ECS Southwest, LLP

Geotechnical Engineering Report

DFW Terminal A Expansion

International Pkwy
DFW Airport, Texas

ECS Project Number 63:1603-A

April 14, 2022

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Ms. Joi-An Oppold
Austin Commercial, LP
3535 Travis Street, Suite 300
Dallas, Texas 75204

ECS Project No. 63:1603

Reference: Geotechnical Engineering Report
DFW Terminal A Expansion
International Pkwy
DFW Airport, Texas

Dear Ms. Oppold:

ECS Southwest, LLP (ECS) has completed the subsurface exploration, laboratory testing, and geotechnical engineering analyses for the referenced project. Our services were performed in general accordance with our agreed scope of work. This report presents our understanding of the geotechnical aspects of the project along with the results of the field exploration and laboratory testing conducted, and our design and construction recommendations.

It has been our pleasure to be of service to Austin Commercial, LP during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during the construction phase operations as well to verify the assumptions of subsurface conditions made for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Southwest. LLP

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EXECUTIVE SUMMARY

The following summarizes the main findings of the exploration, particularly those that may have a cost impact on the planned development. Further, our principal foundation recommendations are summarized. This Executive Summary is intended as a very brief overview of the primary geotechnical conditions that are expected to affect design and construction. Information gleaned from the executive summary should not be utilized in lieu of reading the entire geotechnical report.

- Based on the information provided to us by Austin Commercial, the expansion for Terminal A will consist of a new pier and apron area. Terminal A will have a pier footprint of about 72,400 sq. ft.

- Borings encountered clayey fills followed by fat clays and shaley fat clay soils beneath the concrete pavement. Below the overburden soils, highly weathered gray shale and gray shale bedrock were encountered to the maximum boring termination depths of about 40 to 60 feet.

- Groundwater seepage was not observed in any of the borings during drilling operations or upon completion of drilling.

- Moderately to highly expansive clays are present at this site. Subgrade treatment of the expansive clay soils is necessary to reduce the potential for vertical movements. Specific details on addressing these high expansive clay soils are presented in the body of the report.

- The proposed buildings can be supported on straight drilled shafts bearing in gray shale with a slab on grade or a structural slab. Shallow foundation system can be used to support the elevator pads and other lightly loaded structures, as long as subgrade movement of 1 inch are acceptable.

- It is recommended that ECS conduct a geotechnical review of the project plans (prior to issuance for construction) to check to see that ECS' geotechnical recommendations have been properly interpreted and implemented.

- To prevent misinterpretation of ECS recommendations, ECS should be retained to perform quality control testing and documentation during construction of the earthwork and foundations for the project.

1.0 INTRODUCTION

1.1 General

The purpose of this study was to provide geotechnical information for design of the Terminal A expansion which will consist of additional terminal space of 72,400 se. ft as well as additional new pier of jet bridges along with apron area improvements.

Our services were provided in accordance with our Proposal No. 63:2108-GP (Rev.2) dated January 3, 2022 and authorized on January 11, 2022 by Joi-An Oppold through Consultant Agreement No. 2130-ECS-01.

This report contains the results of our subsurface exploration and geotechnical laboratory testing program, site characterization, engineering analyses, and recommendations for the design and construction of the planned development.

The report includes the following items.

- A brief review and description of our field and laboratory test procedures and the results of testing conducted.
- A review of surface topographical features and site conditions.
- A review of area and site geologic conditions.
- A review of subsurface soil stratigraphy with pertinent available physical properties.
- A final copy of our soil test borings.
- Recommendations for site preparation and construction of compacted fills, including an evaluation of on-site soils for use as compacted fills.
- Recommendations for building pad and jet bridge subgrade and foundations.
- Laboratory testing results for Apron area subgrades.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION/CURRENT SITE USE

The project site is located at the Dallas/Fort Worth International Airport, northeast of Terminal A (GPS: 32.8950 N, 97.0352 W. The location is depicted in Figure 2.1.1 as shown below.

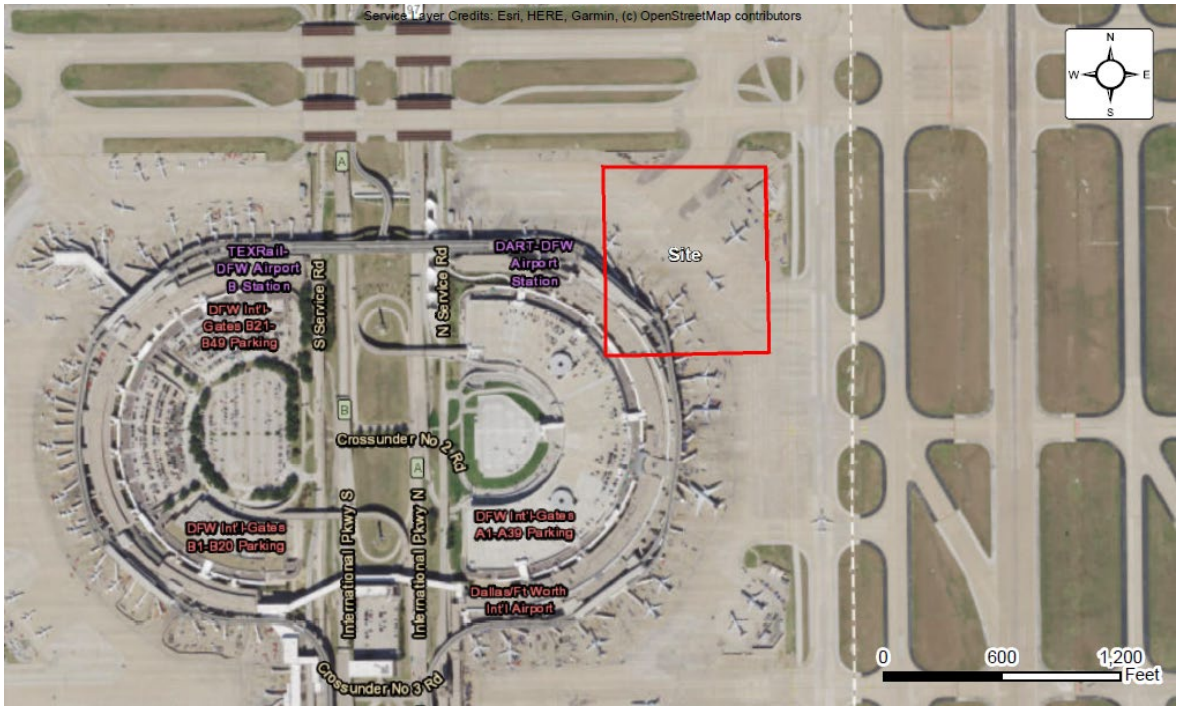


Figure 2.1.1 Site Location

2.2 PROPOSED CONSTRUCTION

Based on the contour map obtained from NCTCOG (www.dfwmaps.com) the overall property slopes down from west to east with a maximum and minimum elevation of EL 574 to 579 ft., respectively. The following information explains our understanding of the planned development including the proposed buildings and related infrastructure.

SUBJECT	DESIGN INFORMATION / ASSUMPTIONS
Building Footprint	72,400 sq. ft.
Usage	Commercial
Framing	Structural steel
Column Loads (assumed)	30 to 250 kips (Full Dead and Live Load) maximum
Wall Loads (assumed)	2 to 5 kips per linear foot (klf) maximum
Lowest Finish Floor Elevation (assumed)	Within 2 feet of existing grades

3.0 FIELD EXPLORATION

Our exploration procedures are explained in greater detail in Appendix B including the insert titled Subsurface Exploration Procedures. Our scope of work included drilling twenty-seven (27) borings. Our borings were located with a handheld GPS unit and their approximate locations are shown on the Boring Location Diagram in Appendix A.

3.1 SUBSURFACE CHARACTERIZATION

The near surface geologic mapping is underlain by the Eagle Ford (Kef) formation. The parent rock of the Eagle Ford consists of uniform, dark gray shale. Chemical and mechanical weathering of the shale forms highly plastic clay soils. These clays are considered to exhibit some of the highest shrink/swell volume with moisture fluctuations. Tan and gray shaley clays are common above the rock, becoming dark brown to dark gray at shallower depths. The shale is typically on 200 to 300 feet thick in full section. Groundwater in these formations is mostly encountered at the contacts and limited in quantity (perched). Please refer to the regional geology in Appendix A.

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil and rock strata. Please refer to the boring logs in Appendix B.

Subsurface Stratigraphy

Approximate Depth to Bottom of Strata (ft)	Elevation of Bottom of Strata [1] (ft)	Stratum	Description	Consistency
3 to 6 [2]	**EL. +570.0 to 575.0**	I	FILL, FAT CLAY, light gray, light brown, brown, with gravel	Firm to Hard
10 to 20[3]	**EL. +557.0 to 569.0**	II	FAT CLAY, dark brown, brown, light brown, light gray, shaley, with calcareous nodules	Very Stiff to Hard
20 to 35 [4]	**EL. +543.0 to 558.0**	III	SHALE, highly weathered, gray	Hard
40 to 60 [5]	**EL. +516.0 to 538.0**	IV	SHALE, gray	-

Notes:

(1) Please note that the ground surface elevations were not surveyed by a licensed surveyor; these elevations are approximate based on dfwmaps.com. Elevation ranges are approximate +/- several feet.
(2) Encountered in all borings.
(3) Encountered in all borings. Borings AA-1 to AA-11 were terminated in this stratum at a depth of about 10 feet.
(4) Encountered in borings BA-1 to BA-12 and AJ-1 to AJ-4.
(5) Encountered in borings BA-1 to BA-12 and AJ-1 to AJ-4. Borings BA-1 to BA-12 and AJ-1 to AJ-4 were terminated in this stratum at depths of about 40 and 60 feet, respectively.

A graphical presentation of the subsurface conditions is shown on the Generalized Subsurface Soil Profile included in Appendix A.

3.2 GROUNDWATER OBSERVATIONS

Groundwater level observations were made in the borings during drilling operations. In auger drilling operations, water is not introduced into the borehole and the groundwater position can often be determined by observing water flowing into the excavation. Furthermore, visual observation of soil samples retrieved can often be used in evaluating the groundwater conditions. Groundwater seepage was not observed in borings during drilling operations or upon completion of drilling.

Variations in groundwater levels can occur because of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors not immediately apparent at the time of this exploration. The highest groundwater observations are normally observed in the late winter and early spring. Therefore, the groundwater conditions at this site could be different at the time of construction. The possibility of groundwater level fluctuation should be considered when developing the design and construction plans for the project.

3.3 LABORATORY TESTING

The laboratory testing consisted of selected tests performed on samples obtained during our field exploration operations. Classification and index property tests were performed on representative soil samples. The tests included moisture content, Atterberg limits, swell, percent passing No. 200 sieve, California Bearing Ratio (CBR), Standard Proctor test, unconfined compressive strength, pH, Photo Ionization Detector (PID) test, sulfate, chloride and laboratory electrical resistivity.

Soil samples were visually classified on the basis of texture and plasticity in accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures) and including USCS classification symbols, and ASTM D2487 Standard Practice for Classification for Engineering Purposes (Unified Soil Classification System (USCS). After classification, the samples were grouped in the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the logs are approximate; in situ, the transitions may be gradual.

4.0 DESIGN RECOMMENDATIONS

The following recommendations have been developed on the basis of previously described project characteristics and subsurface conditions. If there are any changes to the project characteristics or if different subsurface conditions are encountered during construction, ECS should be consulted so that the recommendations of this report can be reviewed. Since the grading plans were not available at the time of preparing this report, we have assumed that the foundation elevation will be within 2 feet of the existing site grades. If the finished floor elevation deviates from this assumed grade, the recommendations provided below should be evaluated by our office.

4.1 EXISTING FILL MATERIALS

Fill materials are present at the site surface up to about 6 feet below existing grade. These fill materials appear to be free of deleterious materials and relatively compact. While these observations are preferred when analyzing undocumented fill as they relate to future settlements, the soil is still moderately expansive. Provided that the subgrade improvement recommendations contained in this report are followed, the fill will be reworked.

4.2 POTENTIAL VERTICAL MOVEMENTS

The soils encountered at this site are moderately to highly expansive. These soils are susceptible to shrink swell tendencies, occurring seasonally, throughout the life of the building with the changes in moisture content. Below are the different methods used to analyze the swell potential of existing building subgrade soils.

1. Based on test method TEX-124-E in the Texas Department of Transportation (TxDOT) Manual of Testing Procedures, and based on “dry” condition, we estimate potential vertical soil movement (PVM) of about 3 to 6 inches.
2. Based on test method TEX-124-E in the Texas Department of Transportation (TxDOT) Manual of Testing Procedures, and based on existing moistures, we estimate potential vertical soil movement (PVM) of about 3.5 inches.
3. Based on the swelling potential of existing clays at current moistures, we estimate potential vertical soil movement (PVM) of about 1 inch, with the exception of Boring BA-08 which has swell potential of up to 3 inches based on the limited absorption swell testing performed on the building boring samples.

Also, please note that the actual movements could be greater if poor drainage, ponded water, and/or other unusual sources of moisture are allowed to saturate the soils beneath the structure after construction.

4.3 SUBGRADE IMPROVEMENTS

We recommend that prior to construction the subgrade needs to be verified by drilling additional borings to 10 feet below subgrade (one boring per every 5,000 sq. ft) and performing absorption swell testing, under final overburden pressures. The average swell for each boring must not be more than 0.75% for each boring and no one test is above 1.5% (testing every 2.5 feet or 3 tests per boring, whichever provides greater testing).

If the PVM values of greater than 1 inch are found, we recommend subgrade improvements below the buildings floor slab to achieve a uniform PVM across the building pad and reduce the risk of future movements. For moisture conditioning, the existing soils should be excavated and replaced after adding water to the levels provided in this report. Select fill or flexible base cap of 1.5 foot thick should be placed on the building pad as soon as the building pad is tested and determined that the pad meets the swell criteria presented above.

The subgrade improvements should extend beyond the building lines to include building entrances, abutting sidewalks, flatwork areas sensitive movement and 5 feet beyond those elements. The select fill or flexible base should not be placed in exposed areas outside the building. Exterior grade beam backfill should consist of on-site moisture conditioned clay.

If additional testing is not performed, to reduce the floor slab movements to about 1 inch, we recommend the following subgrade improvements.

Subgrade Improvements

Granular Cap (feet)	Depth of Moisture Conditioning (feet)	Total Depth of Improved Zone (feet)	PVM (in)
1.5	10	11.5	1

Notes:
1. Water/Chemical injection can be used in-lieu of moisture conditioning of clays.

Some of the risks associated with placing slabs or foundations on improved subgrades may include uneven floors, floor and wall cracking and sticking doors or windows. Even at low level future PVM values, because the movements are seasonal and occur over the life of the structures, these differential movements cause distress throughout the structure.

Positive drainage should be provided away from the structures with moderate irrigation of surrounding lawn and planter areas with no excessive wetting or drying of soils adjacent to the foundations. Greater potential movements could occur with extreme wetting or drying of the soils due to ponding of water, plumbing leaks or lack of irrigation. Recommendations for earthwork operations are found in the "Construction Considerations" portion of this report.

Subgrade Modulus: Provided subgrades are prepared as, discussed herein, the slab may be designed assuming a modulus of subgrade reaction, k_1 of 150 pci (lbs/cu. inch).

Vapor Retarder: Before the placement of concrete, a vapor retarder may be placed on top of the granular drainage layer to provide additional protection against moisture penetration through the floor slab. When a vapor retarder is used, special attention should be given to surface curing of the slab to reduce the potential for uneven drying, curling and/or cracking of the slab. Depending on proposed flooring material types, the structural engineer and/or the architect may choose to eliminate the vapor retarder.

Slab Isolation: Soil-supported slabs should be isolated from the foundations and foundation-supported elements of the structure so that differential movement between the foundations and slab will not induce excessive shear and bending stresses in the floor slab. Where the structural configuration prevents the use of a free-floating slab such as in a drop-down footing/monolithic

slab configuration, the slab should be designed with suitable reinforcement and load transfer devices to preclude overstressing of the slab.

If the above subgrade improvement recommendations are not applicable, additional borings and soil moisture profile and overburden testing during construction is required to check the moisture and swell potential for the subgrade.

4.4 FOUNDATIONS

Straight drilled shafts bearing in the gray shale are recommended to support foundation loads of the planned structure.

4.4.1 Straight Drilled Shafts – Axial Design Parameters

Axial design parameters for straight drilled shafts are presented in the following table:

Straight Drilled Shafts - Axial Design Parameters

Parameter	Recommendations
Acceptable Bearing stratum	Gray Shale
Net allowable end bearing capacity (psf)[1]	25,000
Allowable skin friction in compression (psf)[2]	3,500
Allowable skin friction in tension (psf)[2]	2,700
Reduction in skin friction due to two closely located shafts	No reduction is required for straight drilled shafts with center-to-center spacing of 2.5 times diameter of larger shaft. For closely spaced shafts, the design skin friction varies linearly from the full value at 2.5 times diameters to 50% of the design value at 1.0 times shaft diameter.
Groups of 3 or more shafts spaced closer than 2.5 times shaft diameter	Should be evaluated by ECS. Alternative installation sequences will be required to allow for a minimum of 48 hours of concrete curing time, prior to installation of adjacent shafts.
Soil induced uplift[3]	2,200 psf with no moisture conditioning of subgrade soils and 1200 psf for moisture conditioned soils acting over the shaft perimeter to a depth of 12 feet
Settlement[4]	Less than ½ inch.
Minimum shaft diameter	18 inches.
Notes:	

Parameter	Recommendations
	1. A minimum penetration of 5 feet or one shaft diameter, whichever is greater, into bearing stratum is required to develop the end bearing. The elevations of the top of bearing stratum at boring locations are provided in the table below. *2. The skin friction should be applied to that portion of the drilled shafts in direct contact with the bedrock below any temporary casing and below Highly weathered gray shale.* *3. The drilled shafts will be subject to uplift due to swelling of the expansive clays in contact with the drilled shafts. The drilled shafts must be designed with adequate embedment depth resist uplift forces and should be reinforced with sufficient, full-depth, vertical reinforcing steel to resist uplift forces.* *4. Settlement will primarily be within the elastic range with a portion of settlement occurring during construction.*

Please see the table below for the estimated depth of bearing stratum:

Building Boring No.	Boring Elevation (feet)	Bearing Stratum Elevation (feet)
BA-01	579.0	554.0
BA-02	579.0	554.0
BA-03	579.0	549.0
BA-04	578.0	553.0
BA-05	579.0	554.0
BA-06A	578.0	558.0
BA-07	578.0	553.0
BA-08	578.0	548.0
BA-09	577.0	552.0
BA-10	577.0	552.0
BA-11	577.0	557.0
BA-12	576.0	556.0
AJ-01A	578.0	543.0
AJ-02	576.0	556.0
AJ-03	577.0	552.0
AJ-04	577.0	552.0

4.4.2 Straight Drilled Shafts – Lateral Design Parameters

Drilled shafts may be subject to lateral loads. Lateral design parameters for straight drilled shafts in overburden soils are presented in the following table for use in LPILE 2016 computer program, developed by Ensoft, Inc.

LPILE Design Parameters for Soil

Soil Description	LPILE Material Type	Effective Unit Weight, (pcf)	Undrained Shear strength/Undrained Cohesive Strength, (psf)	Friction Angle, (degrees)	K Value (pcf)	E_{50}
Clay Soil (0' to 3')	Ignore	Ignore	Ignore	Ignore	Ignore	Ignore
Clay Soil (3' to 8' or bottom of moisture conditioned clays)	Soft Clay	120	750	-	-	0.01
Fat Clay (8' to top of gray shale)	Stiff Clay	125	2,250	-	-	0.007

LPILE Design Parameters for Rock

Soil Description	LPile Material Type	Unit Weight, (pcf)	Uniaxial Compressive Strength, (psi)	Elastic Modulus, E_r (psi)	RQD (%)	Krm
Gray Shale	Weak Rock (Reese)	130	175	35,000	70	0.0005

4.4.3 Straight Drilled Shafts – Construction Considerations

The drilled shafts should be installed in accordance with American Concrete Institute's "Standard Specification for the Construction of Drilled Piers" (ACI 336). Recommendations provided in this report are based on proper construction procedures including maintaining a dry shaft excavation. We recommend that all drilled shafts be observed by qualified geotechnical personnel, to verify proper shaft installation. Observations should include:

1. identification of the bearing stratum;
2. minimum penetration depth;
3. removal of all smear zones and cuttings;
4. correct handling of groundwater seepage;
5. shafts are within acceptable vertical tolerance; and
6. other related items

Groundwater was not observed in the borings but could be encountered during installation of the straight drilled shafts, particularly if construction proceeds during a wet period of the year. Rapid placement of steel and concrete will most probably permit shaft installation to proceed without casing. However, the seepage rates could be sufficient enough to require the use of temporary casing for proper installation of the shafts. If casing is used, it must be installed to a sufficient depth to ensure that an adequate seal is obtained. Typically, a casing penetration of 1 to 2 feet into the gray shale will provide a satisfactory seal.

After the satisfactory installation of the temporary casing, water and loose material should be removed prior to beginning the design penetration. The required penetration into the bearing material may be excavated through the casing. The design penetration should be measured from the top of gray shale (bearing stratum as indicated in ***Section 4.4.1***), or below the bottom of temporary casing, whichever is deeper. Reinforcing steel and concrete should be placed immediately after the excavation has been completed, cleaned and observed.

The concrete should have a slump between 5 and 7 inches and should be placed in a manner that prevents it from striking the reinforcing steel and sides of the excavation. Concrete placed in an excavation in excess of 10 feet should be placed in such a manner (using a tremie, centralizing chute, or by similar means) to prevent segregation of aggregates or to prevent concrete from striking the reinforcing steel. The concrete in the upper five feet of the shaft should be mechanically consolidated. Straight drilled shafts should be completed within 8 hours after design penetration into gray sandy shale has begun.

Care should be taken to avoid creating an oversized cap ("mushroom") near the ground surface. A "mushroom" at the top of the drilled shaft could be lifted by expansive soils. Pier caps extending outside the nominal pier diameter (if used) should be constructed over void forms to reduce the potential for additional uplift forces.

Gray shale is relatively hard. We recommend the drilling equipment be equipped with suitable rock drilling teeth and it should have sufficient torque and weight to drill through the rock strata. A contractor experienced with drilling hard bedrock should be retained for this project.

4.4.4 Grade Beams/ Pier Caps

All grade beams should be supported by the drilled shafts and formed with a nominal 12-inch void beneath the beam over subgrades if structural slab is used. If slab on grade is used the void space can be reduced to 9 inches. This void is provided to isolate the grade beams from the underlying active clays. Cardboard carton forms can be used to create this void. A soil retainer should be provided to help prevent “in fill” of this void.

Cardboard void forms must have sufficient strength to support the weight of the grade beam during construction. The excavation in which the void box lays must remain dry. Care must be exercised during construction to prevent collapse of these cartons. Backfill material must not be allowed to enter the void carton area below the grade beams, since this reduces the void space in which the underlying soils need to swell.

Soils placed along the exterior of the grade beams should be on-site clay soils placed and compacted to at least 92% of the Maximum Dry Density at a minimum of 5 percentage points above optimum moisture content as obtained using the Standard Proctor Method (ASTM D-698). The purpose of this clay backfill is to reduce the opportunity for surface or subsurface water infiltration beneath the structure.

4.4.5 Shallow Footings – Design Parameters

Shallow footing may be used for the elevator pits. The design parameters shallow footings are presented in the following table.

Shallow Footing Design Parameters

Parameter	Recommendation
Bearing stratum[1]	On site moisture conditioned soil
Net allowable bearing capacity- continuous footings[1]	2,000 psf
Net allowable bearing capacity- individual footings[1]	2,500 psf
Minimum embedment	2 feet below lowest adjacent final grade
Minimum dimension – continuous footings	18 inches
Minimum dimension – individual footings	36 inches
Ultimate passive pressure (triangular distribution)[2, 3]	260 psf/ ft
Ultimate coefficient of sliding[3]	0.40
Approximate total settlement	1 inch
Approximate differential settlement	½ to ¾ inches

Notes:

(1) *The net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. No footing should be founded within a 45 degree plane from* the base of the adjacent footing or excavation.

(2) The side of the excavation for footings must be nearly vertical and concrete should be placed against these vertical faces. The upper 1-foot of the passive earth pressure should be neglected. In addition, the passive pressure should be ignored if the material in front of the wall will be excavated at any time in the future.

(3) A minimum factor of safety of 1.5 is recommended against sliding.

4.5.6 Shallow Footings - Construction Considerations

Footing excavations should be protected from standing water or desiccation. The base of all foundation excavations should be free of water and loose soil and rock prior to placing concrete. Complete construction of a spread footing or a section of wall footing, including excavation, placement of steel and concrete, and backfilling should be completed in a reasonably continuous manner, preferably within 72 hours of excavation to reduce the disturbance to foundation bearing material. A seal slab of footing strength concrete should be provided at the bottom of any footing which will remain open for more than 72 hours or if rain events are expected before footings are constructed.

Backfilling of footings should be accomplished using excavated material for footings and as soon as possible to reduce disturbance of foundation soils. Backfill should meet the specifications for moisture conditioned clays provided in Section 5.3.1. moisture content and compacted to at least 95% of the Maximum Dry Density as obtained using the Standard Proctor Method (ASTM D-698). Construction of footings should be inspected by a qualified geotechnical engineer to verify the bearing materials and to perform related observations and testing.

4.5 FLOOR SLAB SYSTEMS

Potential vertical movement at the site is estimated to be about 3 to 6 inches. A structural (suspended) floor system in conjunction with drilled shafts is recommended, if the building cannot tolerate movements. If the floor slab is designed to tolerate movements of about 1 inch, it can be supported on grade provided the subgrade is prepared as discussed in Section ***4.3 Subgrade Improvements.*** In addition, flatwork adjacent to the building can be supported on a prepared subgrade.

4.5.1 Structural Floor Slab

Two methods are available for constructing a suspended floor slab system:

1. cardboard carton forms to create a void; and,
2. raising the floor slab above the underlying soils with a crawl space.

Cardboard carton forms should be at least 12 inches thick. If these forms are used, care must be taken to preserve their structural integrity and ability to create a consistent void. A rigid material layer (such as Masonite) should be placed directly on the forms to prevent puncture by personnel during placement of concrete. This rigid layer would also help reduce the potential for concrete to leak down between the cardboard forms.

If crawl space is utilized we recommend that the floor slab be suspended at least 18 inches above final subgrade elevations. If utility lines are suspended beneath the slab, the crawl space clearance should be increased to a minimum of 2 feet to provide access to these lines.

Future movements of soil supported utility lines must be considered when designing connections, especially where these lines approach or enter the stationary structure. In addition, isolating plumbing lines from the soil can be considered to eliminate plumbing line movements. Suspending the plumbing lines beneath the slab or the commercially available Super void Protection system or similar methods can be used to isolate plumbing lines from soil.

The subgrade beneath the crawl space must be graded to remove water from beneath the structure. If gravity drainage cannot adequately remove the water from beneath the structure, it may be necessary to direct the underfloor drainage ditches to a sump pump. Construction must also contain sufficient ventilation to limit corrosion of the metal components.

4.5.2 Slab on Grade

If movements of about one inch can be tolerated in the building, the floor slabs can be supported on a prepared subgrade. To reduce the movements to about one inch, we recommend preparing the building subgrade as discussed in Section ***4.3 Subgrade Improvements.***

We recommend that a modulus of subgrade reaction (ks) of 150 pci be used for the design of the slab-on-grade on reworked fill or flexible base. If a slab on grade is used, we recommend it be isolated from the foundations so differential movements of the structure will not induce shear stresses on the floor slab or pour strips may be considered. For maximum effectiveness, temperature and shrinkage reinforcements in slabs on ground should be positioned in the upper

third of the slab thickness. The Wire Reinforcement Institute recommends the mesh reinforcement be placed 2 inches below the slab surface or upper one-third of slab thickness, whichever is closer to the surface. Adequate construction joints, contraction joints and isolation joints should also be provided in the slab to reduce the impacts of cracking and shrinkage. Please refer to ACI 302.1R96 Guide for Concrete Floor and Slab Construction for additional information regarding concrete slab joint design.

If floor treatments that are sensitive to moisture will be used, a vapor retarder of polyethylene sheeting or similar material should be placed beneath the slab to minimize moisture migration through the slab. If a vapor retarder is considered to provide moisture protection, special attention should be given to the surface curing of the slabs to minimize uneven drying of the slabs and associated cracking and/or slab curling. Please refer to ACI 302.1R96 Guide for Concrete Floor and Slab Construction and ASTM E 1643 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs for additional guidance on this issue.

4.6 BUILDING PERIMETER CONDITIONS

Soils placed along the exterior of the building should be on-site clay soils placed and compacted in accordance with this report ***Section 5.3.1***. The purpose of this clay backfill is to reduce the opportunity for surface or subsurface water infiltration beneath the structure. Additionally, where penetrations into the structure occur, a clay plug (or suitable synthetic alternative) should be placed at the building line to reduce the opportunity for infiltrating water, regardless of the backfill material.

We recommend paving/sidewalks be placed adjacent to the structures (up to 10 feet in width around the entire building) to reduce seasonal drying of the moisture conditioned soils near the perimeter of the structures. Additionally, Irrigation of lawn and landscaped areas should be moderate, with no excessive wetting or drying of soils around the perimeter of the structures allowed. Positive drainage away from the structures should also be provided. Trees and bushes/shrubs planted near the perimeter of the structures can withdraw large amounts of water from the soils and should be planted at least their anticipated mature height away from the buildings.

Routine maintenance is required to ensure that the recommendations contained in this report are followed and maintained. Greater potential movements could occur with extreme wetting or drying of the soils due to poor drainage, ponding of water, plumbing leaks, lack of irrigation, and/or lack of routine maintenance, etc.

4.7 SEISMIC DESIGN CONSIDERATIONS

Seismic Site Classification: The International Building Code (IBC) 2015 requires site classification for seismic design based on the upper 100 feet of a soil profile. The methods are utilized in classifying sites, namely the shear wave velocity (v_s) method; the undrained shear strength (s_u) method; and the Standard Penetration Resistance (N-value) method. The undrained shear strength (s_u) method was used in classifying this site.

The seismic site class definitions for the weighted average of shear wave velocity, SPT N-value or unconfined compressive strength (s_u) in the upper 100 feet of the soil profile are shown in the following table:

Seismic Site Classification

Site Class	Soil Profile Name	Shear Wave Velocity, Vs, (ft./s)	N value (bpf)
A	Hard Rock	Vs > 5,000 fps	N/A
B	Rock	2,500 < Vs ≤ 5,000 fps	N/A
C	Very dense soil and soft rock	1,200 < Vs ≤ 2,500 fps	>50
D	Stiff Soil Profile	600 ≤ Vs ≤ 1,200 fps	15 to 60
E	Soft Soil Profile	Vs < 600 fps	<15

Based upon our interpretation of the subsurface conditions, the appropriate Seismic Site Classification is "C" as shown in the preceding table.

Ground Motion Parameters: In addition to the seismic site classification, ECS has determined the design spectral response acceleration parameters following the IBC methodology. The Mapped Reponses were estimated from the USGS website https://earthquake.usgs.gov/ws/designmaps/. The design responses for the short (0.2 sec, S_{DS}) and 1-second period (S_{D1}) are noted in bold at the far right end of the following table.

GROUND MOTION PARAMETERS [IBC 2015 Method]								
Period (sec)	**Mapped Spectral Response Accelerations (g)**		**Values of Site Coefficient for Site Class**		**Maximum Spectral Response Acceleration Adjusted for Site Class (g)**		**Design Spectral Response Acceleration (g)**	
Reference	Figures 1613.3.1 (1) & (2)		Tables 1613.3.3 (1) & (2)		Eqs. 16-37 & 16-38		Eqs. 16-39 & 16-40	
0.2	S_S	0.097	F_a	1.2	$S_{MS}=F_aS_s$	0.116	$S_{DS}=2/3\ S_{MS}$	0.077
1.0	S_1	0.052	F_v	1.7	$S_{M1}=F_vS_1$	0.088	$S_{D1}=2/3\ S_{M1}$	0.058

The Site Class definition should not be confused with the Seismic Design Category designation which the Structural Engineer typically assesses. If a higher site classification is beneficial to the project, we can provide additional testing methods that may yield more favorable results.

4.8 PAVEMENT SECTIONS

Based on the results of our subsurface exploration procedures (including coring), we have prepared a summary of the existing pavement sections. The findings are summarized in the following table:

Existing Pavement Section

Boring No.	PCC (inches)	Fill (inches)	Fill Material	Subgrade Material
BA-01	29.5	30.5	Clay, light brown	Fat Clay (CH)

Boring No.	PCC (inches)	Fill (inches)	Fill Material	Subgrade Material
BA-02	29.5	30.5	Clay, light brown	Fat Clay (CH)
BA-03	27	21	Clay, light brown	Fat Clay (CH)
BA-04	26	46	Clay, light brown	Fat Clay (CH)
BA-05	24.5	47.5	Clay, light brown	Fat Clay (CH)
BA-06A	28.5	19.5	Clay, light brown	Fat Clay (CH)
BA-07	27	21	Clay, light brown	Fat Clay (CH)
BA-08	31	29	Clay, light brown	Fat Clay (CH)
BA-09	26	32	Clay, light brown	Fat Clay (CH)
BA-10	26	34	Clay, light brown	Fat Clay (CH)
BA-11	31	17	Clay, light brown	Fat Clay (CH)
BA-12	24	36	Clay, light brown	Fat Clay (CH)
AJ-01A	39	22	Clay, light brown	Fat Clay (CH)
AJ-02	27	21	Clay, light brown	Fat Clay (CH)
AJ-03	26	22	Clay, light brown	Fat Clay (CH)
AJ-04	30.5	17.5	Clay, light brown	Fat Clay (CH)
AA-01	28	20	Clay, light brown	Fat Clay (CH)
AA-02	27	21	Clay, light brown	Fat Clay (CH)
AA-03	28.5	19.5	Clay, light brown	Fat Clay (CH)
AA-04	29	19	Clay, light brown	Fat Clay (CH)
AA-05	26	22	Clay, light brown	Fat Clay (CH)
AA-06	33	27	Clay, light brown	Fat Clay (CH)
AA-7A	10	26	Clay, light brown	Fat Clay (CH)

Boring No.	PCC (inches)	Fill (inches)	Fill Material	Subgrade Material
AA-08	28	20	Clay, light brown	Fat Clay (CH)
AA-09	27	21	Clay, light brown	Fat Clay (CH)
AA-10A	26	22	Clay, light brown	Fat Clay (CH)
AA-11	25	23	Clay, light brown	Fat Clay (CH)

Note: PCC – Portland Cement Concrete;

4.9 SOIL CORROSIVITY

Corrosion of metals is an electrochemical process involving oxidation (anodic) and reduction (cathodic) reactions on metal surfaces. For metals in soil or water, corrosion is typically a result of contact with soluble salts found in the soil or water. This process requires moisture to form solutions of the soluble salts. Factors that influence the rate and amount of corrosion include the amount of moisture, the conductivity of the solution (soil and/or water), the hydrogen activity of the solution (pH), and the oxygen concentration (aeration). Other factors such as soil organic content, soil porosity, and texture indirectly effect corrosion of metals in soil by affecting the other factors listed above.

Characterizing the corrosivity of an environment is complicated due to the interaction of the variables described above. For example, a metal buried in an aerated or disturbed soil with a particular resistivity and soluble chloride concentration generally will not experience the same amount of corrosion as a similar metal placed in the same soil in a compacted, less aerated state.

The presence of high acidity, pH of 5.5 or less, in soil or water is also considered a corrosive condition. Soil or water with a pH of 5.5 or less can react with the lime in concrete to form soluble reaction products that can easily leach out of the concrete. The result is a more porous, weaker concrete. Acidic conditions often cause discoloration of the concrete surface. A yellowish or rusted color distributed over the concrete surface should be investigated. Selected sample was tested for soil pH. Soil pH value of 8.4 was measured. Based on this result, the site soils are not considered corrosive to concrete.

For steel piping or structures, the following table can be considered as a guide to assessing corrosion severity of soils in contact with the pipe outside surface; however, the above discussion regarding multiple corrosion factors is recommended to be reviewed and considered.

Soil Resistivity and Corrosion Potential for Steel

RESISTANCE CLASSIFICATION IN UNCOATED STEEL	SOIL RESISTIVITY, OHM-CM	CORROSION POTENTIAL
Low	0 – 2000	Severe
Medium	2000 – 10000	Moderate

RESISTANCE CLASSIFICATION IN UNCOATED STEEL	SOIL RESISTIVITY, OHM-CM	CORROSION POTENTIAL
High	10000 – 30000	Mild
Very High	>30000	None

Selected samples were tested for soil resistivity. Soil resistivity value of 1,075 ohm-cm was measured.

The above results provide information on the specific soils sampled and tested. Other soil at the site, and imported materials, may be different. Providing a detailed assessment of the corrosion potential of the site soil is not within our scope of work. A qualified corrosion specialist should be contacted if a detailed evaluation is required.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 SUBGRADE PREPARATION

In a dry and undisturbed state, the soil at the site will provide good subgrade support for fill placement and construction operations. However, the soils at the site contain fines which are considered moderately erodible, moisture and disturbance sensitive when wet and degrade quickly with disturbance from contractor operations. Therefore, good site drainage should be maintained during earthwork operations in order to keep the surface water away from the project area during the construction phase. We recommend that an attempt be made to enhance the natural drainage without interrupting its pattern. The erosion and sedimentation shall be controlled in accordance with sound engineering practice and current jurisdictional requirements.

5.1.1 Stripping and Grubbing

The subgrade preparation should consist of stripping vegetation, rootmat, topsoil, existing pavements, and soft or yielding materials from the 5-foot expanded pavement limits. In grassy areas of the site may have about 6 inches of topsoil. Deeper topsoil or organic laden soils may be present in flower beds and other landscaping areas. The root balls in large trees may extend deep and will require additional localized stripping depth to completely remove the organics.

ECS should be retained to verify that topsoil and yielding surficial materials have been removed prior to the placement of new fill or construction of pavements.

5.1.2 Proofrolling

Prior to fill placement or other construction on subgrades, the subgrades should be evaluated by an ECS field technician. The exposed subgrade should be proofrolled with construction equipment having a minimum axle load of 10 tons [e.g. fully loaded tandem-axle dump truck]. Proofrolling should be traversed in two perpendicular directions with overlapping passes of the vehicle under the observation of an ECS technician. This procedure is intended to assist in identifying any localized yielding materials.

Where proofrolling identifies areas that are unstable or “pumping” subgrade those areas should be repaired prior to the placement of subsequent fill or other construction materials. Methods of stabilization include undercutting, moisture conditioning, or chemical stabilization. The situation should be discussed with ECS to determine the appropriate procedure. Test pits may be excavated to explore the shallow subsurface materials to help in identifying the cause of the observed unstable materials, and to assist in the evaluation of appropriate actions to prepare the subgrade.

5.2 EARTHWORK OPERATIONS

Prior to placement of any new general fill, all subgrades should be scarified to a depth of 6 inches, compacted to at least 95% of Maximum Dry Density as obtained by the Standard Proctor Method (ASTM D-698) and moisture conditioned above the optimum value. Fills should be benched into the existing soils.

Onsite soils can be used as fill materials. Imported soil used for general fill should not have a Plasticity Index (PI) of greater than the material encountered onsite. General fill material, outside of the building subgrade improvements, should be placed at or above optimum moisture content and compacted to at least 95% of the Maximum Dry Density as obtained by the Standard Proctor Method (ASTM D-698). Fill soils should be placed in 8 inch loose lifts for mass grading operations and 4 inch lifts for trench type excavations where walk behind or "jumping jack" compaction equipment is used.

Upon completion of the filling operations, care should be taken to maintain the soil moisture content prior to construction of floor slabs and pavements. Soil moisture levels can be preserved by various methods that can include covering with plastic, watering, etc. If the soil becomes desiccated, the affected material should be removed and replaced, or these materials should be scarified, moisture conditioned and recompacted.

Utility cuts should not be left open for extended periods of time and should be properly backfilled. Backfilling should be accomplished with properly compacted on-site soils, rather than granular materials. The clay plug detail provided in Appendix D is an acceptable method for the utility trench cut-off.

Field density and moisture tests should be performed on each lift as necessary to verify that adequate compaction is achieved. As a guide, one test per 2,500 square feet per lift is recommended in the building and paving areas (two tests minimum per lift). Utility trench backfill should be tested at a rate of one test per lift per each 150 linear feet of trench (two tests minimum per lift). Certain jurisdictional requirements may require testing in addition to that noted previously. Therefore, these specifications should be reviewed and the more stringent specifications should be followed.

5.3 MATERIAL SPECIFICATIONS

Material specifications recommended for this project are provided below.

5.3.1 Moisture Conditioning Clay Fill

Moisture conditioning may be performed within the building and flatwork areas sensitive to movements. Moisture conditioning of the existing clays, and all new clayey fill is performed to increase the moisture of the clays to a level that reduces their ability to absorb additional water that could result in post-construction heave in these soils.

The moisture conditioning should consist of undercutting the existing soils to the depths recommended in ***Section 4.3 Subgrade Improvements***, scarifying the exposed subgrade, and reworking of excavated soils, as required to achieve the required subgrade improvement. During this process, the clay should receive adequate amounts of water to ensure uniform moisture content of at least 5 percentages or higher above the optimum moisture content. During the addition of water, the soils should be adequately mixed, and re-mixed, to ensure a uniform distribution of the moisture throughout the soil mass. Once appropriately mixed, the material should be compacted to at least 92% of the Maximum Dry Density as obtained using the Standard Proctor Method (ASTM D-698).

Outside of the moisture conditioned zone and where clay is used to establish site grades, we recommend that the clay material be placed and compacted to at least 95% of the Maximum Dry Density at or above the optimum moisture content as obtained using the Standard Proctor Method (ASTM D-698). These soils should be free of deleterious materials and be reworked to ensure a uniform distribution of water in order to achieve a uniform moisture content above the optimum moisture content.

Care should be taken to verify and preserve the specified moisture levels in the reworked clays prior to placement of floor slabs and pavements.

5.3.2 Water or Chemical Pressure Injection

The onsite soils may should be injected to a depths presented in the Table "Subgrade Improvements" in Section 4.3 or as determined by the onsite soil sample evaluation described in Section 4.2. followed by the placement of the required non-expansive fill depth. Provided that the specifications attached with this report are followed, the soil should be injected with sufficient number injection passes to meet the following criteria:

- The average vertical swell, as determined by free absorption swell testing, under final overburden pressures, should be no more than 0.75% for each boring and no one test is above 1.5% (testing every 2.5 feet or 3 tests per boring, whichever provides greater testing).

Initial penetration with injection rods can be difficult in over consolidated clays as encountered on this site and especially if they are injected in a dry condition. There is no possible way to predict the actual required number of injection passes to meet the requirements noted above and multiple injections should be anticipated. For budgetary purposes, the time and cost for multiple injection passes should be included in the budget and schedule.

We have included with this report, a set of General Specifications for this process. Compliance with these specifications is essential to achieving maximum benefits from the injection(s). Multiple injections are typically required to obtain the desired moisture levels, and the time and expense for these injections will need to be included in the project schedule and budget. Very stiff to hard clays will be encountered. These clays can be difficult to penetrate, and may require heavy-duty injection equipment and/or a reduction in injection rod spacing to achieve the recommended injection depth. In some cases the desired moisture levels and/or injection depths cannot be achieved.

5.3.3 Select Fill

For the purposes of this report, Select Fill may consist of imported material that is free of debris and organic matter and have a Plasticity Index (PI) of 5 to 15, and contain 40 to 70 percent passing the No. 200 sieve.

This material should be placed and compacted at workable moisture contents above the optimum moisture content and compacted to at least 95% of the Maximum Dry Density as obtain using the Standard Proctor Method (ASTM D-698).

5.3.4 Flexible Base

Flexible base should meet the requirements of TxDOT Item 247, Type D, Grade 1 or 2. Recycled concrete meeting the gradation requirements of flexible base is also acceptable for use. The flexible base and recycled concrete should be compacted to 95% of maximum dry density at or above the optimum moisture content as obtained using the Standard Proctor Method (ASTM D-698).

5.4 FOUNDATION AND SLAB OBSERVATIONS

Protection of Foundation Excavations: Exposure to the environment may weaken the soils in foundations if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed immediately after the excavation has been completed, cleaned, and observed. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation immediately prior to placement of concrete.

5.5 UTILITY INSTALLATIONS

Utility Subgrades: The soils encountered in our exploration are expected to be generally acceptable for support of utility pipes. The pipe subgrades should be observed and probed for stability by ECS. Any loose or yielding materials encountered should be removed and replaced with acceptable material.

Utility Backfilling: The granular bedding material (often AASHTO #57 stone) should be at least 4 inches thick, but not less than that specified by the civil engineer's project drawings and specifications. We recommend that the bedding materials be placed up to the springline of the pipe. Fill placed for support of the utilities, as well as backfill over the utilities, should satisfy the project requirements.

Excavation Safety: All excavations and slopes should be constructed and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing, constructing, and maintaining stable temporary excavations and slopes. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

6.0 CLOSING

ECS has prepared this report of findings, evaluations, and recommendations to guide geotechnical-related design and construction aspects of the project.

The description of the proposed project is based on information provided to ECS by the client. If any of this information is inaccurate, either due to our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted immediately in order that we can review the report in light of the changes and provide additional or alternate recommendations as may be required to reflect the proposed construction.

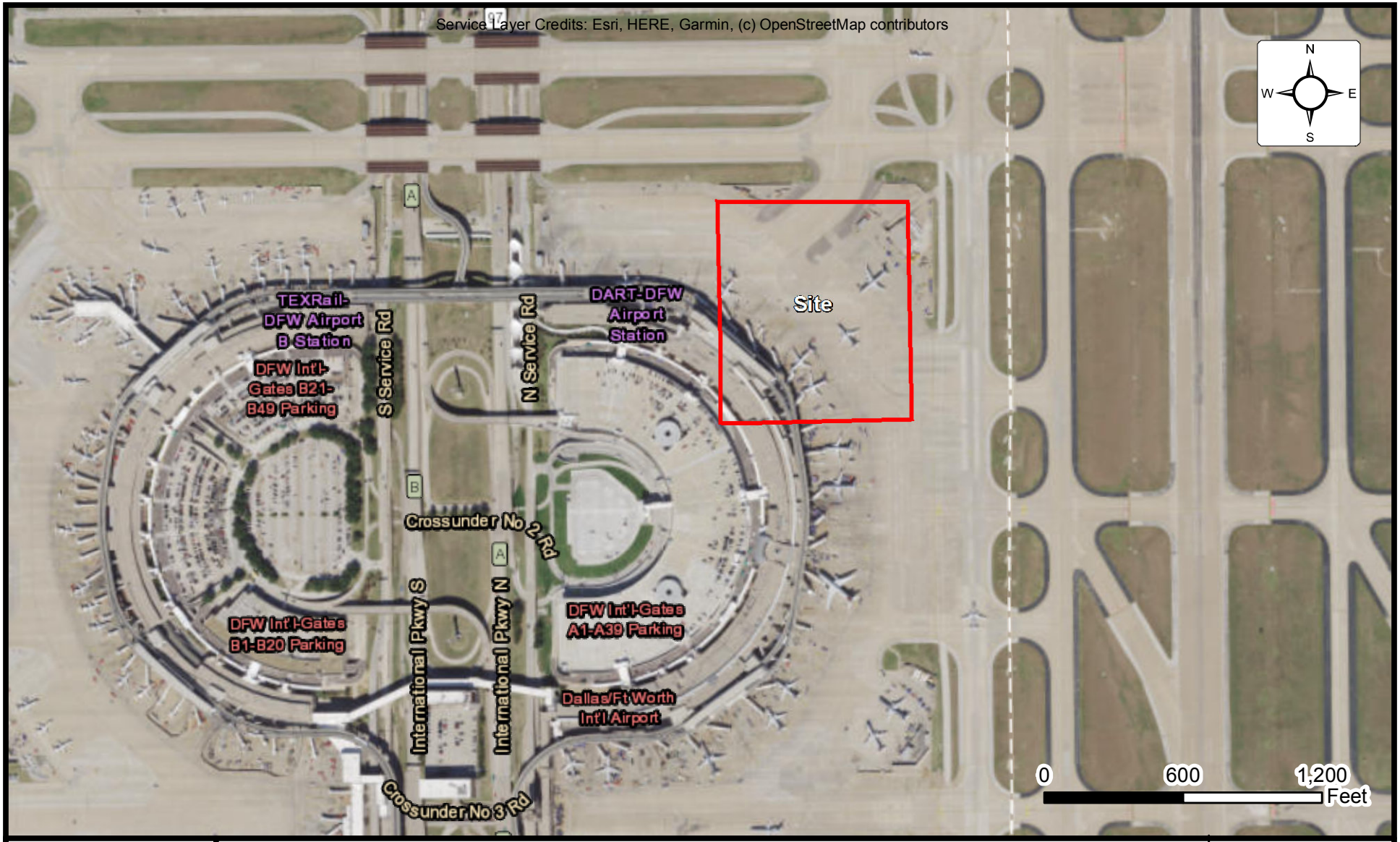
We recommend that ECS be allowed to review the project's plans and specifications pertaining to our work so that we may ascertain consistency of those plans/specifications with the intent of the geotechnical report.

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be allowed to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise. ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings and tests performed at the locations as indicated on the Boring Location Diagram and other information referenced in this report. This report does not reflect any variations, which may occur between the borings. In the performance of the subsurface exploration, specific information is obtained at specific locations at specific times. However, it is a well-known fact that variations in subsurface conditions exist on most sites between boring locations and also such situations as groundwater levels vary from time to time. The nature and extent of variations may not become evident until the course of construction. If variations then appear evident, after performing on-site observations during the construction period and noting characteristics and variations, a reevaluation of the recommendations for this report will be necessary.

APPENDIX A – Drawings & Reports

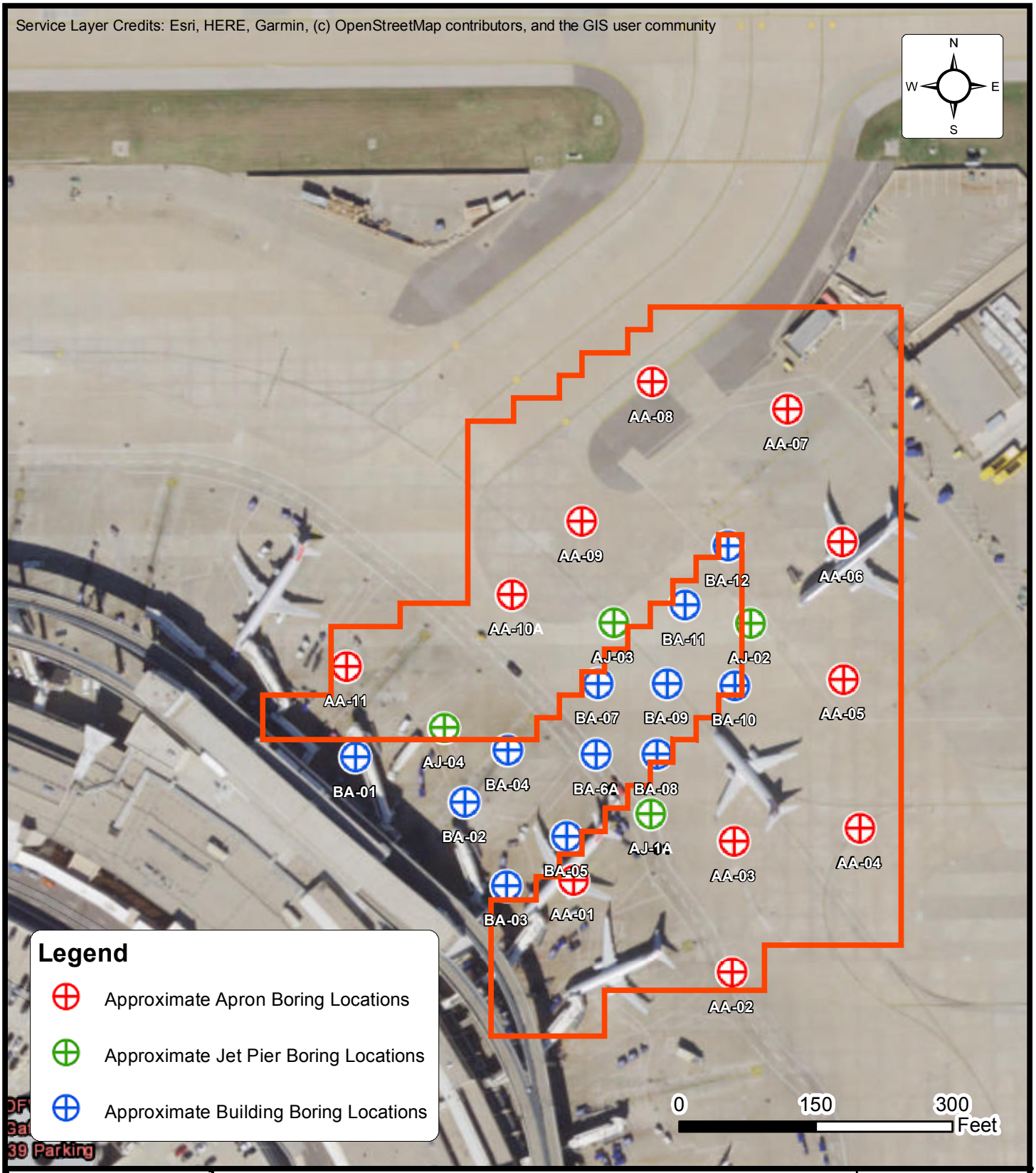
Site Location Diagram
Boring Location Diagram
Regional Geology



SITE LOCATION DIAGRAM
DFW TERMINAL A EXPANSION

2400 AVIATION DRIVE, DFW AIRPORT, TEXAS
AUSTIN COMMERCIAL

ENGINEER	SN
SCALE	AS NOTED
PROJECT NO.	63:1603
SHEET	1 OF 1
DATE	1/27/2022



BORING LOCATION DIAGRAM
DFW TERMINAL A EXPANSION

2400 AVIATION DRIVE, DFW AIRPORT, TEXAS

AUSTIN COMMERCIAL

ENGINEER	SN
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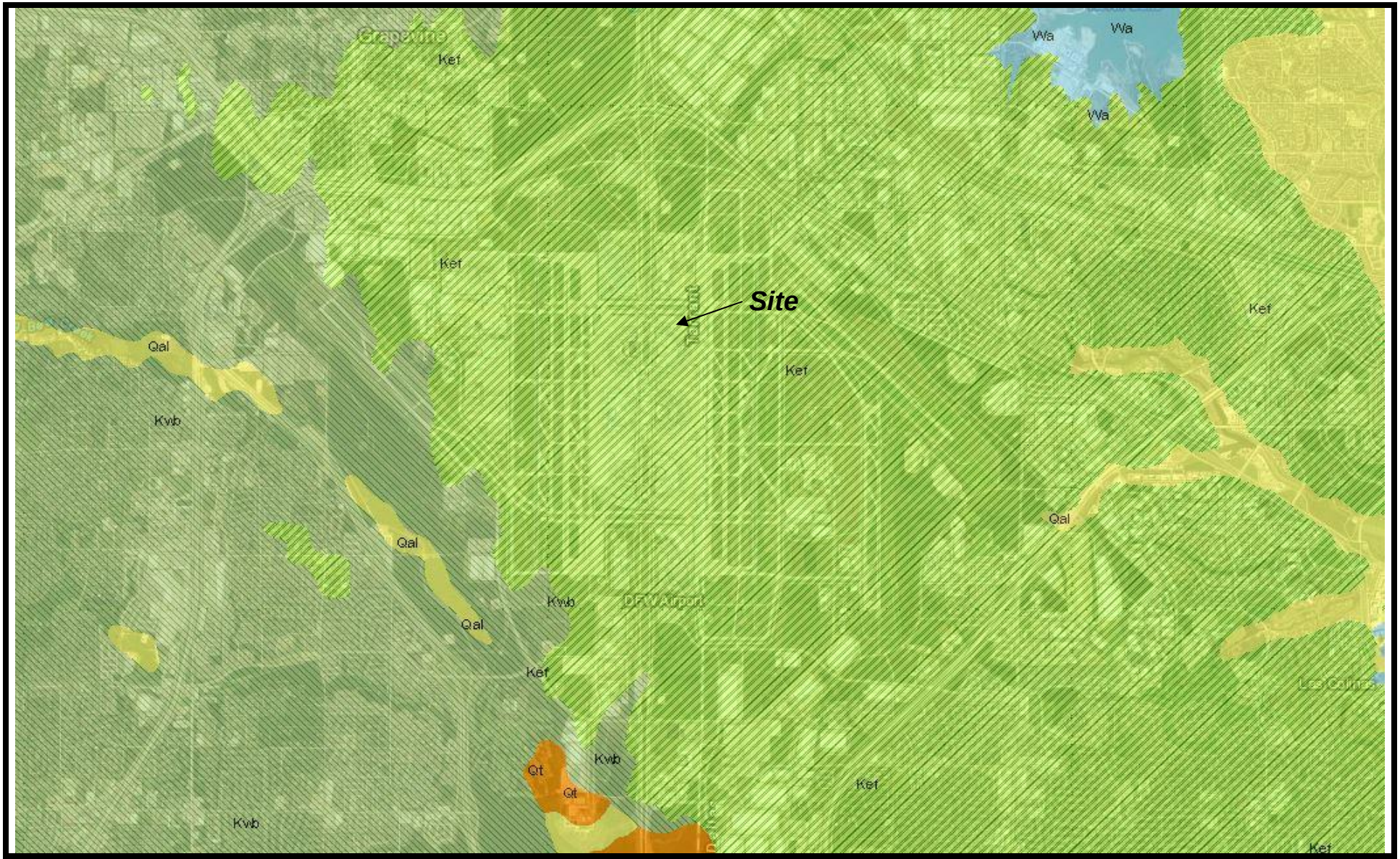
PROJECT NO.	63:1603
SHEET	1 OF 1
DATE	3/25/2022



REGIONAL GEOLOGY
DFW TERMINAL A EXPANSION

EAGLE FORD (Kef) and Woodbine (Kwb)

2400 AVAITION DRIVE, DFW AIRPORT, TEXAS
AUSTIN COMMERCIAL

ENGINEER	SN
SCALE	
PROJECT NO.	63:1603
SHEET	1 OF 1
DATE	01/27/2022

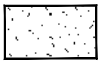
APPENDIX B – Field Operations

Reference Notes for Boring Logs
Subsurface Exploration Procedure
Boring Logs BA-01 to BA-05, BA-6A, BA-07 to BA-12, AJ-1A, AJ-02 to AJ-04 and AA-01 to AA-09, AA-10A, AA-11

REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]


ASPHALT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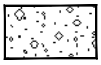
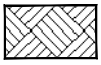
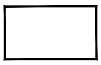
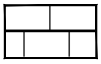

GRAVEL

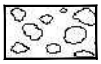

TOPSOIL

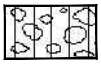

VOID


BRICK

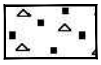

AGGREGATE BASE COURSE

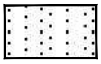

GW **WELL-GRADED GRAVEL**
gravel-sand mixtures, little or no fines

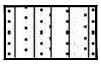

GP **POORLY-GRADED GRAVEL**
gravel-sand mixtures, little or no fines


GM **SILTY GRAVEL**
gravel-sand-silt mixtures

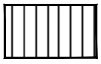

GC **CLAYEY GRAVEL**
gravel-sand-clay mixtures

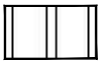

SW **WELL-GRADED SAND**
gravelly sand, little or no fines


SP **POORLY-GRADED SAND**
gravelly sand, little or no fines


SM **SILTY SAND**
sand-silt mixtures

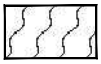

SC **CLAYEY SAND**
sand-clay mixtures

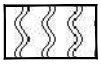

ML **SILT**
non-plastic to medium plasticity

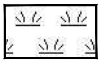

MH **ELASTIC SILT**
high plasticity


CL **LEAN CLAY**
low to medium plasticity


CH **FAT CLAY**
high plasticity


OL **ORGANIC SILT or CLAY**
non-plastic to low plasticity


OH **ORGANIC SILT or CLAY**
high plasticity


PT **PEAT**
highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, Q_P[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	2 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective *(ex: "Silty")*	25 - 45	30 - 45

WATER LEVELS[6]

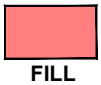

WL (First Encountered)


WL (Completion)


WL (Seasonal High Water)


WL (Stabilized)

FILL AND ROCK


FILL


POSSIBLE FILL


PROBABLE FILL


ROCK

[1]Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

[2]To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

[3]Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

[4]Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5]Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

[6]The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

[7]Minor deviation from ASTM D 2488-17 Note 14.

[8]Percentages are estimated to the nearest 5% per ASTM D 2488-17.

SUBSURFACE EXPLORATION PROCEDURE

The field exploration was planned with the objective of characterizing the project site in general geotechnical and geological terms and to evaluate subsequent field and laboratory data to assist in the determination of geotechnical recommendations.

The subsurface conditions were explored by twenty-seven borings drilled to depths of about 10 to 60 feet below the existing site grades. A truck-mounted drill rig with continuous flight augers was utilized to drill the borings.

The boring locations were determined by and identified in the field by ECS personnel using the supplied diagram. The approximate as-drilled boring locations are shown on the Boring Location Diagram in Appendix A. The ground surface elevations noted in this report were obtained from NCTCOG (www.dfwmaps.com), which provided elevation contours in 2-foot intervals.

Representative soil samples were obtained by means of the split-barrel and Shelby tube sampling procedures in accordance with ASTM Specifications D-1586 and D-1587, respectively. In the split-barrel sampling procedure, a 2-inch O.D., and split-barrel sampler is driven into the soil a distance of 18 inches by means of a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler through a 12-inch interval is termed the Standard Penetration Test (SPT) value and is indicated for each sample on the boring logs. In the Shelby tube sampling procedure, a thin walled, steel seamless tube with sharp cutting edges is pushed hydraulically into the soil, and a relatively undisturbed sample is obtained.

Texas Cone Penetrometer tests were performed to evaluate the load carrying capacity of the gray shale encountered. These tests were performed in general accordance with test method Tex-132-E in the Texas Department of Transportation (TxDOT) Manual of Testing Procedures. The results of these tests are shown on the attached boring logs at the depths of occurrence.

Field logs of the soils encountered in the borings were maintained by the drill crew. After recovery, each geotechnical soil sample was removed from the sampler and visually classified. Representative portions of each soil sample were then wrapped in plastic and transported to our laboratory for further visual examination and laboratory testing. After completion of the drilling operations, the boreholes were backfilled with auger cuttings to the existing ground surface and pavements were patched with concrete.

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-01**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974339.7	**2572286.4**		**579.0**

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
					CONCRETE (29.5 inches)			
	S-1	ST	18	18	FILL, CLAY, gray, light gray, stiff to very stiff, with gravel (30.5 inches)			1.50
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, brown, very stiff to hard, with calcareous nodules		574	3.50
	S-3	ST	24	24				4.50
	S-4	ST	24	24				3.75
10	S-5	ST	24	24	(CH) FAT CLAY, light brown, brown, very stiff to hard, shaley		569	4.50
	S-6	ST	24	24				4.50
15							564	
	S-7	ST	24	24				2.75
20					SHALE, highly weathered, gray		559	
25					SHALE, gray		554	100/ 1.00"
30							549	100/ 1.50"

CONTINUED ON NEXT PAGE

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **Dry**	BORING STARTED: **Mar 09 2022**	CAVE IN DEPTH:	
WL (Completion) **Dry**	BORING COMPLETED: **Mar 09 2022**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-01**	**2 of 2**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974339.7	**2572286.4**		**579.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
35					SHALE, gray		544	100/ 3.00"
40							539	100/ 1.50"
45							534	100/ 8.50"
50							529	100/ 1.75"
55							524	100/ 6.00"
60					**END OF BORING AT 60.0 FT**		519	100/ 1.00"

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered)	**Dry**	BORING STARTED: **Mar 09 2022**		CAVE IN DEPTH:
WL (Completion)	**Dry**	BORING COMPLETED: **Mar 09 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-02**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974289.9	**2572405.8**		**579.0**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
					CONCRETE (29.5 inches)			
	S-1	ST	19	19	FILL, CLAY, light brown, brown, very stiff to hard (30.5 inches)			
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, brown, hard		574	
	S-3	ST	24	24				
	S-4	ST	24	24				
10	S-5	ST	24	24			569	
	S-6	ST	24	24				
15					(CH) FAT CLAY, brown, dark brown, hard, shaley		564	
	S-7	ST	24	24				
20					SHALE, highly weathered, gray		559	
25					SHALE, gray		554	
30							549	

Plastic Limit Water Content Liquid Limit
X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD —— REC

○ CALIBRATED PENETROMETER TON/SF

☒ TEXAS CONE PENETRATION BLOWS/FT

○ 4.50
○ 3.50
○ 4.00
○ 4.50
○ 4.50
○ 4.50
○ 4.00
☒ 100/ 1.50"
☒ 100/ 2.50"

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **Dry**	BORING STARTED: **Mar 03 2022**		CAVE IN DEPTH:
▼ WL (Completion) **Dry**	BORING COMPLETED: **Mar 03 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-02**	**2 of 2**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974289.9	**2572405.8**		**579.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
35					SHALE, gray		544	100/ 3.00"
40							539	100/ 3.25"
45							534	100/ 1.25"
50							529	100/ 2.75"
55							524	100/ 1.00"
60					**END OF BORING AT 60.0 FT**		519	100/ 0.50"

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered)	**Dry**	BORING STARTED: **Mar 03 2022**		CAVE IN DEPTH:
WL (Completion)	**Dry**	BORING COMPLETED: **Mar 03 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-03**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974199.1	**2572453.2**		**579.0**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)	Plastic Limit / Water Content / Liquid Limit; STANDARD PENETRATION BLOWS/FT; ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC); CALIBRATED PENETROMETER TON/SF; TEXAS CONE PENETRATION BLOWS/FT
					CONCRETE (27 inches)				
	S-1	ST	21	21	FILL, CLAY, light brown, light gray, hard, with gravel pieces (21 inches)				4.50
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, brown, hard		574		4.50
	S-3	ST	24	24					4.50
	S-4	ST	24	24					4.50
10	S-5	ST	24	24	(CH) FAT CLAY, brown, dark brown, very stiff to hard, shaley, with calcareous nodules		569		4.50
	S-6	ST	24	24					3.75
15							564		
	S-7	ST	24	24					4.50
20					SHALE, highly weathered, dark gray		559		
	S-8	ST	24	24					4.50
25							554		
30					SHALE, gray		549		100/ 3.00"

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **DRY**	BORING STARTED: **Feb 28 2022**		CAVE IN DEPTH:
WL (Completion) **DRY**	BORING COMPLETED: **Feb 28 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MH4**	DRILLING METHOD: **CFA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-03**	**2 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974199.1	**2572453.2**		**579.0**

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
35					SHALE, gray		544	100/ 2.25"
40							539	100/ 2.25"
45							534	100/ 1.25"
50							529	100/ 2.00"
55							524	100/ 2.00"
60					**END OF BORING AT 60.0 FT**		519	100/ 1.75"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered)	**DRY**	BORING STARTED: **Feb 28 2022**	CAVE IN DEPTH:	
WL (Completion)	**DRY**	BORING COMPLETED: **Feb 28 2022**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MH4**	DRILLING METHOD: **CFA**
WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-04**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974346.1	**2572452.7**		**578.0**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
					CONCRETE (26 inches)			
	S-1	ST	22	24	FILL, CLAY, light brown, brown, hard (46 inches)			4.50
5	S-2	ST	24	24			573	4.50
	S-3	ST	24	24	(CH) FAT CLAY, light brown, brown, hard			4.00
	S-4	ST	24	24				4.00
10	S-5	ST	24	24			568	4.00
	S-6	ST	24	24				4.50
15					(CH) FAT CLAY, dark brown, brown, hard, shaley		563	
	S-7	ST	24	24				4.00
20					SHALE, highly weathered, dark gray		558	
25					SHALE, gray		553	100/ 1.25"
30							548	100/ 3.00"

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

CONTINUED ON NEXT PAGE

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **Dry**	BORING STARTED: **Mar 07 2022**		CAVE IN DEPTH:
WL (Completion) **Dry**	BORING COMPLETED: **Mar 07 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-04**	**2 of 2**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974346.1	**2572452.7**		**578.0**

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)	
35					SHALE, gray		543		100/ 3.00"
40							538		100/ 3.00"
45							533		100/ 1.00"
50							528		100/ 1.25"
55							523		100/ 1.00"
60					**END OF BORING AT 60.0 FT**		518		100/ 1.50"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered)	**Dry**	BORING STARTED: **Mar 07 2022**	CAVE IN DEPTH:	
WL (Completion)	**Dry**	BORING COMPLETED: **Mar 07 2022**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-05**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974253.0	**2572517.7**		**579.0**

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
					CONCRETE (24.5 inches)			
	S-1	ST	24	24	FILL, CLAY, light brown, brown, very stiff (47.5 inches)			
5	S-2	SS	18	18			574	3-3-4 (7)
	S-3	ST	24	24	(CH) FAT CLAY, light brown, light gray, stiff to hard			
	S-4	ST	24	24				
10	S-5	ST	24	24			569	
	S-6	ST	24	24				
15					(CH) FAT CLAY, brown, light brown, very stiff, shaley	▽	564	
	S-7	ST	24	24				
20					SHALE, highly weathered, gray		559	
25					SHALE, gray		554	
30							549	

3.25 (S-1) 7 (S-2) 4.25 (S-3) 2.25 (S-4) 1.75 (S-5) 1.75 (S-6) 3.50 (S-7) 100/1.00" 100/1.25"

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**18.00**	BORING STARTED: **Feb 20 2022**		CAVE IN DEPTH:
▼ WL (Completion)	**Dry**	BORING COMPLETED: **Feb 20 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-05**	**2 of 2**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974253.0	**2572517.7**		**579.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
35					SHALE, gray		544	100/ 2.00"
40							539	100/ 2.00"
45							534	100/ 1.00"
50							529	100/ 1.75"
55							524	100/ 1.00"
60					**END OF BORING AT 60.0 FT**		519	100/ 1.00"

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered)	**18.00**	BORING STARTED: **Feb 20 2022**		CAVE IN DEPTH:
WL (Completion)	**Dry**	BORING COMPLETED: **Feb 20 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-6A**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974341.7	**2572550.6**		**578.0**

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
					CONCRETE (28.5 inches)			
	S-1	ST	19	24	FILL, CLAY, light brown, dark brown, very stiff (19.5 inches)			3.50
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, light gray, hard, shaley		573	3.50
	S-3	ST	24	24				4.50
	S-4	ST	24	24				4.50
10	S-5	ST	24	24			568	4.50
	S-6	ST	24	24				4.50
15					SHALE, highly weathered, gray		563	
20					SHALE, Gray		558	100/ 2.00"
25							553	100/ 1.00"
30							548	100/ 1.00"

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **Dry**	BORING STARTED: **Feb 09 2022**		CAVE IN DEPTH:
WL (Completion) **Dry**	BORING COMPLETED: **Feb 09 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-6A**	**2 of 2**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974341.7	**2572550.6**		**578.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
35					SHALE, Gray		543	100/ 6.00"
40							538	100/ 1.25"
45							533	100/ 1.25"
50							528	100/ 6.50"
55							523	100/ 2.50"
60					**END OF BORING AT 60.0 FT**		518	100/ 1.25"

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **Dry**	BORING STARTED: **Feb 09 2022**	CAVE IN DEPTH:	
WL (Completion) **Dry**	BORING COMPLETED: **Feb 09 2022**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-07**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974421.3	**2572552.3**		**578.0**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
					CONCRETE (27 inches)			
	S-1	ST	21	21	FILL, CLAY, brown, very stiff, with gravel fragments (21 inches)			
5	S-2	ST	24	24	(CH) FAT CLAY, dark brown, brown, very stiff to hard, with calcareous nodules		573	
	S-3	ST	24	24				
	S-4	ST	24	24				
10	S-5	ST	24	24	(CH) FAT CLAY, brown, hard, shaley		568	
	S-6	ST	24	24				
15					SHALE, highly weathered, dark gray		563	
	S-7	ST	24	24				
20							558	
25					SHALE, gray		553	
30							548	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

2.00

2.00

4.50

4.50

4.50

4.50

4.50

100/ 2.75"

100/ 2.25"

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **Dry**	BORING STARTED: **Mar 13 2022**		CAVE IN DEPTH:
WL (Completion) **Dry**	BORING COMPLETED: **Mar 13 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-07**	**2 of 2**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974421.3	**2572552.3**		**578.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
35					SHALE, gray		543	100/ 2.25"
40							538	100/ 2.25"
45							533	100/ 2.00"
50							528	100/ 7.75"
55							523	100/ 1.75"
60					**END OF BORING AT 60.0 FT**		518	100/ 2.50"

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered)	**Dry**	BORING STARTED: **Mar 13 2022**	CAVE IN DEPTH:	
WL (Completion)	**Dry**	BORING COMPLETED: **Mar 13 2022**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-08**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974343.9	**2572616.9**		**578.0**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
					CONCRETE (31 inches)			
	S-1	ST	17	17	FILL, CLAY, brown, light brown, very stiff to hard (29 inches)			
5	S-2	ST	24	24	(CH) FAT CLAY, brown, dark brown, hard, with sand seams		573	
	S-3	ST	24	24				
	S-4	ST	24	24				
10	S-5	ST	24	24	(CH) FAT CLAY, brown, dark brown, very stiff to hard, shaley, with calcareous layers		568	
	S-6	ST	24	24				
15							563	
	S-7	ST	24	24				
20					SHALE, highly weathered, dark gray		558	
	S-8	ST	24	24				
25							553	
30					SHALE, gray		548	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

4.50 3.75 4.50 4.50 4.50 2.00 2.75 100/2.50"

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **Dry**	BORING STARTED: **Mar 10 2022**		CAVE IN DEPTH:
WL (Completion) **Dry**	BORING COMPLETED: **Mar 10 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-08**	**2 of 2**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974343.9	**2572616.9**		**578.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
35					SHALE, gray		543	100/ 3.50"
40							538	100/ 1.50"
45							533	100/ 2.00"
50							528	100/ 1.75"
55							523	100/ 1.25"
60					**END OF BORING AT 60.0 FT**		518	100/ 2.50"

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered)	**Dry**	BORING STARTED: **Mar 10 2022**		CAVE IN DEPTH:
WL (Completion)	**Dry**	BORING COMPLETED: **Mar 10 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-09**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974422.4	**2572629.3**		**577.0**

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
					CONCRETE (26 inches)			
	S-1	ST	22	22	FILL, CLAY, brown, light brown, hard (32 inches)			4.50
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, brown, hard		572	4.50
	S-3	ST	24	24				4.50
	S-4	ST	24	24				4.50
10	S-5	ST	24	24			567	4.50
	S-6	ST	24	24				4.50
15					(CH) FAT CLAY, dark brown, brown, hard, shaley		562	
	S-7	ST	24	24				4.50
20					SHALE, highly weathered, gray		557	
25					SHALE, gray		552	100/ 1.00"
30							547	100/ 2.00"

CONTINUED ON NEXT PAGE

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **Dry**	BORING STARTED: **Mar 01 2022**	CAVE IN DEPTH:	
WL (Completion) **Dry**	BORING COMPLETED: **Mar 01 2022**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-09**	**2 of 2**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974422.4	**2572629.3**		**577.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
35					SHALE, gray		542	100/ 1.25"
40							537	100/ 0.75"
45							532	100/ 1.25"
50							527	100/ 1.00"
55							522	100/ 1.50"
60					**END OF BORING AT 60.0 FT**		517	100/ 2.00"

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered)	**Dry**	BORING STARTED: **Mar 01 2022**		CAVE IN DEPTH:
WL (Completion)	**Dry**	BORING COMPLETED: **Mar 01 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-10**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974420.2	**2572702.6**		**577.0**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
					CONCRETE (26 inches)			
	S-1	ST	22	22	FILL, CLAY, brown, light brown, hard, with gravel pieces (34 inches)			
5	S-2	SS	18	18			572	20-13-20 (33)
	S-3	ST	24	24	(CH) FAT CLAY, brown, very stiff to hard, with calcareous nodules			
	S-4	ST	24	24				
10	S-5	ST	24	24			567	
	S-6	ST	24	24				
15					(CH) FAT CLAY, dark brown, brown, hard, shaley		562	
	S-7	ST	24	24				
20					SHALE, highly weathered, gray		557	
25					SHALE, gray		552	
30							547	

Plastic Limit Water Content Liquid Limit
X——●——△

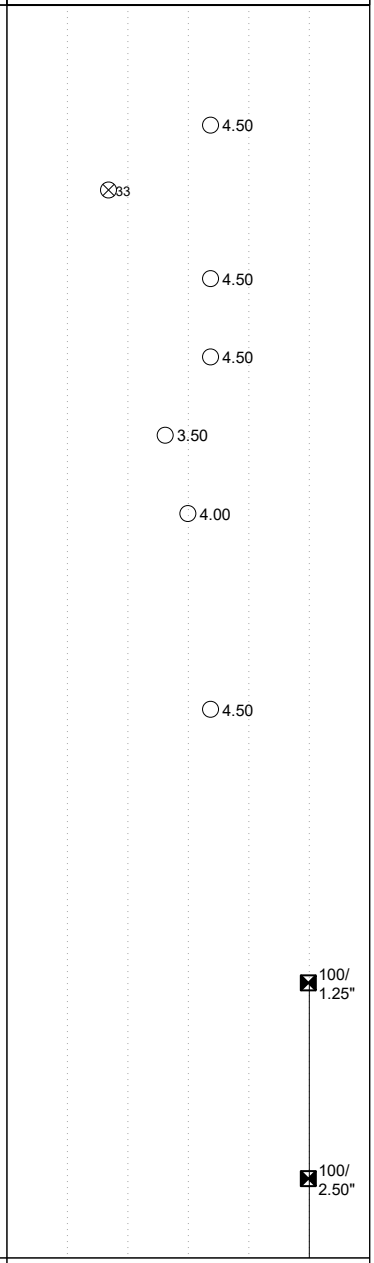
⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD —— REC

○ CALIBRATED PENETROMETER TON/SF

☒ TEXAS CONE PENETRATION BLOWS/FT



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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **DRY**	BORING STARTED: **Feb 27 2022**	CAVE IN DEPTH:	
▼ WL (Completion) **DRY**	BORING COMPLETED: **Feb 27 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MH4**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-10**	**2 of 2**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974420.2	**2572702.6**		**577.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
35					SHALE, gray		542	100/ 4.00"
40							537	100/ 2.50"
45							532	100/ 2.50"
50							527	100/ 1.50"
55							522	100/ 1.00"
60					**END OF BORING AT 60.0 FT**		517	100/ 1.50"

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered)	**DRY**	BORING STARTED: **Feb 27 2022**		CAVE IN DEPTH:
WL (Completion)	**DRY**	BORING COMPLETED: **Feb 27 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MH4**	DRILLING METHOD: **CFA**
WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-11**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974507.4	**2572647.1**		**577.0**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
					CONCRETE (31 inches)			
	S-1	ST	5	5	FILL, CLAY, light brown, light gray, stiff (17 inches)			38-24-28 (52)
	S-2	SS	18	18				
5	S-2	ST	18	18	(CH) FAT CLAY, light gray, light brown, very stiff to hard		572	
	S-3	ST	24	24				
	S-4	ST	24	24				
10	S-5	ST	24	24	(CH) FAT CLAY, light brown, light gray, hard, shaley		567	
	S-6	ST	24	24				
15							562	
					SHALE, highly weathered, gray			
20					SHALE, Gray		557	
25							552	
30							547	

Plastic Limit Water Content Liquid Limit
X———●———△
⊗ STANDARD PENETRATION BLOWS/FT
ROCK QUALITY DESIGNATION & RECOVERY
RQD —— REC
○ CALIBRATED PENETROMETER TON/SF
⊠ TEXAS CONE PENETRATION BLOWS/FT

○ 1.00
⊗ 52
○ 4.50
○ 2.75
○ 4.00
○ 4.50
○ 4.50
⊠ 100/ 1.50"
⊠ 100/ 1.50"
⊠ 100/ 2.25"

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **Dry**	BORING STARTED: **Feb 08 2022**	CAVE IN DEPTH:	
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 08 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-11**	**2 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974507.4	**2572647.1**		**577.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
35					SHALE, Gray		542	100/ 3.25"
40							537	100/ 1.00"
45							532	100/ 1.75"
50							527	100/ 1.50"
55							522	100/ 0.75"
60					**END OF BORING AT 60.0 FT**		517	100/ 1.75"

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **Dry**	BORING STARTED: **Feb 08 2022**	CAVE IN DEPTH:	
WL (Completion) **Dry**	BORING COMPLETED: **Feb 08 2022**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-12**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974572.8	**2572695.8**		**576.0**

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
					CONCRETE (24 inches)			
	S-1	ST	24	24	FILL, CLAY, light brown, light gray, hard (36 inches)			4.50
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, light gray, very stiff to hard, shaley		571	4.50
	S-3	ST	24	24				4.50
	S-4	ST	24	24				3.00
10	S-5	ST	24	24			566	4.50
	S-6	ST	24	24				4.50
15					SHALE, highly weathered, gray		561	
20					SHALE, Dark Gray		556	100/ 0.50"
25							551	100/ 1.00"
30							546	100/ 2.25"

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **Dry**	BORING STARTED: **Feb 09 2022**	CAVE IN DEPTH:	
WL (Completion) **Dry**	BORING COMPLETED: **Feb 09 2022**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**BA-12**	**2 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974572.8	**2572695.8**		**576.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
35					SHALE, Dark Gray		541	100/ 1.25"
40							536	100/ 1.00"
45							531	100/ 1.75"
50							526	100/ 1.50"
55							521	100/ 1.00"
60					**END OF BORING AT 60.0 FT**		516	100/ 1.25"

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered)	**Dry**	BORING STARTED: **Feb 09 2022**		CAVE IN DEPTH:
WL (Completion)	**Dry**	BORING COMPLETED: **Feb 09 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AJ-01A**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974277.3	**2572611.2**		**578.0**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
					CONCRETE (39 inches)			
	S-1	ST	9	9	FILL, CLAY, brown, light brown, hard, with gravel (22 inches)			
5	S-2	ST	24	24	(CH) FAT CLAY, brown, light brow, very stiff to hard		573	
	S-3	ST	24	24				
	S-4	ST	24	24				
10	S-5	ST	24	24			568	
	S-7	ST	24	24				
15					(CH) FAT CLAY, dark brown, brown, very stiff, shaley		563	
	S-8	ST	24	24				
20					SHALE, highly weathered, gray		558	
	S-9	ST	24	24				
25							553	
	S-10	ST	24	24				
30							548	

Plastic Limit Water Content Liquid Limit
X———●———△

⊗ STANDARD PENETRATION BLOWS/FT
ROCK QUALITY DESIGNATION & RECOVERY
RQD —— REC
○ CALIBRATED PENETROMETER TON/SF
☒ TEXAS CONE PENETRATION BLOWS/FT

○4.50
○4.50
○4.25
○4.25
○4.50
○3.00
○3.50
○3.50
○2.50

CONTINUED ON NEXT PAGE

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **DRY**	BORING STARTED: **Feb 20 2022**	CAVE IN DEPTH:	
▼ WL (Completion) **DRY**	BORING COMPLETED: **Feb 20 2022**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MH4**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AJ-01A**	**2 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974277.3	**2572611.2**		**578.0**

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
					SHALE, highly weathered, gray			
	S-11	ST	24	24				
35					SHALE, gray		543	
40					**END OF BORING AT 40.0 FT**		538	
45							533	
50							528	
55							523	
60							518	

2.50

100/ 2.50"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **DRY**	BORING STARTED: **Feb 20 2022**	CAVE IN DEPTH:	
WL (Completion) **DRY**	BORING COMPLETED: **Feb 20 2022**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MH4**	DRILLING METHOD: **CFA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AJ-02**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974487.6	**2572718.6**		**576.0**

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)	
					CONCRETE (27 inches)				
	S-1	ST	21	24	FILL, CLAY, light brown, brown, very stiff, with gravel (21 inches)				3.50
5	S-2	SS	18	18	(CH) FAT CLAY, dark brown, brown, very stiff to hard, shaley		571	17-12-6 (18)	18
	S-3	ST	24	24					3.50
	S-4	ST	24	24					2.00
10	S-5	ST	24	24			566		4.50
	S-6	ST	24	24					4.50
15					SHALE, highly weathered, gray		561		
20					SHALE, gray		556		100/ 1.50"
25							551		100/ 1.25"
30							546		100/ 1.50"

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **Dry**	BORING STARTED: **Jan 17 2022**	CAVE IN DEPTH:	
WL (Completion) **Dry**	BORING COMPLETED: **Jan 24 2022**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AJ-02**	**2 of 2**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974487.6	**2572718.6**		**576.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
35					SHALE, gray		541	100/1.75"
40					**END OF BORING AT 40.0 FT**		536	100/2.50"
45							531	
50							526	
55							521	
60							516	

Plastic Limit Water Content Liquid Limit
X———●———△

⊗ STANDARD PENETRATION BLOWS/FT
ROCK QUALITY DESIGNATION & RECOVERY
RQD —— REC
○ CALIBRATED PENETROMETER TON/SF
⊠ TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**Dry**	BORING STARTED: **Jan 17 2022**		CAVE IN DEPTH:
▼ WL (Completion)	**Dry**	BORING COMPLETED: **Jan 24 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AJ-03**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974488.4	**2572569.8**		**577.0**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)	Plastic Limit / Water Content / Liquid Limit; STANDARD PENETRATION BLOWS/FT; ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC); CALIBRATED PENETROMETER TON/SF; TEXAS CONE PENETRATION BLOWS/FT
					CONCRETE (26 inches)				
	S-1	ST	22	22	FILL, CLAY, light brown, brown, hard, with gravel (22 inches)				4.50
5	S-2	SS	18	18	(CH) FAT CLAY, light brown, brown, hard		572	18-9-11 (20)	20
	S-3	ST	24	24					4.50
	S-4	ST	24	24					4.00
10	S-5	ST	24	24			567		4.25
	S-6	ST	24	24					4.25
15	S-7	ST	24	24	(CH) FAT CLAY, dark brown, brown, hard, shaley		562		4.50
	S-8	ST	24	24					4.50
20					SHALE, highly weathered, gray		557		
25					SHALE, gray		552		100/ 1.75"
30							547		100/ 2.50"

CONTINUED ON NEXT PAGE

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **Dry**	BORING STARTED: **Feb 09 2022**	CAVE IN DEPTH:	
WL (Completion) **Dry**	BORING COMPLETED: **Feb 09 2022**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AJ-03**	**2 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974488.4	**2572569.8**		**577.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
35					SHALE, gray		542	100/ 2.25"
40					**END OF BORING AT 40.0 FT**		537	100/ 3.00"
45							532	
50							527	
55							522	
60							517	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered)	**Dry**	BORING STARTED: **Feb 09 2022**		CAVE IN DEPTH:
WL (Completion)	**Dry**	BORING COMPLETED: **Feb 09 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AJ-04**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974371.9	**2572383.2**		**577.0**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
					CONCRETE (30.5 inches)			
	S-1	ST	18	24	FILL, CLAY, light brown, brown, hard, with gravel (17.5 inches)			
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, brown, hard		572	
	S-3	ST	24	24				
	S-4	ST	24	24				
10	S-5	ST	24	24			567	
	S-6	ST	24	24				
15					(CH) FAT CLAY, dark brown, brown, hard, shaley		562	
	S-7	ST	24	24				
20					SHALE, highly weathered, gray		557	
25					SHALE, gray		552	
30							547	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

4.50 4.50 4.00 4.50 4.50 4.00 4.50 100/1.25" 100/1.25"

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **Dry**	BORING STARTED: **Mar 08 2022**		CAVE IN DEPTH:
WL (Completion) **Dry**	BORING COMPLETED: **Mar 08 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AJ-04**	**2 of 2**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974371.9	**2572383.2**		**577.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
35					SHALE, gray		542	100/2.00"
40					**END OF BORING AT 40.0 FT**		537	100/2.00"
45							532	
50							527	
55							522	
60							517	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD REC

CALIBRATED PENETROMETER TON/SF

TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered)	**Dry**	BORING STARTED: **Mar 08 2022**		CAVE IN DEPTH:
WL (Completion)	**Dry**	BORING COMPLETED: **Mar 08 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AA-01**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974204.4	**2572526.3**		**579.00**

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit
X———●———△

⊗ STANDARD PENETRATION BLOWS/FT
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
○ CALIBRATED PENETROMETER TON/SF
[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					CONCRETE (28 inches)			
	S-1	ST	20	20	FILL, CLAY, light brown, brown, stiff, with gravel (20 inches)			
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, light gray, hard, shaley		574	
	S-3	ST	24	24				
	S-4	ST	24	24				
10					**END OF BORING AT 10.0 FT**		569	
15							564	
20							559	
25							554	
30								

○ 1.00
○ 4.00
○ 4.50
○ 4.50

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**Dry**	BORING STARTED: **Feb 13 2022**		CAVE IN DEPTH:
▼ WL (Completion)	**Dry**	BORING COMPLETED: **Feb 13 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AA-02**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974103.4	**2572700.8**		**578.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					CONCRETE (27 inches)			
	S-1	ST	21	21	FILL, CLAY, brown, light brown, hard, with gravel (21 inches)			
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, light gray, very stiff to hard, shaley		573	
	S-3	ST	24	24				
	S-4	ST	24	24				
10					**END OF BORING AT 10 FT**		568	
15							563	
20							558	
25							553	
30								

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ **STANDARD PENETRATION BLOWS/FT**

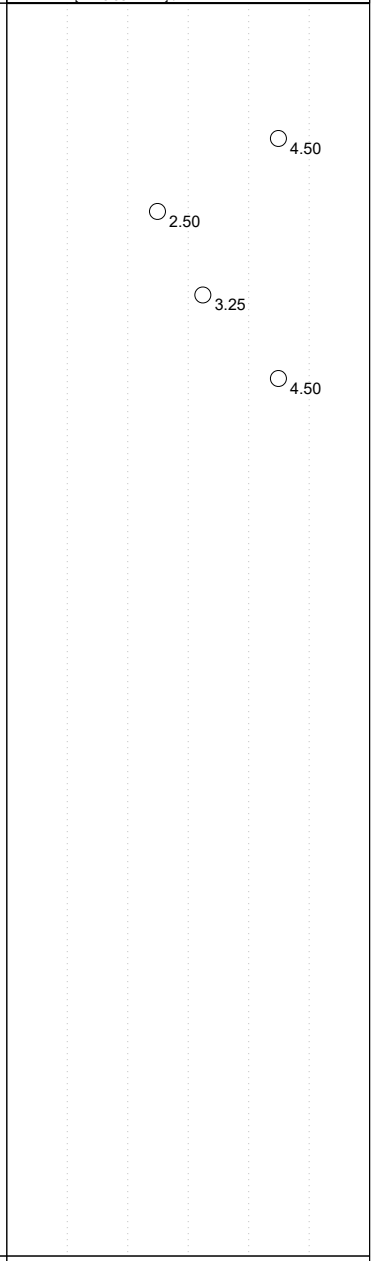
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ **CALIBRATED PENETROMETER TON/SF**

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**DRY**	BORING STARTED: **Feb 21 2022**		CAVE IN DEPTH:
▼ WL (Completion)	**DRY**	BORING COMPLETED: **Feb 21 2022**		HAMMER TYPE: **Auto**
⧩ WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MH4**	DRILLING METHOD: **CFA**
⧩ WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AA-03**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974248.2	**2572703.9**		**578.00**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Liquid Limit X——●——△ ⊗ STANDARD PENETRATION BLOWS/FT ROCK QUALITY DESIGNATION & RECOVERY RQD REC ○ CALIBRATED PENETROMETER TON/SF [FINES CONTENT] %
					CONCRETE (28.5 inches)				
	S-1	ST	19	19	FILL, CLAY, light brown, brown, hard, with gravel (19.5 inches)				○ 4.50
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, light gray, hard, shaley		573		○ 4.50
	S-3	ST	24	24					○ 4.50
	S-4	ST	24	24					○ 4.50
10					**END OF BORING AT 10.0 FT**		568		
15							563		
20							558		
25							553		
30									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **Dry**	BORING STARTED: **Feb 10 2022**		CAVE IN DEPTH:
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 10 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AA-04**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974261.4	**2572840.2**		**576.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					CONCRETE (29 inches)			
	S-1	ST	MΦ	MΦ	FILL, CLAY, light brown, brown, hard, with gravel (19 inches)			
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, light gray, hard, shaley		571	
	S-3	ST	24	24				
	S-4	ST	24	24				
10					**END OF BORING AT 10.0 FT**		566	
15							561	
20							556	
25							551	
30								

Plastic Limit Water Content Liquid Limit
X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

○ 4.00

○ 4.50

○ 4.50

○ 4.00

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **Dry**	BORING STARTED: **Feb 10 2022**		CAVE IN DEPTH:
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 10 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AA-05**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:	BOTTOM OF CASING
14974425.6	**2572822.7**		**576.00**	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					CONCRETE (26 inches)			
	S-1	ST	22	22	FILL, CLAY, light brown, brown, hard, with gravel (22 inches)			
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, light gray, hard, shaley		571	
	S-3	ST	24	24				
	S-4	ST	24	24				
10					**END OF BORING AT 10.0 FT**		566	
15							561	
20							556	
25							551	
30								

Plastic Limit Water Content Liquid Limit
X——●——△

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

○ 4.00

○ 4.50

○ 4.50

○ 4.50

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **Dry**	BORING STARTED: **Feb 08 2022**		CAVE IN DEPTH:
▼ WL (Completion) **Dry**	BORING COMPLETED: **Feb 08 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AA-06**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974576.8	**2572820.5**		**575.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Liquid Limit X—●—△ ⊗ STANDARD PENETRATION BLOWS/FT; ROCK QUALITY DESIGNATION & RECOVERY — RQD — REC; ○ CALIBRATED PENETROMETER TON/SF [FINES CONTENT] %
					CONCRETE (33 inches)				
	S-1	ST	15	15	FILL, CLAY, light brown, brown, hard, with gravel (27 inches)				○ 4.50
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, light gray, hard, shaley		570		○ 4.50
	S-3	ST	24	24					○ 4.50
	S-4	ST	24	24					○ 4.50
10					**END OF BORING AT 10.0 FT**		565		
15							560		
20							555		
25							550		
30									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**Dry**	BORING STARTED: **Feb 07 2022**	CAVE IN DEPTH:
▼ WL (Completion)	**Dry**	BORING COMPLETED: **Feb 07 2022**	HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **Truck** / LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AA-07**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974723.8	**2572759.3**		**574.00**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					CONCRETE (10 inches)			
	S-1	ST	14	14	FILL, CLAY, light brown, brown, hard, with gravel (26 inches)			
	S-2	ST	24	24				
5	S-3	ST	24	24	(CH) FAT CLAY, light brown, light gray, very stiff to hard, shaley		569	
	S-4	ST	24	24				
	S-5	ST	24	24				
10					**END OF BORING AT 10.0 FT**		564	
15							559	
20							554	
25							549	
30								

Plastic Limit Water Content Liquid Limit
X———●———△

⊗ **STANDARD PENETRATION BLOWS/FT**

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ **CALIBRATED PENETROMETER TON/SF**

[FINES CONTENT] %

○ 4.50

○ 4.50

○ 4.50

○ 4.50

○ 3.50

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **DRY**	BORING STARTED: **Feb 21 2022**		CAVE IN DEPTH:
▼ WL (Completion) **DRY**	BORING COMPLETED: **Feb 21 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MH4**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AA-08**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
DFW Terminal A Expansion	**Total Depth**		
SITE LOCATION:			LOSS OF CIRCULATION
International Pkwy, DFW Airport, Texas 75261			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974753.4	**2572611.5**		**575.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					CONCRETE (28 inches)			
	S-1	ST	24	24	FILL, CLAY, light brown, brown, hard, with gravel (20 inches)			
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, light gray, hard, shaley		570	
	S-3	ST	24	24				
	S-4	ST	24	24				
10					**END OF BORING AT 10.0 FT**		565	
15							560	
20							555	
25							550	
30								

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ **STANDARD PENETRATION BLOWS/FT**

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ **CALIBRATED PENETROMETER TON/SF**

[FINES CONTENT] %

○ 4.50

○ 4.50

○ 4.00

○ 4.50

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**Dry**	BORING STARTED: **Feb 10 2022**		CAVE IN DEPTH:
▼ WL (Completion)	**Dry**	BORING COMPLETED: **Feb 10 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AA-09**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974597.5	**2572534.7**		**577.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					CONCRETE (27 inches)			
	S-1	ST	21	21	FILL, CLAY, light brown, brown, very stiff, with gravel (21 inches)			
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, light gray, very stiff to hard, shaley		572	
	S-3	ST	24	24				
	S-4	ST	24	24				
10					**END OF BORING AT 10.0 FT**		567	
15							562	
20							557	
25							552	
30								

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ **STANDARD PENETRATION BLOWS/FT**

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ **CALIBRATED PENETROMETER TON/SF**

[FINES CONTENT] %

○ 2.50

○ 4.50

○ 3.25

○ 4.50

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**Dry**	BORING STARTED: **Feb 07 2022**		CAVE IN DEPTH:
▼ WL (Completion)	**Dry**	BORING COMPLETED: **Feb 07 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AA-10A**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974518.2	**2572457.6**		**578.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					CONCRETE (26 inches)			
	S-1	ST	22	22	FILL, CLAY, light brown, brown, hard, with gravel (22 inches)			
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, light gray, hard, shaley		573	
	S-3	ST	24	24				
	S-4	ST	24	24				
10					**END OF BORING AT 10.0 FT**		568	
15							563	
20							558	
25							553	
30								

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ **STANDARD PENETRATION BLOWS/FT**

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ **CALIBRATED PENETROMETER TON/SF**

[FINES CONTENT] %

○ 4.00

○ 4.50

○ 4.50

○ 4.50

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**Dry**	BORING STARTED: **Feb 09 2022**		CAVE IN DEPTH:
▼ WL (Completion)	**Dry**	BORING COMPLETED: **Feb 09 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **Truck**	LOGGED BY: **MA23**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Austin Commercial, LP	**63:1603**	**AA-11**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
DFW Terminal A Expansion	**Total Depth**

SITE LOCATION: **International Pkwy, DFW Airport, Texas 75261**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
14974439.7	**2572275.1**		**579.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					CONCRETE (25 inches)			
	S-1	ST	23	23	FILL, CLAY, light brown, brown, stiff, with gravel (23 inches)			
5	S-2	ST	24	24	(CH) FAT CLAY, light brown, light gray, stiff to hard, shaley		574	
	S-3	ST	24	24				
	S-4	ST	24	24				
10					**END OF BORING AT 10 FT**		569	
15							564	
20							559	
25							554	
30								

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ **STANDARD PENETRATION BLOWS/FT**

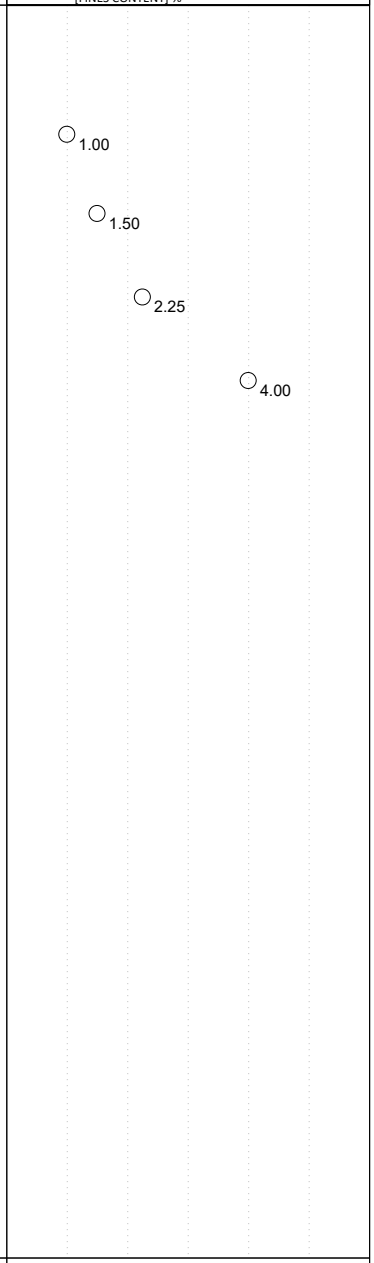
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ **CALIBRATED PENETROMETER TON/SF**

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **DRY**	BORING STARTED: **Feb 21 2022**		CAVE IN DEPTH:
▼ WL (Completion) **DRY**	BORING COMPLETED: **Feb 21 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck**	LOGGED BY: **MH4**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

APPENDIX C – Laboratory Testing

Laboratory Testing Summary
Laboratory Compaction Characteristics of Soil Using Standard Effort
California Bearing Ratios (CBR) of Laboratory-Compacted Soils
Laboratory Electrical Resistivity Test Results
PID Readings
Analytical Report

ECS Southwest, LLP

Fort Worth, Texas

Labortory Testing Summary

Project Number: 63:1603 **Project Name: DFW Airport Terminal A Expansion** **Date: 03/21/2022**

Project Engineer: MH **Principal Engineer: SN**

Boring Number	Sample Number	Depth (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3]			Percent Passing No. 200 Sieve[4]	Dry Unit Weight[5] (pcf)	One-Dimensional Swell[6]			Unconfined Compressive Strength[7] (tsf)	pH	Sulfate (ppm)	Chloride (ppm)
					LL	PL	PI			Final Moisture (%)	Surcharge (psf)	Swell (%)				
BA-7	S-1	2' - 4'	37.0													
	S-2	4' - 6'	33.2													
	S-3	6' - 8'	31.6													
	S-4	8' - 10'	30.5	CH	76	28	48	79.8	89.8	30.6	875	0.1				
	S-5	10' - 12'	33.3													
	S-6	13' - 15'	31.3						93.4				3.4			
BA-8	S-1	2' - 4'	39.3													
	S-2	4' - 6'	32.3	CH	86	35	51	83.7	88.0	33.2	375	1.9				
	S-3	6' - 8'	28.7													
	S-4	8' - 10'	40.9													
	S-5	10' - 12'	29.8	CH	61	24	37	86.5								
	S-6	13' - 15'	32.1						90.5				2.0			
BA-9	S-1	2' - 4'	29.6													
	S-2	4' - 6'	28.9													
	S-3	6' - 8'	28.8	CH	66	31	35	87.0	88.0	28.8	625	0.8				
	S-5	10' - 12'	33.5	CH	80	27	53	91.0								
	S-6	13' - 15'	33.1						91.6				3.6			
BA-10	S-1	2' - 4'	30.8													
	S-3	6' - 8'	34.6	CH	71	44	27	63.0	74.8	42.3	625	0.8				
	S-4	8' - 10'	37.5													
	S-5	10' - 12'	36.5	CH	88	38	50	73.9								
	S-6	13' - 15'	35.8						88.0				2.9			
BA-11	S-1	2' - 4'	38.1											8.4		135.3
	S-2	4' - 6'	35.7													
	S-3	6' - 8'	27.0	CH	79	29	50	88.7								
	S-4	8' - 10'	20.2													
	S-5	10' - 12'	41.9	CH	74	34	41	90.3	90.6	28.0	1,125	0.3				
	S-6	13' - 15'	28.7						90.9				4.6			
BA-12	S-1	2' - 4'	28.1													
	S-2	4' - 6'	31.1													
	S-3	6' - 8'	31.3													
	S-4	8' - 10'	29.5	CH	88	39	48	86.2	88.2	30.0	875	0.5				
	S-5	10' - 12'	33.2	CH	88	31	59	55.8								

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 7260, 5. ASTM D 1140, 6. ASTM D 4546, 7. ASTM D 2166

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, NP: Non Plastic

ECS Southwest, LLP

Fort Worth, Texas

Labortory Testing Summary

Project Number: 63:1603 **Project Name: DFW Airport Terminal A Expansion** **Date: 03/21/2022**

Project Engineer: MH **Principal Engineer: SN**

Boring Number	Sample Number	Depth (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3]			Percent Passing No. 200 Sieve[4]	Dry Unit Weight[5] (pcf)	One-Dimensional Swell[6]			Unconfined Compressive Strength[7] (tsf)	pH	Sulfate (ppm)	Chloride (ppm)
					LL	PL	PI			Final Moisture (%)	Surcharge (psf)	Swell (%)				
AJ-1	S-1	2' - 4'	40.5													
	S-2	4' - 6'	27.6	CH	65	28	38	76.6	90.4	31.4	375	0.2				
	S-3	6' - 8'	29.3													
	S-4	8' - 10'	25.8	CH	66	26	40	73.7								
	S-5	10' - 12'	30.2						114.3				2.5			
	S-6	13' - 15'	30.1													
	S-7	18' - 20'	29.9						94.2				3.7			
AJ-2	S-1	2' - 4'	21.9	CH	72	40	32	53.9								
	S-2	4' - 6'	28.1													
	S-3	6' - 8'	28.5	CH	69	31	38	94.0	89.0	29.6	625	0.1				
	S-4	8' - 10'	27.5													
	S-5	10' - 12'	31.2													
	S-6	13' - 15'	32.6													
	S-7	18' - 20'	21.2													
AJ-3	S-1	2' - 4'	20.9													
	S-2	4' - 6'	34.1													
	S-3	6' - 8'	34.2													
	S-4	8' - 10'	21.8	CH	70	28	42	79.1	91.9	29.7	875	0.0				
	S-5	10' - 12'	29.9	CH	77	29	48									
	S-6	13' - 15'	30.5													
	S-7	18' - 20'	17.6													
AJ-4	S-1	2' - 4'	38.2													
	S-2	4' - 6'	25.7													
	S-3	6' - 8'	31.6	CH	77	34	43	28.6								
	S-4	8' - 10'	29.2													
	S-5	10' - 12'	0.0													
	S-6	13' - 15'	30.7						92.9				1.2			
	S-7	18' - 20'	30.8						90.4				1.6			

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 7260, 5. ASTM D 1140, 6. ASTM D 4546, 7. ASTM D 2166

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, NP: Non Plastic

ECS Southwest, LLP

Fort Worth, Texas

Labortory Testing Summary

Project Number: 63:1603

Project Name: DFW Airport Terminal Expansion (Terminal A)

Date: 03/21/2022

Project Engineer: MH

Principal Engineer: SN

Boring Number	Sample Number	Depth (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3]			Percent Passing No. 200 Sieve[4]	Dry Unit Weight[5] (pcf)	One-Dimensional Swell[6]			Unconfined Compressive Strength[7] (tsf)	pH	Sulfate (ppm)	Chloride (ppm)
					LL	PL	PI			Final Moisture (%)	Surcharge (psf)	Swell (%)				
AA-1	S-1	2' - 4'	33.5													
	S-2	4' - 6'	27.9						87.1	30.0	375	0.3				
	S-3	6' - 8'	34.9	CH	97	56	41	79.9								
	S-4	8' - 10'	30.2													
AA-2	S-1	2' - 4'	35.5					87.0								
	S-2	4' - 6'	33.2													
	S-3	6' - 8'	32.9						73.5	47.3	625	1.1				
	S-4	8' - 10'	26.8													
AA-3	S-1	2' - 4'	30.7													
	S-2	4' - 6'	27.2													
	S-3	6' - 8'	31.5													
	S-4	8' - 10'	26.3	CH	58	28	31	75.3	90.0	28.8	875	0.1				
AA-4	S-1	2' - 4'	32.7													
	S-2	4' - 6'	25.4													
	S-3	6' - 8'	30.3	CH	60	25	35	85.3								
	S-4	8' - 10'	27.3													
AA-5	S-1	2' - 4'	34.4													
	S-2	4' - 6'	30.1													
	S-3	6' - 8'	27.0	CH	67	30	37	85.3	84.7	31.2	625	0.0				
	S-4	8' - 10'	39.5													

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 7260, 5. ASTM D 1140, 6. ASTM D 4546, 7. ASTM D 2166

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, NP: Non Plastic

ECS Southwest, LLP

Fort Worth, Texas

Labortory Testing Summary

Project Number: 63:1603 **Project Name: DFW Airport Terminal A Expansion** **Date: 03/21/2022**

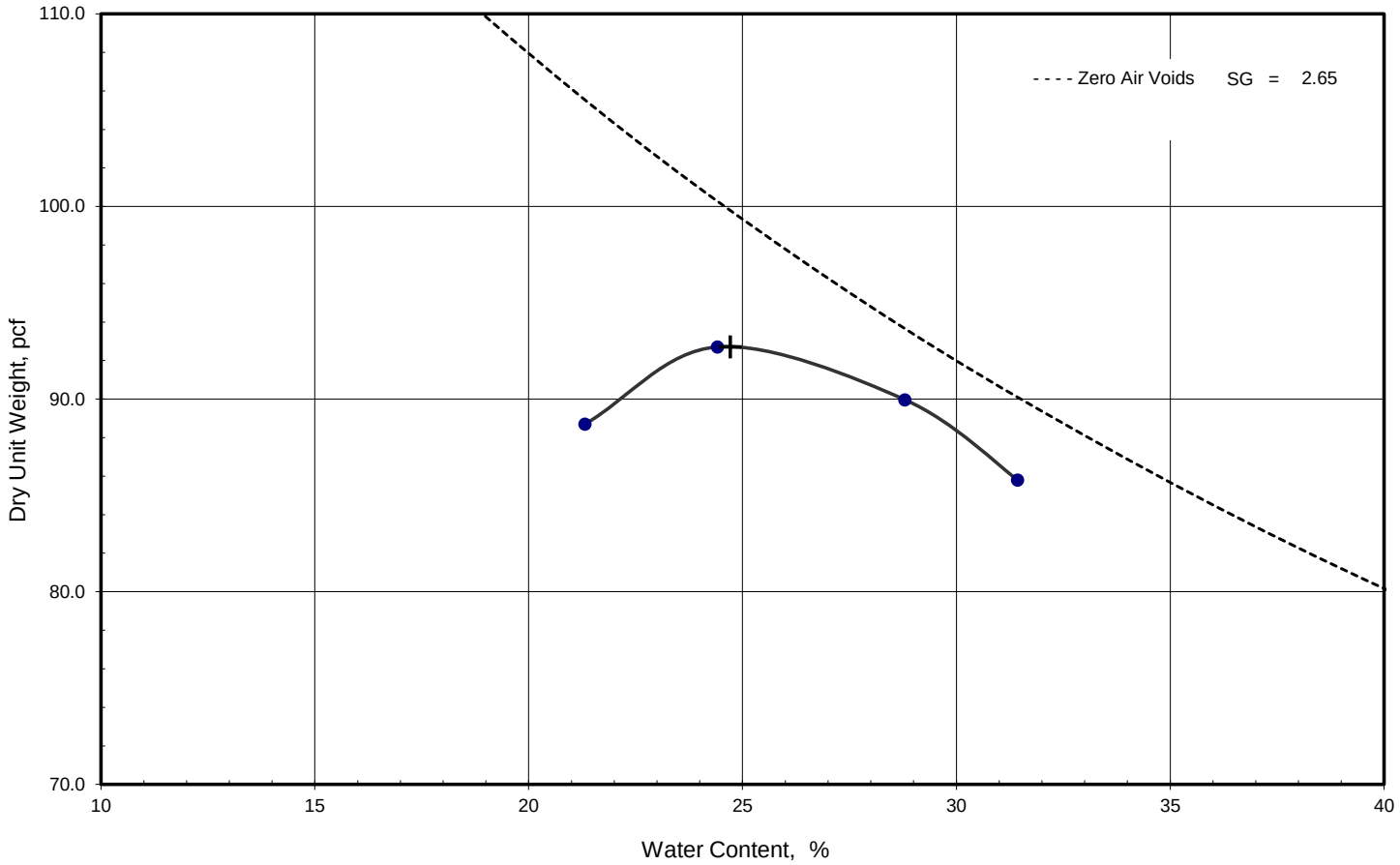
Project Engineer: MH **Principal Engineer: SN**

Boring Number	Sample Number	Depth (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3]			Percent Passing No. 200 Sieve[4]	Dry Unit Weight[5] (pcf)	One-Dimensional Swell[6]			Unconfined Compressive Strength[7] (tsf)	pH	Sulfate (ppm)	Chloride (ppm)
					LL	PL	PI			Final Moisture (%)	Surcharge (psf)	Swell (%)				
AA-6	S-2	4' - 6'	32.4													
	S-3	6' - 8'	26.9	CH	60	29	31	95.6	90.3	30.3	625	0.1				
	S-4	8' - 10'	28.4													
AA-7	S-1	2' - 4'	29.7													
	S-2	4' - 6'	32.9												230.5	
	S-3	6' - 8'	31.8													
	S-4	8' - 10'	31.6	CH	67	30	37	92.7	83.5	35.6	875	0.1				
AA-8	S-1	2' - 4'	21.9													
	S-2	4' - 6'	30.9													
	S-3	6' - 8'	30.0													
	S-4	8' - 10'	29.4													
AA-9	S-2	4' - 6'	33.4	CH	89	42	47	74.5								
	S-3	6' - 8'	31.8													
	S-4	8' - 10'	33.4													
AA-10	S-1	2' - 4'	40.9													
	S-2	4' - 6'	42.3	CH	107	63	44	66.1								
	S-3	6' - 8'	23.6													
	S-4	8' - 10'	30.6						87.2	33.2	875	1.1				
AA-11	S-1	2' - 4'	31.4													
	S-2	4' - 6'	34.3													
	S-3	6' - 8'	31.5													
	S-4	8' - 10'	26.0													

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 7260, 5. ASTM D 1140, 6. ASTM D 4546, 7. ASTM D 2166

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, NP: Non Plastic

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content		**24.7**	%
Maximum Dry Unit Weight		**92.7**	pcf
Cumulative material retained on:	3/4 in. sieve	0.0	%
	3/8 in. sieve	0.0	%
	#4 sieve	0.0	%

Preparation	ASTM moist preparation	
Type of rammer	Mechanical - circular face	
Test Specfication / Method	ASTM D698-12e2-method A	
Specific gravity - D854 water pycnometer	2.65	Historical
Coarse Aggregate Specific Gravity -		

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Fat Clay, Light brown		64	41	93.2	CH	

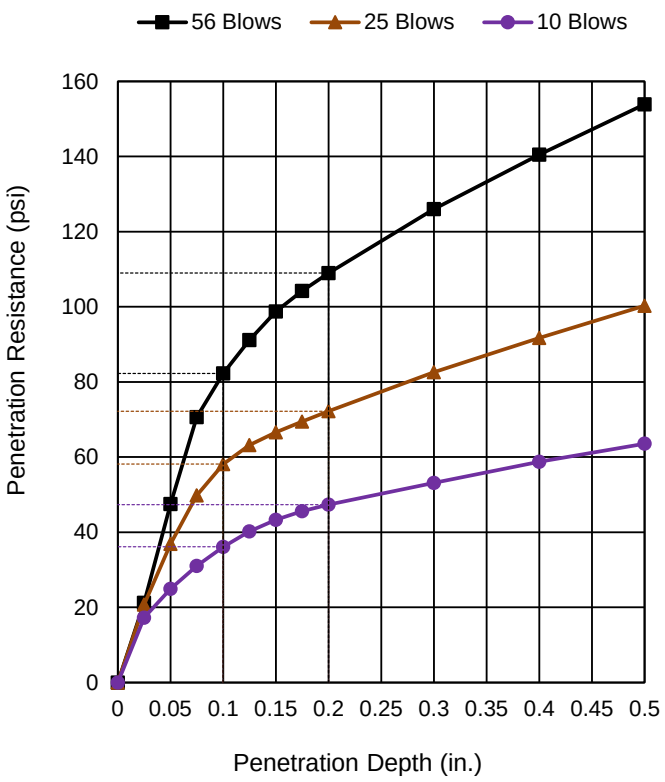
Project: DFW Terminal A Expansion
Client: Austin Commercial
Sample / Source Boring AA-2/Terminal A
Test Reference/No.:

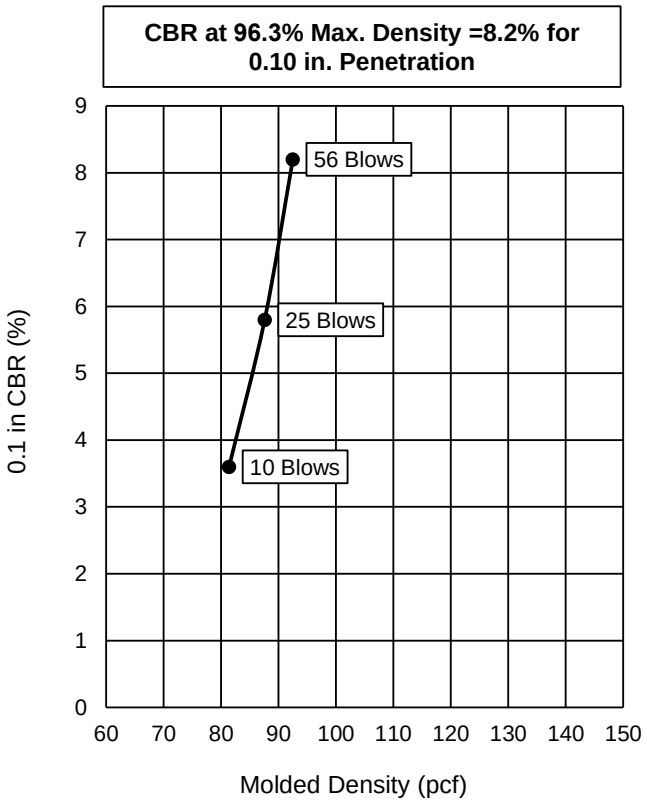
Project No.: 63:1603
Depth (ft.): 0 - 5
Sample No.: D3S-431
Date Reported: 2/22/2022

Office / Lab	Address	Office Number / Fax
ECS Southwest LLP - Dallas	3033 Kellway Drive Suite 110 Carrollton, TX 75006	(972)392-3222 (214)483-9684

Tested by	Checked by	Approved by	Date Received	Remarks
KMarupudi	bbaby	bbaby	2/17/2022	

California Bearing Ratios (CBR) of Laboratory-Compacted Soils





TEST RESULTS ()

	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.1 in.	0.2 in.			
1	92.5	99.8	27.3	89.3	96.3	31.0	8.2	7.3	0.00	10	0.67
2	87.6	94.5	30.8	85.6	92.3	33.0	5.8	4.8	0.00	10	0.72
3	81.4	87.8	33.1	78.4	84.6	37.3	3.6	3.2	0.00	10	0.74

Material Description	AASHTO	USCS	MAX. Dens. (pcf)	Optimum Moisture (%)	LL	PI	% Fines	% Gravel
Fat Clay, Light brown		CH	92.7	24.7	64	41		

Project: DFW Terminal A Expansion
Client: Austin Commercial
Sample / Source Boring AA-2/Terminal A
Test Reference/No.: 1

Project No.: 63:1603
Depth (ft.): 0 - 5
Sample No.: D3S-431
Date Reported: 2/22/2022

Office / Lab	Address	Office Number / Fax
ECS Southwest LLP - Dallas	3033 Kellway Drive Suite 110 Carrollton, TX 75006	(972)392-3222 (214)483-9684

Tested by	Checked by	Approved by	Date Received	Remarks
KMarupudi	bbaby	bbaby	2/17/2022	

ECS Southwest, LLP
Fort Worth, TX

Project No. 63-1603

Date : 03/30/2022

Tested By : KM

Project Name : DFW Terminal A Expansion

Source/Sample No : BA-09 Depth: 4-6

Laboratory Resistivity of Soils Material:

Moisture Content, (%)	Resistivity, (Ω - Cm.)	Remarks
0	>1,000,000	
7	>1,000,000	
13	2,430	
20	1,681	
27	1,491	
33	1,237	
40	1,055	
47	1,012	
53	1,075	
60	1,165	

ECS Southwest, LLP **Project Number: 63:1603**

Fort Worth, Texas **Project Name: DFW Terminal A Expansion**

PID READINGS **Date: 3/23/2022**

Boring Number	Sample Number	Depth (feet)	PID (ppm)
BA-1	S-1	2-4	15.2
	S-2	4-6	271.6
	S-3	6-8	88.0
	S-4	8-10	208.0
	S-5	10-12	7.9
	S-6	13-15	23.3
	S-7	18-20	21.1
BA-2	S-1	2-4	2.0
	S-2	4-6	4.5
	S-3	6-8	5.2
	S-4	8-10	59.2
	S-5	10-12	24.7
	S-6	13-15	10.8
	S-7	18-20	2.7
BA-3	S-1	2-4	14.3
	S-2	4-6	12.8
	S-3	6-8	60.2
	S-4	8-10	20.2
	S-5	10-12	164.2
	S-6	13-15	132.2
	S-7	18-20	5.2
	S-8	23-25	2.0
BA-4	S-1	2-4	1.1
	S-2	4-6	10.1
	S-3	6-8	26.1
	S-4	8-10	17.0
	S-5	10-12	0.9
	S-6	13-15	0.5
	S-7	18-20	0.7
BA-5	S-1	2-4	1.6
	S-3	6-8	1.8
	S-4	8-10	1.4
	S-5	10-12	1.2
	S-6	13-15	1.0
	S-7	18-20	1.0
BA-6A	S-1	2-4	0.4
	S-2	4-6	0.2
	S-3	6-8	0.2
	S-4	8-10	0.1
	S-5	10-12	0.8
	S-6	13-15	0.5

ECS Southwest, LLP **Project Number: 63:1603**

Fort Worth, Texas **Project Name: DFW Terminal A Expansion**

PID READINGS **Date: 3/23/2022**

Boring Number	Sample Number	Depth (feet)	PID (ppm)
BA-7	S-1	2-4	0.3
	S-2	4-6	0.4
	S-3	6-8	0.6
	S-4	8-10	0.4
	S-5	10-12	0.5
	S-6	13-15	3.2
	S-7	18-20	0.5
BA-8	S-1	2-4	1.7
	S-2	4-6	1.4
	S-3	6-8	1.6
	S-4	8-10	1.0
	S-5	10-12	1.4
	S-6	13-15	1.4
	S-7	18-20	2.0
	S-8	23-25	1.8
BA-9	S-1	2-4	2.4
	S-2	4-6	1.6
	S-3	6-8	3.0
	S-4	8-10	3.6
	S-5	10-12	4.0
	S-6	13-15	2.8
	S-7	18-20	3.8
BA-10	S-1	2-4	2.7
	S-2	4-6	0.4
	S-3	6-8	0.8
	S-4	8-10	2.8
	S-5	10-12	3.0
	S-6	13-15	1.6
	S-7	18-20	0.7
BA-11	S-1	2-4	0.3
	S-2	4-6	0.4
	S-3	6-8	0.3
	S-4	8-10	0.6
	S-5	10-12	0.7
	S-6	13-15	0.5
BA-12	S-1	2-4	0.2
	S-2	4-6	0.7
	S-3	6-8	0.6
	S-4	8-10	0.7
	S-5	10-12	0.6
	S-6	13-15	0.2

ECS Southwest, LLP **Project Number: 63:1603**

Fort Worth, Texas **Project Name: DFW Terminal A Expansion**

PID READINGS **Date: 3/23/2022**

Boring Number	Sample Number	Depth (feet)	PID (ppm)
AJ-1A	S-1	2-4	2.2
	S-2	4-6	1.9
	S-3	6-8	0.9
	S-4	8-10	1.7
	S-5	10-12	2.1
	S-6	13-15	2.3
	S-7	18-20	2.2
	S-8	23-25	1.9
	S-9	28-30	2.7
	S-10	33-35	2.6
AJ-2	S-1	2-4	0.6
	S-2	4-6	0.8
	S-3	6-8	0.6
	S-4	8-10	0.7
	S-5	10-12	0.8
	S-6	13-15	0.7
AJ-3	S-1	2-4	0.2
	S-3	6-8	1.0
	S-4	8-10	0.3
	S-5	10-12	0.4
	S-6	12-14	0.3
	S-7	15-17	0.5
	S-8	18-20	0.7
AJ-4	S-1	2-4	26.1
	S-2	4-6	261.7
	S-3	6-8	383.2
	S-4	8-10	166.2
	S-5	10-12	200.5
	S-6	13-15	17.5
	S-7	18-20	13.4
AA-1	S-1	2-4	1.0
	S-2	4-6	0.3
	S-3	6-8	1.4
	S-4	8-10	0.8
AA-2	S-1	2-4	1.3
	S-2	4-6	1.6
	S-3	6-8	1.1
	S-4	8-10	1.0

ECS Southwest, LLP **Project Number: 63:1603**

Fort Worth, Texas **Project Name: DFW Terminal A Expansion**

PID READINGS **Date: 3/23/2022**

Boring Number	Sample Number	Depth (feet)	PID (ppm)
AA-3	S-1	2-4	0.1
	S-2	4-6	0.1
	S-3	6-8	0.3
	S-4	8-10	0.3
AA-4	S-1	2-4	0.1
	S-2	4-6	0.1
	S-3	6-8	0.2
	S-4	8-10	0.1
AA-5	S-1	2-4	7.5
	S-2	4-6	4.5
	S-3	6-8	6.7
	S-4	8-10	5.6
AA-6	S-1	2-4	22.5
	S-2	4-6	24.0
	S-3	6-8	21.7
	S-4	8-10	14.7
AA-7	S-1	2-4	1.6
	S-2	4-6	1.5
	S-3	6-8	1.1
	S-4	8-10	1.2
AA-8	S-1	2-4	0.0
	S-2	4-6	0.4
	S-3	6-8	0.2
	S-4	8-10	0.2
AA-9	S-1	2-4	14.5
	S-2	4-6	15.7
	S-3	6-8	19.0
	S-4	8-10	20.0
AA-10A	S-1	0-2	0.3
	S-2	2-4	0.4
	S-3	4-6	0.2
	S-4	6-8	0.1
AA-11	S-1	0-2	1.2
	S-2	2-4	1.1
	S-3	4-6	1.7
	S-4	6-8	3.6

ANALYTICAL REPORT

March 24, 2022

1 Cp
2 Tc
3 Ss
4 Cn
5 Tr
6 Sr
7 Qc
8 Gl
9 Al
10 Sc

ECS Southwest, LLP - Dallas, TX

Sample Delivery Group:	L1472853
Samples Received:	03/17/2022
Project Number:	1603
Description:	

Report To: Ishtiaque Hossain
2621 White Settlement Rd.
Fort Worth, TX 76107

Entire Report Reviewed By:

Lori A Vahrenkamp
Project Manager

Pace Analytical Services, LLC -Dallas
400 W. Bethany Drive Suite 190 Allen, TX 75013 972-727-1123 800-767-5859 www.pacenational.com

TABLE OF CONTENTS

SAMPLE SUMMARY

AJ-4 L1472853-01 GW

Collected by: Asif Akhtar
Collected date/time: 03/09/22 04:30
Received date/time: 03/17/22 13:50

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260	WG1835828	1	03/21/22 19:01	03/21/22 19:01	ZST	Allen, TX
TPH by TCEQ Method 1005	WG1835773	1	03/21/22 12:51	03/22/22 20:37	TTP	Allen, TX

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Lori A Vahrenkamp
Project Manager

Sample Delivery Group (SDG) Narrative

Analyzed from headspace vial.

Lab Sample ID	Project Sample ID	Method
L1472853-01	AJ-4	8260

Laboratory Data Package Cover Page

This data package consists of this signature page, the laboratory review checklist, and the following reportable data as applicable:

R1 - Field chain-of-custody documentation;

R2 - Sample identification cross-reference;

R3 - Test reports (analytical data sheets) for each environmental sample that includes:

a. Items consistent with NELAC Chapter 5,

b. dilution factors,

c. preparation methods,

d. cleanup methods, and

e. if required for the project, tentatively identified compounds (TICs).

R4 - Surrogate recovery data including:

a. Calculated recovery (%R), and

b. The laboratory's surrogate QC limits.

R5 - Test reports/summary forms for blank samples;

R6 - Test reports/summary forms for laboratory control samples (LCSs) including:

a. LCS spiking amounts,

b. Calculated %R for each analyte, and

c. The laboratory's LCS QC limits.

R7 - Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:

a. Samples associated with the MS/MSD clearly identified,

b. MS/MSD spiking amounts,

c. Concentration of each MS/MSD analyte measured in the parent and spiked samples,

d. Calculated %Rs and relative percent differences (RPDs), and

e. The laboratory's MS/MSD QC limits

R8 - Laboratory analytical duplicate (if applicable) recovery and precision:

a. The amount of analyte measured in the duplicate,

b. The calculated RPD, and

c. The laboratory's QC limits for analytical duplicates.

R9 - List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.

R10 - Other problems or anomalies.

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Lori A Vahrenkamp
Project Manager

Laboratory Review Checklist: Reportable Data

Laboratory Name: Pace Analytical National	LRC Date: 03/24/2022 14:45
Project Name:	Laboratory Job Number: L1472853-01
Reviewer Name: Lori A Vahrenkamp	Prep Batch Number(s): WG1835828 and WG1835773

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1	OI	Chain-of-custody (C-O-C)					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?		X			1
		Were all departures from standard conditions described in an exception report?	X				
R2	OI	Sample and quality control (QC) identification					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3	OI	Test reports					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample detection limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?	X				
		Were % moisture (or solids) reported for all soil and sediment samples?			X		
		Were bulk soils/solids samples for volatile analysis extracted with methanol per SW846 Method 5035?			X		
		If required for the project, are TICs reported?			X		
R4	O	Surrogate recovery data					
		Were surrogates added prior to extraction?	X				
		Were surrogate percent recoveries in all samples within the laboratory QC limits?	X				
R5	OI	Test reports/summary forms for blank samples					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6	OI	Laboratory control samples (LCS):					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability check sample data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7	OI	Matrix spike (MS) and matrix spike duplicate (MSD) data					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?		X			2
		Were MS/MSD RPDs within laboratory QC limits?	X				
R8	OI	Analytical duplicate data					
		Were appropriate analytical duplicates analyzed for each matrix?			X		
		Were analytical duplicates analyzed at the appropriate frequency?			X		
		Were RPDs or relative standard deviations within the laboratory QC limits?			X		
R9	OI	Method quantitation limits (MQLs):					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs and DCSs included in the laboratory data package?	X				
R10	OI	Other problems/anomalies					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Was applicable and available technology used to lower the SDL to minimize the matrix interference effects on the sample results?	X				
		Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Review Checklist: Supporting Data

Laboratory Name: Pace Analytical National	LRC Date: 03/24/2022 14:45
Project Name:	Laboratory Job Number: L1472853-01
Reviewer Name: Lori A Vahrenkamp	Prep Batch Number(s): WG1835828 and WG1835773

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1	OI	Initial calibration (ICAL)					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2	OI	Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?			X		
S3	O	Mass spectral tuning					
		Was the appropriate compound for the method used for tuning?	X				
		Were ion abundance data within the method-required QC limits?	X				
S4	O	Internal standards (IS)					
		Were IS area counts and retention times within the method-required QC limits?	X				
S5	OI	Raw data (NELAC Section 5.5.10)					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6	O	Dual column confirmation					
		Did dual column confirmation results meet the method-required QC?			X		
S7	O	Tentatively identified compounds (TICs)					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8	I	Interference Check Sample (ICS) results					
		Were percent recoveries within method QC limits?			X		
S9	I	Serial dilutions, post digestion spikes, and method of standard additions					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?			X		
S10	OI	Method detection limit (MDL) studies					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11	OI	Proficiency test reports					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12	OI	Standards documentation					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13	OI	Compound/analyte identification procedures					
		Are the procedures for compound/analyte identification documented?	X				
S14	OI	Demonstration of analyst competency (DOC)					
		Was DOC conducted consistent with NELAC Chapter 5?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15	OI	Verification/validation documentation for methods (NELAC Chapter 5)					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16	OI	Laboratory standard operating procedures (SOPs)					
		Are laboratory SOPs current and on file for each method performed	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Review Checklist: Exception Reports

Laboratory Name: Pace Analytical National	LRC Date: 03/24/2022 14:45
Project Name:	Laboratory Job Number: L1472853-01
Reviewer Name: Lori A Vahrenkamp	Prep Batch Number(s): WG1835828 and WG1835773

ER #[1]	Description
1	8260 WG1835828 L1472853-01: Analyzed from headspace vial.
2	TCEQ Method 1005 WG1835773 TPH C12 - C28: Percent Recovery is outside of established control limits.

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Volatile Organic Compounds (GC/MS) by Method 8260

Analyte	Result mg/l	Qualifier	SDL mg/l	Unadj. MQL mg/l	MQL mg/l	Dilution	Analysis date / time	Batch
Benzene	U		0.000493	0.00200	0.00200	1	03/21/2022 19:01	WG1835828
Ethylbenzene	U		0.000462	0.00200	0.00200	1	03/21/2022 19:01	WG1835828
Toluene	U		0.000998	0.00500	0.00500	1	03/21/2022 19:01	WG1835828
Xylenes, Total	U		0.00132	0.00600	0.00600	1	03/21/2022 19:01	WG1835828
(S) 1,2-Dichloroethane-d4	*96.3*				*70.0-130*		*03/21/2022 19:01*	WG1835828
(S) 4-Bromofluorobenzene	*100*				*70.0-130*		*03/21/2022 19:01*	WG1835828
(S) Toluene-d8	*96.5*				*70.0-130*		*03/21/2022 19:01*	WG1835828

TPH by TCEQ Method 1005

Analyte	Result mg/l	Qualifier	SDL mg/l	Unadj. MQL mg/l	MQL mg/l	Dilution	Analysis date / time	Batch
TPH C6 - C12	1.20		0.752	0.900	0.900	1	03/22/2022 20:37	WG1835773
TPH C12 - C28	1.04		0.467	0.900	0.900	1	03/22/2022 20:37	WG1835773
TPH C28 - C35	U		0.467	0.900	0.900	1	03/22/2022 20:37	WG1835773
TPH C6 - C35	2.24		0.467	0.900	0.900	1	03/22/2022 20:37	WG1835773
(S) o-Terphenyl	*97.9*				*70.0-130*		*03/22/2022 20:37*	WG1835773
(S) 1-chlorooctane	*87.0*				*70.0-130*		*03/22/2022 20:37*	WG1835773

Method Blank (MB)

(MB) R3772467-2 03/21/22 11:29

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Benzene	U		0.000493	0.00200
Ethylbenzene	U		0.000462	0.00200
Toluene	U		0.000998	0.00500
Xylenes, Total	U		0.00132	0.00600
(S) 1,2-Dichloroethane-d4	*100*			*70.0-130*
(S) 4-Bromofluorobenzene	*98.7*			*70.0-130*
(S) Toluene-d8	*96.4*			*70.0-130*

Laboratory Control Sample (LCS)

(LCS) R3772467-1 03/21/22 10:45

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	0.0200	0.0201	101	73.0-131	
Ethylbenzene	0.0200	0.0210	105	76.0-129	
Toluene	0.0200	0.0196	98.0	73.0-130	
Xylenes, Total	0.0600	0.0633	105	78.0-124	
(S) 1,2-Dichloroethane-d4			*96.5*	*70.0-130*	
(S) 4-Bromofluorobenzene			*102*	*70.0-130*	
(S) Toluene-d8			*97.7*	*70.0-130*	

L1472377-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1472377-01 03/21/22 14:14 • (MS) R3772467-3 03/21/22 14:31 • (MSD) R3772467-4 03/21/22 14:49

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Benzene	0.0200	0.00481	0.0256	0.0252	104	102	1	74.0-130			1.57	20
Ethylbenzene	0.0200	U	0.0209	0.0210	105	105	1	77.0-127			0.477	20
Toluene	0.0200	U	0.0198	0.0197	99.0	98.5	1	74.0-127			0.506	20
Xylenes, Total	0.0600	U	0.0632	0.0629	105	105	1	71.0-133			0.476	20
(S) 1,2-Dichloroethane-d4					*99.5*	*97.8*		*70.0-130*				
(S) 4-Bromofluorobenzene					*98.2*	*99.2*		*70.0-130*				
(S) Toluene-d8					*98.2*	*98.0*		*70.0-130*				

QUALITY CONTROL SUMMARY

L1472853-01

Method Blank (MB)

(MB) R3773036-1 03/22/22 11:53

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
TPH C6 - C12	U		0.752	0.900
TPH C12 - C28	U		0.467	0.900
TPH C28 - C35	U		0.467	0.900
TPH C6 - C35	U		0.467	0.900
(S) o-Terphenyl	*103*			*70.0-130*
(S) 1-chlorooctane	*89.9*			*70.0-130*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3773036-2 03/22/22 12:16 • (LCSD) R3773036-3 03/22/22 12:40

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
TPH C6 - C12	41.7	42.6	44.1	102	106	75.0-125			3.46	20
TPH C12 - C28	41.7	47.3	49.2	113	118	75.0-125			3.94	20
TPH C6 - C35	83.2	89.9	93.3	108	112	75.0-125			3.71	20
(S) o-Terphenyl				*101*	*103*	*70.0-130*				
(S) 1-chlorooctane				*104*	*106*	*70.0-130*				

L1472540-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1472540-01 03/22/22 13:53 • (MS) R3773036-4 03/22/22 13:03 • (MSD) R3773036-5 03/22/22 13:29

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TPH C6 - C12	40.3	10.2	56.3	53.5	114	109	1	75.0-125			5.10	20
TPH C12 - C28	40.3	U	52.1	49.7	129	125	1	75.0-125	J5		4.72	20
TPH C6 - C35	80.5	10.2	108	103	121	116	1	75.0-125			4.74	20
(S) o-Terphenyl					*108*	*103*		*70.0-130*				
(S) 1-chlorooctane					*111*	*109*		*70.0-130*				

GLOSSARY OF TERMS

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
MQL	Method Quantitation Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
SDL	Sample Detection Limit.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Sample Detection Limit.
Unadj. MQL	Unadjusted Method Quantitation Limit.
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high.

ACCREDITATIONS & LOCATIONS

Pace Analytical Services, LLC -Dallas 400 W. Bethany Drive Suite 190 Allen, TX 75013

Arkansas	88-0647	Kansas	E10388
Florida	E871118	Texas	T104704232-20-32
Iowa	408	Oklahoma	8727
Louisiana	30686		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

ANALYTICAL REPORT

March 24, 2022

ECS Southwest, LLP - Dallas, TX

Sample Delivery Group:	L1472851
Samples Received:	03/18/2022
Project Number:	1603
Description:	

Report To: Ishtiaque Hossain
2621 White Settlement Rd.
Fort Worth, TX 76107

Entire Report Reviewed By:

Lori A Vahrenkamp
Project Manager

Pace Analytical Services, LLC -Dallas
400 W. Bethany Drive Suite 190 Allen, TX 75013 972-727-1123 800-767-5859 www.pacenational.com

TABLE OF CONTENTS

BA-4 L1472851-01 GW

Collected by: Asif Akhtar | Collected date/time: 03/08/22 04:30 | Received date/time: 03/18/22 13:50

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260	WG1835828	1	03/21/22 17:49	03/21/22 17:49	ZST	Allen, TX
TPH by TCEQ Method 1005	WG1836341	1	03/22/22 12:30	03/23/22 02:14	TTP	Allen, TX

BA-1 L1472851-02 GW

Collected by: Asif Akhtar | Collected date/time: 03/10/22 04:30 | Received date/time: 03/18/22 13:50

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260	WG1835828	1	03/21/22 18:07	03/21/22 18:07	ZST	Allen, TX
TPH by TCEQ Method 1005	WG1836341	1.13	03/22/22 12:30	03/23/22 02:40	TTP	Allen, TX

BA-2 L1472851-03 GW

Collected by: Asif Akhtar | Collected date/time: 03/08/22 04:30 | Received date/time: 03/18/22 13:50

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260	WG1835828	1	03/21/22 18:25	03/21/22 18:25	ZST	Allen, TX
TPH by TCEQ Method 1005	WG1836341	1	03/22/22 12:30	03/23/22 03:03	TTP	Allen, TX

BA-3 L1472851-04 GW

Collected by: Asif Akhtar | Collected date/time: 03/08/22 04:30 | Received date/time: 03/18/22 13:50

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260	WG1835828	1	03/21/22 18:43	03/21/22 18:43	ZST	Allen, TX
TPH by TCEQ Method 1005	WG1836341	1	03/22/22 12:30	03/23/22 03:27	TTP	Allen, TX

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Lori A Vahrenkamp
Project Manager

Sample Delivery Group (SDG) Narrative

No extra volume received to perform Matrix Spike samples.

Lab Sample ID	Project Sample ID	Method
L1472851-01	BA-4	TCEQ Method 1005
L1472851-02	BA-1	TCEQ Method 1005
L1472851-03	BA-2	TCEQ Method 1005
L1472851-04	BA-3	TCEQ Method 1005

Analyzed from headspace vial.

Lab Sample ID	Project Sample ID	Method
L1472851-01	BA-4	8260
L1472851-03	BA-2	8260
L1472851-04	BA-3	8260

Laboratory Data Package Cover Page

This data package consists of this signature page, the laboratory review checklist, and the following reportable data as applicable:

R1 - Field chain-of-custody documentation;

R2 - Sample identification cross-reference;

R3 - Test reports (analytical data sheets) for each environmental sample that includes:

a. Items consistent with NELAC Chapter 5,

b. dilution factors,

c. preparation methods,

d. cleanup methods, and

e. if required for the project, tentatively identified compounds (TICs).

R4 - Surrogate recovery data including:

a. Calculated recovery (%R), and

b. The laboratory's surrogate QC limits.

R5 - Test reports/summary forms for blank samples;

R6 - Test reports/summary forms for laboratory control samples (LCSs) including:

a. LCS spiking amounts,

b. Calculated %R for each analyte, and

c. The laboratory's LCS QC limits.

R7 - Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:

a. Samples associated with the MS/MSD clearly identified,

b. MS/MSD spiking amounts,

c. Concentration of each MS/MSD analyte measured in the parent and spiked samples,

d. Calculated %Rs and relative percent differences (RPDs), and

e. The laboratory's MS/MSD QC limits

R8 - Laboratory analytical duplicate (if applicable) recovery and precision:

a. The amount of analyte measured in the duplicate,

b. The calculated RPD, and

c. The laboratory's QC limits for analytical duplicates.

R9 - List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.

R10 - Other problems or anomalies.

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Lori A Vahrenkamp
Project Manager

Laboratory Review Checklist: Reportable Data

Laboratory Name: Pace Analytical National	LRC Date: 03/24/2022 14:45
Project Name:	Laboratory Job Number: L1472851-01, 02, 03 and 04
Reviewer Name: Lori A Vahrenkamp	Prep Batch Number(s): WG1835828 and WG1836341

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1	OI	Chain-of-custody (C-O-C)					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?		X			1
		Were all departures from standard conditions described in an exception report?	X				
R2	OI	Sample and quality control (QC) identification					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3	OI	Test reports					
		Were all samples prepared and analyzed within holding times?		X			2
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample detection limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?	X				
		Were % moisture (or solids) reported for all soil and sediment samples?			X		
		Were bulk soils/solids samples for volatile analysis extracted with methanol per SW846 Method 5035?			X		
		If required for the project, are TICs reported?			X		
R4	O	Surrogate recovery data					
		Were surrogates added prior to extraction?	X				
		Were surrogate percent recoveries in all samples within the laboratory QC limits?	X				
R5	OI	Test reports/summary forms for blank samples					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6	OI	Laboratory control samples (LCS):					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability check sample data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7	OI	Matrix spike (MS) and matrix spike duplicate (MSD) data					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	X				
		Were MS/MSD RPDs within laboratory QC limits?	X				
R8	OI	Analytical duplicate data					
		Were appropriate analytical duplicates analyzed for each matrix?			X		
		Were analytical duplicates analyzed at the appropriate frequency?			X		
		Were RPDs or relative standard deviations within the laboratory QC limits?			X		
R9	OI	Method quantitation limits (MQLs):					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs and DCSs included in the laboratory data package?	X				
R10	OI	Other problems/anomalies					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Was applicable and available technology used to lower the SDL to minimize the matrix interference effects on the sample results?	X				
		Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
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5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Review Checklist: Supporting Data

Laboratory Name: Pace Analytical National	LRC Date: 03/24/2022 14:45
Project Name:	Laboratory Job Number: L1472851-01, 02, 03 and 04
Reviewer Name: Lori A Vahrenkamp	Prep Batch Number(s): WG1835828 and WG1836341

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1	OI	Initial calibration (ICAL)					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2	OI	Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?			X		
S3	O	Mass spectral tuning					
		Was the appropriate compound for the method used for tuning?	X				
		Were ion abundance data within the method-required QC limits?	X				
S4	O	Internal standards (IS)					
		Were IS area counts and retention times within the method-required QC limits?	X				
S5	OI	Raw data (NELAC Section 5.5.10)					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6	O	Dual column confirmation					
		Did dual column confirmation results meet the method-required QC?			X		
S7	O	Tentatively identified compounds (TICs)					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8	I	Interference Check Sample (ICS) results					
		Were percent recoveries within method QC limits?			X		
S9	I	Serial dilutions, post digestion spikes, and method of standard additions					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?			X		
S10	OI	Method detection limit (MDL) studies					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11	OI	Proficiency test reports					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12	OI	Standards documentation					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13	OI	Compound/analyte identification procedures					
		Are the procedures for compound/analyte identification documented?	X				
S14	OI	Demonstration of analyst competency (DOC)					
		Was DOC conducted consistent with NELAC Chapter 5?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15	OI	Verification/validation documentation for methods (NELAC Chapter 5)					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16	OI	Laboratory standard operating procedures (SOPs)					
		Are laboratory SOPs current and on file for each method performed	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Review Checklist: Exception Reports

Laboratory Name: Pace Analytical National	LRC Date: 03/24/2022 14:45
Project Name:	Laboratory Job Number: L1472851-01, 02, 03 and 04
Reviewer Name: Lori A Vahrenkamp	Prep Batch Number(s): WG1835828 and WG1836341

ER #[1]	Description
1	No extra volume received to perform Matrix Spike samples. 8260 WG1835828 L1472851-04, 01 and 03: Analyzed from headspace vial.
2	TCEQ Method 1005 WG1836341 L1472851-04: Prepared and/or analyzed past holding time as defined in the method. Concentrations should be considered minimum values.

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Volatile Organic Compounds (GC/MS) by Method 8260

Analyte	Result mg/l	Qualifier	SDL mg/l	Unadj. MQL mg/l	MQL mg/l	Dilution	Analysis date / time	Batch
Benzene	0.000628	J	0.000493	0.00200	0.00200	1	03/21/2022 17:49	WG1835828
Ethylbenzene	U		0.000462	0.00200	0.00200	1	03/21/2022 17:49	WG1835828
Toluene	U		0.000998	0.00500	0.00500	1	03/21/2022 17:49	WG1835828
Xylenes, Total	U		0.00132	0.00600	0.00600	1	03/21/2022 17:49	WG1835828
(S) 1,2-Dichloroethane-d4	*94.0*				*70.0-130*		*03/21/2022 17:49*	WG1835828
(S) 4-Bromofluorobenzene	*99.4*				*70.0-130*		*03/21/2022 17:49*	WG1835828
(S) Toluene-d8	*96.9*				*70.0-130*		*03/21/2022 17:49*	WG1835828

TPH by TCEQ Method 1005

Analyte	Result mg/l	Qualifier	SDL mg/l	Unadj. MQL mg/l	MQL mg/l	Dilution	Analysis date / time	Batch
TPH C6 - C12	1.42		0.752	0.900	0.900	1	03/23/2022 02:14	WG1836341
TPH C12 - C28	1.94		0.467	0.900	0.900	1	03/23/2022 02:14	WG1836341
TPH C28 - C35	U		0.467	0.900	0.900	1	03/23/2022 02:14	WG1836341
TPH C6 - C35	3.36		0.467	0.900	0.900	1	03/23/2022 02:14	WG1836341
(S) o-Terphenyl	*100*				*70.0-130*		*03/23/2022 02:14*	WG1836341
(S) 1-chlorooctane	*88.0*				*70.0-130*		*03/23/2022 02:14*	WG1836341

Volatile Organic Compounds (GC/MS) by Method 8260

Analyte	Result	Qualifier	SDL	Unadj. MQL	MQL	Dilution	Analysis	Batch
	mg/l		mg/l	mg/l	mg/l		date / time	
Benzene	U		0.000493	0.00200	0.00200	1	03/21/2022 18:07	WG1835828
Ethylbenzene	U		0.000462	0.00200	0.00200	1	03/21/2022 18:07	WG1835828
Toluene	U		0.000998	0.00500	0.00500	1	03/21/2022 18:07	WG1835828
Xylenes, Total	U		0.00132	0.00600	0.00600	1	03/21/2022 18:07	WG1835828
(S) 1,2-Dichloroethane-d4	*93.9*				*70.0-130*		*03/21/2022 18:07*	WG1835828
(S) 4-Bromofluorobenzene	*99.5*				*70.0-130*		*03/21/2022 18:07*	WG1835828
(S) Toluene-d8	*96.7*				*70.0-130*		*03/21/2022 18:07*	WG1835828

TPH by TCEQ Method 1005

Analyte	Result	Qualifier	SDL	Unadj. MQL	MQL	Dilution	Analysis	Batch
	mg/l		mg/l	mg/l	mg/l		date / time	
TPH C6 - C12	0.985	J J3	0.850	0.900	1.02	1.13	03/23/2022 02:40	WG1836341
TPH C12 - C28	1.19	J3	0.528	0.900	1.02	1.13	03/23/2022 02:40	WG1836341
TPH C28 - C35	U		0.528	0.900	1.02	1.13	03/23/2022 02:40	WG1836341
TPH C6 - C35	2.18	J3	0.528	0.900	1.02	1.13	03/23/2022 02:40	WG1836341
(S) o-Terphenyl	*99.4*				*70.0-130*		*03/23/2022 02:40*	WG1836341
(S) 1-chlorooctane	*87.0*				*70.0-130*		*03/23/2022 02:40*	WG1836341

Volatile Organic Compounds (GC/MS) by Method 8260

Analyte	Result mg/l	Qualifier	SDL mg/l	Unadj. MQL mg/l	MQL mg/l	Dilution	Analysis date / time	Batch
Benzene	U		0.000493	0.00200	0.00200	1	03/21/2022 18:25	WG1835828
Ethylbenzene	U		0.000462	0.00200	0.00200	1	03/21/2022 18:25	WG1835828
Toluene	U		0.000998	0.00500	0.00500	1	03/21/2022 18:25	WG1835828
Xylenes, Total	U		0.00132	0.00600	0.00600	1	03/21/2022 18:25	WG1835828
(S) 1,2-Dichloroethane-d4	*93.3*				*70.0-130*		*03/21/2022 18:25*	WG1835828
(S) 4-Bromofluorobenzene	*102*				*70.0-130*		*03/21/2022 18:25*	WG1835828
(S) Toluene-d8	*96.3*				*70.0-130*		*03/21/2022 18:25*	WG1835828

TPH by TCEQ Method 1005

Analyte	Result mg/l	Qualifier	SDL mg/l	Unadj. MQL mg/l	MQL mg/l	Dilution	Analysis date / time	Batch
TPH C6 - C12	2.32		0.752	0.900	0.900	1	03/23/2022 03:03	WG1836341
TPH C12 - C28	6.45		0.467	0.900	0.900	1	03/23/2022 03:03	WG1836341
TPH C28 - C35	U		0.467	0.900	0.900	1	03/23/2022 03:03	WG1836341
TPH C6 - C35	8.77		0.467	0.900	0.900	1	03/23/2022 03:03	WG1836341
(S) o-Terphenyl	*99.6*				*70.0-130*		*03/23/2022 03:03*	WG1836341
(S) 1-chlorooctane	*87.3*				*70.0-130*		*03/23/2022 03:03*	WG1836341

Volatile Organic Compounds (GC/MS) by Method 8260

Analyte	Result mg/l	Qualifier	SDL mg/l	Unadj. MQL mg/l	MQL mg/l	Dilution	Analysis date / time	Batch
Benzene	U		0.000493	0.00200	0.00200	1	03/21/2022 18:43	WG1835828
Ethylbenzene	U		0.000462	0.00200	0.00200	1	03/21/2022 18:43	WG1835828
Toluene	U		0.000998	0.00500	0.00500	1	03/21/2022 18:43	WG1835828
Xylenes, Total	U		0.00132	0.00600	0.00600	1	03/21/2022 18:43	WG1835828
(S) 1,2-Dichloroethane-d4	*94.6*				*70.0-130*		*03/21/2022 18:43*	WG1835828
(S) 4-Bromofluorobenzene	*102*				*70.0-130*		*03/21/2022 18:43*	WG1835828
(S) Toluene-d8	*97.0*				*70.0-130*		*03/21/2022 18:43*	WG1835828

TPH by TCEQ Method 1005

Analyte	Result mg/l	Qualifier	SDL mg/l	Unadj. MQL mg/l	MQL mg/l	Dilution	Analysis date / time	Batch
TPH C6 - C12	3.02	T8	0.752	0.900	0.900	1	03/23/2022 03:27	WG1836341
TPH C12 - C28	1.79	T8	0.467	0.900	0.900	1	03/23/2022 03:27	WG1836341
TPH C28 - C35	U	T8	0.467	0.900	0.900	1	03/23/2022 03:27	WG1836341
TPH C6 - C35	4.81		0.467	0.900	0.900	1	03/23/2022 03:27	WG1836341
(S) o-Terphenyl	*99.1*				*70.0-130*		*03/23/2022 03:27*	WG1836341
(S) 1-chlorooctane	*87.0*				*70.0-130*		*03/23/2022 03:27*	WG1836341

Method Blank (MB)

(MB) R3772467-2 03/21/22 11:29

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Benzene	U		0.000493	0.00200
Ethylbenzene	U		0.000462	0.00200
Toluene	U		0.000998	0.00500
Xylenes, Total	U		0.00132	0.00600
(S) 1,2-Dichloroethane-d4	*100*			*70.0-130*
(S) 4-Bromofluorobenzene	*98.7*			*70.0-130*
(S) Toluene-d8	*96.4*			*70.0-130*

Laboratory Control Sample (LCS)

(LCS) R3772467-1 03/21/22 10:45

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	0.0200	0.0201	101	73.0-131	
Ethylbenzene	0.0200	0.0210	105	76.0-129	
Toluene	0.0200	0.0196	98.0	73.0-130	
Xylenes, Total	0.0600	0.0633	105	78.0-124	
(S) 1,2-Dichloroethane-d4			*96.5*	*70.0-130*	
(S) 4-Bromofluorobenzene			*102*	*70.0-130*	
(S) Toluene-d8			*97.7*	*70.0-130*	

L1472377-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1472377-01 03/21/22 14:14 • (MS) R3772467-3 03/21/22 14:31 • (MSD) R3772467-4 03/21/22 14:49

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Benzene	0.0200	0.00481	0.0256	0.0252	104	102	1	74.0-130			1.57	20
Ethylbenzene	0.0200	U	0.0209	0.0210	105	105	1	77.0-127			0.477	20
Toluene	0.0200	U	0.0198	0.0197	99.0	98.5	1	74.0-127			0.506	20
Xylenes, Total	0.0600	U	0.0632	0.0629	105	105	1	71.0-133			0.476	20
(S) 1,2-Dichloroethane-d4					*99.5*	*97.8*		*70.0-130*				
(S) 4-Bromofluorobenzene					*98.2*	*99.2*		*70.0-130*				
(S) Toluene-d8					*98.2*	*98.0*		*70.0-130*				

Method Blank (MB)

(MB) R3773038-1 03/22/22 23:01

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
TPH C6 - C12	U		0.752	0.900
TPH C12 - C28	U		0.467	0.900
TPH C28 - C35	U		0.467	0.900
TPH C6 - C35	U		0.467	0.900
(S) o-Terphenyl	*100*			*70.0-130*
(S) 1-chlorooctane	*88.0*			*70.0-130*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3773038-2 03/22/22 23:24 • (LCSD) R3773038-3 03/22/22 23:48

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
TPH C6 - C12	41.7	42.4	43.4	102	104	75.0-125			2.33	20
TPH C12 - C28	41.7	47.3	47.9	113	115	75.0-125			1.26	20
TPH C6 - C35	83.3	89.7	91.3	108	110	75.0-125			1.77	20
(S) o-Terphenyl				*101*	*100*	*70.0-130*				
(S) 1-chlorooctane				*103*	*103*	*70.0-130*				

L1472851-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L1472851-02 03/23/22 02:40 • (MS) R3773038-4 03/23/22 00:12

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
TPH C6 - C12	41.7	0.985	45.2	106	1	75.0-125	
TPH C12 - C28	41.7	1.19	51.4	120	1	75.0-125	
TPH C6 - C35	83.3	2.18	96.6	113	1	75.0-125	
(S) o-Terphenyl				*101*		*70.0-130*	
(S) 1-chlorooctane				*103*		*70.0-130*	

GLOSSARY OF TERMS

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
MQL	Method Quantitation Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
SDL	Sample Detection Limit.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Sample Detection Limit.
Unadj. MQL	Unadjusted Method Quantitation Limit.
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J	The identification of the analyte is acceptable; the reported value is an estimate.
J3	The associated batch QC was outside the established quality control range for precision.
T8	Sample(s) received past/too close to holding time expiration.

ACCREDITATIONS & LOCATIONS

Pace Analytical Services, LLC -Dallas 400 W. Bethany Drive Suite 190 Allen, TX 75013

Arkansas	88-0647	Kansas	E10388
Florida	E871118	Texas	T104704232-20-32
Iowa	408	Oklahoma	8727
Louisiana	30686		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

APPENDIX D – Supplemental Report Documents

General Specifications – Chemical or Water Pressure Injection
Clay Plug Detail

GENERAL SPECIFICATIONS - CHEMICAL or WATER PRESSURE INJECTION

1. The injection process shall be observed on a full time basis by an authorized representative of ECS.

2. The injection process should be performed after the subgrade has been established to the desired elevation and prior to placement of select fill (if any), installation of underground utilities, and construction of pavements.

3. Chemical (ion exchange solution) shall be added to the water for the Chemical Injection Operation and Surfactant shall be added to the water for the Water Injection Operation. The chemical/surfactant should be added in accordance with the manufacturer's recommendations.

4. Hole patterns on the lower portion of the injection rods shall be orientated to uniformly disperse the fluid throughout the injected zone.

5. Injection pressures shall be between 50 and 200 pounds per square inch and shall be adjusted to disperse as large a volume of fluid as possible.

6. The injection pipe shall be forced downward in 12 inch intervals. The pipes shall not be jetted or washed to achieve each penetration. The total depth of injection shall be in accordance with the recommendations contained in the report and is dependent on the depth of Select Fill (if any).

7. Injection shall continue to refusal (i.e. until the soil will not take any more fluid and fluid is running freely on the surface) to the specified injection depth. Refusal should be determined by an on-site representative of ECS.

8. Injection spacing shall not exceed 5 feet on center in each direction. Injections shall extend at least 5 feet beyond the building perimeter. Subsequent injection shall be orthogonally offset 2.5 feet from the previous injection pass.

9. A minimum of 24-hours should elapse between injection passes.

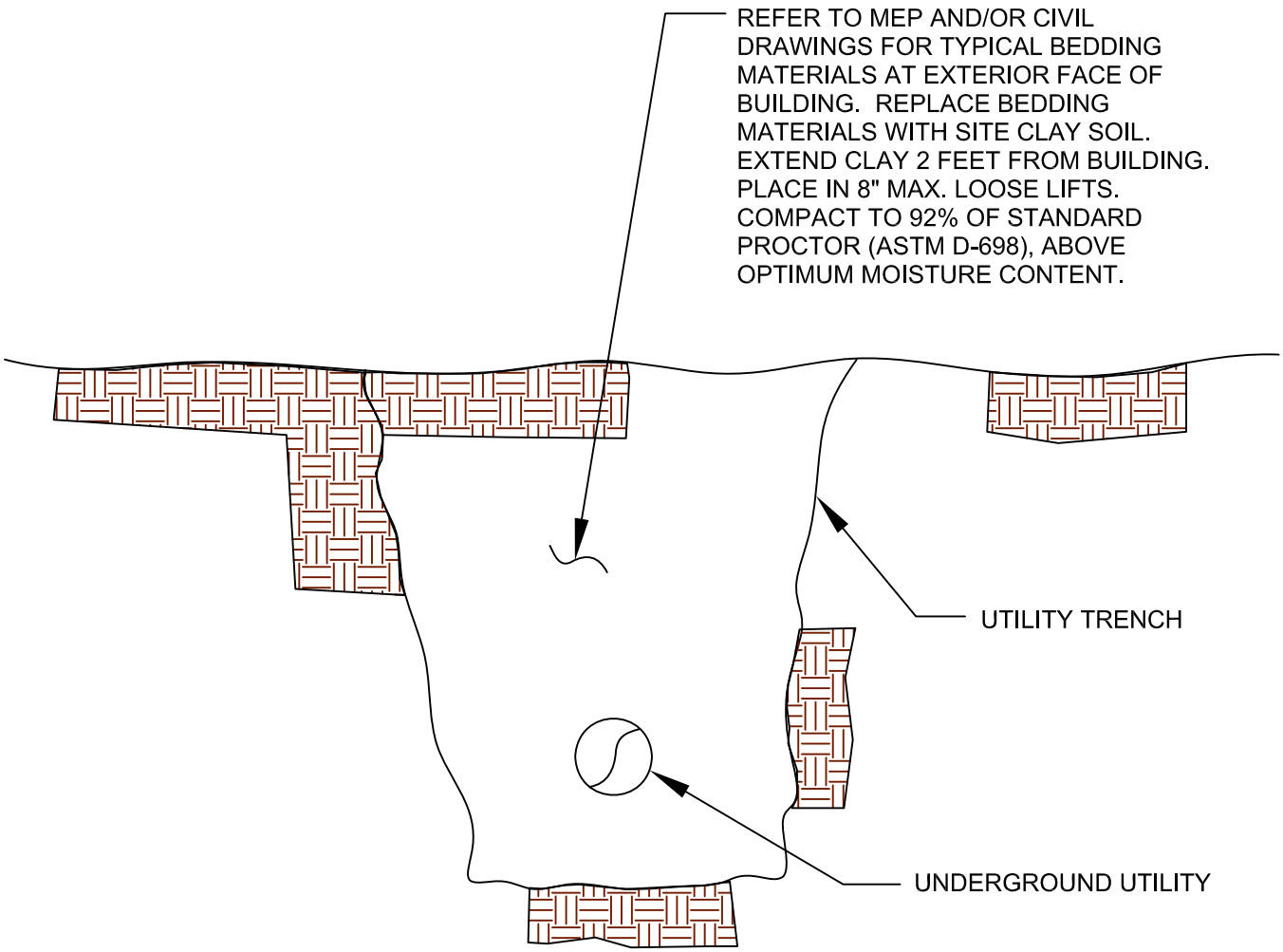
10. Post injection evaluation (after 72 hour mellowing period) of the building pad shall include soil borings conducted at a minimum frequency of one boring per 3,000 square feet, or a minimum of two borings per building pad.

11. Continuous tube samples shall be obtained in the injected zone. Continuous moisture contents and hand penetrometer testing shall be conducted every 12 inches as well as swell testing every 2.5 feet of injection depth, but no less than three swell tests per boring.

12. At completion of the injection process, the surface should be scarified to a depth of 12 inches and recompacted to a minimum of 92% of the maximum standard Proctor dry density as determined by ASTM D-698 at moisture contents at least 3% above optimum.

13. Completion of the building pad shall proceed in a timely manner after injection and recompaction is complete to preserve the moisture content of the injected soils.

14. ECS should be retained to observe the entire injection process, provide post-injection laboratory testing, and evaluate the effectiveness of the injection process.



TYPICAL DETAIL DIAGRAM	ECS	**CLAY PLUG AT UTILITY TRENCH**	ENGINEER	SCALE NTS
			DRAFTSMAN CLL	PROJECT NO.
			REVISIONS	SHEET 1 OF 1
				DATE 11/7/08