ECS Southwest, LLP

Geotechnical Engineering Report

Sherwin Williams – Haslet

2101 Avondale Haslet Road
Haslet, TX

ECS Project Number 63:1901

July 14, 2023

ECS SOUTHWEST, LLP
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July 14, 2023

Mr. Aditya Rangrej
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ECS Project No. 63:1901

Reference: Geotechnical Engineering Report
Sherwin Williams – Haslet
2101 Avondale-Haslet Road
Haslet, TX

Dear Mr. Rangrej:

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 Fort Worth Development Group, LLC 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,

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APPENDICES

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.

- The borings encountered Sandy Fat Clay (CH) and Sandy Lean Clay (CL) followed by weathered tan Limestone. Below weathered tan Limestone, gray Limestone was encountered until the termination depth of 20 feet below existing grades. Groundwater was not observed within borings during drilling operations.

- Moderately to highly expansive clays are present at this site. The potential vertical soil movements of floor slabs placed near existing grade are estimated to be about 1 to 2 inches. Subgrade treatment of the expansive clay soils is necessary to reduce the potential for vertical movements.

- The planned building can be supported on a shallow foundation system consisting of shallow footings placed on improved subgrade if some movements in the foundation system can be tolerated.

- 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

The purpose of this study was to provide geotechnical information for the design and construction of a new building with an approximate footprint of 4,500 SF on a 0.932-arce site. Associated surface parking/driveways are also included in this project. The recommendations developed for this report are based on project information supplied by the client in their email dated June 15, 2023.

Our services were provided in accordance with our Proposal No. 63:2900-GP, dated June 20, 2023, and executed on June 20, 2023, which includes modified ECS Terms Conditions of Service.

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 foundations.
- Recommendations for floor slabs.
- Recommendations for pavement subgrades.
- Recommendations for site preparation and construction of compacted fills, including an evaluation of on-site soils for use as compacted fills.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION/CURRENT SITE USE

The project site is located at 2101 Avondale-Haslet Rd in Haslet, Texas (GPS: 32.9683 N, 97.4062 W). The site is currently undeveloped and covered with grass and vegetations. The site slopes down from the northwest to southeast with a relief of about 2 feet. The location is depicted below.

2.2 PROPOSED CONSTRUCTION

We understand the project will consist of the design and construction of a new building with an approximate footprint of 4,500 SF on a 0.932-arce site. The following information explains our understanding of the planned development including the proposed buildings and related infrastructure.

SUBJECT	DESIGN INFORMATION / ASSUMPTIONS
Building Type	One single-story building with footprint of 4,500 SF
Usage	Commercial
Column Loads (assumed)	200 kips (Full Dead and Live Load) maximum
Wall Loads (assumed)	4 kips per linear foot (klf) maximum
Lowest Finish Floor Elevation (assumed)	Within 2 feet of existing grades

If ECS' understanding of the project is not correct, especially if the structural loads are different, please contact ECS so that we may review these changes and revise our recommendations, as appropriate.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

Our exploration procedures are explained in greater detail in Appendix B including the insert titled Subsurface Exploration Procedures. Our scope of work included drilling three (3) 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 regional parent geologic mapping indicates that the site is underlain by the Fort Worth Limestone and Duck Creek (Kfd) geologic formation. In the Fort Worth Limestone and Duck Creek Formation, the parent rock consists of alternating layers of limestone and shale while the Duck Creek formation consists predominately of hard limestone with marl layers. Generally, the more intact un-weathered limestone is grayish in color and weathers into a tan limestone or into highly plastic clay soils. These clays typically exhibit high to very high shrink/swell with change in moisture contents. The clays can typically range from tan directly above the rock to darker colors near the ground surface and will have higher shrink/swell tendencies near the surface. Please refer to the geological survey map 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[2]	EL. +839.0	I	(CL) SANDY LEAN CLAY, brown	Very Stiff to hard
2[3]	EL. +840.0	II	(CH) SANDY FAT CLAY, brown	Hard
5 to 12[4]	EL. +830.0 to 837 .0	III	LIMESTONE, weathered, tan, with clay seams	-
20[5]	EL. +822.0	IV	LIMESTONE, gray, with shale seams	-

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 Boring B-01.
(3) Encountered in Borings B-02 and P-01
(4) Encountered in all borings. Boring P-01 was terminated in this stratum at a depth of 5 feet from the existing ground surface.
(5) Encountered in Borings B-01 and B-02. These borings were terminated in this stratum at a depth of 20 feet from the existing ground surface.

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 within borings during drilling operations.

Variations in groundwater levels can occur as a result 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 soil samples were tested for moisture content, Atterberg Limits, overburden swell, and gradations and the results are presented in Appendix C.

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 the 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 site grading information was not available at the time of preparing this report; we have assumed that the proposed building will have a finished floor elevation within 2 feet of the existing site grade. If the finished floor elevation deviates from this assumed grade, the recommendations provided below should be evaluated by our office.

We understand that the client prefers shallow foundations for this building. The planned new building can be supported on shallow footings on improved subgrade if some movement in the foundation can be tolerated. If reduced foundation movements are preferred, we should be contacted for alternate foundation recommendations. The following sections provide recommendations for shallow foundations, floor slabs, seismic design and pavements.

4.1 FOUNDATIONS

4.1.1 Shallow Footings – Design Parameters

The planned structure can be supported on a shallow footing foundation system on improved subgrade if some movement can be tolerated. Based on test method TEX-124-E in the Texas Department of Transportation (TxDOT) Manual of Testing Procedures, overburden swell tests and our experience with similar soils, we estimate potential vertical soil movements (PVM) on the order of 1 to 2 inches in floor slabs placed near existing grade. The subgrade soils should be prepared to reduce the potential vertical movement (PVM) as discussed in ***Section 4.2 Floor Slab Systems.*** The design parameters for shallow footings are presented in the following table.

Design Parameter	Recommendations
Bearing stratum[1]	Moisture Conditioned Soils/ tan limestone
Minimum Penetration into bearing Stratum[1]	2 feet
Net allowable bearing capacity- continuous footings[2]	2,000 psf (soil)/3,000 psf (tan limestone)
Net allowable bearing capacity – individual footings[2]	2,500 psf (soil)/3,500 psf (tan limestone)
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)[3, 4]	260 psf/ ft
Ultimate coefficient of sliding[3]	0.40
Approximate total settlement	1 inch
Approximate differential settlement	½ to ¾ inches

Notes:

1. *To reduce differential movements in foundations, we recommend foundations be placed in one type bearing materials (either moisture conditioned soils or tan limestone).*
2. *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.*
3. *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.*
4. *A minimum factor of safety of 1.5 is recommended against sliding.*

4.1.2 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 be placed at a minimum of 4 percentage points above optimum moisture content and compacted to at least 93% 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.

4.2 FLOOR SLAB SYSTEMS

The clay soils encountered at this site are moderately expansive. These soils are susceptible to shrink swell tendencies, occurring seasonally, throughout the life of the facility with the changes in moisture content. Based on test method TEX-124-E in the Texas Department of Transportation (TxDOT) Manual of Testing Procedures, overburden swell tests and our experience with similar soils, we estimate potential vertical soil movements (PVM) on the order of 1 to 2 inches in floor slabs placed near existing grade . The actual movements could be greater if fill materials are placed on existing grade or poor drainage, ponded water, and/or other unusual sources of moisture are allowed to saturate the soils beneath the structure after construction.

If movements of about one inch or less can be tolerated, the floor slab can be placed on a prepared subgrade. We recommend subgrade improvements below the building floor slabs to achieve a uniform PVM across the building pad and reduce the risk of future movements. To reduce the floor slab movements to about one inch or less, we recommend the following subgrade improvements.

Subgrade Improvements

Depth of Non-Expansive Fill (feet)	Depth of Moisture Conditioning (feet) (1)	Total Depth of Improved Zone (feet)	Anticipated PVM (inches)
1	2	2	1
3	N/A	N/A	½

(1) Or top of tan Limestone, whichever is shallower.

The moisture conditioning should extend beyond the building lines to include building entrances, abutting sidewalks, flatwork areas sensitive to movement and 5 feet beyond those elements. The non-expansive fill should not be placed outside the building lines. Exterior grade beam backfill should consist of on-site moisture conditioned clays. The non-expansive fill can either be select fill or flexible base. Properties of moisture conditioned soil, select fill, and flexible base are provided in S***ection 5.3 Material Specifications***.

Any imported fill material should have similar Plasticity Index (PI) to on-site soils. Higher PI soils if imported, could impact the recommendations. Should differing materials than encountered on this site, we would be pleased to update our recommendations.

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 of future PVM values, because the movements are seasonal and occur over the life of the structures, these differential movements cause distress throughout the structure.

Subgrade Modulus: Provided subgrades are prepared as, discussed herein, the slab may be designed assuming a modulus of subgrade reaction, k_1 of 100 pci (moisture conditioned soil) and 150 pci (non-expansive fill) (lbs/cu. inch).

Joints: 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 the concreter slab joint design.

Vapor Retarder: Before the placement of concrete, a vapor retarder may be placed below the floor slab 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.

4.3 BUILDING PERIMETER CONDITIONS

Soils placed along the exterior of the building should be on-site clay soils placed and compacted at least 93% of the Maximum Dry Density at least at 4 percentages 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. 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. A typical clay plug at utility trench detail is provided in Appendix D of the report.

Positive drainage away from the structures should also be provided. 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. 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.

Where flatwork is placed against or near the structure, a positive seal must be installed and adequately maintained to reduce water intrusion. Down spouts and gutters should be used to collect and distribute water away from the structure.

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.

4.4 SEISMIC DESIGN CONSIDERATIONS

Seismic Site Classification: The International Building Code (IBC) 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.

Seismic Site Classification

SEISMIC SITE CLASSIFICATION				
Site Class	**Soil Profile Name**	**Shear Wave Velocity, Vs, (ft./s)**	**N value (bpf)**	**S_u (psf)**
A	Hard Rock	Vs > 5,000 fps	N/A	N/A
B	Rock	2,500 < Vs ≤ 5,000 fps	N/A	N/A
C	Very dense soil and soft rock	1,200 < Vs ≤ 2,500 fps	>50	$s_{u \geq}$ 2,000
D	Stiff Soil Profile	600 ≤ Vs ≤ 1,200 fps	15 to 60	1,000 ≤ s_u ≤ 2000
E	Soft Soil Profile	Vs < 600 fps	<15	s_u < 1000

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 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	0.096	F_a	1.2	$S_{MS}=F_aS_S$	0.115	$S_{DS}=2/3\ S_{MS}$	0.077
1.0	S_1	0.05	F_v	1.7	$S_{M1}=F_vS_1$	0.085	$S_{D1}=2/3\ S_{M1}$	0.057

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.

4.5 PAVEMENT SECTIONS – PRIVATE DRIVES AND PARKING

As previously noted, the PVM of this site is up to about 1 to 2 inches for pavements placed near existing grade. Should these movements be unacceptable for the pavements, we should be contacted for recommendations to reduce potential movements.

The proposed paved areas should be proof rolled with heavy compaction equipment to attempt to locate any soft or yielding soils so they can be removed and replaced with properly placed and compacted soils. Any new fill may consist of on-site soils or similar. These materials should be compacted to at least 95% of the Maximum Dry Density at or above optimum moisture content as obtained using the Standard Proctor Method (ASTM D-698). Care should be taken to verify and preserve the specified moisture levels in the reworked clays prior to placement of the pavements.

Both asphalt pavement and portland cement concrete pavement can be considered for this site. Lime stabilization is recommended beneath asphaltic concrete pavements. If lime stabilization is considered, we recommend testing the soils for soluble sulfate during construction. We should be contacted to evaluate the feasibility of lime stabilization.

For lime stabilization, a preliminary application rate of 7% lime by dry weight of clay can be used. The actual amount of lime required should be confirmed by additional laboratory tests (lime series) during the construction phase. The lime stabilization should conform TxDOT Item 260. The stabilized soil should be compacted to at least 95% of the Maximum Dry Density at workable moisture contents of about 3 percentage points above the optimum moisture content as obtained using the Standard Proctor Method (ASTM D-698). Stabilization should extend at least 1 foot beyond the pavement edges.

Typical preliminary pavement sections are provided below. The Standard Duty and Medium Duty asphalt pavements with lime stabilization are adequate for design life of 50,000 and 100,000 ESAL, respectively. The Standard Duty and Medium Duty concrete pavements without lime stabilization are adequate for design life of 50,000 and 125,000 ESAL, respectively. If lime stabilization is performed beneath concrete pavements, the Standard Duty and Medium Duty concrete pavements are adequate for design life of 80,000 and 200,000 ESAL, respectively.

In some cases, jurisdictional standards for pavement section construction may exceed those provided below. In that case, the pavement sections should follow the jurisdictional standards.

Pavement Sections – Light Duty and Medium Duty Pavements

Material Description	**Asphaltic Concrete Pavement**		**Portland Cement Concrete (PCC) Pavement**		
	Standard Duty	**Medium Duty**	**Standard Duty**	**Medium Duty**	**Dumpster Area**
Asphalt Surface Course	2 inches	2 inches	--	--	--
Asphalt Binder Course[1]	3 inches	4 inches	--	--	--
Portland Cement Concrete	--	--	5 inches	6 inches	7 inches
Subgrade[2]	6 inches lime Stabilized	6 inches lime Stabilized	6 inches Compacted soil or lime stabilized soil	6 inches Compacted soil or lime stabilized soil	6 inches Compacted soil or lime stabilized soil

Notes:

1. *Flexible base material may be substituted for the asphalt binder using a substitute ratio of three inches of flexible base for each inch of asphalt binder.*
2. *Flexible base materials may be substituted with the lime stabilization at an equivalent thickness substitution*

An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should reduce the possibility of the subgrade materials becoming saturated during the normal service period of the pavement.

Pavement should be specified, constructed, and tested to meet the following requirements:

1. Reinforcing steel may consist of #3 reinforcing steel bars placed at 18 inches on center each way. The reinforcing steel should be placed at mid-point of the pavement section.

2. Hot Mix Asphaltic Concrete: Item 340 of the TxDOT Standard Specifications, Type A or B Base Course (binder), Type D Surface Course. The coarse aggregate in the surface course should be crushed limestone rather than gravel.

3. Portland Cement Concrete: Minimum compressive strength of 3,600 lbs per sq inch at 28 days. Concrete should be designed with 3 to 6 percent entrained air.

4. Flexible Base Material: Item 247 of the TxDOT Standard Specifications, Type D, Grade 1 or 2. The material should be compacted to a minimum 95 percent of standard Proctor maximum dry density (ASTM D 698) and within three percentage points of the material's optimum moisture content.

Proper joint placement and design is critical to pavement performance. Load transfer at all joints and maintenance of watertight joints should be accomplished by use of proper joint seals and dowels. Control joints in new pavement should be sawed as soon as practical and preferably within 5 to 12 hours after placing concrete in order to control the location of cracks which form as the concrete cures. Longitudinal and transverse control joints should be sawed at about 15-foot spacing. Joints should be properly cleaned and sealed as soon as possible to avoid infiltration of water, small gravel, etc.

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 outside the moisture conditioned area 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 yielding 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 yielding 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) greater than 40. 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 4.2 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 4 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 relatively uniform distribution of the moisture throughout the soil mass. Once appropriately mixed, the material should be compacted to at least 93% 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 relatively uniform distribution of water.

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 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).

5.3.3 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 and Reports

Site Location Diagram
Boring Location Diagram(s)
Subsurface Cross-Section(s)
Geologic/Soil Survey Maps

SITE LOCATION DIAGRAM
SHERWIN WILLIAMS - HASLET

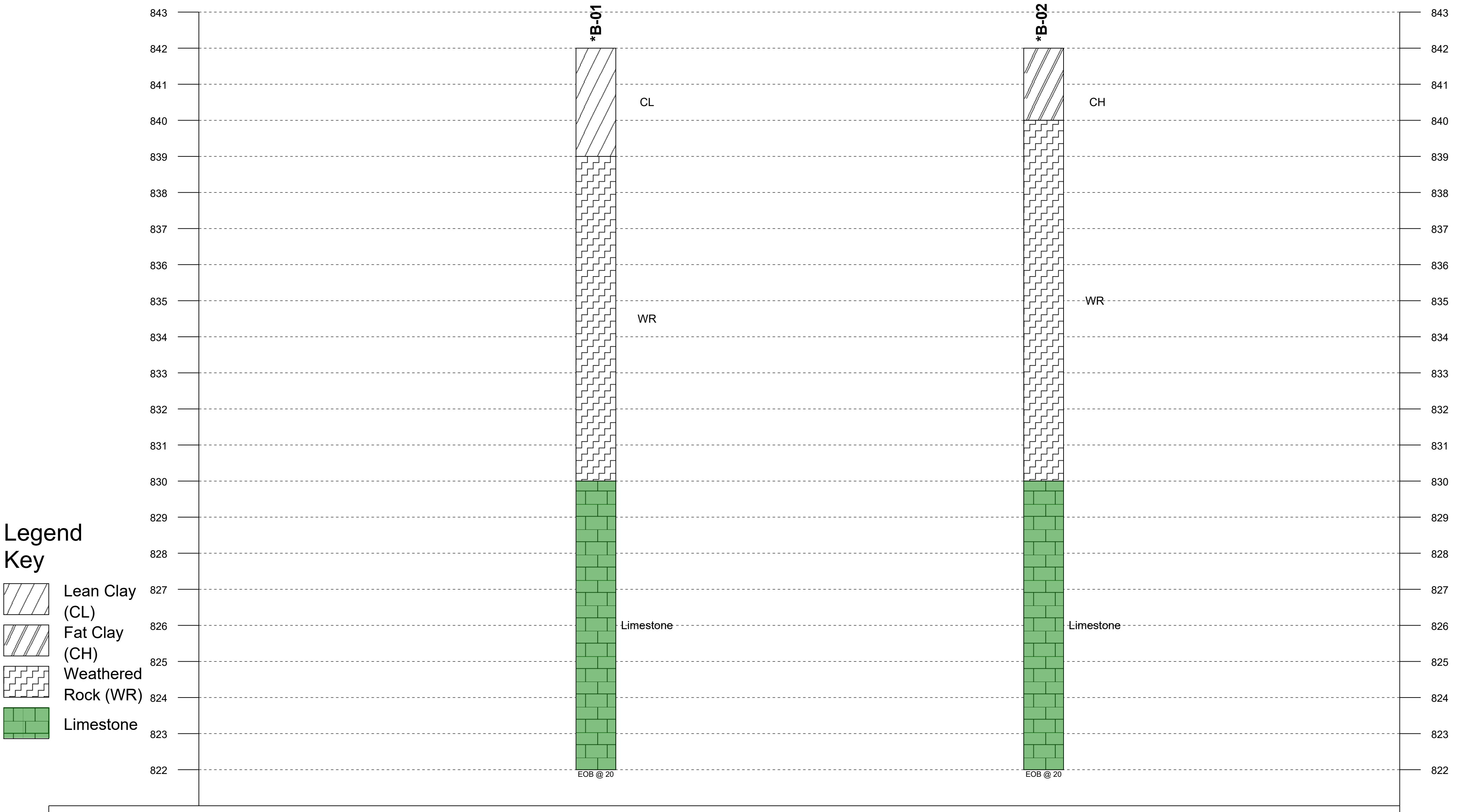
2101 AVONDALE HASLET ROAD, HASLET, TEXAS
FORT WORTH DEVELOPMENT GROUP, LLC

ENGINEER
RJ
SCALE
AS NOTED
PROJECT NO.
63:1901
SHEET
1 OF 1
DATE
7/6/2023

BORING LOCATION DIAGRAM
SHERWIN WILLIAMS - HASLET

2101 AVONDALE HASLET ROAD, HASLET, TEXAS
FORT WORTH DEVELOPMENT GROUP, LLC

ENGINEER	RJ
SCALE	AS NOTED
PROJECT NO.	63:1901
FIGURE	1 OF 1
DATE	7/5/2023



Notes:

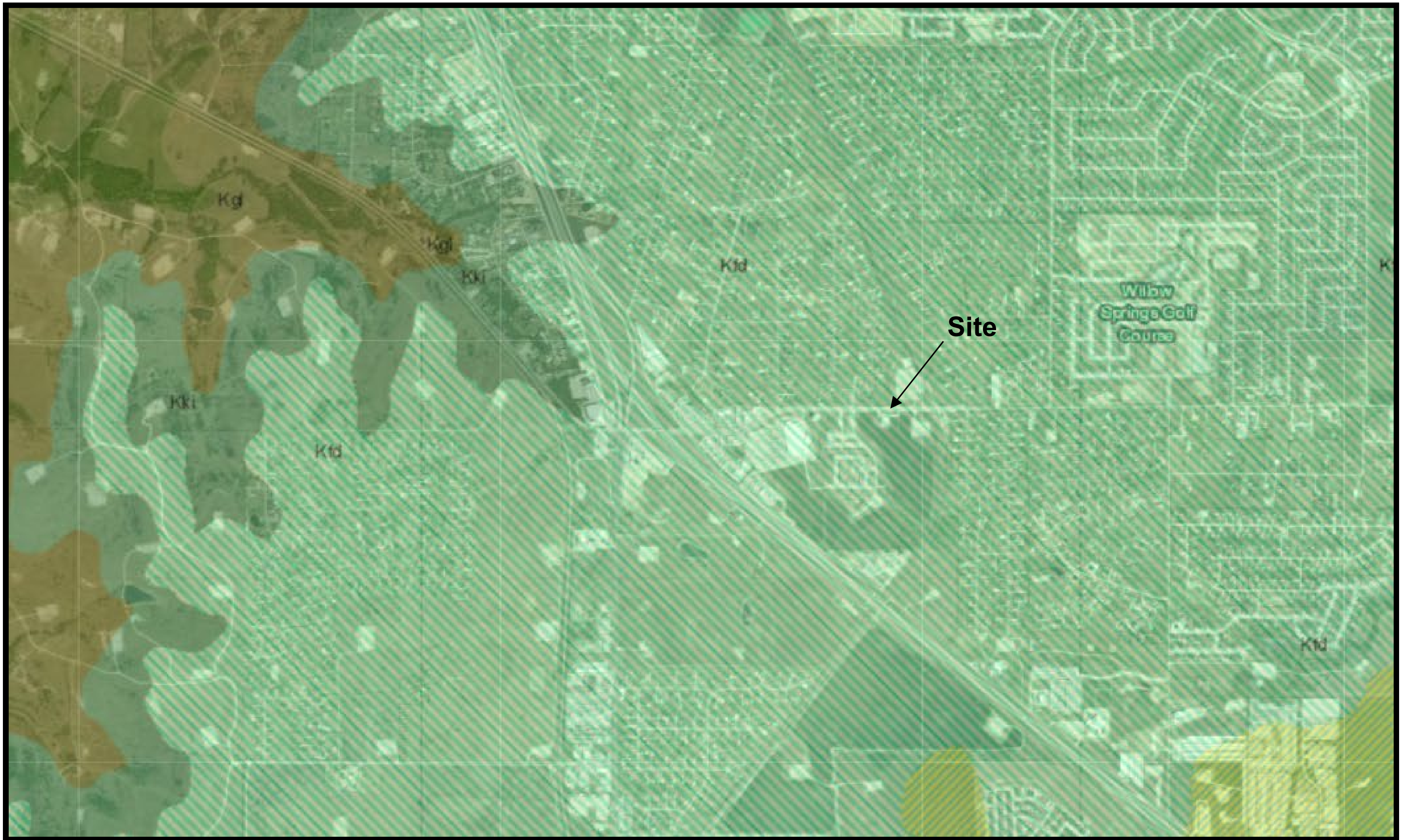
1- EOB: END OF BORING AR: AUGER REFUSAL SR: SAMPLER REFUSAL.
2- THE NUMBER BELOW THE STRIPS IS THE DISTANCE ALONG THE BASELINE.
3- SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL INFORMATION.
4- STANDARD PENETRATION TEST RESISTANCE (LEFT OF BORING) IN BLOWS PER FOOT (ASTM D1586).

Plastic Limit Water Content Liquid Limit X——●——△		▽	WL (First Encountered)	🟥	Fill
[FINES CONTENT %]		▼	WL (Completion)	🟪	Possible Fill
◀	BOTTOM OF CASING	▽	WL (Estimated Seasonal High Water)	■	Probable Fill
100%	LOSS OF CIRCULATION	▽	WL (Stabilized)	🟩	Rock

GENERALIZED SUBSURFACE Cross-Section A-A'

Sherwin Williams - Haslet
Fort Worth Development Group, LLC
2101 Avondale Haslet Road

Project No: 63:1901 Date: 07/05/2023



GEOLOGICAL SURVEY MAP
SHERWIN WILLIAMS – HASLET

FORT WORTH LIMESTONE AND DUCK CREEK FORMATION (Kfd)

2101 AVONDALE-HASLET ROAD, HASLET, TEXAS
FORT WORTH DEVELOPMENT GROUP, LLC

ENGINEER	RJ
SCALE	NOT IN SCALE
PROJECT NO.	63:1901
SHEET	1 OF 1
DATE	06/26/2023

Appendix B – Field Operations

Reference Notes
Exploration Procedures
Boring Logs

REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]

■		**ASPHALT**
⁘		**CONCRETE**
⁘		**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, QP[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

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

GRAVELS, SANDS & NON-COHESIVE SILTS

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

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 three borings drilled to depths of about 5 to 20 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 Shelby tube sampling procedures in accordance with ASTM Specifications D-1587. 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 tan and gray limestone 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.

CLIENT: **Fort Worth Development Group, LLC**	PROJECT NO.: **63:1901**	BORING NO.: **B-01**	SHEET: **1 of 1**
PROJECT NAME: **Sherwin Williams - Haslet**	DRILLER/CONTRACTOR: **Coretest**		
SITE LOCATION: **2101 Avondale Haslet Road**			LOSS OF CIRCULATION
LATITUDE: **32.968196**	LONGITUDE: **-97.406408**	STATION:	SURFACE ELEVATION: **842.0**
			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)	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
	S-1	ST	24	24	(CL) SANDY LEAN CLAY, brown, very stiff to hard				○ 2.50
	S-2	ST	12	12					○ 4.50
					LIMESTONE, weathered, tan, with clay seams				☒ 100/ 9.50" ☒ 100/ 3.25"
5							837		
10							832		☒ 100/ 1.50"
					LIMESTONE, gray, with shale seams				
15							827		☒ 100/ 0.25"
20					**END OF BORING AT 20 FT**		822		☒ 100/ 0.50"
25							817		
30							812		

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

▽ WL (First Encountered)	**DRY**	BORING STARTED: **Jun 26 2023**	CAVE IN DEPTH:
▼ WL (Completion)	**DRY**	BORING COMPLETED: **Jun 26 2023**	HAMMER TYPE: **Auto**
▽ WL (Seasonal High Water)	**N/A**	EQUIPMENT: **Truck** / LOGGED BY: **LL3**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)	**N/A**		

GEOTECHNICAL BOREHOLE LOG

CLIENT: **Fort Worth Development Group, LLC**	PROJECT NO.: **63:1901**	BORING NO.: **B-02**	SHEET: **1 of 1**	ECS
PROJECT NAME: **Sherwin Williams - Haslet**	DRILLER/CONTRACTOR: **Coretest**			
SITE LOCATION: **2101 Avondale Haslet Road**				LOSS OF CIRCULATION
LATITUDE: **32.968449**	LONGITUDE: **-97.406246**	STATION:	SURFACE ELEVATION: **842.0**	BOTTOM OF CASING

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

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL		WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)
0 – 2	S-1	ST	24	24	(CH) SANDY FAT CLAY, brown, hard	▨			
2 – 12					LIMESTONE, weathered, tan, with clay seams	▨			
12 – 20					LIMESTONE, gray, with shale seams	🟩			
20					**END OF BORING AT 20 FT**				

DEPTH (FT)	ELEVATION (FT)
5	837
10	832
15	827
20	822
25	817
30	812

DEPTH (FT)	CALIBRATED PENETROMETER TON/SF	TEXAS CONE PENETRATION BLOWS/FT
1	4.00	
2		100/ 6.50"
5		100/ 6.50"
10		100/ 0.75"
15		100/ 0.50"
20		100/ 0.25"

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

▽ WL (First Encountered)	**DRY**	BORING STARTED:	**Jun 26 2023**	CAVE IN DEPTH:
▼ WL (Completion)	**DRY**	BORING COMPLETED:	**Jun 26 2023**	HAMMER TYPE: **Auto**
▽ WL (Seasonal High Water)	**N/A**	EQUIPMENT: **Truck**	LOGGED BY: **LL3**	DRILLING METHOD: **CFA**
▽ WL (Stabilized)	**N/A**			

GEOTECHNICAL BOREHOLE LOG

CLIENT: **Fort Worth Development Group, LLC**	PROJECT NO.: **63:1901**	BORING NO.: **P-01**	SHEET: **1 of 1**
PROJECT NAME: **Sherwin Williams - Haslet**	DRILLER/CONTRACTOR: **Coretest**		
SITE LOCATION: **2101 Avondale Haslet Road**			

LATITUDE: **32.968484**	LONGITUDE: **-97.406240**	STATION:	SURFACE ELEVATION: **842.0**

LOSS OF CIRCULATION 100%

BOTTOM OF CASING

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

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)	
	S-1	ST	24	24	(CH) SANDY FAT CLAY, brown, hard				○4.50
					LIMESTONE, weathered, tan, with clay seams				☒ 100/ 0.50" ☒ 100/ 2.50"
5					**END OF BORING AT 5 FT**		837		
10							832		
15							827		
20							822		
25							817		
30							812		

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

▽ WL (First Encountered)	**DRY**
▼ WL (Completion)	**DRY**
▽ WL (Seasonal High Water)	**N/A**
▽ WL (Stabilized)	**N/A**

BORING STARTED: **Jun 26 2023**		CAVE IN DEPTH:
BORING COMPLETED: **Jun 26 2023**		HAMMER TYPE: **Auto**
EQUIPMENT: **Truck**	LOGGED BY: **LL3**	DRILLING METHOD: **CFA**

GEOTECHNICAL BOREHOLE LOG

Appendix C – Laboratory Testing

Laboratory Testing Summary

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	One-Dimensional			Dry Unit Weight (pcf)
					LL	PL	PI		Final Moisture (%)	Surcharge (psf)	Swell (%)	
B-01	S-2	2-3	16.9	CL	44	18	26	55.6	20.9	360	0.5	102.5
B-02	S-1	0-2	21.7	CH	68	26	42	60.1				
P-01	S-1	0-2	19.5	CH	75	26	49	59.0				

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, @FM 5-515, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: Sherwin Williams - Haslet
Client: Fort Worth Development Group, LLC

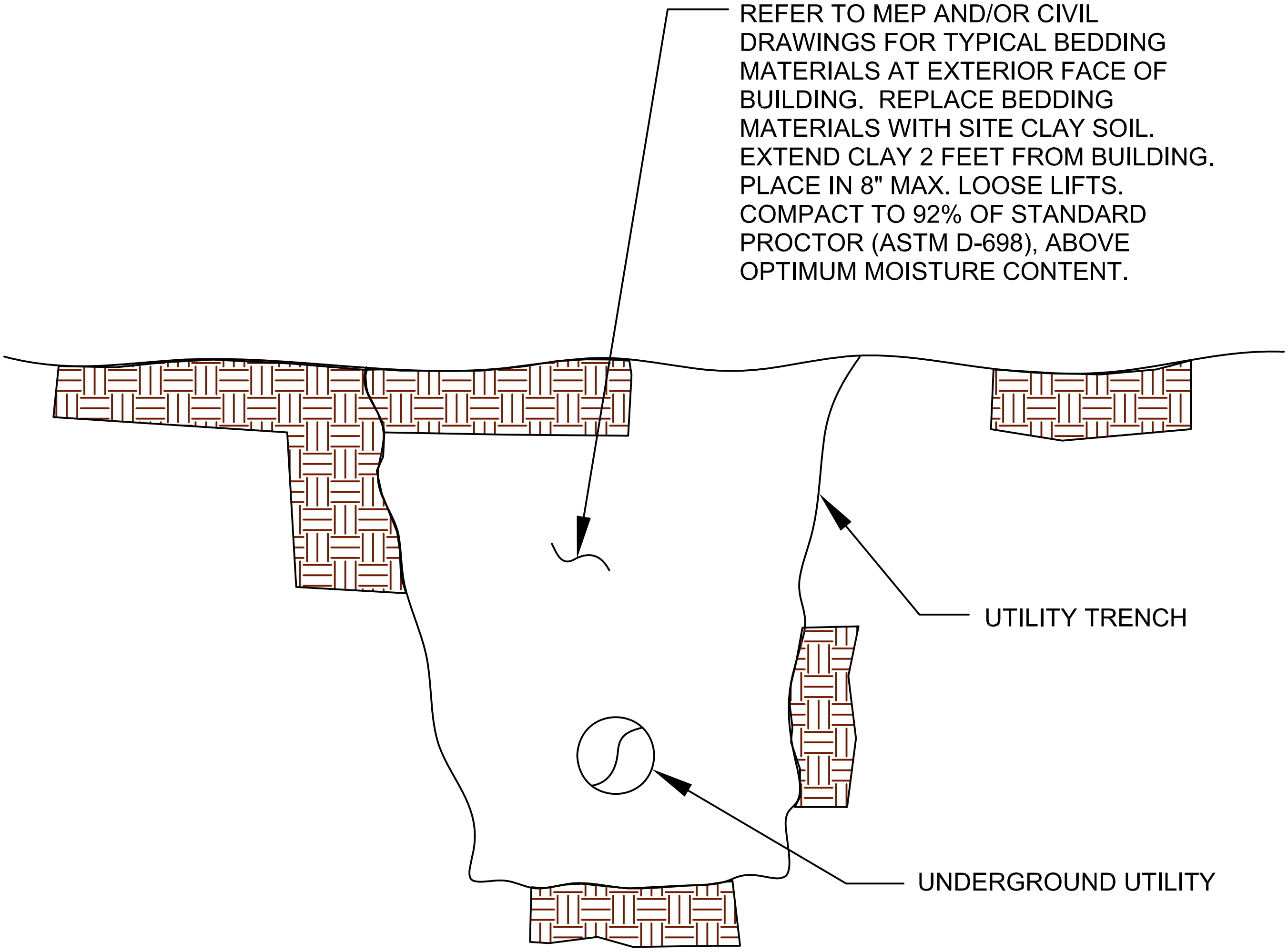
Project No.: 63:1901
Date Reported: 6/29/2023

Office / Lab	Address	Office Number / Fax
ECS Southwest LLP - Fort Worth	2621 White Settlement Road Fort Worth, TX 76107	(682)350-2250 (817)847-8616

Tested by	Checked by	Approved by	Date Received
	DKGreen	DKGreen	

Appendix D – Supplemental Documents

Other Supplemental Documents



REFER TO MEP AND/OR CIVIL DRAWINGS FOR TYPICAL BEDDING MATERIALS AT EXTERIOR FACE OF BUILDING. REPLACE BEDDING MATERIALS WITH SITE CLAY SOIL. EXTEND CLAY 2 FEET FROM BUILDING. PLACE IN 8" MAX. LOOSE LIFTS. COMPACT TO 92% OF STANDARD PROCTOR (ASTM D-698), ABOVE OPTIMUM MOISTURE CONTENT.

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