B2Z ENGINEERING

August 3, 2021

Valde Guerra, Executive Officer
Attn: Glinda Pacheco, Planning Analyst III
County of Hidalgo Texas Executive Office
2818 S. Bus. Hwy. 281
Edinburg, Texas 78539

RE: Professional Engineering Services for Construction Materials Testing (C-20-184-01-12)
Work Authorization No. 1 ~ Geotechnical Engineering & Construction Materials Testing

Dear Mr. Guerra:

Attached for your review and approval is our invoice for services rendered under Work Authorization #1 during the month of July 2021 on the subject referenced project.

The following is attached:

- Invoice No. 40137

The following is a narrative of the progress for this period.

	% Complete
Geotechnical Drilling, Testing & Engineering Services	**100%**
UPDATED: B2Z has assisted, developed, or completed the following tasks: 1. All Field Drilling, Lab. Testing & Geo. Engineering are complete. Final Geotechnical Report was signed & sealed 07/09/2021.	

Should you have any questions regarding this submittal, please do not hesitate to call me at (956) 585-3773.

Sincerely,

Jesse Ozuna
Project Manager
B2Z Engineering, LLC

P.O. Box 2724 • McAllen, TX 78502
(956) 585-3773 • www.B2ZEng.com

B2Z ENGINEERING

P.O. Box 2724
McAllen, Tx. 78502
(956) 585-3773

Invoice

Date	Invoice #
8/3/2021	40137

Please send remittance with copy of invoice to:
Attn: Mrs. Aisha Gonzalez
P.O. Box 2724
McAllen, Tx. 78502

Bill To:
County of Hidalgo Texas Executive Office
2818 S. Bus. Hwy. 281
Edinburg, TX 78539

Project Info:
Work Authorization #1
Geotechnical Engineering for
Bio/Safety Laboratory
Contract # C-20-184-01-12

B2Z JOB: 4121

Billing Period **July 2021**

Description	Contract	Previous Applications	Current Completed	Total Completed	% Complete
Geotechnical Drilling, Testing & Engineering	$ 11,977.39	$ -	$ 11,977.39	$ 11,977.39	100%
			Total For This Billing Period		**$11,977.39**

Work Authorization ~ Summary

WA No.	WA Amount	Previously Inv.	Percent Complete	Remaining Balance
1	$11,977.39	$0.00	100.0%	$0.00

Aisha Gonzalez - President

B2Z ENGINEERING

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Aisha Gonzalez - President

B2Z ENGINEERING

GEOTECHNICAL INVESTIGATION
FOR

HIDLAGO COUNTY PCT 4 BIO-SAFETY LABORATORY FACILITY
HIDALGO COUNTY, TEXAS

Prepared For:
Hidalgo County Pct. 4

Prepared By:
B2Z Engineering, LLC
[Texas Registered Engineering Firm F-11187]

B2Z Project No. 4121
July 09, 2021

Date: 07/09/2021

Oliver Salgado, P.E.
Senior Project Manager

900 S. Stewart Rd., Suite 4, Mission, TX, 78572
www.B2ZEng.com

INTRODUCTION

B2Z Engineering, LLC (B2Z) was contracted by **Hidalgo County Pct 4 (HC Pct 4)** to perform a subsurface geotechnical investigation for the proposed Hidalgo County Bio-Safety Laboratory Facility. This report addresses foundation recommendations, parameters for slab foundation design criteria based on the Post Tension Institute (3rd Edition) and Wire Reinforcement Institute specifications, as well as recommendations for maximum allowable bearing capacity of shallow foundations and Potential Vertical Rise (PVR).

GENERAL PROJECT OVERVIEW

Project Description

B2Z is pleased to submit this document presenting our findings as the result of a subsurface geotechnical exploration performed at the request of **HC Pct 4**. The project site is located within Edinburg, Texas, approximately 0.25 mile north of Freddy Gonzalez Dr. and I-69C NB Frontage Road (towards the east half of a County site that will house the Hidalgo County Justice Center on the west half of the site and this project on the east half). It is our understanding that the project involves the construction of a single story building, with concrete walkways (sidewalk). Additionally we understand that the flexible pavement analysis and recommendations were completed in a previously developed report therefore pavement will not be discussed in this report. See the 'Previous Geotechnical Studies (Referenced)' section of this report for further information. A preliminary general site plan sheet/project layout for the proposed facility was provided by the Client and is included in Appendix C. No grading plans or structural loads for the building/structures were provided; thus all foundation and site improvement recommendations as provided in this report are based on the geotechnical properties of the soils and generalized assumptions as noted.

Previous Geotechnical Studies (Referenced)

Through coordination with the Client and research, we understand that a previous Geotechnical Report was completed for this site which included the study of the Hidalgo County Justice Center (proposed to be located on the west half of the site) and the pavement and parking areas for the entire site. The report is titled "Geotechnical Investigation for the Hidalgo County Pct 4 Justice Center" completed by L&G Consulting Engineers, Inc., L&G Project No. G20010, Dated: July 25, 2020.

Scope and Limitations of Investigation

This report has been prepared in general accordance with accepted geotechnical engineering practices for the subject project site and the anticipated construction. No specific warranty program or other special standards, except acceptable industry standards for the general South Texas area, were followed during the course of this investigation and analysis. This geotechnical report is intended for use by **HC Pct 4**, and any direct representatives or affiliates. This geotechnical report may not contain sufficient information for purposes of other parties, or other uses in determining construction means and methods.

The strata, shown on the boring logs (included in Appendix B), represent the subsurface conditions at the boring locations at the time of our investigation. These strata designate approximate boundaries between subsurface materials; however, their actual transition may be gradual or may occur at varying depths. Variations may occur due to unexpected deposits of soft clays, silts or other undesirable soil material not detected through our investigation. It should be noted that the exploratory borings were performed within the limits of the proposed project as approved and agreed upon by all previously noted parties prior to the commencement of our field operations.

The benchmarks of this geotechnical study are to:

1. explore the general existing subsurface conditions at the site
2. evaluate the relevant engineering properties of the subsurface materials
3. provide the potential vertical rise and recommendations to minimize shrink/swell
4. provide the maximum allowable bearing capacity of in-situ soils for shallow foundations
5. provide design parameters for several foundation design methods including WRI and PTI
6. provide recommendations for foundation construction

The scope of this geotechnical engineering study does not include an environmental assessment of the air, soil, rock or water conditions on or adjacent to the site. No environmental opinions are presented in this report. If environmental clearances are needed prior to construction, please contact our offices for assistance in this matter.

EXISTING SURFACE AND SUB-SURFACE CONDITIONS

Site Location / Description

The project site is located within Edinburg, Texas, approximately 0.25 mile north of Freddy Gonzalez Dr. and I-69C NB Frontage Road (towards the east half of a County site that will house the Hidalgo County Justice Center on the west half of the site and this project on the east half). The boring locations were drilled as close as possible to the locations specified by the Client as shown on figures in Appendix A. No surveyor was contracted to determine the exact coordinates for the borings, as this was not a part of the scope of work for the project; however, field handheld GPS coordinates were retrieved and are noted on the boring logs in Appendix B. Elevations were approximated from Google Earth. The property had minimal vegetation at the time of drilling (cleared minimal grasses and dirt).

Geology

The Geologic Atlas of Texas, McAllen-Brownsville Sheet, dated 1976, indicates that the subject site is located within the *Lissie Formation Undivided* (Ql) section of the Quaternary epoch (Pleistocene or Pilocene period). The description of the materials is as follows:

Lissie Formation Undivided – "Clay, silt, sand, gravel, and caliche; gray to brown to pale yellow; gravel mainly siliceous, locally cemented by and interbedded with sandy caliche; caliche massive to modular; surface characterized by many undrained circular to irregular depressions, by relict clay dunes, and by stabilized northwest-trending longitudinal dunes".

Soil Survey Description

According to the Soil Survey of Hidalgo County, Texas, published by the United States Department of Agriculture, the proposed site is located within the Hidalgo-Urban Land Complex, 0 to 1 percent slopes (Soil Map Unit #31).

Hidalgo-Urban Land Complex, 0 to 1% Slopes (Soil Map Unit #31) – These soils are deep, nearly level soils on convex uplands. This unit is well drained with a moderate available water capacity (about 7.8 inches) and moderate permeability. It is non-saline to slightly saline (about 0.0 to 4.0 mmhos/cm) with no frequency of flooding or ponding.

Rainfall

The mean annual precipitation for this area of Hidalgo County is approximately 20-27 inches, as reported by the U.S. Department of Agriculture Soil Conservation Service. Our geotechnical investigation, performed in July 2020 was conducted during a non-drought condition (None, as noted by the National Weather Service and U.S. Drought Monitor). The National Oceanic and Atmospheric Administration (NOAA) reports for the subject date indicated that no significant rainfall observations (at least one inch) occurred prior to or during our exploration that could have had significant effects on any groundwater levels or moisture content of surface soils.

SITE INVESTIGATION

Soil Borings and Laboratory Tests

Subsurface conditions at the site were evaluated through three (3) structural borings (designated as B-#) drilled to a depth of twenty (20) feet below natural ground elevation respectively at the locations shown on figures in Appendix A. The soil borings were drilled and sampled in general accordance with American Society of Testing Materials Procedures (ASTM) D1452 and D1586 using a truck mounted drilling rig (Simco 2800 HS (HT)) and solid stem augers.

As part of the sampling procedures, split barrel (spoon) and Standard Penetration Tests (SPT) were performed and recorded. Standard Penetration Test results are noted on the boring logs as blows per foot or twelve (12) inch increment. The sampler was advanced through three (3) consecutive six inch increments; however, the first six inch increment is considered the seating drive, which eliminates the effect of cuttings or disturbances on the test result. The sum of the blows for the last two six (6) inch increments is considered the "standard penetration resistance value" or "field N-value". Where hard or very dense materials were encountered, the SPT was terminated and noted on the boring log when one of the following situations occurred:

1. *a total of 50 blows were applied on one six inch increment*
2. *a total of 100 blows were applied during the test*
3. *no advancement of the sampler was observed during the application of ten (10) consecutive blows from the hammer*

Representative portions of the split barrel samples were identified, packaged, sealed in containers to reduce moisture loss, and transported to our laboratory for subsequent testing. In the laboratory, each sample was evaluated and visually classified by a member of our geotechnical engineering staff. The properties of each stratum were evaluated by a series of laboratory index

tests. A summary of the laboratory data and their corresponding depths are presented on the boring logs. Samples will be retained in our laboratory for 30 days after submittal of this report. Other arrangements may be provided at the request of the Client to hold the samples through the construction process.

Subsurface Stratigraphy

Based on the results of the field and laboratory sample analyses, the subsurface stratigraphy at the project location contains primarily lean and fat clays in varying configurations. It should be noted, the Soil Strata and Description provided, are typical summarized representation of the site stratigraphy. The lines designating the interfaces between strata on the boring logs represent approximate boundaries. Transitions between strata may be gradual and may occur at varying depths.

Water Strikes

During the drilling operations, water strikes were not encountered at the boring locations, however moist soils noted at the middle to bottom level of the borings indicated likely presence of waterstrike near below bottom of borings. It should be noted that fluctuations in groundwater levels are influenced by variations in rainfall and surface water run-off from season to season. The construction process itself may also cause variations in the groundwater level. If the water level is critical to the construction process, **B2Z** recommends that the Contractor check the subsurface water conditions immediately prior to construction excavation through the installation of piezometer wells.

GEOTECHNICAL BORING ANALYSIS

Moisture Content

The moisture content of a soil is defined as the ratio of the weight of the water in the sample to the dry weight of the soil sample. The moisture contents for the samples obtained as part of our geotechnical exploration were performed in compliance with ASTM procedure D2216 (and Tex-103-E). A comprehensive list of all moisture contents by corresponding depth can be found on the boring logs.

Plasticity Index

The Plasticity Index (PI) is defined as the difference between the liquid limit and the plastic limit of a soil. These limits are commonly referred to as the Atterberg limits, which describe the consistency of soils with respect to their varying moisture contents. The plasticity indices for the samples obtained as part of our geotechnical exploration were performed in compliance with ASTM procedure D4318 (and Tex-104-E thru Tex-106-E). A comprehensive list of all plasticity indices by corresponding depth can be found on the boring logs.

Particle Size Analysis (Determination of Fines Content)

The standard grain size analysis is used to determine the relative proportions of different grain sizes as they are distributed along a range of different sized sieves. The minus 200 sieve analysis is used commonly as a tool for soil classification and identification using the Unified Soils

Classification System. Results for this test are reported as a percentage of soil passing the No. 200 sieve, which has openings 0.075mm wide. The particle size analyses for the samples obtained as part of our geotechnical exploration were performed in compliance with ASTM procedure D1140 (and Tex-111-E). A comprehensive list of all fines contents by corresponding depth can be found on the boring logs.

Particle Size Analysis (Gradation Curves)

Full standard gradation analysis is necessary to establish soil gradation curves. Standard gradation analysis involves two parts, the sieve analysis and the hydrometer analysis. The sieve analysis consists of stacking progressively finer sieves and passing a soil mass through. The sieve sizes correspond to different particle sizes within a soil. Hydrometer analyses are used primarily in fine grained soils but are also very useful in establishing the 'tail-end' of a gradation curve for soils having a mixture of coarse grained and fine grained soil constituents. Full standard gradation analysis is also useful in defining percentages of particle diameters. Full gradation curves can be found in Appendix B.

Sulfate Content of Soil (Concrete Structures)

The presence of high concentrations of water-soluble sulfates (SO_4) in soils can be detrimental to concrete structures in direct contact. Concrete exposed to these sulfate rich soils (buried concrete structures, foundations, slabs-on-grade) are highly vulnerable to deterioration typically in the form of expansion, extensive cracking and spalling. In the long-term, sulfates causing micro-cracks in concrete structures can form areas of additional ettringite (calcium sulfoaliminate) formation that can potentially penetrate the structures and lead to weakening of the cement paste and structure as a whole. In order to detect levels of water-soluble sulfates in the soils, we performed testing at various depths at boring locations (soils that could potentially be in contact with the deep foundations) in accordance with Tex-145-E (Determining Sulfate Content in Soils – Colorimetric Method). The results are presented on the boring logs.

FOUNDATION RECOMMENDATIONS

Proposed Project Foundation System Information

The proposed facilities, as previously noted, will be constructed throughout the project site. At the time this report was written, the Client had specified general slab on grade construction with potential shallow square footings at column/high load locations and perimeter grade beams was to be the primary foundation system (if possible) for shallow foundations on-site. No specific construction techniques were provided to **B2Z** at the time this report was written. It should be noted, the selection of an appropriate type of foundation design is based on several factors including, but not limited to, soil conditions, site drainage, economics, climate, vegetation, city/government codes, and the level of risk acceptable to the owner/developer.

The most commonly constructed and typically most cost effective foundation system built in the South Texas Area is the Slab on Grade system (including a steel reinforced concrete slab). The Slab on Grade foundation is intended to be supported in the shallow surface soils through the use of a monolithic slab; however, these foundations can be complemented through the use of

exterior and interior stiffened grade beams and/or shallow footings to support concentrated perimeter or wall loads and column loads respectively. For these systems, the compatibility between foundation rigidity and the type of superstructure to be built on the foundation must be considered in order to avoid damage to the superstructure and architectural components.

The foundation system selected for construction must be designed with sufficient bearing capacity to resist the imposed loadings without experiencing failure of the underlying soils. The foundation system must also resist soil movements, or volume change, from expansion and contraction of soils due to changes in moisture content. The following sections will provide allowable bearing capacities, potential vertical rise (including earthwork recommendations to minimize shrink and swell), and Slab on Grade design parameters (Welded Reinforcement Institute – WRI, Post-Tensioning Institute – PTI). It should be noted that the recommendations provided are based on geotechnical properties of the project soils and assumptions of construction of this type since no structural loadings were provided. If structural loadings exceed capacities as provided in this report, **B2Z** should be advised of the loadings to re-analyze and provide alternate recommendations, if needed.

It is important to stress the fact that maintenance of Slab on Grade foundations will help to reduce the potential for structural damage in the present and for the life of the structure. Maintenance can include, but is not limited to procedures such as:

1. Ensure positive drainage around the perimeter of the foundation through site grading
2. Incorporate paving or sidewalks adjacent to foundations for moisture protection
3. Do not plant vegetation closer to the foundation than its mature height
4. Extend canopies or roof drains away from foundation to prevent ponding near foundation
5. Avoid excess wetting or drying of soils around foundations

Bearing Capacity of Soils (Shallow Foundations)

The bearing capacity of the existing natural ground is defined as the ability of a foundation to safely support the imposed loadings (surcharge), without experiencing any form of shear failure. The ultimate bearing capacity is a measure of the soil's maximum resistance immediately prior to a bearing capacity failure. The ultimate bearing capacity was estimated using the methods and equations, as recommended by the USACE in Manual EM 1110-1-1905 titled "Bearing Capacity of Soils"

$$q_u = c\,N_c\zeta_c + \tfrac{1}{2}\,B\,\gamma_h\,N_\gamma\zeta_\gamma + \sigma\,N_q\zeta_q$$

where:
- q_u = ultimate bearing capacity
- c = soil cohesion
- B = effective width of foundation
- γ_h = effective unit weight of soil within failure zone
- σ = effective soil surcharge pressure at depth
- N_c, N_γ, N_q = Bearing capacity factors
- ζ_c ζ_γ ζ_q = dimensionless correction factors for cohesion, soil unit weight, and surcharge

Nc, Nγ, and Nq are the dimensionless bearing capacity factors developed by Meyerhof, Hansen, and Vesic for general shear failure listed in Table 4-4 of EM 1110-1-1905. Cohesion values for

cohesive soils and angle of friction values for granular soils were estimated using a correlation with the Standard Penetration Tests performed in the field. All correlations used were in accordance with the applicable USACE manuals. Where cohesive material was prevalent, the angle of friction value was conservatively assumed to equal zero.

The factor of safety used in our analysis was equal to 3.0, as recommended by Chapter 1 of EM 1110-1-1905. The absolute minimum factor of safety, as recommended by Chapter 1 of EM 1110-1-1905 for this construction is 2.0. The maximum allowable bearing capacity was calculated by dividing the ultimate bearing capacity by the factor of safety. All recommendations reflect the maximum allowable bearing capacity in pounds per square foot.

Bearing Capacity of Soils (Foundation Pads, Slabs on Grade, Shallow Footings)

The maximum allowable bearing capacity for this project overall is **2,000 pounds per square foot**. This value was calculated using square foundation geometry and a factor of safety equal to 3 (FOS = 3).

Potential Vertical Rise (Slab on Grade)

The soils at this site consisted primarily of moderate to high plasticity clays, which have a medium to high potential for exhibiting appreciable differential movements or swell/shrink capabilities with moisture changes. The Potential Vertical Rise (PVR) calculations for the general soil profile were performed using the Texas Department of Transportation's (TxDOT) TEX 124-E method. Based on review of the soil log, water table observation, geometric configuration of the area, and typical climatic conditions of the area, zone of influence was estimated.

The calculated **PVR** value for the existing soil profile, based on the strata found at each boring location and the existing conditions, ranged from approximately **2.0 to 2.2 inches**. This value represents total vertical in-situ movements and does not consider differential swell between any two points on the ground; nor does it take into account movements caused by uncontrolled water sources such as poor drainage, migration of subsurface water from off-site locations, and utility line leaks. Typically, **PVR** values of around **1.0 inch (+/- 0.5 inch)** are considered acceptable for most at grade or shallow foundation designs. In order to control the effects of PVR on this site, we recommend adherence to the recommendations as presented in the 'Earthwork Recommendations (Shallow Foundations – Prep. of Foundation Pads)' section of this report.

Post-Tensioning Institute (PTI) Slab Design Parameters

The recommendations for foundation design criteria in this section have been calculated using the method described by the Post-Tensioning Institute manual, "Design of Post-Tensioned Slabs-on-Ground" Third Edition; also known as the PTI method. This method gives soil parameters for ribbed or uniform thickness (monolithic) foundations that can be used in the design of post-tensioned or traditionally reinforced foundations. The PTI method does not allow for the development of design parameters for collapsing soils or other highly unusual conditions. It must be emphasized that the determination of these parameters is based upon normal climate-moisture variance from season to season in the local area and are invalid when influenced to any significant degree by other conditions, including but not limited to those mentioned in the previous sections.

The edge moisture variation distances (e_m) for the center and edge lift conditions were derived based on a Thornthwaite index of -30 for the project site. The Thornthwaite index is based on the average rainfall over a significant period of time (e.g. 20 or 30 years) in excess or deficit of the average evapotranspiration rates of the area. Other parameters and influencing variables were derived using information collected from the laboratory tests performed on the recovered soil samples as stated in the PTI guidelines for geotechnical exploration and laboratory testing schedule. Table 3 lists the PTI design parameters for a slab-on-grade foundation supported in the shallow surface soils.

	Center Lift Conditions		Edge Lift Conditions	
Equilibrium Soil Suction (pF)	Center Moisture Variation Distance e_m (ft)	Est. Differential Movement y_m (in)	Edge Moisture Variation Distance e_m (ft)	Est. Differential Movement y_m (in)
4.04	8.60	0.33	4.40	0.79

Table 3 - Recommended PTI Slab Design Parameters

**Incl. Foundation Improvements denoted in 'Earthwork Recommendations' section of this report*

Wire Reinforcement Institute (WRI) Slab Design Parameters

The Wire Reinforcement Institute (WRI) method is an empirically derived foundation design method that was developed by observing slab performance over time and creating and modifying equations to give results which approximate foundation designs that exhibit the best results. While the WRI method deals only with foundations reinforced with reinforcing bars or welded wire reinforcement, the procedure has been developed to be independent of the type of reinforcement used.

The climatic rating reflects the stability of the moisture content which may be expected in the soil due to the climatic conditions which may vary from year to year. The effective design Plasticity Index was obtained by weighting the test values in each boring as described in the WRI procedures. The slope correction factor is based on the average slope of the tract of land. Since the slope is relatively small the adjustment factor was negligible. Table 4 lists these WRI design parameters for a slab-on-grade foundation supported in the shallow surface soils.

Effective PI	Climatic Rating	Slope Coefficient	Soil Support Index, C
20	15	1	0.94

Table 4 - Recommended WRI Slab Design Parameters

**Incl. Foundation Improvements denoted in 'Earthwork Recommendations' section of this report*

Earthwork Recommendations (Shallow Foundations – Prep. of the Foundation Pads)

B2Z recommends the following earthwork recommendations within the foundation footprint areas:

- Clear and grub all vegetation, organic topsoil, and other miscellaneous debris up to a minimum of 5 feet beyond all proposed foundation pad areas.
- Area shall be excavated to 2 feet below top of natural ground.
- The exposed subgrade below the excavation to minimum depth of 12 inches shall be scarified, moisture conditioned and re-compacted to a minimum 95% of the maximum dry density, as determined by ASTM D-698 at a moisture content ranging from 0 to +3 percent of the optimum moisture content.
- The foundation shall be brought to grade (excavated area should then be filled) with 'Select Fill' or 'Structural Fill' that meets the requirements of the "General Construction Considerations – Select Fill and Structural Fill Recommendations" section of this report.

GENERAL CONSTRUCTION CONSIDERATIONS

Site Grading Recommendations

Site grading plans can result in changes in almost all aspects of foundation recommendations. We have prepared the foundation recommendations based on the existing ground surface and the stratigraphic conditions encountered at the time of our study. We recommend gradual slopes away from foundations at structure locations to assist with site drainage, ponding, and any potential shrink/swell issues. Based on the upper site soils, erosion and slope sloughing, causing for periodic maintenance are limitations when utilizing 2:1 slopes or steeper. We recommend the use of 3:1 slopes (or flatter) for general site grading.

Site Drainage Recommendations

Drainage is one of the most important aspects to be addressed to ensure the successful performance of any foundation. Positive surface drainage should be implemented prior to, during and maintained after construction to prevent water ponding at or adjacent to the proposed facilities. We advise that construction drainage programs be implemented to assist with standing waters from precipitation, general surface runoff or other moisture intrusion. It is recommended that the site design include site drainage features to channel runoff away from the proposed site location and most importantly away from all shallow foundations.

Site Preparation Recommendations

The proposed site areas and all areas used to support foundation construction should be cleared and grubbed of all vegetation, organic topsoil and other miscellaneous debris up to a minimum of five (5) feet beyond the proposed site perimeters. This shall include the removal of all trees, brush, roots, weeds, or other organic debris that will interfere with construction. After clearing, the contractor should follow the earthwork procedures outlined in the 'Foundation Recommendations' section of this report. Any soft and/or compressible soft spots noted during

compaction activities shall be over-excavated and replaced with Select Fill. All placements of Select Fill and Structural Fill shall be in accordance with the "General Construction Considerations – Select Fill & Structural Fill Recommendations" section of this report.

Select Fill & Structural Fill Recommendations

Materials used for **Select Fill** (General Site Grading) shall meet the following requirements:

1. Soils classified according to the Unified Soils Classification System as SM, SC, GM, GC, CL, ML and combinations of these soils. These soils shall be free of organic material, topsoil, debris, or other deleterious material that cannot be properly compacted. In addition to the USCS classification, select materials shall have a **liquid limit of less than 40 and a plasticity index between 8 and 20**.
2. Soils classified as CH, MH, OH, OL and PT, under the USCS are not considered suitable for use as select fill materials at this site.
3. **B2Z** recommends additional quality control of all 'General Site Fill' materials as they are placed and compacted to ensure that they meet the requirements specified.

Select Fill shall be placed in lifts not to exceed 8 inches loose (6 inches compacted) and compacted to a minimum 95 percent of the maximum dry density as determined in accordance with ASTM D698. The water content of the fill shall be maintained within the range of optimum moisture to three (3) percentage points above the optimum moisture content until the fill is permanently covered. The fill should be properly compacted in accordance with these recommendations and tested for compaction as specified.

Materials used for **Structural Fill** shall meet the following requirements:

1. Soils classified as Base Material meeting the requirements of TxDOT 2014 Specification Item 247 Type E, Grade 4 - Caliche (see Table 5 for specifications & requirements) or Item 247 Type A, Grade 1-2 - Limestone (see Table 6 for specifications & requirements).
2. **L&G** recommends additional quality control of all Structural Fill materials as they are placed and compacted to ensure that they meet the requirements specified.

Structural Fill shall be compacted to a minimum 98 percent of the maximum dry density as determined by the ASTM D698 at moisture contents ranging between minus two (-2) and plus two (+2) percentage points of the optimum moisture content. Structural Fill shall be placed in loose lifts not to exceed 8 inches (6 inches compacted). The fill should be properly compacted in accordance with these recommendations and tested for compaction as specified.

Gradation - Sieve Size	Percent Retained on Sieve
2"	0%
1/2"	20-60%
No. 4	40-75%
No. 40	70-90%
Laboratory Test	**Limit Values**
Max. PI:	15
Max. Wet Ball PI:	15
Wet Ball Mill Max Amount:	50
Min. Comp. Strength PSI:	150 at 15 PSI Lateral Pressure
Triaxial Test	Tex-117-E

Table 5 – Structural Fill - Type E Grade 4 Specifications

Gradation - Sieve Size	Percent Retained on Sieve
2"	0%
1 ¾"	0-10%
7/8"	10-35%
3/8"	30-65%
No. 4	45-75%
No. 40	65-90%
Laboratory Test	**Limit Values**
Max. PI / Max. LL:	10 / 40
Wet Ball Mill Max Amount:	40
Min. Comp. Strength PSI:	35 at 0 PSI Lateral Pressure 175 at 15 PSI Lateral Pressure
Triaxial Test	Tex-117-E

Table 6 – Structural Fill - Type A Grade 1-2 Specifications

Excavation, Sloping, Benching and Utility Considerations

If trenches are to extend to or below a depth of five (5) ft, the contractor or persons doing the trenching should adhere to the current Occupational Health and Safety Administration (OSHA) guidelines on trench excavation safety and protection measures or other applicable industry standards. The collection of specific geotechnical data and development of a plan for trench safety, sloping, benching or various types of temporary shoring, is beyond the scope of the this study. Utilities that protrude through the slab-on-grade should be designed with some degree of flexibility or with sleeves. Such features will help reduce the risk of damage to utility facilities from soil movements related to shrinkage and expansion.

REFERENCES

1. Jacobs, Jerry L., 1981, "Soil Survey of Hidalgo County, Texas", Washington, D.C.

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3. TxDOT, 2014, "Standard Specification for the Construction of Highways, Streets, and Bridges", Austin, TX.

4. TxDOT, 2005-Current, "100-E, Soils & Aggregates Test Procedures", Austin, TX.

5. American Society of Testing Materials, Volume 04.08, Soil and Rock (I): D420- D5779 (Up to Date).

6. TxDOT, 2000, 2006, 2012, 2018 "Geotechnical Manual", Austin, TX.

7. TxDOT Pharr District, 2014, "TxDOT Pharr District Master General Notes" (Updated 3-20-2019), Pharr, TX

8. United Stated Army Corps of Engineers, "Bearing Capacity of Soils", EM 1110-1-1905

9. United Facilities Criteria (UFC), "Soils & Geology Procedures for Foundation Design of Building and Other Structures", UFC 3-220-03FA, (January 2004).

10. Post-Tensioning Institute, 2004, "Design of Post-Tensioned Slabs on Ground", Phoenix, AZ.

11. Wire Reinforcement Institute, 1981, "Design of Slab-on-Ground Foundations", Hartford, CT.

APPENDIX A – FIGURES

Figure 1 – General Location Map (Blue Outline Denotes Approx. Location of Hidalgo County Bio-Safety Lab)

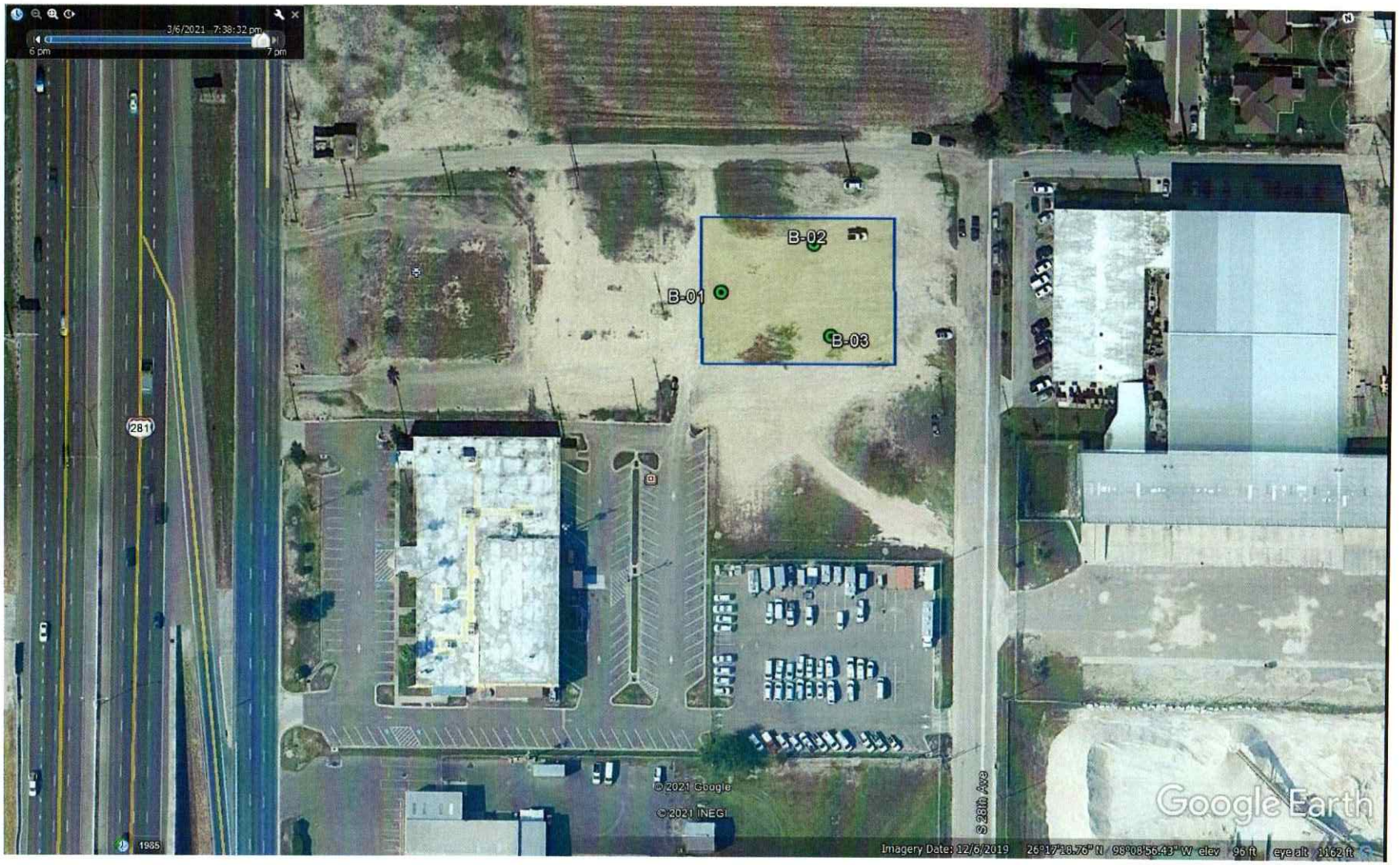

Figure 2 – General Geotechnical Boring Location Map

APPENDIX B – BORING LOGS & GEOTECHNICAL TESTING

B2Z ENGINEERING
TBPE No. F-11187

B2Z Engineering, LLC
900 S. Stewart Rd., Ste. 4
Mission, TX 78572
Phone: 956-585-3773

KEY TO SYMBOLS

CLIENT Hidalgo County Pct. 4

PROJECT NAME Hidalgo County Bio Safety Lab Project

PROJECT NUMBER B2Z No 4121

PROJECT LOCATION Hidalgo County

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)

CH: USCS High Plasticity Clay

CL: USCS Low Plasticity Clay

SAMPLER SYMBOLS

Standard Penetration Test

WELL CONSTRUCTION SYMBOLS

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)

TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UC - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION

Water Level at Time Drilling, or as Shown

Water Level at End of Drilling, or as Shown

Water Level After 24 Hours, or as Shown

B2Z ENGINEERING
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B2Z Engineering, LLC
900 S. Stewart Rd., Ste. 4
Mission, TX 78572
Phone: 956-585-3773

BORING NUMBER B-01

CLIENT Hidalgo County Pct. 4
PROJECT NAME Hidalgo County Bio Safety Lab Project
PROJECT NUMBER B2Z No 4121
PROJECT LOCATION Hidalgo County
DATE STARTED 6/14/21 **COMPLETED** 6/14/21
GROUND ELEVATION 95 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR B2Z Engineering, LLC
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger
AT TIME OF DRILLING --- No Waterstrike Encountered
LOGGED BY DAS **CHECKED BY** DAS
AT END OF DRILLING ---
NOTES GPS 26°17'15.57"N, 98° 8'50.05"W (Elev. Approx.)
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		(CL) Sandy Lean Clay, Brown, w/ Calcareous Nodules, Stiff to Med. Stiff to Stiff, Dry	SPT 1		4-6-5 (11)			17				55
			SPT 2		2-2-3 (5)			9	35	15	20	
5			SPT 3		2-4-5 (9)			21	45	15	30	70
		(CH) Fat Clay w/ Sand, Brown to Lt. Brown, w/ Calcareous Nodules, Stiff to Very Stiff, Dry to Moist	SPT 4		4-6-8 (14)			10	58	17	41	
10			SPT 5		4-7-10 (17)			21				80
15		(CL) Sandy Lean Clay, Brown w/ Black Mottling, Very Stiff, Moist	SPT 6		5-8-9 (17)			18	39	13	26	68
20		(CH) Fat Clay w/ Sand, Lt. Brown, Very Stiff, Moist	SPT 7		5-12-15 (27)			19	55	17	38	79
		Bottom of borehole at 20.0 feet.										

B2Z ENGINEERING
TBPE No. F-11187

B2Z Engineering, LLC
900 S. Stewart Rd., Ste. 4
Mission, TX 78572
Phone: 956-585-3773

BORING NUMBER B-02

CLIENT Hidalgo County Pct. 4
PROJECT NAME Hidalgo County Bio Safety Lab Project
PROJECT NUMBER B2Z No 4121
PROJECT LOCATION Hidalgo County
DATE STARTED 6/14/21 **COMPLETED** 6/14/21
GROUND ELEVATION 95 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR B2Z Engineering, LLC
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger
AT TIME OF DRILLING --- No Waterstrike Encountered
LOGGED BY DAS **CHECKED BY** DAS
AT END OF DRILLING ---
NOTES GPS 26°17'15.87"N, 98° 8'49.09"W (Elev. Approx.)
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		(CL) Sandy Lean Clay, Brown, w/ Calcareous Nodules, Stiff, Dry	SPT 1		3-6-8 (14)			15	38	14	24	57
		(CL) Lean Clay w/ Sand, Brown to Grayish Brown, w/ Calcareous Nodules, Med. Stiff to Stiff, Moist	SPT 2		2-3-4 (7)			21				71
5			SPT 3		3-5-7 (12)			18	41	15	26	
			SPT 4		3-6-8 (14)			20				71
10		(CH) Fat Clay w/ Sand, Brown to Brown w/ Gray Mottling, w/ Calcareous Nodules,Stiff, Moist	SPT 5		4-6-9 (15)			21	59	19	40	
15		(CL) Lean Clay w/ Sand, Brown, Very Stiff, Moist	SPT 6		5-7-9 (16)			20	47	14	33	77
20		(CH) Fat Clay w/ Sand, Lt. Brown, Very Stiff, Moist	SPT 7		5-12-17 (29)			24	59	16	43	81

Bottom of borehole at 20.0 feet.

B2Z ENGINEERING
TBPE No. F-11187

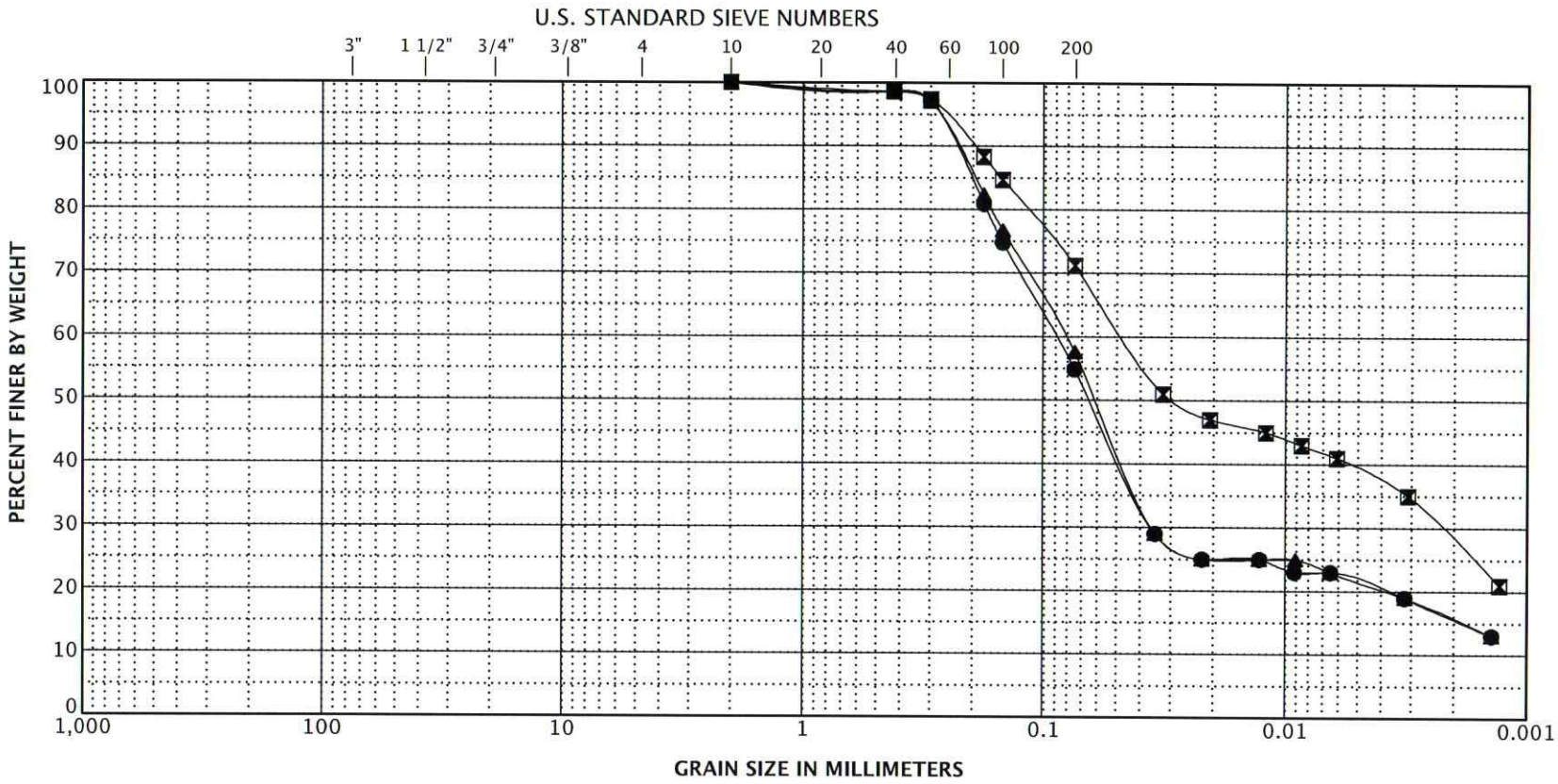
B2Z Engineering, LLC
900 S. Stewart Rd., Ste. 4
Mission, TX 78572
Phone: 956-585-3773

BORING NUMBER B-03

CLIENT Hidalgo County Pct. 4
PROJECT NAME Hidalgo County Bio Safety Lab Project
PROJECT NUMBER B2Z No 4121
PROJECT LOCATION Hidalgo County
DATE STARTED 6/14/21 **COMPLETED** 6/14/21
GROUND ELEVATION 95 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR B2Z Engineering, LLC
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger
AT TIME OF DRILLING --- No Waterstrike Encountered
LOGGED BY DAS **CHECKED BY** DAS
AT END OF DRILLING ---
NOTES GPS 26°17'15.05"N, 98° 8'49.06"W (Elev. Approx.)
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(CL) Sandy Lean Clay, Brown to Grayish Brown, w/ Calcareous Nodules, Stiff to Med. Stiff, Dry to Moist	SPT		3-4-5 (9)			19				58
			SPT		1-2-3 (5)			26	39	15	24	
5		(CL) Lean Clay w/ Sand, Brown, w/ Calcareous Nodules, Med. Stiff to Stiff, Moist	SPT		2-3-5 (8)			22				74
			SPT		4-6-7 (13)			19	49	15	34	
10			SPT		4-5-7 (12)			21				72
15		(CL) Lean Clay, Brown w/ Dk. Gray to Black Mottling, Very Stiff, Moist	SPT		4-7-9 (16)			20	49	17	32	88
20		(CH) Fat Clay w/ Sand, Lt. Brown, Very Stiff, Moist	SPT		6-10-14 (24)			18	53	17	36	82

Bottom of borehole at 20.0 feet.



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

KEY	EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	MOISTURE CONTENT (PERCENT)	D90	D60	D50	D30	D10	GRAVEL (PERCENT)	SAND (PERCENT)	SILT (PERCENT)	CLAY (PERCENT)
●	B-1	0.5		0.24	0.09	0.065	0.036		0	45	33	21
⊠	B-2	2.5		0.20	0.05	0.029	0.002		0	29	32	39
▲	B-3	0.5		0.24	0.08	0.061	0.036		0	42	36	21

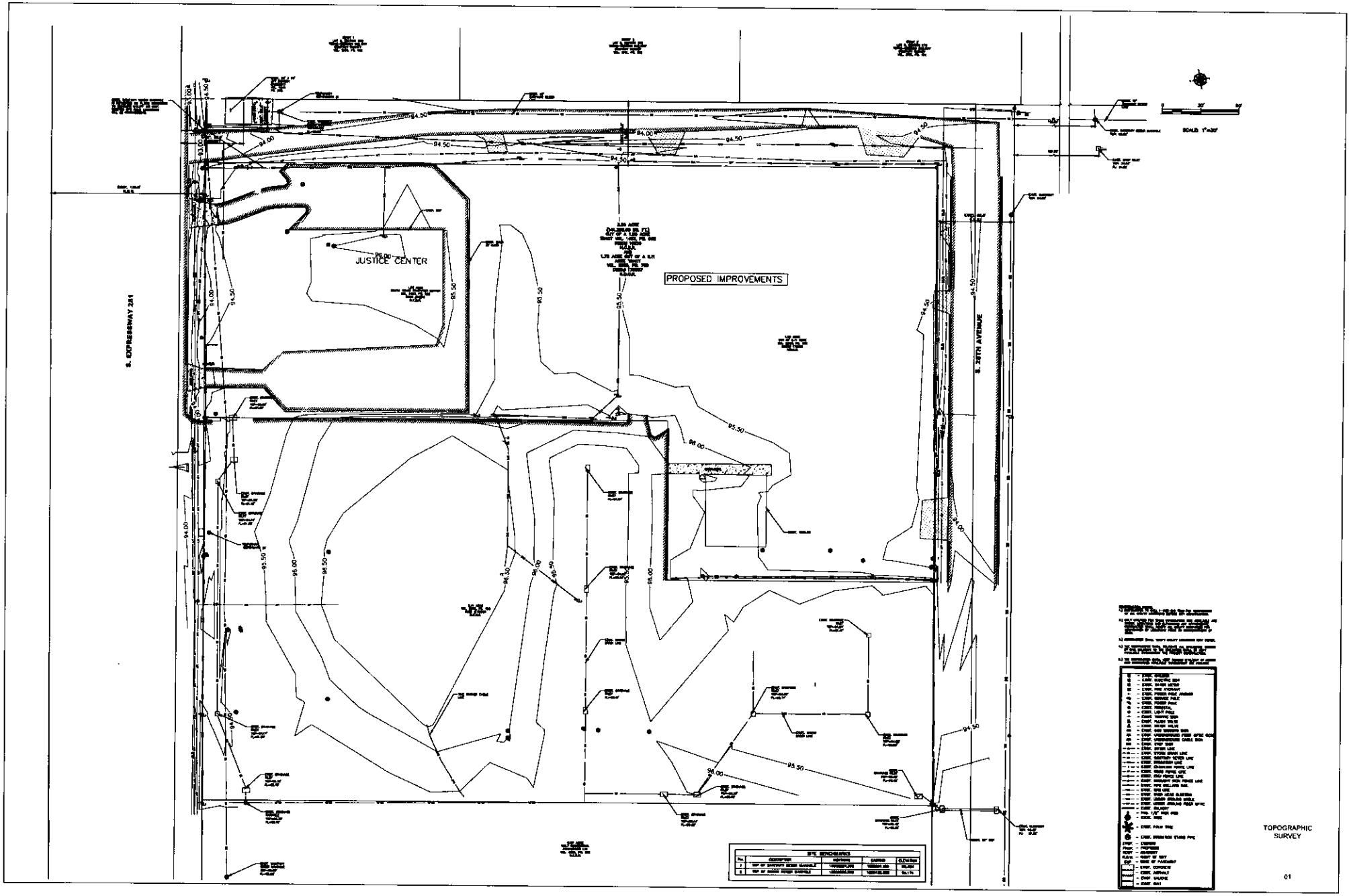
B2Z ENGINEERING

GRAIN-SIZE TEST RESULTS

HIDALGO COUNTY BIO SAFETY LAB PROJECT
HIDALGO COUNTY

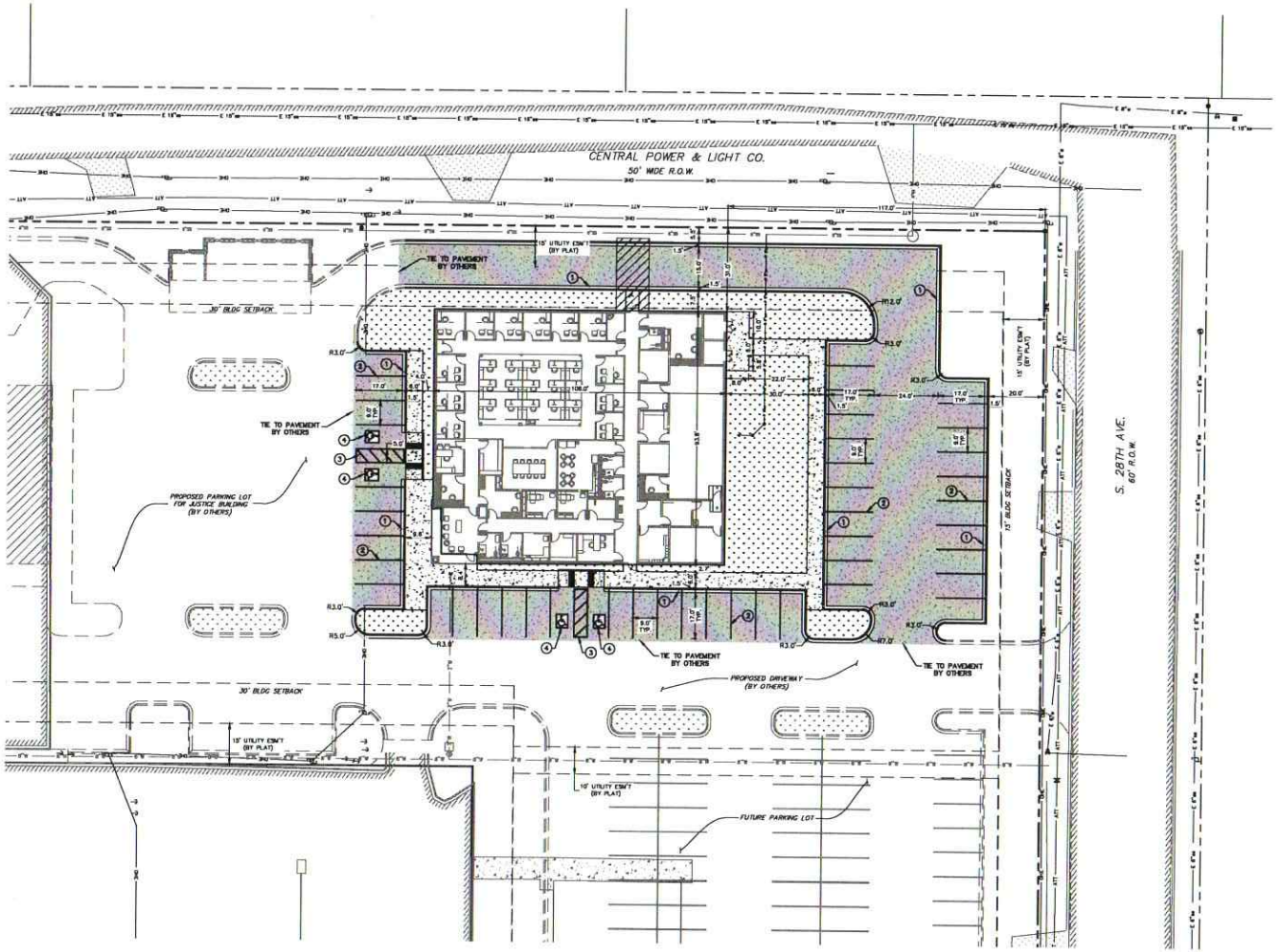
FIGURE

APPENDIX C – PLANS & SPECS (PROVIDED BY CLIENT)



TOPOGRAPHIC SURVEY

01



GRAPHIC SCALE 20'

LEGEND

- NEW LIGHT-DUTY PAVEMENT SECTION
- NEW HEAVY-DUTY PAVEMENT SECTION

NOTES:

1. NO SLOPE SHALL EXCEED 2% IN ANY DIRECTION WITHIN HANDICAP SPACES.
2. NO ACCESSIBLE ROUTES SHALL EXCEED A RUNNING SLOPE GREATER THAN 1:20.
3. ALL CONCRETE CURBS SHALL BE 6" UNLESS OTHERWISE NOTED ON PLAN.

EXISTING LEGEND

PROPOSED LEGEND

1. 6" CURB & GUTTER
2. 4" WIDE SINGLE SOLID LINE
3. 4" WIDE BLUE STRIPING, 45° @ 3' SPACING
4. BLUE HANDICAP SYMBOL

PRELIMINARY
FOR REVIEW

SAM Engineering & Surveying, Inc.
200 S. 10TH ST, SUITE 1500
McALLEN, TEXAS 78501
TEL: (956) 702-8880
FAX: (956) 702-8883

HIDALGO COUNTY TESTING BIOSAFETY LAB
EDINBURG, TEXAS

REVISIONS

REV.	DESCRIPTION	DATE

DOCUMENT RELEASED FOR INTERIM REVIEW
UNDER THE AUTHORITY OF
NADIA N. LOPEZ, P.E. 111983
DOCUMENT INCOMPLETE.
DO NOT USE FOR BIDDING, PERMIT OR CONSTRUCTION PURPOSES.
INTERIMS: APRIL 22, 2021

SAMES, INC
TEXAS REGISTERED ENGINEERING FIRM F-10761

PROJ. NO.	ENG. 20.010
DATE:	APRIL 2021
SCALE:	AS NOTED

SHEET NAME:

SITE PLAN & DIMENSION CONTROL PLAN

SHEET NUMBER:

C3.0