CAMERON COUNTY PURCHASING
1100 East Monroe St,
Brownsville, Texas 78520
(956) 544-0871 Fax: (956) 550-7219

DATE OUT: 01/30/24

RFP TITLE: OLMITO NATURE PARK PHASE 1

RFP NUMBER # 240201

DEADLINE: ~~January 31, 2024 at 3:00 p.m.~~ – February 7, 2024 at 3:00 p.m

(IN ORDER TO AVOID DISQUALIFICATION – ALL ADDENDUMS MUST BE SIGNED AND RETURNED BY DEADLINE AND INCLUDED IN THE SEALED BID PACKAGE SUBMITTED)

1.- CHANGE # 1

RFP DUE DATE WILL BE CHANGED TO THE FOLLOWING:

FROM:

RFP DUE DATE: JANUARY 31, 2024 **RFP DUE TIME: 3:00 P.M.**

TO:

RFP DUE DATE: FEBRUARY 7, 2024 **RFP DUE TIME: 3:00 P.M.**

2.- Please find additional information/clarifications provided by GMS Architects and EarthCO, Geotech Engineering. (Clarifications, geotechnical report and drawings)

Note:

This addendum shall become part of the RFP and all RESPONDERS/PARTICIPANTS shall be bound by its content. All aspects of the scope of work/services not covered herein shall remain the same.

Acknowledgment of receipt:

Company Name_________________________________ Phone # ___________

Vendor Signature________________________________ Date ______________

Must include and return with RFP package.

January 30, 2024

CAMERON COUNTY OLMITO NATURE PARK – PHASE I
PROJECT # 2022-C2203031

GMS ARCHITECTS
BROWNSVILLE, TEXAS 78526
(956) 546-0110

ADDENDUM NO. 4

A. PURPOSE AND INTENT

This addendum is issued for the purpose of modifying the plans and specifications for the Cameron County Olmito Nature Park – Phase I.

This addendum shall become part of the contract and all CONTRACTORS shall be bound by its content. All aspects of the specifications and drawings not covered herein shall remain the same.

The General Conditions and the Special Conditions of the specifications shall govern all parts of the work and apply in full force to this addendum.

B. SCOPE

I. CLARIFICATION:

- Bid Proposal Due Date will be extended to **Wednesday, February 7, 2024, at 3pm**.
- List of Subcontractors Form. Form to be submitted within 24 hours of the proposal opening.

II. ***SPECIFICATIONS:***

- Add EarthCo Geotechnical Report – 28 Pages to Construction Documents.

II. PLANS:

- Civil Sheet 10 of 18 – Overview Map of Utilities
  - Provide 8'-0" tall chain link fencing and double gates at perimeter of lift station.

- Civil Sheet 13 of 18 – Paving Details
  - Delete Asphalt Paving Section with 3" asphalt + 8" Limestone + 10" Lime stabilized subgrade. Refer to "Typical Paving Section" on this sheet for paving section to be utilized on this project.

- Civil Sheet 17 of 18 Lift Station Details
  - Delete treated wood.fencing details. Chain link fencing will be utilized on this project.

- Add Sheet A0.01 – Existing Grades at Fishing Piers and Observation Piers to Construction Documents.

- Sheet A1.01 Overall Park Site Plan
  - Keyed Note #11 – Refer to Sheet ES 1.01 for light pole locations.

LIST OF SUBCONTRATORS

To be submitted in a separate envelope with the Bid Proposal

Owner's Project: **Cameron County Olmito Nature Park Phase 1**

To: Cameron County

The undersigned submit the following names of subcontractors to be used in performing the Contract. Each subcontractor is required to submit a standard AIA Qualification Statement clearly indicating prior historical restoration project experience and references.

SUBCONTRACTORS

1. Site Work and Paving ________________________________
2. Landscape / Irrigation ________________________________
3. Decomposed Granite Trail ________________________________
4. Concrete ________________________________
5. Masonry ________________________________
6. Finish Carpentry ________________________________
7. Metal Roofing ________________________________
8. Painting ________________________________
9. HVAC ________________________________
10. Plumbing ________________________________
11. Electrical ________________________________
12. Environmental ________________________________

All Qualification Statements will be reviewed by the Architect, who will make appropriate recommendations to the Owner.

EarthCo Project No. G230043

Geotechnical Site Assessment

Proposed
Olmito Nature Park
Paredes Line Road and Gregory Avenue
Brownsville, Texas

Prepared for:

Cameron County
1390 W. Expressway 83
San Benito, Texas 78586

Prepared by:
EarthCo, LLC
1110 W. Jackson Street
Harlingen, Texas 78550
Ph. (956)428-2443
Fax (956)202-0491
TBPE Firm No. F-10895

September 20, 2023

STATE OF TEXAS
JAIME M. CANTU
93689
LICENSED
PROFESSIONAL ENGINEER

Jaime M. Cantu
9/20/2023

EarthCo
A Geotechnical Engineering and Materials Testing Company

Geotechnical Engineering and Construction Materials Testing Company

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Purpose

This report presents the results of a Geotechnical Site Assessment prepared by EarthCo, LLC for the Proposed Olmito Nature Park to be southwest of Hayes Road and Old Highway 77 in Olmito, Texas. The purpose of the assessment was to provide recommendations for the design of proposed park improvements and other geotechnical aspects of the proposed construction.

1.2 Scope of Services

The scope of work included the following:

. • Review of available data pertinent to the site.
. • Conduct a subsurface investigation.
. • Conduct basic laboratory testing of select soils.
. • Perform a geotechnical engineering analysis regarding the proposed construction, using the information obtained from the subsurface investigation and laboratory testing.
. • Prepare this report of our findings, conclusions, and tentative recommendations
. for the geotechnical engineering aspects of the proposed construction.

1.3 Authorization

This assessment was performed and the report prepared in general accordance with our proposal. Cameron County Purchasing issued Purchase Order Number P350633 on September 20, 2023, 2023 as authorization to proceed.

1.4 Standard of Care

The services performed by EARTHCO were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical profession practicing contemporaneously under similar conditions in the locality of the project. No other warranty, expressed or implied, is made.

Limitations of this report are discussed in Appendix A. These limitations further explain the realities of geotechnical engineering and the limitations that exist in evaluating geotechnical issues.

This report has been prepared for the exclusive use of Cameron County and the design team, with specific application to the proposed project.

2.0 PROJECT DESCRIPTION

2.1 Proposed Development

It is understood that the proposed project consists of the construction of new Recreational Vehicle (RV) Concrete Pads, Restroom Facilities, Picnic Canopies, Walking Trail and associated parking and driveway areas. The site is located on the southwest corner of Hayes Road and Santos Gutierrez Road in Olmito, Texas. The proposed improvements will be as indicated on the Site Plan in Appendix B.

If the locations of the assumed loadings, proposed improvements or any other site features change from what is shown on the site plan included in this report, EARTHCO should be notified so that the changes can be reviewed to determine if the recommendations presented in this report are still applicable.

2.2 Site Description

The site is located on southwest corner of southeast corner of Hayes Road and Santos Gutierrez Road in Olmito, Texas. As indicated earlier, proposed park improvements include new RV Concrete Pads, Restroom Facilities, Picnic Canopies, Walking Trail and associated parking and driveway areas. The park is located at the southeast corner of Hayes Road and Santos Gutierrez Road in Olmito, Texas. A site plan is enclosed in Appendix B.

3.0 INVESTIGATION AND TESTING

3.1 Subsurface Investigation

The field investigation to determine the engineering characteristics of the subsurface materials included a reconnaissance of the project site, drilling of boring, performing standard penetration tests and obtaining disturbed split-barrel samples, and auger samples.

The drilling consisted of two (2) borings at opposite ends of the proposed park near the locations depicted on the Site Plan (Appendix B). The drilling was carried out on 08/13/2023 using a drilling rig equipped with a rotary head contracted from Southwest Drilling.

Soil samples were obtained at selected intervals in the soil test borings. Disturbed soil samples were obtained in general accordance with ASTM D-1586 (Penetration Test and Split-Barrel Sampling of Soils). A split-spoon sampler is a 2-inch O.D. tube that is driven into the soil to be sampled that can be split open lengthwise for easy removal and visual inspection of the soil obtained. All samples were identified according to project number, boring number and depth, placed in plastic bags to protect against moisture loss, and transported to our laboratory.

During the sampling procedures, standard penetration tests were performed in the borings in conjunction with the split-barrel sampling. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer, falling thirty inches, required to advance the split-spoon sampler one-foot into the soil (ASTM D-1585).

The sampler is lowered to the bottom of the drill hole and the number of blows recorded for each of the three successive increments of six inches penetration. The "N" value is obtained by adding the second and third incremental numbers. The results of the standard penetration test indicate the relative density and comparative consistency of the soils, and thereby provide a basis for estimating the relative strength and compressibility of the soil profile components.

Water level observations were made during the boring operations and the results are noted on the boring logs. In relatively pervious soils, such as sandy soils, the indicated elevations are considered reliable ground water levels.

In relatively impervious soils, the accurate determination of the ground water elevation may not be possible even after several days of observation. Seasonal variations, temperature and recent rainfall conditions may influence the levels of the ground water table and volumes of water will depend on the permeability of the soils.

A field log was prepared for each boring. Each log-contained information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as silt, clay, gravel or sand and observations of ground water. It also contained an interpretation of subsurface conditions between samples. Therefore, these logs included both factual and interpretive information. The boring logs are included in Appendix C.

On completion of each borehole, the hole was filled in with cuttings from the drilling operations. Special backfilling with sand and gravel and sealing the top with cement was not deemed necessary at this project site. The holes were covered with the cuttings from our drilling operations.

3.2 Laboratory Testing

Laboratory tests were carried out in a number of selected soil samples in order to acquire necessary information with regards to the physical and mechanical properties of the soil layers and further on to evaluate and determine the parameters required for the calculations. All phases of the laboratory-testing program were performed in general accordance with the applicable ASTM Specifications.

The following tests were conducted on the selected soil samples:

- 27 Moisture Tests
- 9 Atterberg Limits Tests
- 9 -200 Sieve Wash Tests

The samples collected will be stored for 30 days from the date of issue of this report, and then disposed of unless otherwise instructed in writing by the client.

4.0 SUBSURFACE CONDITIONS

4.1 Stratigraphy

The following soil types were encountered in the soil test borings performed at the site:

From the surface to depths of twenty-five (25) feet, a statum of Sandy Lean Clay (CL) was encountered with stiff soil consistencies.

Below the Sandy Lean Clay (CL) and extending to boring termination depth of thirty (30) feet, a stratum of Fat Clay (CH) soils was encountered with firm to stiff consistencies.

Detailed description of the type of soil layer(s) encountered during drilling is given in the borehole logs *(Appendix B)*. The lines designating the interface between soil strata on the boring logs represent approximate boundaries, the transition between materials may be gradual.

4.2 Groundwater

Groundwater was encountered at fifteen (15) feet below the surface during drilling operations and measured at fifteen (15) feet below the surface upon completion of the drilling operations. Holes were covered immediately after the field operations were complete.

Groundwater levels may fluctuate with seasonal climatic variations and changes in the land use. Low permeability soils will require several days or longer for groundwater to enter and stabilize in the test borings.

5.0 RECOMMENDATIONS

The recommendations presented in the following sections of this report are based on the information available regarding the proposed construction, the results obtained from our soil sampling and laboratory tests, and our experience with similar projects. Because the test borings represent a very small statistical sampling of subsurface conditions, it is possible that conditions may be encountered during construction that are substantially different from those indicated by the sampling locations. In these instances adjustments to design and construction may be necessary.

This geotechnical report is based on the Site Plan and project information developed by EARTHCO and the assumptions stated in this report. Changes in the proposed location or design of the structures can have significant effects on the conclusions and recommendations of the geotechnical report. EARTHCO should be contacted in the event of such changes.

5.1 Site Preparation

Concrete pavement, building rubble, concrete foundations and any other debris noted at or below the existing ground surface should be removed as part of the site preparation for the proposed construction area. In all new fill and excavation areas, vegetation, topsoil, roots and other deleterious materials (typically 6 to 12 inches), deemed unsuitable shall be removed from the proposed construction areas, and replaced with controlled fill. Site clearing, grubbing and stripping will need to be performed only during dry weather conditions. Operation of heavy equipment on the site during wet conditions could result in excessive rutting and mixing of organic debris with the underlying soils.

5.2 Excavations

Temporary construction slopes should be designed and excavated in strict compliance with the rules and regulations of the Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA), 29 CFR, Part 1926. This document was prepared to better insure the safety of workers entering trenches or excavations, and requires that all excavations conform to the new OSHA guidelines.

The contractor is solely responsible for protecting excavations by shoring, sloping, benching or other means as required to maintain stability of both the excavation sides and bottom. EARTHCO does not assume any responsibility for construction site safety or the activities of the contractor.

5.3 Structural Fill

It is recommended that structural fills be constructed as controlled, well-compacted engineered fills. Structural engineered fill should be inorganic, low plastic clay, sand, or gravel. Any existing soils with a high organic content (browns) are suitable for reuse as fill in landscaping areas only. It is recommended that only granular fill be used within the foundation footprint and within 5 feet of the foundation footprint. Fill materials should be free of organic or other deleterious materials, have a maximum particle size less than two (2) inches, have a liquid limit less than 40 percent and plasticity index between seven (7) and 17. The intent of these recommendations is to reduce the potential for consolidation and settlement of new fills.

Laboratory testing should be performed on the fill materials to determine the appropriate moisture-density relationship of the fill being placed. Adjustments to the soil moisture by wetting or drying should be made as needed during fill placement.

During grading operations, representative samples of the proposed imported structural fill materials should be periodically checked via laboratory testing. A full-time representative from the testing agency should be on site to monitor excavation and grading operation as well as the suitability of fill materials.

Suitable fill material should be placed in thin lifts (lift thickness depends on type of compaction equipment, but in general, lifts of 8 inches loose measurements are recommended). The soil should be compacted by the necessary compaction equipment to meet the specified compaction recommendations.

Self-propelled compactors similar to Caterpillar Model 815 with tamping feet or sheepsfoot rollers may be required to adequately compact fine-grained fill material (silts and clay). If the fill material is granular (sands and gravels) with less than 10% clays and silts, smooth-drum vibratory compactors should be used. In addition, a smooth-drum roller should be provided to “seal” the fill at the end of each workday to reduce the impact of precipitation. In areas undergoing removal of seepage water, the engineered fill should be limited to well-graded sand and gravel or crushed stone.

Within small excavations, such as in utility trenches (less than 24 inches in width), around manholes or behind retaining walls, we recommend the use of "wacker packers", "Rammax" compactors or vibrating plate compactors to achieve the specified compaction. Loose lift thickness of 4 inches are recommended in small area fills.

We recommend that structural fill and backfill be compacted in accordance with the criteria stated in Table 1. A qualified field representative should periodically observe fill placement operations and perform field density tests at various locations throughout each lift, including trench backfill, to indicate if the specified compaction is being achieved.

TABLE 1 STRUCTURAL FILL PLACEMENT GUIDELINES

Areas of Fill Placement	Compaction Recommendation(ASTM D698-StandardProctor)	Moisture Content (Percent of Optimum)
Granular cushion beneath Floor Slab and over Footings	95%	-3% to +3%
Structural fill supporting Footings	98%	-3% to +3%
Structural fill placed within 5 feet beyond the perimeter of the building pad	95%	-3% to +3%
Grade-raise fill placed within 1 foot of the base of the pavement	92%	-3% to +3%
Structural fill placed below the base of the Pavement Soil Subgrade	95%	-3% to +3%
Utility Trenches - Within building and pavement areas	98%	-3% to +3%
Beneath Landscaped/Grass Areas	98%	-3% to +3%

Compaction of any fill by flooding is not considered acceptable. This method will generally not achieve the desired compaction and the large quantities of water will tend to soften the foundation soils.

5.4 Potential Vertical Rise

Potential Vertical Rise, PVR, expressed in inches, is defined as the latent or potential ability of a soil material, at a given density, moisture and loading condition, when exposed to capillary or surface water, to swell and thereby increase the elevation of its upper surface along with anything resting on it.

The estimated PVR is calculated using the State Department of Highways and Public Transportation – Materials and Testing Division, Test Method Tex-124E using the Atterberg Limit test results of the site soils within a 10 feet seasonal active zone. This method is based on a proposed floor system constructed at present grade elevations and applying a sustained surcharge load of approximately one (1) pound per square inch of the subgrade soils. The values represents the increase in elevation that could be experienced by dry subsoils if they are allow to become completely saturated due to a combination of poor drainage conditions and introduction of moisture near or directly underneath structures. The actual movement will be dependent on the degree of saturation of the site soils. A maximum of one (1) inch of PVR is recommended to reduce the possibility of noticeable foundation movements.

Base on laboratory test results, the estimated PVR at this site is approximately 1-1/2 inches in its present condition. Placing non-expansive select fill between the existing soils and the building slab will help reduce the PVR to approximately one (1) inch or less. Replacing the upper twelve (12) inches of the in-situ soils with non-expansive select fill material and adding a minimum of twelve (12) inches of select fill above existing grades will reduce the PVR to approximately one (1) inch or less and improve the site by reducing the potential for differential movements.

5.5 Monolithic Slab-on-Grade Foundations (Restrooms/Showers)

Alternatively, to a spread footing foundation with a grade-supported slab system recommended above, the building structure may be founded on a monolithic, steel reinforced (post-tensioned reinforcing), slab-on-grade foundation system with a waffle-type grade beam configuration provided that some differential movement can be tolerated and the recommended site work activities are performed accordingly. If the slab-on-grade foundations are founded directly on the natural site soils, the design Potential Vertical Rise (PVR) is on the order of 1-1/2 inches, assuming that the subgrade soils are allowed to increase in moisture content from a relatively dry condition to a relatively wet condition. Design values are presented below considering potential movements of two (2) inches with no remedial earthwork performed and one (1) inch or less provided remedial earthwork measures as performed as discussed in the “Site Preparation”, “Structural Fill” and “Potential Vertical Rise” sections of this report.

Grade beams (stiffener beams) supported on the existing soils or on compacted fill soils may be designed using a maximum allowable bearing capacity of **1,800** pounds per square foot based on dead load plus design live load considerations. The grade beams should have a minimum width of

10 inches even if the actual bearing pressure is less than the design value. The perimeter grade beams should bear at least 12 inches below adjacent surface grades (i.e. bottoms of beams and pads should bear at least 12 inches below the adjacent ground surface). If soft or loose soils are encountered at the design bearing level, they should be undercut to stiff or dense soils and the excavation back-filled with concrete.

Uniform compaction of fill materials is important to reduce total and differential settlement. If the site is prepared as recommended, total settlement of the slab should not exceed one inch.

Utilizing the "Building Research Board No. 33" (Brab Report) as a guideline, the following design criteria are provided for this site considering the minimum site preparation previously presented:

TABLE 1 – BRAB DESIGN VALUES		
	PVR ≈ 1.5" (no remedial earthwork measures)	PVR ≈ 1.0" (1 foot removal of in-situ soils)
	Option 1	Option 2
Climatic Rating (Cw)	15	15
Effective Plasticity Index	25	20
Support Index	0.88	0.93
Unconfined Compressive Strength (tsf)	1.0	1.0

Based on this information and using the "Design and Construction of Post-Tensioned Slabs-On-Ground", 2nd Edition, published by the Post-Tensioning Institute (PTI) as a guideline, the following design criteria may be used for this site considering the minimum site preparation previously presented.

TABLE 2 – PTI DESIGN PARAMETERS		
	PVR ≈ 1.5” (no remedial earthwork measures)	PVR ≈ 1.0” (1 foot removal of in-situ soils)
	Option 1	Option 2
Edge moisture variation distance, em (ft.) for Center Lift	6	6
Differential movement, ym (in.) for Center Lift	1.794	1.402
Edge moisture variation distance, em (ft.) for Edge Lift	3	3
Differential movement, ym (in.) for Edge Lift	0.676	0.466

The Post-Tensioning Institute (PTI) design parameters provided above are for the full expansive potential of the subgrade soils in their present condition. These parameters consider a Thornthwaite moisture index value of -30, a soil suction of 3.4 pF, a moisture velocity of 0.7 inches/month and a montmorillonite clay type classification. The design should take into account the added effect of trees and non-seasonal moisture sources, such as irrigation, plumbing or drainage leaks and poor surface drainage.

Grade beam excavations should be observed and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. The foundation concrete should be placed during the same day the excavation is made. If it is required that grade beam excavations be left open for more than one day, they should be protected to reduce evaporation or entry of moisture. The use of a vapor barrier such as polyethylene sheeting is recommended directly beneath the floor slab.

5.6 Foundation Design – Footings (Canopies)

The planned construction may be supported on conventional spread footing foundations bearing a minimum of two (2) feet below final subgrade elevations after replacement of the twenty-four (24) inches of existing soils with select fill and the addition of at least twelve (12) inches of select fill above existing grades for a proposed slab-on-grade foundation. Spread footings for building columns and continuous footings for bearing walls can be designed for an allowable soil bearing pressure of **2,000 psf** based on dead load plus design live load. This value contains a factor of safety of three (3). Minimum dimensions of 24 inches for column footings and 18 inches for continuous footings should be used in foundation design to minimize the possibility of a local bearing capacity failure.

Horizontal loads acting on shallow foundations are resisted by friction along the foundation base and by passive pressure acting against the footing cast against the soil. For lateral loads, the coefficient of friction between the base of the footing and the subgrade soils is estimated to be 0.30. The ultimate passive earth pressure, in psf, can be computed by using an equivalent fluid pressure of 240 pcf/ft. A factor of safety of 2 is recommended for sustained loading conditions, and 1.5 for transient loading conditions.

Uplift resistance of shallow foundations formed in an open excavation should be taken as the weight of the foundation and soil above it. For design purposes, the uplift resistance should be based on effective unit weights of 110 and 150 lbs. per cubic foot (pcf) for soil and concrete, respectively. A factor of safety of 2 is recommended for sustained loading conditions, and 1.5 for transient loading conditions.

Consolidation of the overburden resulting from the foundation loads will result in measurable but tolerable increments of soils settlements. Based on results of the field tests and the anticipated foundation loads, we estimate that the maximum foundation settlement will not exceed one (1) inch. Estimated differential settlement between two (2) adjacent columns should not exceed ½ to ¾ inch.

The foundation excavations should be observed by a representative of EARTHCO prior to steel or concrete placement to assess that the foundation materials are capable of supporting the design loads and are consistent with the materials discussed in this report. This is especially important to identify the acceptability of the existing fill under the footing. Soft or loose soil zones encountered at the bottom of the footing excavations should be removed to the level of unyielding natural soils or adequately compacted fill as directed by the geotechnical Engineer. Cavities formed as a result of excavation of soft or loose soil zones should be backfilled with lean concrete or dense graded compacted crushed stone, as determined by the geotechnical Engineer.

After opening, footing excavations should be observed, and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. The foundation concrete should be placed during the same day the excavation is made. If it is required that footing excavations be left open for more than one day, they should be protected to reduce evaporation or entry of moisture.

5.7 Grade-Supported Floor Slab

The floor slab may be grade-supported. The subgrade should be prepared as discussed in the sections entitled "Site Preparation", "Structural Fill" and "Potential Vertical Rise" in order to minimize soil movement beneath the floor slab.

If some vertical and differential floor movement can be tolerated, the floor slabs may consist of an independent slab-on-grade foundation that is not rigidly connected to the building walls, columns, or foundations. If the floor slab is rigidly connected to the building walls, then it is likely that a hinge crack will develop in the slab parallel to the wall at a short distance from the wall. The severity of the cracking will be dependent on the amount of movement that occurs, the rigidity of the floor slab and the rigidity of the connection. In extreme cases, excessive movement and cracking of walls and foundations could occur if the connection of the floor slab is sufficiently rigid.

It is recommended that a vapor barrier such as polyethylene sheeting be provided directly beneath soil-supported floor slabs. Adequate construction joints and reinforcement should be provided to reduce the potential for cracking of the floor slabs due to differential movement. A relatively consistent thickness of fill should be provided so that the floor slabs are more uniformly supported. Once the finished floor elevations are determined, EARTHCO should be given the opportunity to review and revise our PVR analyses.

5.8 Running Trail Subgrade Preparation

The subgrade should be proofrolled with a fully loaded dump truck, scraper, or similar rubber-tired equipment weighing at least 25 tons or a 10-ton vibratory steel drum roller. Do not use vibratory rollers to proof-roll materials containing significant amounts (>10%) of fines if the subgrade materials are wet or near groundwater levels, since vibratory rollers tend to wick water to the surface.

Proof-rolling operations should be observed by a representative of EARTHCO. Unstable and unsuitable soils, which are revealed by proof-rolling and which cannot be adequately densified in-place, should be removed under the direction of the EARTHCO representative. It may be necessary to perform selective removal of soft, wet soils and/or stabilize existing soft soils in-place. We recommend the use of lime stabilization of the subgrade soils. The methods of stabilization will typically include incorporating hydrated lime, fly ash, a lift of crushed stone materials, or a geosynthetic over the soft soils. ***We recommend the use of geogrid material combined with the lime-stabilized subgrade between the subgrade and the base material. We recommend a geogrid material equal to Tensar Biaxial Geogric BX1200 or better. The lime stabilization and geogrid material should extend at least two (2) feet beyond the inside and outside perimeter of the running track.***

A lime determination should be performed at the time of construction to verify actual amount of lime needed to stabilize the subgrade soils to reach full stabilization and a pH of 12.4. The subgrade should be lime treated and compacted to a minimum of 95% of the maximum proctor density of ASTM D-698-91, Standard Proctor Moisture-Density Relationship. The moisture content should also be controlled between -1% to plus 3% of the optimum. The subgrade should be tested by a representative of EARTHCO and approved for placement of select fill.

5.9 Running Trail Design

The stabilization of the subgrade soils using lime and proof-rolling and moisture conditioning is being recommended at this site. The anticipated California Bering Ratio (CBR) value of the existing subgrade soils at this site is anticipated to be between 10 to 15 or a Modulus of Subgrade Reaction (k) of 200 to 225 psi.

Our recommended hike and bike trial pavement thickness design is based on a subgrade prepared as recommended in the Pavement Subgrade Preparation section above. AASHTO pavement design procedures were used to estimate the required pavement thicknesses. The following parameters were adopted for the thickness design:

- Assumed CBR value with Lime Stabilized of Subgrade Soils: 3.0
- Effective Roadbed Soil Resilient Modulus (M_R) = 4500 psi

The Medium-Duty pavement recommendations are based on terminal serviceability = 2.0, reliability = 85%, initial serviceability = 4.2, and standard deviation = 0.45 for flexible pavements.

Based on the above design parameters, we recommend the following hike and bike trail pavement design thickness should be considered

TABLE 2 ASPHALTIC CONCRETE PAVEMENT THICKNESS RECOMMENDATIONS

RUNNING TRAIL PAVEMENT SECTION(S)		
Structural Number (SN)	2.32	
Approx. 18K ESAL LOADS	22,000	
Decomposed Granite	4”	4
Base Material – Limestone (a = 0.14)	---	6”
Base Material – Caliche (a = 0.11)	8”	---
Lime Stabilized Subgrade Plus Geogrid (a = 0.10)	8”	8”

After surface organics and deleterious material have been removed, the upper six (6) inches of scarified subgrade soils should be moisture conditioned and compacted to a dry density of at least 95% of the standard Proctor maximum dry density (ASTM D-698) at a moisture content between -3 to +3% of optimum moisture content.

Base materials in flexible pavement areas should be placed in maximum 8" loose lifts and compacted to at least 95% of the modified Proctor (ASTM D-1557) maximum dry density near optimum moisture content. Caliche base materials should meet the plasticity and gradation requirements specified in TxDOT Item 247, Grade 2. Hot-mix asphaltic concrete shall conform to TxDOT Item 340, Type "D"

Surface drainage around the hike and bike trail pavement and proper maintenance are also important to long-term performance. Curbs should be backfilled as soon as possible after construction of the pavement. Backfill should be compacted and should be sloped to prevent water from ponding and infiltration under the pavement. All pavement joints should be caulked and any cracks should be quickly patched or sealed to prevent moisture from reaching and softening the subgrade.

5.10 Pavement Subgrade Preparation

The subgrade should be proofrolled with a fully-loaded dump truck, scraper, or similar rubber-tired equipment weighing at least 25 tons or a 10-ton vibratory steel drum roller. Do not use vibratory rollers to proof-roll materials containing significant amounts (>10%) of fines if the subgrade materials are wet or near groundwater levels, since vibratory rollers tend to wick water to the surface.

Proof-rolling operations should be observed by a representative of EARTHCO. Unstable and unsuitable soils, which are revealed by proof-rolling and which cannot be adequately densified in-place, should be removed under the direction of the EARTHCO representative. It may be necessary to perform selective removal of soft, wet soils and/or stabilize existing soft soils in-place. If required, the methods of stabilization will typically include incorporating hydrated lime, fly ash, a lift of crushed stone materials, or a geosynthetic over the soft soils. **We anticipate the need to use hydrated lime stabilization at this project site.** We recommend a lime determination be performed at the time of construction to determine the percent of lime required to stabilize the site surface soils. Upon stabilization operations are complete, the subgrade should be lime treated and compacted to a minimum of 98% of the maximum proctor density of ASTM D-698-91, Standard Proctor Moisture-Density Relationship. The moisture content should also be controlled between minus 3% to plus 3% of the optimum. The subgrade should be tested by a representative of EARTHCO and approved for placement of select fill.

5.11 Pavement Design

The stabilization of the subgrade soils using hydrated lime and proof-rolling and moisture conditioning is being recommended at this site. The anticipated California Bering Ratio (CBR) value of the existing subgrade soils at this site is anticipated to be between 3.0 to 5.0 or a Modulus of Subgrade Reaction (k) of 100 to 132 psi.

Our recommended pavement thickness designs are based on a subgrade prepared as recommended in the Pavement Subgrade Preparation section above. A pavement design life of 20 years is used. AASHTO pavement design procedures were used to estimate the required pavement thicknesses. The following parameters were adopted for the thickness design:

- Assumed CBR value with Lime Stabilized of Subgrade Soils: 3.0
- Effective Roadbed Soil Resilient Modulus (M_R) = 4500 psi

The Medium-Duty pavement recommendations are based on a design life of 20 years, terminal serviceability = 2.0, reliability = 85%, initial serviceability = 4.2, and standard deviation = 0.45 for flexible pavements.

Based on the above design parameters, we recommend the following minimum pavement design thickness.

TABLE 2 ASPHALT CONCRETE PAVEMENT THICKNESS RECOMMENDATIONS

LIGHT DUTY PAVEMENT SECTIONS								
Structural Number (SN)	**2.28**		2.40		2.52		2.61	
Approx. 18K ESAL LOADS	**20,000**		28,000		38,000		47,000	
Asphalt Thickness (a = 0.44)	**2.0”**	**2.0”**	2.0”	2.0”	2.0”	2.0”	2.5”	2.5”
Base Material – Limestone (a = 0.14)	**---**	**6”**	---	7”	---	8”	---	7”
Base Material – Caliche (a = 0.12)	**8”**	**---**	9”	---	10”	---	9”	---
Lime Stabilized Subgrade (a = 0.08)	**6”**	**6”**	6”	6”	6”	6”	6”	6”

Alternatively, the following minimum pavement design thickness is recommended for Portland Cement Concrete pavement.

TABLE 3 PORTLAND CEMENT CONCRETE PAVEMENT THICKNESS RECOMMENDATIONS

Traffic Area	Lime Stabilized Sugrade	Limestone or Caliche Base	Recommended Pavement Section Thickness (inches)
Heavy Duty Pavement	8”	6”	6.0”

It is recommended that Portland cement concrete pavement with a minimum thickness of six inches and 4,000 psi strength be used in areas that will experience heavier stationary loads and/or at sharp turning and stopping areas, e.g. trash dumpster pads and loading areas, truck loading and unloading areas, road intersections, etc.

Surface drainage around the pavement and proper maintenance are also important to long-term performance. Curbs should be backfilled as soon as possible after construction of the pavement. Backfill should be compacted and should be sloped to prevent water from ponding and infiltration under the pavement. All pavement joints should be caulked and any cracks should be quickly patched or sealed to prevent moisture from reaching and softening the subgrade

6.0 DRAINAGE AND GROUNDWATER CONSIDERATIONS

The site should be graded to provide positive drainage to reduce storm water infiltration. A minimum gradient of one percent for asphalt areas should be maintained. A three percent gradient should be maintained for landscaped areas immediately adjacent (within 10 feet) to the proposed hike and bike trail. In general, water should not be allowed to collect near the surface of the road subgrade and base areas during or after construction. If water were allowed to accumulate next to the road subgrade areas, it would provide an available source of free water to the expansive soil underlying the roadpag. Similarly, surface water drainage patterns or swales must not be altered so that runoff is allowed to collect along the road alignment.

Temporary drainage provisions should be established, as necessary, to minimize water runoff into the construction areas. Since soils generally tend to soften when exposed to free water, provisions should be made to remove seepage water from excavations, should it occur. Also, undercut or excavated areas should be sloped toward one corner to facilitate the collection and removal of rainwater or surface runoff. Adequate protection against sloughing of soils should be provided for workers and inspectors entering the excavations. This protection should meet O.S.H.A. and other applicable building codes.

Groundwater seepage was not encountered in our borings during drilling. Depending on recent weather conditions prior to construction, groundwater seepage may be encountered within the proposed subgrade excavation, utility trenches and grading excavations at the time of construction, especially after periods of heavy precipitation. Small quantities of seepage may be handled by conventional sump and pump methods of dewatering.

7.0 ADDITIONAL SERVICES

The recommendations presented in this report are contingent on EARTHCO observing and/or monitoring:

- Proofrolling and fill Subgrade conditions;
- Backfilling and compaction of excavations;
- Suitability of borrow materials;
- Fill placement and compaction;
- Road subgrades; and
- Compliance with the geotechnical recommendations.

8.0 CLOSURE

We trust that this report will assist you in the design and construction of the proposed project. EARTHCO appreciates the opportunity to provide our services on this project and looks forward to working with you during construction and on future projects. Should you have any questions, please do not hesitate to contact us.

This report was prepared by Jaime M. Cantu, P.E.

Respectfully submitted,
EarthCo, Limited Liability Corporation

Jaime M. Cantu

Jaime M. Cantu, P.E.,
Geotechnical Project Engineer

APPENDIX A
LIMITATIONS

This report was prepared for the exclusive use of Cameron County and the design team for the design of the proposed development described in Section 2. The report may not be relied upon by any other person or entity without the written permission of Cameron County and EarthCo, LLC. This report was prepared in accordance with current, generally accepted geotechnical engineering practices. No other warrantee is provided.

EARTHCO should be allowed the opportunity to review the geotechnical aspects of plans and specifications prior to construction, to allow confirmation of the correct interpretation of the recommendations provided in this report.

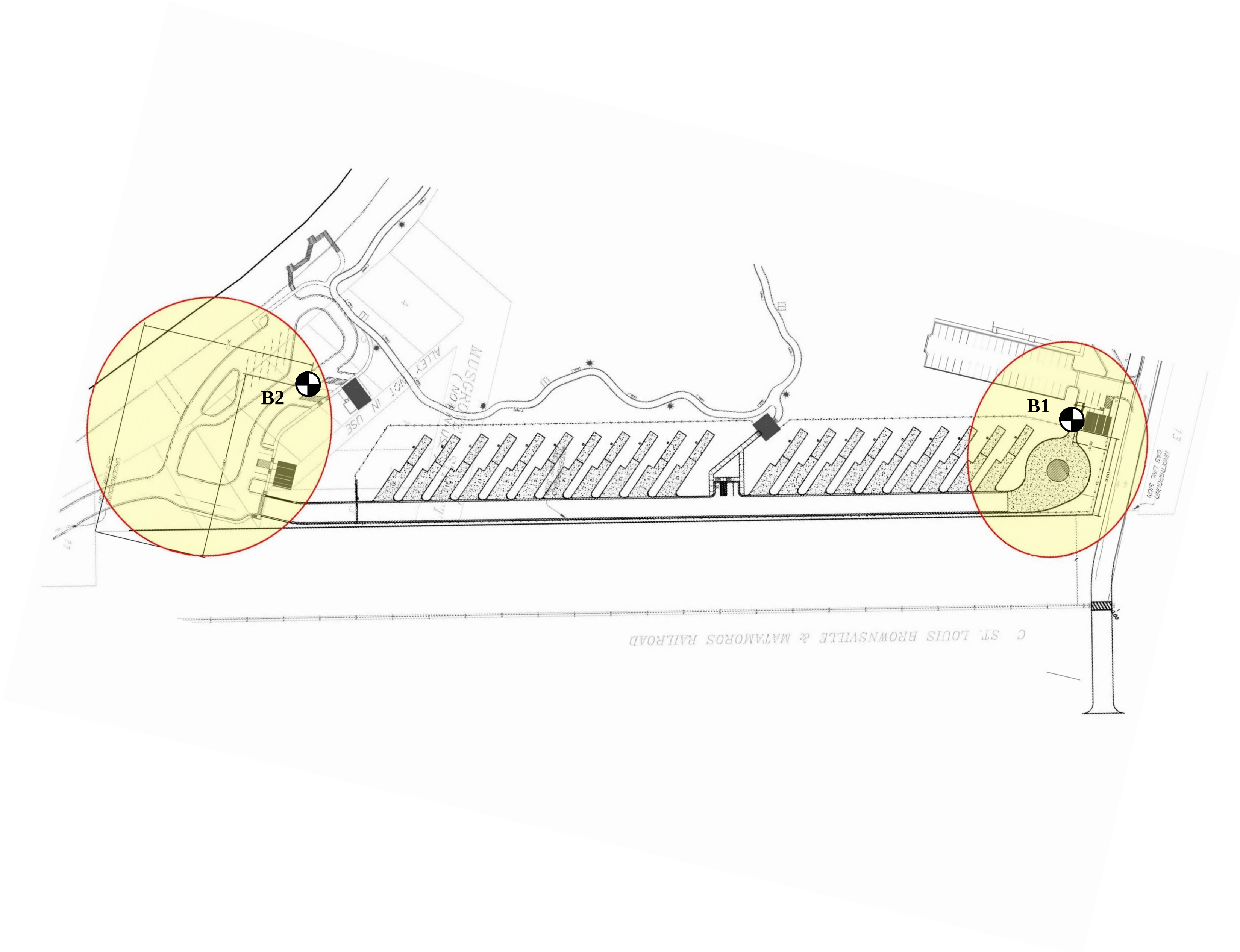
Foundation, earthworks, underground construction, and pavement construction should be undertaken only with full time monitoring by qualified personnel. EARTHCO can provide these services on request.

The conclusions and recommendations submitted in this report are based upon the data obtained from a limited number of widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction or further investigation. If variations or other latent conditions do become evident, it will be necessary to re-evaluate the recommendations of this report.

The recommendations contained herein are not intended to dictate construction methods or sequences. Instead, they are furnished solely to help designers identify potential construction problems related to foundation and earth plans and specifications, based upon findings derived from sampling. Depending upon the final design chosen for the project, the recommendations may also be useful to personnel who observe construction activity. Potential contractors for the project must evaluate potential construction problems on the basis of their review of the contract documents, their own knowledge of and experience in the local area, and on the basis of similar projects in other localities, taking into account their own proposed methods and procedures.

The Scope of Services did not include any environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors or unusual or suspicious items or conditions are strictly for the information of the client.

APPENDIX B
DRAWING



EarthCo
A Geotechnical Engineering and Materials Testing Company
1110 W. Jackson Street
Harlingen, TX 78550
(956) 428-2443 - FAX (956) 202-0491

Boring Location Plan

Proposed Olmito Nature Park
Hayes Road and Santos Gutierrez Road
Olmito, Texas

APPENDIX C
BORING LOGS

LOG OF BORING NO. B1

Proposed Olmito Nature Park - Cameron County
Olmito, Texas
EarthCo Project No. : G230043

TYPE BORING: Straight Flight Auger

LOCATION: See Site Plan

SURF. ELEV.: N/A

DEPTH, FT.	SOIL DESCRIPTION	% PASSING #200 SIEVE	BLOWS PER FOOT	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	UNIT DRY WT. LB./CU FT.
0–25	SANDY LEAN CLAY (CL), light brown, firm to stiff	84	9	48	28	13	
			8			16	
			16			19	
		85	14	47	26	23	
			6			20	
			5			26	
			4			28	
		86	4	37	19	26	
25–30	FAT CLAY (CH), brown, firm		6			27	

STRENGTH IN TSF: ○ HAND PEN ● UNC CMP 2.00 3.00 4.00

PL WC LL 20 40 60

BORING DEPTH: 30.0 FEET

DATE: 8/13/23

DEPTH TO WATER: Boring Dry;

DELAYED WATER READING: Boring Dry and open to 20 ft.;

PLATE 1

EarthCo Geotechnical Engineering & Materials Testing Company
Harlingen, Texas

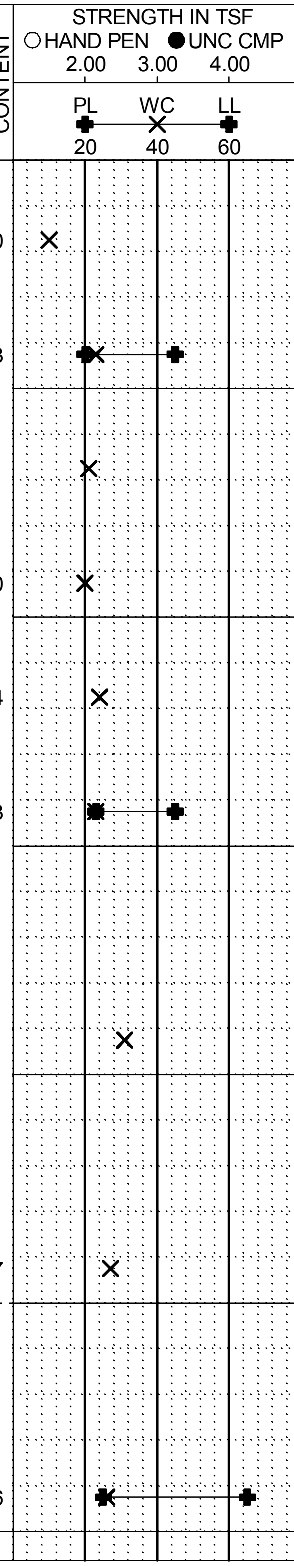
LOG OF BORING NO. B2

Proposed Olmito Nature Park - Cameron County
Olmito, Texas
EarthCo Project No. : G230043

TYPE BORING: Straight Flight Auger
LOCATION: See Site Plan

SURF. ELEV.: N/A

DEPTH, FT.	SOIL DESCRIPTION	% PASSING #200 SIEVE	BLOWS PER FOOT	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	UNIT DRY WT. LB./CU FT.
0–25	SANDY LEAN CLAY (CL), light brown, firm to stiff		8			10	
		90	6	45	24	23	
5			6			21	
			10			20	
10			10			24	
		89	8	45	22	23	
15			7			31	
20			9			27	
25–30	FAT CLAY (CH), brown, firm	96	8	65	40	26	
30							



BORING DEPTH: 30.0 FEET
DATE: 8/13/23
DEPTH TO WATER: Boring Dry;
DELAYED WATER READING: Boring Dry and open to 20 ft.;

PLATE 2

EarthCo
Geotechnical Engineering & Materials Testing Company
Harlingen, Texas

UNIFIED SOIL CLASSIFICATION (ASTM D-2487-98)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	Cu>4 AND 1<Cc<3	GW	WELL-GRADED GRAVEL
			Cu>4 AND 1>Cc>3	GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR CL	GM	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINE	Cu>6 AND 1<Cc<3	SW	WELL-GRADED SAND
			Cu>6 AND 1>Cc>3	SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR CL	SM	SILTY SAND
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	PI>7 AND PLOTS>"A" LINE	CL	LEAN CLAY
			PI>4 AND PLOTS<"A" LINE	ML	SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	PI PLOTS >"A" LINE	CH	FAT CLAY
			PI PLOTS <"A" LINE	MH	ELASTIC SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT

OTHER MATERIAL SYMBOLS

Poorly Graded Sand with Clay	Sand
Clayey Sand	Silt
Sandy Silt	Well Graded Gravelly Sand
Low to High Plasticity Clay	Gravelly Silt
Poorly Graded Gravelly Sand	Asphalt
Topsoil	Boulders and Cobble
Well Graded Gravel with Clay	
Well Graded Gravel with Silt	

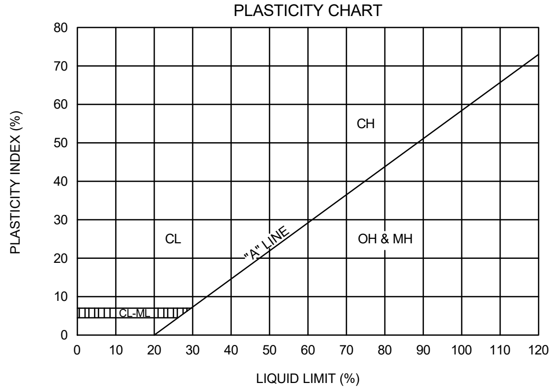
SAMPLE TYPES

- Split Spoon
- Shelby Tube
- Rock Core
- Grab Sample

ADDITIONAL TESTS

CA	-	CHEMICAL ANALYSIS (CORROSIVITY)	(200)	-	(WITH % PASSING NO. 200 SIEVE
CD	-	CONSOLIDATED DRAINED TRIAXIAL			
CN	-	CONSOLIDATION	SW	-	SWELL TEST
CU	-	CONSOLIDATED UNDRAINED TRIAXIAL	TC	-	CYCLIC TRIAXIAL
DS	-	DIRECT SHEAR	TV	-	TORVANE SHEAR
PP	-	POCKET PENETROMETER (TSF)	UC	-	UNCONFINED COMPRESSION
(3.0)	-	(WITH SHEAR STRENGTH IN KSF)	(1.5)	-	(WITH SHEAR STRENGTH IN KSF)
RV	-	R-VALUE			
SA	-	SIEVE ANALYSIS: % PASSING #200 SIEVE	UU	-	UNCONSOLIDATED UNDRAINED TRIAXIAL
▽	-	WATER LEVEL (WITH DATE OF) MEASUREMENT	WA	-	WASH ANALYSIS
			(200%)	-	(WITH % PASSING NO. 200 SIEVE)

PLASTICITY CHART

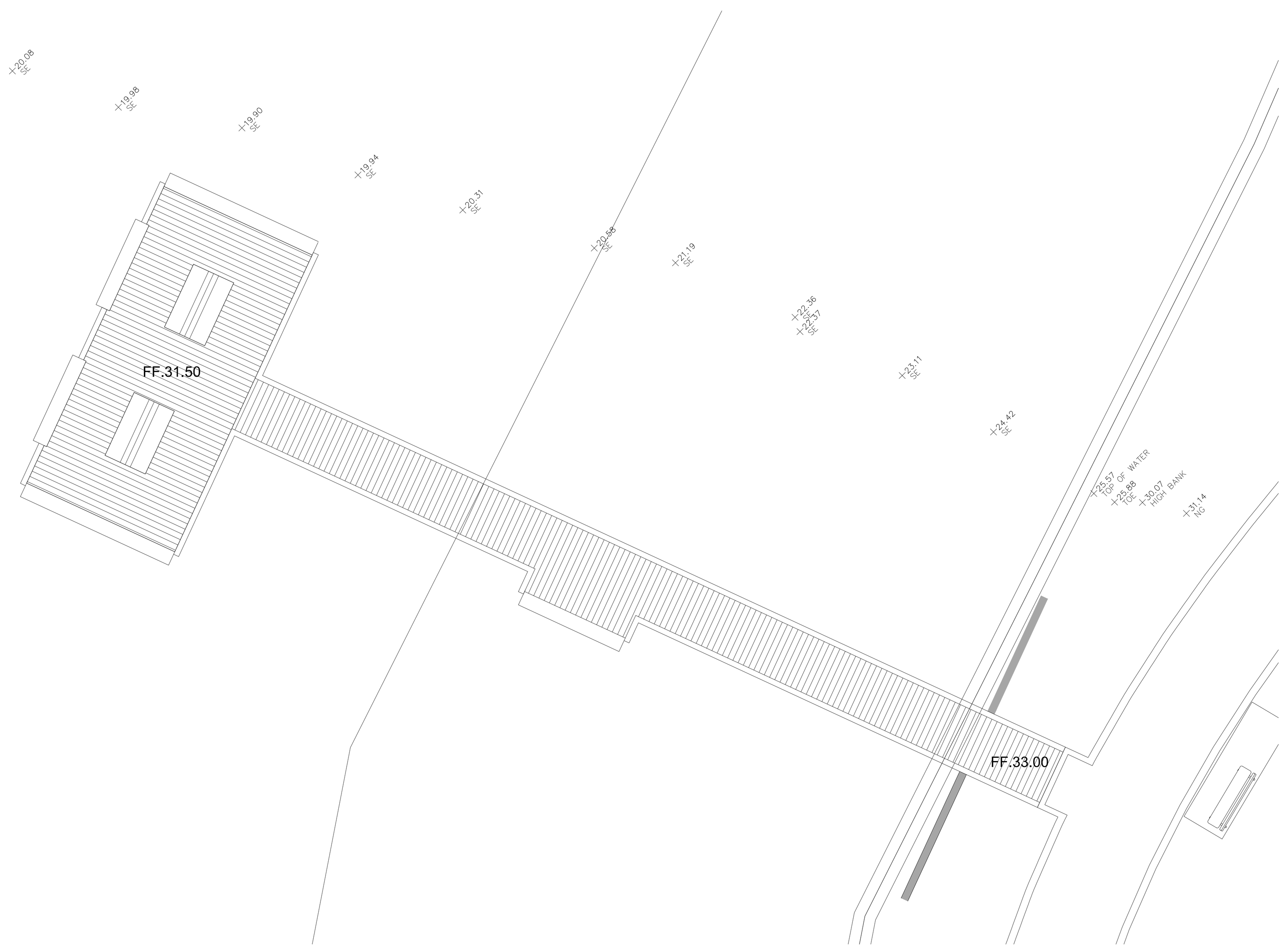


PENETRATION RESISTANCE (RECORDED AS BLOWS / 0.5 FT)

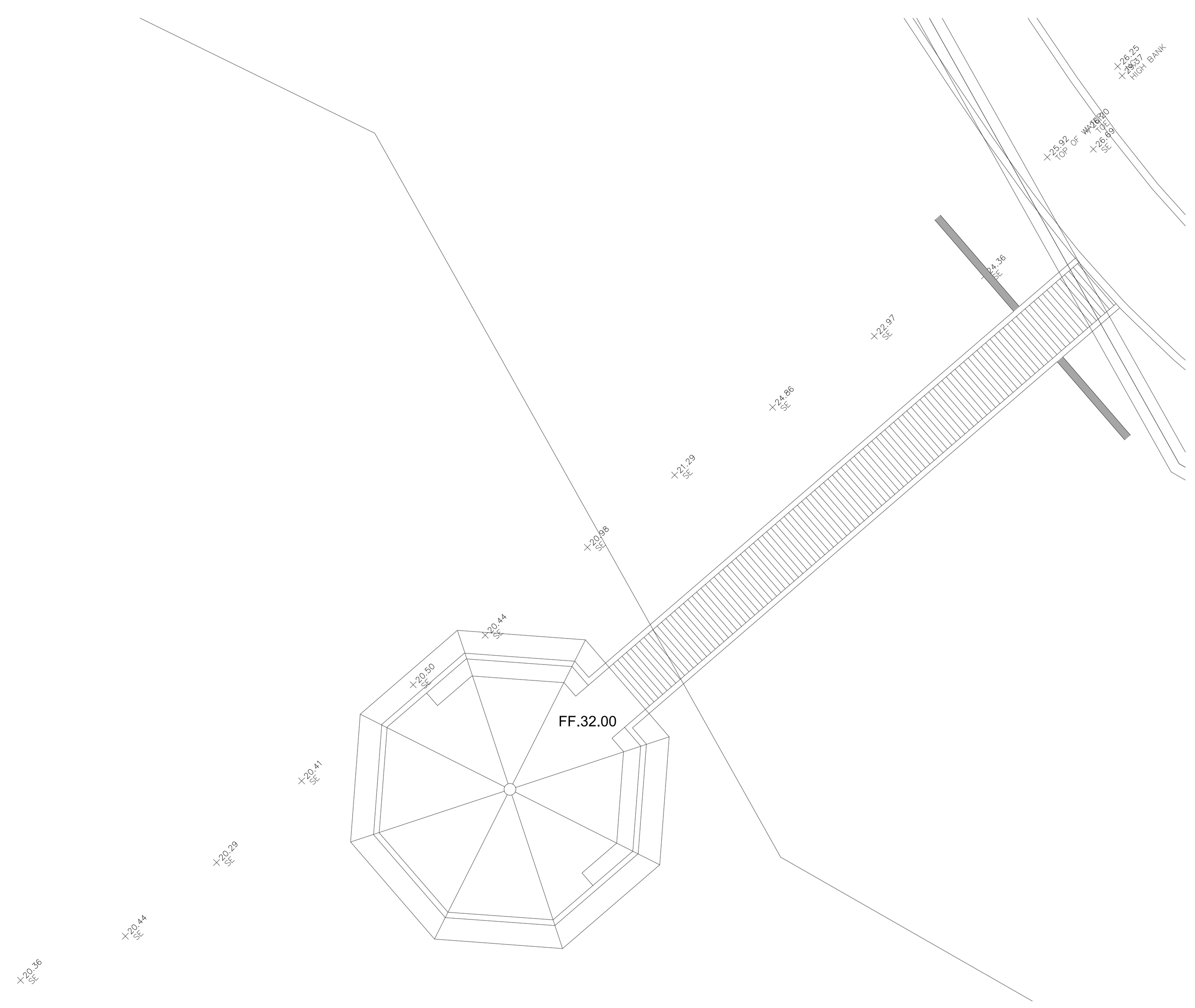
SAND & GRAVEL		SILT & CLAY		
RELATIVE DENSITY	BLOWS/FOOT*	CONSISTENCY	BLOWS/FOOT*	COMPRESSIVE STRENGTH (TSF)
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 4	0.25 - 0.50
MEDIUM DENSE	10 - 30	FIRM	4 - 8	0.50 - 1.0
DENSE	30 - 50	STIFF	8 - 15	1.0 - 2.0
VERY DENSE	OVER 50	VERY STIFF	15 - 30	2.0 - 4.0
		HARD	OVER 30	OVER 4.0

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

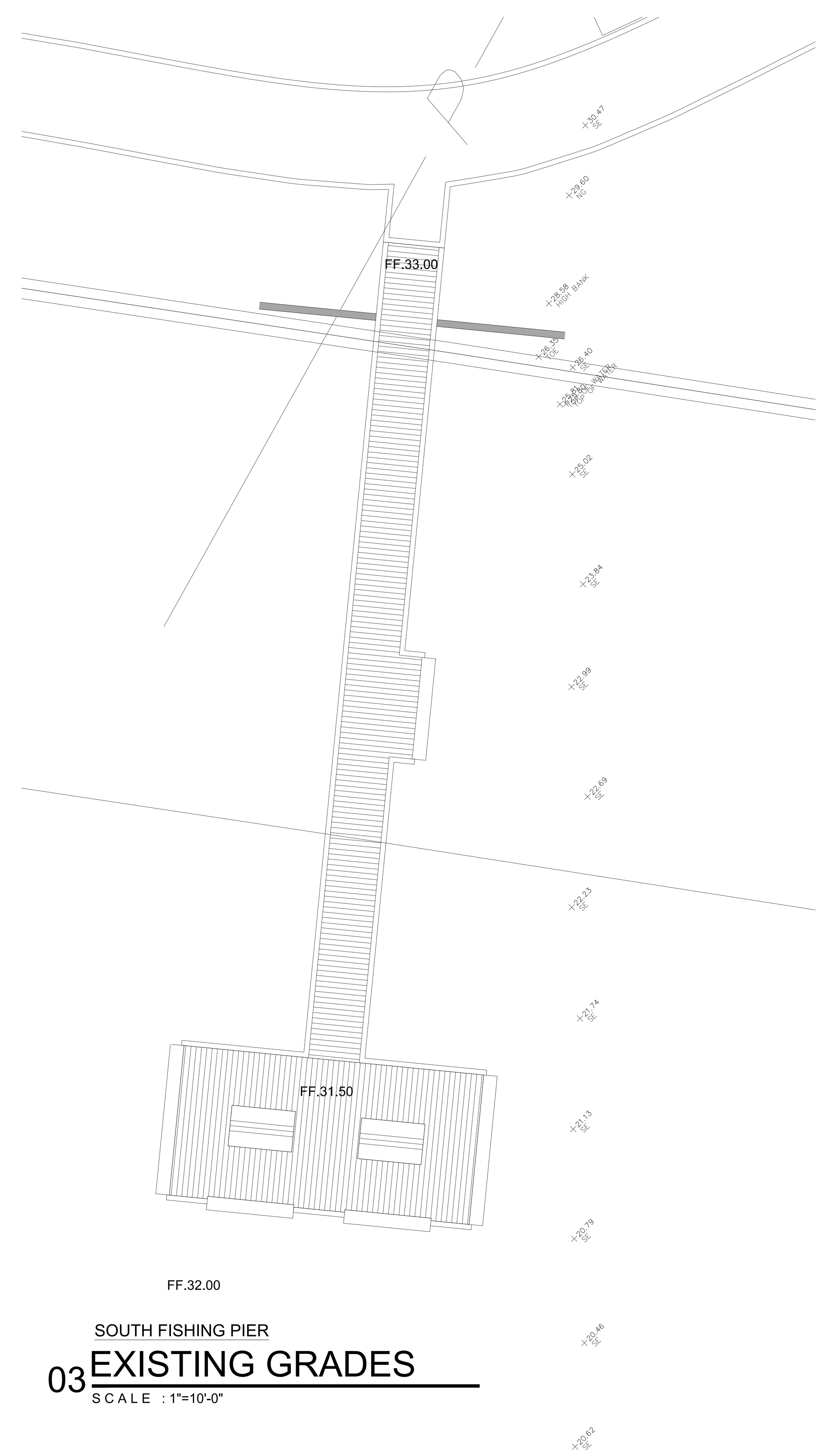
EarthCo	LEGEND TO SOIL DESCRIPTIONS	FIGURE 1
Job No.		



NW FISHING PIER
01 EXISTING GRADES
SCALE : 1"=10'-0"

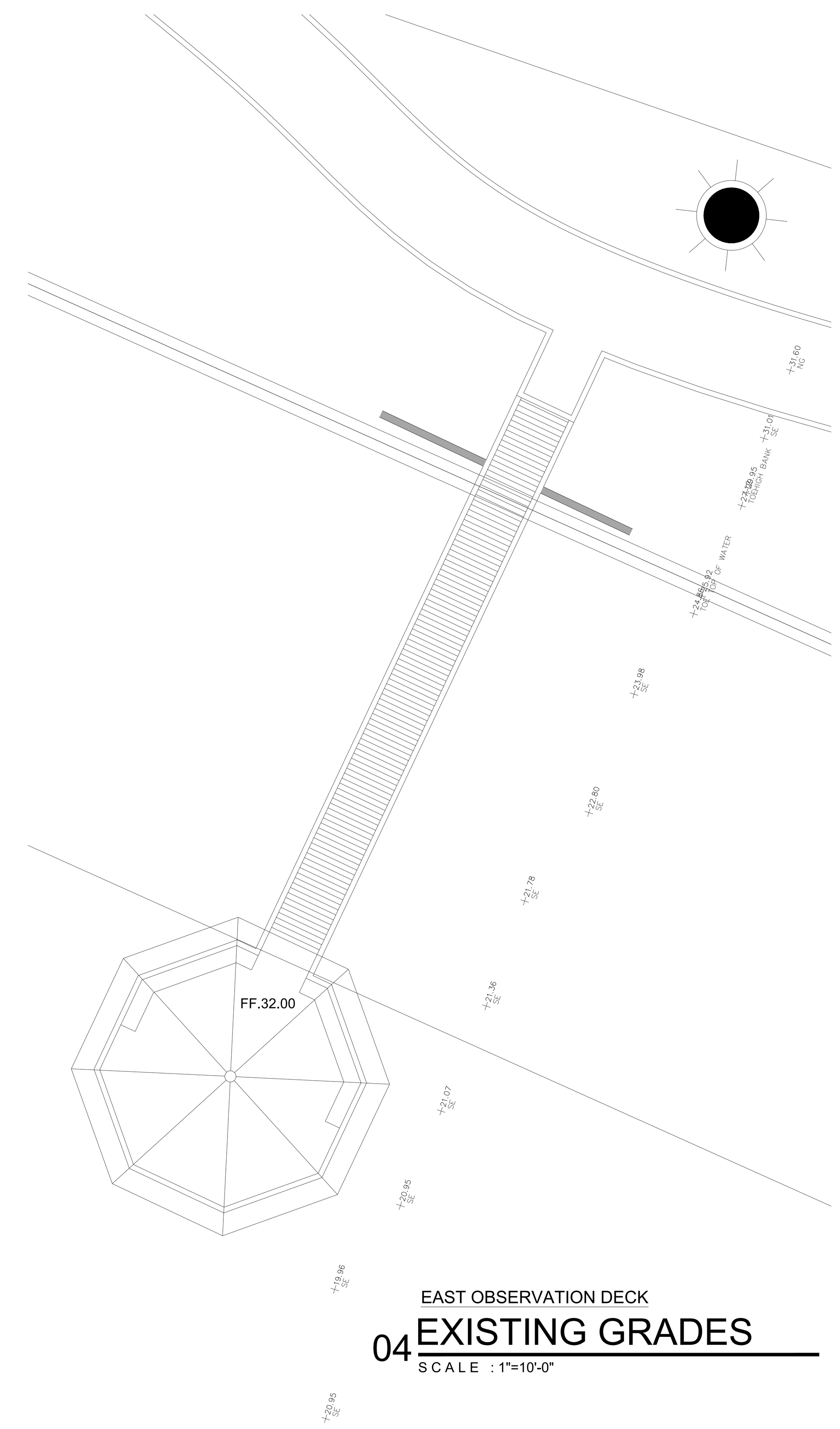


WEST OBSERVATION DECK
02 EXISTING GRADES
SCALE : 1"=10'-0"



FF.32.00

SOUTH FISHING PIER
03 EXISTING GRADES
SCALE : 1"=10'-0"



SCALE : 1"=10'-0"

EAST OBSERVATION DECK
04 EXISTING GRADES
SCALE : 1"=10'-0"

No.	REVISIONS	BY
#4	1/30/2024	RN

GMS ARCHITECTS
1150 Paredes Line Rd.
Brownsville
Texas, 78526
(956) 546-0110
Fax (956) 546-0196

CAMERON COUNTY PARKS
OLMITO PARK COMPLEX
BROWNSVILLE, TEXAS

TEXAS PARKS & WILDLIFE

RTP Project
RTS-22003

Date: 11/2023
Scale: As Noted
Project Architect: Roan G. Gomez, AIA
Drawn By: RN
Job No. CC Olmito Park
Sheet: A0.01