81	52	94	UC	--	360					
10	0.75						5	11-12											
	0.50				Medium stiff gray & brown humus w/roots	Pt	6	14-15	160	31	82	UC	--	535					
20	0.50						7	19-20											
	0.50				Soft dark gray humus w/roots	Pt	8	24-25	252	21	73	UC	--	485					
					Extremely soft gray sandy clay	CL													
30							9	29-30											
	0.50						10	34-35	41	82	115	UC	--	95					
40	0.50				Medium dense gray silty sand	SM	11	39-40											
	0.50						12	44-45	29	95	123								
50	0.50				Soft gray clay	CH	13	49-50	63	63	102	UC	--	350					

Comments: Latitude: 29° 51.591' N
Longitude: 89° 59.344' W

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 20234 **Date Drilled:** 9/24-25/08 **Boring:** 2 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	ø	C	LL	PL	PI		
50					Soft gray clay	CH													
	0.50						14	54-55											
60	0.50						15	59-60	61	64	104	UC	--	340					
	0.50						16	64-65	62	63	102	UC	--	485					
70	0.50						17	69-70											
					Medium stiff gray clay	CH													
	0.50						18	74-75	62	62	101	UC	--	600					
					Medium dense gray clayey sand	SC													
80	0.75						19	79-80	28										
90																			
100																			

Comments: Latitude: 29° 51.591' N
Longitude: 89° 59.344' W

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 20234 **Date Drilled:** 9/25-26/08 **Boring:** 3

Refer to "Legends & Notes"

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	ø	C	LL	PL	PI		
0					Medium stiff gray clay w/roots & silt pockets	CH	1	0-0.5	40										
	1.50				Stiff gray & tan silty clay w/humus	CL	2	2-3											
	0.50				Medium stiff brown & gray clay w/trace of roots & silt pockets	CH	3	5-6	42	78	111	UC	--	750					
	0.75				Medium stiff dark gray organic clay w/decayed wood	OH	4	8-9											
10	0.50						5	11-12	138	34	80	UC	--	895					
	0.50				Medium stiff brown & gray silty clay w/humus	CL	6	14-15											
20	0.25				Soft dark brown humus	Pt	7	19-20	221	22	72	UC	--	315					
					Very soft brown & gray silty clay	CL	8	24-25											
30					Extremely soft gray clay w/silty sand lenses	CH	9	29-30	65	63	103	UC	--	75					
	0.50				Medium stiff gray silty clay	CL	10	34-35											
40					Soft gray clay w/silty sand lenses	CH	11	39-40	52	70	107	UC	--	320					
	0.25				Loose gray silty sand w/clay layers	SM	12	44-45	35										
50	0.50				Medium stiff gray clay	CH	13	49-50	59	65	104	UC	--	640					

Comments: Latitude: 29° 51.612' N
Longitude: 89° 59.342' W

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 20234 **Date Drilled:** 9/25-26/08 **Boring:** 3 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ø	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50			Medium stiff gray clay	CH													
	0.50		w/silt layers		14	54-55											
			Soft gray clay w/silt pockets	CH													
60	0.50				15	59-60	61	64	104	UC	--	450					
	0.50				16	64-65											
			Medium dense gray silty sand w/shell fragments	SM													
70	0.50				17	69-70	32										
	0.25		Soft gray sandy clay w/shell fragments	CL	18	74-75	37										
80	0.50		Medium dense brown & gray silty sand	SM	19	79-80	26										
		16			20	80-81.5	28										
			Medium dense gray silty sand	SM													
		7			21	83-84.5	40										
90	0.50		Medium stiff gray clay w/silt pockets	CH	22	89-90	42	79	112	UC	--	750					
			Stiff gray & tan silty clay w/decayed wood & concretions	CL													
	0.50				23	94-95	35	84	113	UC	--	1075					
	0.50		Medium stiff gray clay w/silt pockets & wood	CH	24	97-98	59										
100		50=6"			25	98.5-100	27										

Comments: Latitude: 29° 51.612' N
Longitude: 89° 59.342' W

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 20234 **Date Drilled:** 9/25-26/08 **Boring:** 3 **Refer to "Legends & Notes"**

Scale In Feet	PF	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	ø	C	LL	PL	PI		
100					Very dense gray silty sand	SM													
110																			
120																			
130																			
140																			
150																			

Comments: Latitude: 29° 51.612' N
Longitude: 89° 59.342' W

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

(Sheet 1 of 2)

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 20234 **Date Drilled:** 9/29-30/08 **Boring:** 4 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	ø	C	LL	PL	PI		
0					Medium stiff tan clay w/roots	CH	1	0-0.5	43										
	1.25				Medium stiff tan & gray clay w/silt pockets	CH	2	2-3	44	76	110	UC	--	810					
	1.25				Stiff gray & tan clay	CH	3	5-6											
10	0.50				Soft gray clay w/silt pockets	CH	4	8-9	77	56	99	UC	--	320					
	0.50				Medium stiff tan & gray organic clay	OH	5	11-12	153										
	0.50				Soft dark gray organic clay w/decayed wood & silty sand lenses	OH	6	14-15	150	33	82	UC	--	395					
20	0.50				Medium stiff gray & black silty clay	CL	7	19-20											
					Extremely soft gray clay	CH	8	24-25	75	56	98	UC	--	105					
30					Very soft gray clay w/silty sand lenses	CH	9	29-30											
							10	34-35	42	79	112	UC	--	175					
40	0.75				Medium dense gray silty sand	SM	11	39-40											
	1.50				Medium stiff gray sandy clay	CL	12	44-45	31	90	118	UC	--	710					
50	0.25				Soft gray clay	CH	13	49-50											

Comments: Latitude: 29° 51.609' N
Longitude: 89° 59.363' W

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

(Sheet 2 of 2)

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 20234 **Date Drilled:** 9/29-30/08 **Boring:** 4

Refer to "Legends & Notes"

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	ø	C	LL	PL	PI		
50					Soft gray clay	CH													
	0.25						14	54-55	59	65	103	UC	--	400					
60	0.75				Medium stiff gray clay	CH	15	59-60											
	0.50						16	64-65	58	66	105	UC	--	580					
70	0.50				Soft gray sandy clay w/shell fragments	CL	17	69-70											
	1.00						18	74-75	31	89	117	UC	--	350					
80					Medium dense gray silty sand	SM	19	79-80											
90																			
100																			

Comments: Latitude: 29° 51.609' N
Longitude: 89° 59.363' W

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 20234 **Date Drilled:** 9/22/08 **Boring:** A-1

Refer to "Legends & Notes"

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ø	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					Medium stiff gray clay w/organic matter	CH	1	0-0.5											
							2	0.5-1	45										
							3	1-2											
					Medium stiff tan & gray clay w/silt pockets	CH	4	2-3	47										
							5	3-4											
5					Medium stiff tan & gray clay		6	4-5	54										
							7	5-6											
10																			
15																			
20																			
25																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 20234 **Date Drilled:** 9/22/08 **Boring:** A-2 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ø	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					Medium stiff gray silty clay	CL	1	0-0.5											
							2	0.5-1											
					Medium stiff gray & tan silty clay	CL	3	1-2	32										
							4	2-3											
							5	3-4	35										
5							6	4-5											
					Medium stiff black clay	CH	7	5-6	30										
10																			
15																			
20																			
25																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

(Sheet 1 of 1)

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 20234 **Date Drilled:** 9/22/08 **Boring:** A-3 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	ø	C	LL	PL	PI		
0					Medium stiff gray clay	CH	1	0-0.5	46										
							2	0.5-1											
					Medium stiff gray & tan silty clay	CL	3	1-2											
					Medium stiff tan & gray clay	CH	4	2-3	46										
							5	3-4											
5							6	4-5	54										
10																			
15																			
20																			
25																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 20234 **Date Drilled:** 9/24/08 **Boring:** A-4 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ø	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					Medium stiff gray clay	CH	1	0-0.5											
							2	0-0.5											
							3	1-2	44										
							4	2-3											
					Medium stiff tan & gray clay	CH	5	3-4	43										
5					Medium stiff black & gray organic clay	OH	6	4-5											
							7	5-6	121										
10																			
15																			
20																			
25																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

YMCA OF GREATER NEW ORLEANS
LA HIGHWAY 23 AT EVE STREET
BELLE CHASSE, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 20234 **Date Drilled:** 9/26/08 **Boring:** A-5 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ø	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					Medium stiff gray & tan clay w/silt pockets	CH	1	0-1	41										
							2	1-2											
							3	2-3	45										
							4	3-4											
5							5	4-5	55										
							6	5-6											
10																			
15																			
20																			
25																			

Comments: