



**GEOTECHNICAL EXPLORATION REPORT
SAN SIMON PORT OF ENTRY SITE IMPROVEMENTS
ADOT PROJECT NO. 010 CH 383 F0728 01D
FEDERAL AID NO. 010-F(238)T
SAN SIMON, ARIZONA**

Prepared for:



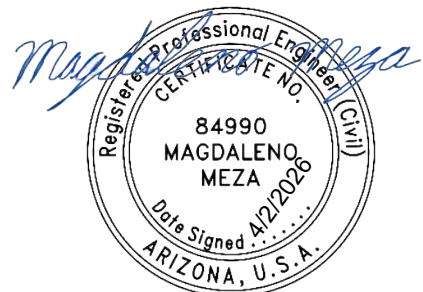
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**SUBJECT: Geotechnical Exploration Report
San Simon Port of Entry Site Improvements
ADOT Project No. 010 CH 383 F0728 01D
Federal Aid No. 010-F(238)T
ADOT Contract No. 2022-006.08, Task Order No. 52
San Simon, Arizona**

Ethos Engineering, LLC (Ethos) is pleased to present the results of a geotechnical investigation performed for the planned San Simon Port of Entry improvements in San Simon, Arizona. Our scope of services was performed in general accordance with our proposal dated July 5, 2024. The results of our field investigation, laboratory testing, engineering analysis, and corresponding geotechnical engineering recommendations for support of the proposed improvements are presented herein.

We appreciate the opportunity to be of service to Kimley-Horn & Associates, Inc. (KHA) on this project. If you have any questions regarding this report, please do not hesitate to contact us.

Sincerely,
Ethos Engineering, LLC



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Reviewed By:



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1.0 PROJECT DESCRIPTION

We understand KHA has been working with the Arizona Department of Transportation (ADOT) to develop design plans for the San Simon Port of Entry (POE) Site Improvements on Interstate 10 (I-10). The project will install a new 100-foot scale and construct a double inspection pit with an enclosed canopy. Improvements include concrete pavement, Americans with Disabilities Act (ADA) walkway, median removal, secured employee parking, an access gate from the Frontage Road, pavement marking, pavement rehabilitation throughout the site, and utility service adjustments. The project location is presented on the Vicinity Map included as Figure 1.

2.0 FIELD EXPLORATION

During the subsurface exploration for the project was performed on July 8, 2025 and included three (3) exploratory borings, identified as B-1, B-2, and B-3, each advanced to approximate depths of 26.5 feet. Boring B-1 was advanced near the location of the planned scale. Borings B-2 and B-3 were drilled in the footprint of the proposed double inspection pit. As part of the Project Assessment, a preliminary boring (P-1) on the southeast side of the canopy structure was performed on January 31, 2024 to an approximate depth of 26.5 feet.

Prior to performing the borings (B-1 to B-3), an Ethos representative marked the planned locations and coordinated utility clearance of our work areas with Arizona 811. The boring locations are shown on the Site Plan Showing Boring Locations included as Figure 2.

Drilling was performed by ACS Services LLC (ACS) using a truck-mounted CME-75 drill rig equipped with hollow-stem auger. Prior to drilling, each of the locations required coring of the existing Portland Cement Concrete Pavement (PCCP) prior to advancing the hollow-stem auger in subsurface soils. Bulk samples of the near surface soils were obtained from the drill cuttings at each boring location. Drive sampling was performed using standard penetration test (SPT) split spoon samplers or open-end drive samplers (2.42-inch-diameter brass rings) at maximum 5-foot intervals. The drive sampling was performed using an automatic hydraulic actuated 140-pound hammer free falling 30 inches. The SPT and ring samplers were driven 18 and 12 inches, respectively, or to refusal (i.e. 50 blows for less than a 6-inch interval). Unless noted otherwise on the boring logs, the sample penetration resistance was recorded as number of blows per six inches of penetration. The penetration results are presented on the borings logs adjacent to each sample.

The recovered soil samples were removed from the sampler, sealed to reduce moisture loss, and stored for subsequent review and laboratory testing. Upon completion, the borings were backfilled with soil cuttings and fast-setting concrete.

Encountered soils were visually inspected, labeled and classified in the field, and logged in general accordance with ASTM D2488, the Unified Soil Classification System (USCS), and Ethos guidelines. Field direction, and logging of borings were performed by Ethos personnel. Logs of the borings are presented in Appendix A.

3.0 LABORATORY TESTING

Selected laboratory tests were assigned by Ethos and performed by ACS on representative samples recovered from the borings to support our field classification and to provide information regarding engineering characteristics and properties of the subsurface soils. A summary of the laboratory testing program is presented in Table 3.1.

Table 3.1: Laboratory Testing Program

Item/Description	Estimated Number
Grain Size Analysis (Total - Coarse and Fine) - ASTM C136 & C117	4
Atterberg Limits (Plasticity Index) - ASTM D4318	4
Moisture Content - ASTM D2216	3
Soil Density and Moisture Content – ASTM D2937	3
Consolidation – ASTM D2435	1
R-value - ASTM D2844	2
pH and Resistivity - AZ Method 236e	1
Sulfates and Chlorides - AZ Method 733b	1

The results of the laboratory tests are presented in Appendix B. The results of moisture content, in-place dry density, Atterberg Limits, and fines content (i.e., percent passing the #200 sieve) testing are also presented on the boring logs in Appendix A at the corresponding sample depth.

4.0 SITE CONDITIONS AND GEOTECHNICAL PROFILE

4.1 Site Conditions

The existing POE consists of a main administration building with an adjacent canopy structure and weigh scale. The weighmaster/credential booth is currently attached to the north side of the administration building adjacent to the weigh scale lane. The canopy structure is used as the inspection area and parking lot for the employees. There are currently no striped employee parking areas, but there is an ADA parking space east of the administration building. The area west of the administration building is currently a 15-stall truck parking area that is in poor to fair condition with several areas designated to be replaced with the renovations of the POE. The area includes a septic field to the north of the current bypass lane and a well at the northwest corner of the project area. The entire project is parallel to the Union Pacific Railroad (UPRR) to the north and I-10 to the south and the site and generally slopes upwards to the east. Portland Cement Concrete Pavement (PCCP) was encountered at each of the boring locations. The PCCP condition was poor with 32 full and 16 partial PCCP slabs identified for removal and replacement. The approximate core and subgrade thicknesses are summarized below in Table 4.1.

Table 4.1 – Pavement Core and Subgrade Thickness Summary

Boring ID and Location	PCCP (Type)	AC Base	AB (Class 2)	Total Thickness
B-1 Bypass Lane	8.25 (plain)	--	7.25	15.5
B-2 Parking Area	11.0 (plain)	--	6.0	17.0
B-3 Parking Area	10.25 (plain)	--	4.0	14.25

Notes: PCCP – Portland Cement Concrete Pavement; AB – Aggregate Base; AC Base – Asphalt concrete Base

4.2 Regional Geologic Setting

The project site is in the Basin and Range Geologic Province of the southwestern United States. The Basin and Range Province is characterized by a modern landscape consisting of broad alluvial valleys interspersed with and bounded by uplifted and fault-block mountain ranges, often with well-developed pediments and alluvial fans. Generally, the mountain ranges and valleys trend in a north-south to northwest-southeast direction. The modern landscape was formed by late Tertiary (Miocene-Pliocene) extensional tectonism and high-angle normal faulting, followed by subsequent erosion of the uplifted mountains and alluvial deposition of the sediments in the newly-formed basins.

Published geologic mapping indicates that surficial geologic units along the project consist of Quaternary Surficial deposits (AZGS 2022). Unconsolidated to strongly consolidated alluvial and eolian deposits. This unit includes: coarse, poorly sorted alluvial fan and terrace deposits on middle and upper piedmonts and along large drainages; sand, silt and clay on alluvial plains and playas; and wind-blown sand deposits.

4.3 Site Subsurface Conditions

Based on the conditions encountered in the borings, subsurface conditions can be generalized as presented in Table 4.2. Refer to the boring logs in Appendix A and laboratory test results in Appendix B for additional details.

Table 4.2: Generalized Subsurface Profile

Stratum	Approximate Stratum Bottom Depth (feet)	USCS Material Types	Relative Firmness
1	10	Clayey Sand (SC)	Soft to Firm
1	26.5 (maximum depth explored)	Sandy Clay (CL)	Moderately Firm to Very Firm

The clayey soils generally exhibited medium plasticity. Greater subordinate amounts of gravel presented in shallow site soils and generally decreased with depth. The relative firmness and percent fines of the subsurface soils generally increased at depth.

4.4 Site Seismicity

The project site is located in south-eastern Arizona which is an area of generally low seismic activity. Based on the soil conditions at the site and depth of exploration, Site Class D is considered appropriate. In accordance with AASHTO (2012) the project site has the Horizontal Spectral Response Acceleration Coefficients with a 7 percent probability of exceedance in 75 years. The probabilistic horizontal spectral acceleration values for the designated return period and corresponding horizontal peak ground acceleration (PGA) were obtained from the United States Geological Survey (USGS) seismic hazards program website (USGS 2002). The values obtained from the website are based on 2009 AASHTO Guide Specifications for Load Resistance Factor Design (LRFD) Seismic Bridge Design and use 2002 USGS seismic hazard data. For structural design, the seismic parameters in Table 4.3 should be used.

Table 4.3: Summary of Seismic Parameters

Parameter	Value	AASHTO 2012 Reference
Latitude 32.25760° N, Longitude 109.17920° W		
Site Class Definition	D	Table 3.10.3.1-1
Site Coefficient, F_{PGA}	1.6	Table 3.10.3.2-1
Site Coefficient, F_a	1.6	Table 3.10.3.2-2
Site Coefficient, F_v	2.4	Table 3.10.3.2-3
PGA	0.071	
Spectral Acceleration, S_{DS}	0.262 g	Equation 3.10.4.2-3
Spectral Acceleration, S_{D1}	0.118 g	Equation 3.10.4.2-6

The project site falls into Seismic Zone 1, in accordance with Article 3.10.6 (AASHTO 2012), since the mapped spectral response acceleration coefficient, S_{D1} , is less than the threshold value of 0.15 g, based on Table 3.10.6-1 (AASHTO 2012). Due to the low site seismicity, the impact of seismic forces on the stability of embankments is negligible.

4.5 Moisture and Groundwater Conditions

Groundwater was not encountered during the field investigation and is not anticipated to impact design and construction. The moisture conditions in the borings were generally slightly moist to moist throughout the boring depths at the time of the exploration. The depth to regional groundwater was measured at approximately 64 feet (water surface elevation of approximately 3567 feet above mean sea level) in November 2024 at an Arizona Department of Water Resources (ADWR) index well site (GWSI Site ID 321355109120501) located approximately 2.0 miles southwest of the site on N Franklin Road north of W Rivers Road.

4.6 Land Subsidence and Earth Fissures

ADWR monitors land subsidence in areas throughout Arizona using interferometric synthetic aperture radar (InSAR). The project lies within the Bowie and San Simon study area. The InSAR measured subsidence within this area between May 2010 to April 2025 was measured at approximately 7.9 to 15.7 inches (ADWR 2024). From May 2023 to April 2024, the land subsidence rate was measured using InSAR data for the Bowie and San Simon Areas at a rate of approximately 0.8 to 1.2 inches per year (ADWR, 2025).

Earth fissures typically develop at the boundaries of land subsidence areas and over areas where relatively shallow bedrock is present. The Arizona Geological Survey (AZGS) documents earth fissures through the preparation of maps showing confirmed and unconfirmed fissures. Based on a review of the AZGS Natural Hazards in Arizona web tool (AZGS, 2025), the nearest known earth fissures are located approximately 3.5 miles southwest of the site northeast of the intersection of Parker Road and W Coyote Song Road (AZGS, 2025). The risk of earth fissures is currently low, due to the project area residing in the Bowie and San Simon study area subsidence area, subsidence and any potential earth fissures formation should be monitored and documented in the future. As of the time of this geotechnical investigation earth fissures should not be of concern.

5.0 ENGINEERING ANALYSES AND RECOMMENDATIONS

The following sections of this report present our recommendations regarding foundation design, lateral earth pressures, site preparation, and related geotechnical engineering considerations. The recommendations are based on our understanding of the project, the results of the exploration and laboratory testing performed for the project, and engineering analyses.

The following sections of this report present our recommendations regarding foundation design for the new building and retaining walls, construction considerations, site preparations and grading, moisture protection, excavations and backfills.

5.1 Foundation Recommendations

5.1.1 Recommendation for Spread Footings

5.1.1.1 Bearing Resistance

The information presented in this section is based on the four exploratory borings which were advanced for the proposed improvements. Our understanding is that the proposed building and retaining wall structures will be founded on shallow-type spread footings. Included herein are bearing resistance recommendations for shallow-type spread footings.

The strength and service limit state design analyses for spread footings were completed per the methods presented in Sections 10.5 and 10.6, respectively, (AASHTO 2012), and ADOT Geotechnical Design Policy SF-1 (2010a). Based on current design information provided by KHA, retaining walls will be supported on spread footings bearing on existing native soils. The following recommendations can be applied to both retaining wall and inspection building locations assuming the provisions in Section 5.2.1.5 are followed.

The factored net bearing resistance, qR_n , for the strength limit state design was determined using the net nominal bearing resistance (ultimate bearing capacity), q_{nn} , calculated per Section 10.6.3.1.2a and bearing resistance factor, ϕ_b , from Section 10.5.5.2.2 (AASHTO 2012). The parameters presented below in Table 5.1 were assumed for the nominal resistance and strength limit state analyses. The parameters used, particularly angle of internal friction, are considered to be conservative for the soil conditions encountered.

The footing length and depth were assumed based on information provided by the project team. The resulting factored net bearing resistance, qR_n , versus effective footing width, B' , is shown as the "Strength Limit State" line in Figures C1 and C2.

Table 5.1 - Spread Footing Analysis Parameters Strength Limit State Design for Bearing Resistance

Parameter	Symbol	Footings
Soil Angle of Internal Friction	ϕ_f	28 degrees
Soil Total Unit Weight	γ	110 pcf
Cohesion	c	50 psf
Assumed Footing Length	L	100 ft
Footing Bearing Depth	D_f	1 to 8 ft
Effective Footing Width	B_f	2 to 10 ft
Bearing Resistance Factor	ϕ_b	0.45

Per the ADOT Geotechnical Design Policy SF-1 (2010a), the modified Schmertmann method presented in Section 8.5 of the Federal Highway Administration (FHWA) Soils and Foundation Reference Manual (FHWA 2006) was used to calculate settlements for the service limit state analysis. The parameters assumed for this analysis are presented in Table 5.2.

Table 5.2- Spread Footing Analysis Parameters Service Limit State Design for Bearing Resistance

Parameter	Symbol	Depth Interval (ft) ⁽¹⁾	
		0-20	Below 20
Soil Type	--	Sand with Fines	Sand with Fines
Soil Unit Weight (pcf)	γ	110	110
Corrected SPT N-value to hammer efficiency	N_{60}	18 to 50	50
Elastic Modulus (ksf)	E_s	$5N_{60}$	$5N_{60}$

1. Depth of zero assumed to be at base of footing.
2. pcf = pounds per cubic foot
3. ksf = kips per square foot

The parameters are based on the measured soil densities, distribution of N values and on the Es-N correlations (FHWA 2006). Figures C1 and C2 present the family of service limit state curves developed per ADOT Geotechnical Design Policy SF-1 (2010a) for design settlements of 0.25, 0.5, 0.75, and 1.0 inches and effective footing widths, Bf, ranging from 2 to 8 feet.

5.1.1.2 Sliding Resistance

The factored sliding resistance, RR, for limit state design should be determined using the nominal sliding resistance between soil and foundation, R_{τ} , and nominal passive resistance, R_{ep} , per Section 10.6.3.4, and corresponding resistance factors, ϕ_{τ} and ϕ_{ep} , from Section 10.5.5.2.2 (AASHTO 2012). We recommend the parameters presented in Table 5.3 be used for analyzing sliding resistance.

Passive lateral soil resistance should typically be neglected in the upper 3 feet of finished grade due to the potential for disturbance. Below a depth of 3 feet, the nominal passive resistance can be estimated assuming a hydrostatic pressure distribution of 360 psf per foot.

Table 5.3: Spread Footing Analysis Parameters - Strength Limit State Design for Sliding

Parameter	Symbol	Value
Factored Sliding Resistance		
Resistance Factor for Shear Between Soil and Foundation	ϕ_{τ}	0.90 ⁽¹⁾
Resistance Factor for Passive Resistance	ϕ_{ep}	0.50
Nominal Sliding Resistance		
Soil Angle of Internal Friction	ϕ_f	28 degrees
Soil Total Unit Weight	γ	110 pcf
Cohesion	C	50
Shear Resistance Between Soil and Foundation	δ	30 degrees = ϕ_f
Passive Earth Pressure Coefficient	K_p	2.77
Active Earth Pressure Coefficient	K_a	0.36

⁽¹⁾ Use resistance factor of 0.90 for soil-on-soil interface for the bottom horizontal plane of footing between toe and front of key. For remainder of footing bottom use values provided in Table 10.5.5.2.2-1 (AASHTO 2012).

5.1.1.3 Eccentricity

The eccentricity in the L (long) dimension of an abutment or wall footing is typically negligible, such that $L = L'$. The effective footing length (B') in the B (short) dimension is calculated as $B' = B - 2eB$, where eB is the B dimension eccentricity determined by the structural engineer. The maximum allowable eccentricity at the strength limit state should be calculated in accordance with ADOT Geotechnical Design Policy SF-2 (ADOT 2010b).

5.1.1.4 Nominal Lateral Load Acting on Retaining Walls

Walls retaining soils should be designed for the lateral earth pressure imposed by the soils. The magnitude of the lateral earth pressure is a function of the backfill material, imposed surcharge loads, drainage accommodations and the rigidity of the retaining structure. The recommended lateral earth pressure values presented below assume the backfill will be structure backfill comprised of granular soils which meet the requirements of Section 203 of the current ADOT Standard Specifications (ADOT 2021). The limits of structure backfill placement are assumed to be the entire limits of excavations for the abutments and abutment wingwalls, and in all cases the structure backfill should extend a minimum of 3 feet laterally from the back edge of all walls.

Walls which are free to deflect a minimum of 0.1 percent of the wall height should be designed for the full active earth pressure condition and an active equivalent fluid unit weight on the order of 43 psf per foot of wall height. Walls which are restrained from lateral movement should be designed for the at rest condition using an equivalent fluid unit weight of 64 psf per foot of wall height. Retaining walls should be designed to drain water and avoid hydrostatic pressures. These recommendations assume a horizontal backfill surface, no surcharge loadings and adequate drainage. Surcharge loads from traffic, sloped backfills, or other sources, will impose additional pressures.

Horizontal loads acting on foundations cast in open excavations against undisturbed native soil or properly placed and compacted fill will be resisted by friction acting along the base of the footing and by passive earth pressures against the loaded side of the footing. If design makes use of passive earth pressure against backfill, it is important that a representative of the geotechnical engineer be present to monitor, and test backfill placement and compaction in order to develop passive resistance with low strains.

5.1.1.5 Foundation Subgrade Preparation

Foundation elements for the associated walls will be constructed on native site soils and roadway embankment, respectively. Trash, debris, vegetation (including roots) and other organics, any existing spread fill, any unstable (soft, loose, disturbed, water softened, sedimentation, collapsible, expansive, etc.) soils, and other deleterious materials should be removed from proposed structure foundation areas prior to construction. This site grading should extend laterally a minimum of 2 feet beyond structure areas. All areas of excavation should be observed and approved by the geotechnical engineer after clearing and before any placement of foundations or backfilling operations begin at the site.

Subgrade preparation should be performed as outlined in Section 203 of the current ADOT Standard Specifications (ADOT 2021). In proposed foundation areas, the ground surface should be prepared to a minimum depth of 6 inches below finished subgrade. Subgrade preparation should consist of scarification of 6 inches, moisture conditioning to within 2 percent of the optimum moisture content, and compaction to a minimum of 95 percent of the maximum ASTM D698 Standard Proctor density.

If soft, loose, disturbed, water softened, low density, collapsible, expansive, or other undesirable materials are encountered in proposed footing areas at the exposed depth of overexcavation, the area should be deepened to extend through these undesirable materials. A lean concrete (Controlled Low Strength Material – MAG Section 728, 1 sack slurry mix) may be used to backfill. Alternatively, the deepened area could be backfilled with structure backfill. The extent of removal of unsuitable materials should be as directed by the geotechnical engineer.

5.1.1.6 Structure Backfill

All backfill placed for this project to build the site to final design grades (following foundation excavations) should consist of structure backfill meeting the requirements of Section 203 of the current ADOT Standard Specifications (ADOT 2021). All structure backfill should be moisture conditioned to within 2 percent of the optimum moisture content and compacted to a minimum of 95 for general embankment. Consideration should be made at the time of construction in terms of compaction equipment to be used and the level of effort, lift thickness etc., for compaction immediately adjacent to walls.

5.2 Portland Cement Concrete Pavement

Laboratory testing of subgrade samples for support of pavements was performed on four (4) samples. It is anticipated the new Portland cement concrete pavement (PCCP) will be near existing site grades. The results of laboratory grain-size analysis and Atterberg limits testing are presented in Table 5.4.

Table 5.4 - Results of Subgrade Testing

Boring ID & Depth (feet)	USCS	%Passing #200 Sieve	Plasticity Index	Tested R-Value	Correlated R-Value
B-1	1.3 - 4.3	--	--	--	71
B-2	1.4 - 4.4	SC	26	15	11
B-3	1.2 - 4.2	SC	18	10	--
Average				41.0	45.8
Standard Deviation				42.4	9.8

Two correlated R-values ranged from 39 to 53, and two tested R-values are pending. The calculated Rmean value of 45.8 translates to a resilient modulus (Mr) value of 21,565 pounds per square inch (psi) based on a seasonal variation factor of 1.6 determined for San Simon, Arizona from Table 2-4 of the Pavement Design Manual (PDM) (ADOT 2017). However, given the construction control R-value was calculated at 15.5, to be conservative a design R-value of 20 is recommended which corresponds to an Mr value of 9,146 psi. Additionally, a construction control R-value of 20 is recommended which should allow the majority of subgrade to remain in place.

5.3 Slopes

5.3.1 Permanent Slopes

Non-stabilized embankment cut and fill slopes should be on the order of 3:1 horizontal to vertical (H:V) or flatter. Flatter slopes will promote re-vegetation and can accept landscaping.

5.3.2 Temporary Slopes

Temporary slopes should be excavated in accordance with OSHA (2020). In accordance with Subpart P, Appendix A, the near surface soils to an approximate depth of 20 feet are considered to be Type C soils. For excavations less than 20 feet in such soils, Subpart P, Appendix B indicates a maximum allowable unshored slope of 1.5H:1V for Type C soils. Flatter slopes may be required where either sandy soils are encountered or where the soils become excessively wet, and soft. Should steeper slopes be required due to the proximity of existing structures or other contractor needs, the stability of the slopes should be verified by a registered geotechnical engineer (State of Arizona) who is proficient in slope stability analyses.

The perimeter of all excavations should be protected against water runoff and infiltration near the edges to maintain stability. Heavy equipment and spoil piles should not be allowed within 10 feet of the edge of the excavation. The perimeter of all excavations should be protected against water runoff and infiltration near the edges to maintain stability.

5.4 Surface Drainage

Long-term performance of structures and slabs will require that the subgrade soils and backfill be protected against excessive water infiltration and/or saturation. Surface drainage should be established away from foundations and pavements to minimize moisture infiltration into the subgrade. Engineered fill and backfill should be well compacted to reduce possible moisture infiltration through loose soil intervals.

5.5 Site Grading for Pavement

The following site grading recommendations are intended to provide support for the proposed pavements and foundations. The grading activities at the site should be performed under observation and testing directed by the Ethos geotechnical engineer.

Trash, debris, vegetation (including roots) and other organics, any existing spread fill, any unstable (soft, loose, disturbed, water softened, etc.) soils, and other deleterious materials should be removed from proposed pavement areas prior to construction. Site grading should extend laterally a minimum of 2 feet beyond pavement areas. All areas of excavation should be observed and approved by a representative of the geotechnical engineer after clearing and before any filling operations begin at the site.

5.5.1 Site Preparation

Completely remove all vegetation (including roots) and other organics, debris, any unstable (soft, loose, disturbed, water softened, etc.) soils, any uncontrolled fill, structural elements not intended to remain, and other deleterious materials from proposed structure areas prior to construction. This site grading should extend laterally a minimum of 2 feet beyond structure areas unless noted otherwise. All areas of excavation should be observed and approved by a representative of the geotechnical engineer after clearing and before any filling operations begin at the site.

5.6 Corrosion Potential

Representative samples of the near-surface soils were tested for pH, laboratory minimum resistivity, soluble sulfates, and soluble chlorides to help characterize the corrosion potential to buried metal and concrete. The testing was performed in accordance with Arizona Test Methods 236c, 733b and 736b, respectively, and the results are presented in Table 5.5 and included in Appendix B.

Table 5.5: Results of Corrosion Testing

Location	Sample Depth (feet)	pH	Minimum Resistivity (ohm-cm)	Soluble Sulfate (ppm)	Soluble Chloride (ppm)
B-2	1.4 - 4.4	9.5	2,960	--	--
B-3	1.2 – 4.2	--	--	198	5

Notes: ohm-cm – ohm centimeters; ppm – parts per million

The laboratory pH value of the in situ soil was of 9.5 and the minimum resistivity value measured 2,960 ohm-centimeters (ohm-cm). Pipe locations where the pH is less than 6.0, greater than 9.0, and/or the resistivity is less than 2,000 ohm-cm require the use of special pipes and/or pipe coatings. It is recommended that the type and/or coating of metal in direct contact with soil be selected in accordance with ADOT Pipe Selection Guidelines (ADOT, 1996).

Total soluble sulfate values were of 198 parts per million (ppm). The sulfate test measures the water-leachable or “available” sulfate content. These results were compared to Table 19.3.1.1, “Exposure Categories and Classes,” in Section 19.3.1 of the American Concrete Institute’s (ACI’s) Building Code Requirements for Structural Concrete (ACI 2019). All the samples fall within Exposure Class S0 for water-soluble sulfate (SO_4^{2-}) in soil by percent mass ($\text{SO}_4 < 0.1\%$ or 1,000 ppm) with values of less than 3 ppm and are categorized with a severity level of “not applicable” in terms of sulfate exposure. Based on Table 19.3.2.1, “Requirements for Concrete by Exposure Class,” in Section 19.3.2 (ACI 2019), there is no restriction on Portland cement type for concrete structures in contact with these materials.

The chlorides test result value was 5 ppm. Regarding chloride attack, Section 19.3.2 (ACI 2019) indicates that when concrete is exposed to external sources of chlorides, concrete should be proportioned to satisfy the requirements for the applicable exposure class in Table 19.3.1.1 (ACI 2019). The anticipated concrete exposure for this segment falls within Exposure Class C1. Table 19.3.2.1 (ACI 2019) should be referred to for requirements for concrete by exposure class. For Exposure Class C1, the minimum compressive strength of concrete specified for is 2,500 psi and the maximum water-soluble chloride ion content in concrete, by percent weight of cement, is 0.30% for non-prestressed concrete and 0.06% for prestressed concrete.

The results presented in this section are general in nature and may not be representative of site conditions. We recommend that the results of our laboratory testing be reviewed by a person or firm experienced in corrosion protection designs for the actual construction at the site, and/or by the appropriate pipe or material manufacturer. A qualified corrosion engineer should be consulted if corrosion of underground utilities is a concern or if a detailed evaluation is necessary.

6.0 CLOSURE

The geotechnical services were performed in a manner consistent with that level of care and skill ordinarily exercised by other members of the geotechnical profession practicing in the same locality, under similar conditions and at the date the services were provided. Our conclusions, opinions and recommendations are based on the completed test borings, visual observations and the review of plans prepared by others. It is possible that conditions could vary beyond the data evaluated. Ethos makes no guarantee or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

This report may be used only by the Client and their representatives, and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on site and off site), or other factors may change over time, and additional work may be required with the passage of time. Any party other than the Client who wishes to use this report shall notify Ethos of such intended use. Based on the intended use of the report, Ethos may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the Client or anyone else will release Ethos from any liability resulting from the use of this report by any unauthorized party.

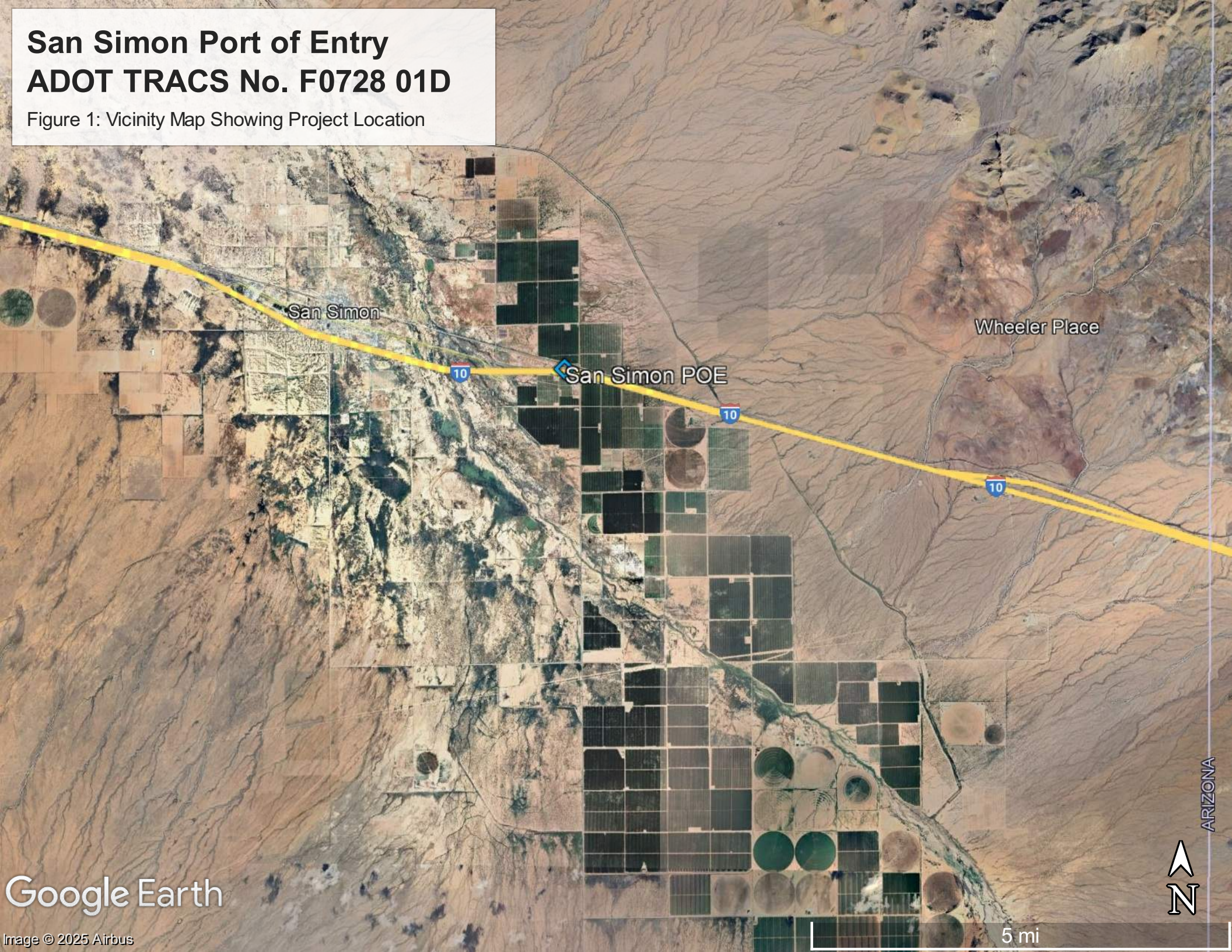
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FIGURES

San Simon Port of Entry ADOT TRACS No. F0728 01D

Figure 1: Vicinity Map Showing Project Location



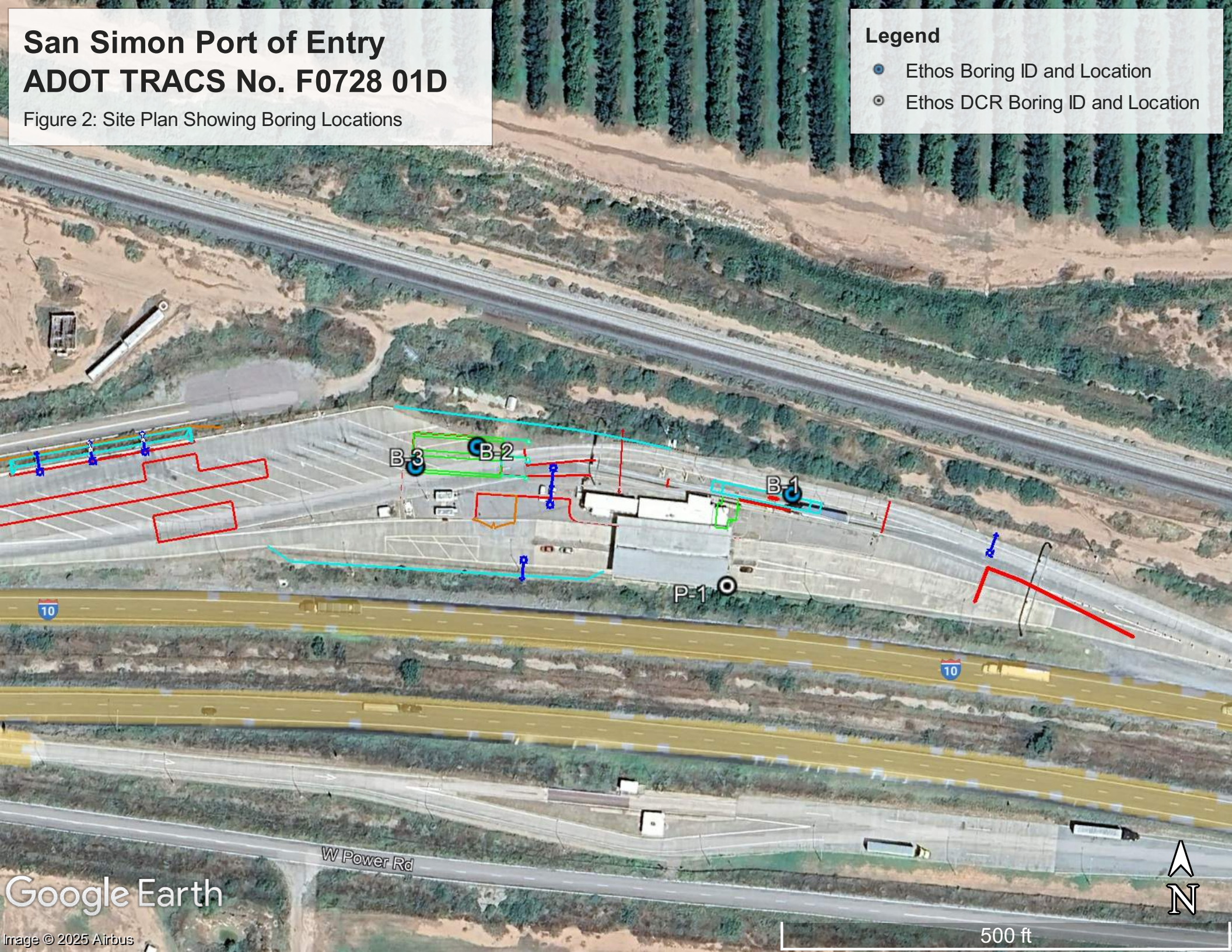
Google Earth

San Simon Port of Entry ADOT TRACS No. F0728 01D

Figure 2: Site Plan Showing Boring Locations

Legend

- Ethos Boring ID and Location
- Ethos DCR Boring ID and Location



APPENDIX A

Boring Logs

SOILS SAMPLING & BORING LOG INFORMATION

The material and in-situ moisture descriptions of soils presented on the boring logs are based on visual observation and classification in accordance with the Unified Soil Classification System (USCS), presented on the next page. The field logs were modified, where appropriate, based on laboratory testing of selected samples.

The relative density and firmness described on the test boring logs are generally based on standard penetration test (SPT) blows per foot (N) for mostly cohesionless and cohesive soils. 2-inch outside diameter (O.D.) SPT samplers are advanced up to 18 inches into undisturbed soils beyond the base of either a hollow stem auger or drill casing. The samplers are driven with a 140-pound hammer and a 30-inch drop. SPT values are recorded on the boring logs for each 6-inch increment of penetration with sampler refusal based on a penetration of less than 6 inches and a blowcount of 50.

Relative Density

Relative density for mostly cohesionless, uncemented sands and sand and gravel mixtures is described based on the following SPT blowcounts:

N	Relative Density
0-4	Very Loose
5-10	Loose
11-30	Medium Dense
31-50	Dense
>50	Very Dense

Relative Firmness

Relative Firmness for cohesive and/or cemented soils including silts, clays and silty to clayey sandy and gravelly soils is described based on the following SPT blowcounts:

N	Relative Firmness
0-4	Very Soft
5-8	Soft
9-15	Moderately Firm
16-30	Firm
31-49	Very Firm
50+	Hard

Undisturbed samples of firmer soils, typically present in the southwest, are obtained with 3-inch O.D. samplers lined with 2.42-inch inside diameter (I.D.) brass rings. The samplers are advanced up to 12 inches into undisturbed soils beyond the base of either a hollow stem auger or drill casing. The samplers are driven with a 140-pound hammer and a 30-inch drop. The N value blowcounts are recorded on the boring logs for each 6-inch increment of penetration with sampler refusal based on a penetration of less than 12 inches and a blowcount of 100.

Boring Log Sample Type Legend:



BULK



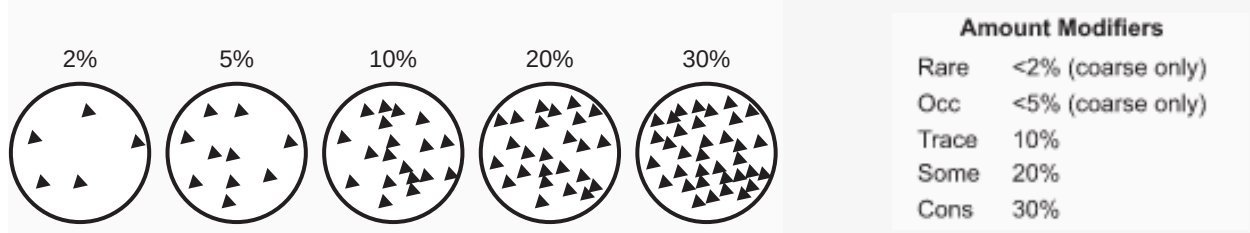
SPT

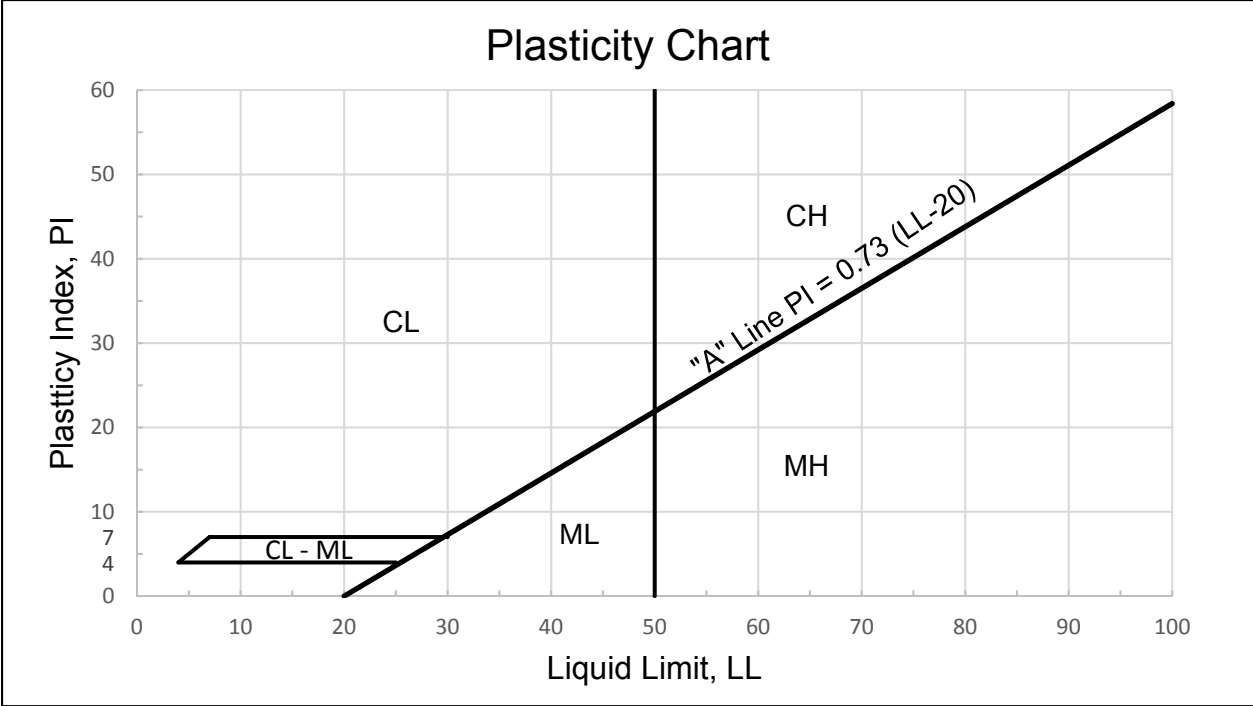


RING

Unified Soil Classification System (ASTM D2487)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests				Group Symbol	Group Description
Coarse-Grained Soils (More than 50% Retained on No. 200 Sieve).	Gravels More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravels Less than 5% Fines		GW	Well Graded Gravels, Gravel-Sand Mixtures or Sand-Gravel-Cobble Mixtures.
				GP	Poorly Graded Gravels, Gravel-Sand Mixtures or Sand-Gravel-Cobble Mixtures.
		Gravels with More than 12% Fines	Fines Classify as ML or MH	GM	Silty Gravels, Gravel-Sand-Silt Mixtures
			Fines Classify as CL or CH	GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	Sands 50% or More of Coarse Fraction Passes No. 4 Sieve	Clean Sands Less than 5% Fines		SW	Well Graded Sands, Gravelly Sands.
				SP	Poorly Graded Sands, Gravelly Sands.
		Sands with More than 12% Fines	Fines Classify as ML or MH	SM	Silty Sands, Sand-Silt Mixtures
			Fines Classify as CL or CH	SC	Clayey Sands, Sand-Clay Mixtures
Fine-Grained Soils (50% or More Passes No. 200 Sieve).	Silts and Clays (Liquid Limit less than 50)	PI > 7 and Plots on Above "A" Line		CL	Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
		PI < 4 or Plots Below "A" Line		ML	Inorganic Silts, Clayey Silts with Low Plasticity
	Silts and Clays (Liquid Limit 50 or More)	PI Plots on Above "A" Line		CH	Inorganic Clays of High Plasticity, Fat Clays, Silty and Sandy Clays of High Plasticity
		PI Plots Below "A" Line		MH	Inorganic Silts of High Plasticity, Silty Soils, Elastic Silts





Angularity	
Angular	
Subangular	
Subrounded	
Rounded	

Soil Particle Definitions	
Material	Particle Size Range
Boulders	Greater than 300 mm (12 in.)
Cobbles	300 mm to 75 mm (12 in. to 3 in.)
Coarse Gravel	75 mm to 19 mm (3 in. to ¾ in.)
Fine Gravel	19 mm (¾ in.) to No. 4 sieve
Coarse Sand	No. 4 Sieve to No. 10 Sieve
Medium Sand	No. 10 Sieve to No. 40 Sieve
Fine Sand	No. 40 Sieve to No. 200 Sieve
Fines (Silt or Clay)	Less than No. 200 Sieve

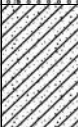
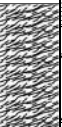
Plasticity	
PI = 0	Non-Plastic
$1 \leq PI \leq 7$	Low
$8 \leq PI \leq 25$	Medium
$PI \geq 25$	High

Moisture
Slightly Moist
Moist
Wet
(Saturated)

		PROJECT NAME: San Simon Port of Entry		BORING ID: B-1	
		PROJECT LOCATION: San Simon, Arizona		AGENCY PROJECT NUMBER: ADOT TRACS No. F0728 01D	
PROJECT NUMBER: 2024114		CLIENT NAME: Kimley-Horn & Associates, Inc.		DATE STARTED: 07/08/2025	DATE COMPLETED: 07/08/2025
DRILLING METHOD(S): Hollow Stem Auger		TOOLING: 6-5/8" OD Hollow Stem Auger		HAMMER TYPE: Auto	HAMMER EFFICIENCY: 71.4%
SURFACE ELEVATION: 3652'		STATION: -	OFFSET AND OFFSET DIRECTION: --		-
DRILLING FIRM: ACS Drilling Services, LLC		DRILLER: N. Zamora	FIELD ENGINEER: R. Bohon	RIG TYPE: CME-75	RIG NUMBER: 51
REPORTED DEPTH: 25.0'		GROUNDWATER DEPTH: N/A	REVIEWED BY: P. Garza	LATITUDE: 32.257883	LONGITUDE: -109.17890

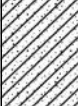
Elevation (feet)	Depth (feet)	Graphic Log	Soil Description and Remarks	Samples			Laboratory Results				
				Bulk	Driven	Blow Counts/6"	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (LL-PL-Pi)	Fines (%)	
3650			PORTLAND CEMENT CONCRETE PAVEMENT, 8.25 inches								
			0.7								
			AGGREGATE BASE, 7.25 inches			22-12-9 (21)					
			1.3								
	5		CLAYEY SAND WITH GRAVEL (SC), trace to some fine subangular gravel, fine to coarse subrounded sand, medium plasticity, brown, moist, firm			18-14-9 (23)					
3645			Note: moderately firm below 5 feet			13-7					
	10										
			10.0								
3640			SANDY CLAY (CL), considerable predominantly fine sand, medium plasticity, brown, moist, firm			11-8-9 (17)					
	15										
3635						13-20	11.5	95.4	30-16-14	68.0	
	20										
			20.0								
3630			CLAYEY SAND (SC), occasional fine subangular to subrounded gravel, predominantly fine sand, medium plasticity, brown, moist, hard			15-13-38 (51)					
	25										
			Note: firm at 25 feet			18-10-10 (20)					
			26.5								
Auger stopped at 25 feet. Sampler stopped at 26.5 feet. Backfilled with cuttings. Capped with 12 inches of nonshrink rapidset grout.											

	PROJECT NAME: San Simon Port of Entry		BORING ID: B-2	
	PROJECT LOCATION: San Simon, Arizona		AGENCY PROJECT NUMBER: ADOT TRACS No. F0728 01D	
PROJECT NUMBER: 2024114	CLIENT NAME: Kimley-Horn & Associates, Inc.		DATE STARTED: 07/08/2025	DATE COMPLETED: 07/08/2025
DRILLING METHOD(S): Hollow Stem Auger	TOOLING: 6-5/8" OD Hollow Stem Auger		HAMMER TYPE: Auto	HAMMER EFFICIENCY: 71.4%
SURFACE ELEVATION: 3652'	STATION: -	OFFSET AND OFFSET DIRECTION: --		
DRILLING FIRM: ACS Drilling Services, LLC	DRILLER: N. Zamora	FIELD ENGINEER: R. Bohon	RIG TYPE: CME-75	RIG NUMBER: 51
REPORTED DEPTH: 25.0'	GROUNDWATER DEPTH: N/A	REVIEWED BY: P. Garza	LATITUDE: 32.258030	LONGITUDE: -109.17009

Elevation (feet)	Depth (feet)	Graphic Log	Soil Description and Remarks	Samples			Laboratory Results			
				Bulk	Driven	Blow Counts/6"	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (LL-PL-PI)	Fines (%)
3650			PORTLAND CEMENT CONCRETE PAVEMENT, 11 inches 0.9							
			AGGREGATE BASE, 6 inches 1.4			16-20	7.6	105.8		
3645	5		CLAYEY SAND WITH GRAVEL (SC), considerable predominantly fine subangular gravel, fine to coarse subrounded sand, medium plasticity, brown, moist, moderately firm to firm 5.0			6-5-8 (13)	6.9		26-11-15	26.0
			CLAYEY SAND (SC), trace predominantly fine subangular gravel, fine to coarse subrounded sand, medium plasticity, brown, moist, firm			7-9-17 (26)				
3640	10		SANDY CLAY (CL), considerable predominantly fine sand, medium plasticity, brown, moist, moderately firm to firm 10.0			10-9				
3635	15					9-8-11 (19)				
3630	20					10-9-11 (20)				
	25					4-5-7 (12)				
			26.5							

Auger stopped at 25 feet. Sampler stopped at 26.5 feet. Backfilled with cuttings. Capped with 12 inches of nonshrink rapidset grout.

	PROJECT NAME: San Simon Port of Entry		BORING ID: B-3	
	PROJECT LOCATION: San Simon, Arizona		AGENCY PROJECT NUMBER: ADOT TRACS No. F0728 01D	
PROJECT NUMBER: 2024114	CLIENT NAME: Kimley-Horn & Associates, Inc.		DATE STARTED: 07/08/2025	DATE COMPLETED: 07/08/2025
DRILLING METHOD(S): Hollow Stem Auger	TOOLING: 6-5/8" OD Hollow Stem Auger		HAMMER TYPE: Auto	HAMMER EFFICIENCY: 71.4%
SURFACE ELEVATION: 3651'	STATION: -	OFFSET AND OFFSET DIRECTION: --		
DRILLING FIRM: ACS Drilling Services, LLC	DRILLER: N. Zamora	FIELD ENGINEER: R. Bohon	RIG TYPE: CME-75	RIG NUMBER: 51
REPORTED DEPTH: 25.0'	GROUNDWATER DEPTH: N/A	REVIEWED BY: P. Garza	LATITUDE: 32.257972	LONGITUDE: -109.18034

Elevation (feet)	Depth (feet)	Graphic Log	Soil Description and Remarks	Samples			Laboratory Results			
				Bulk	Driven	Blow Counts/6"	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (LL-PL-PI)	Fines (%)
3650			PORTLAND CEMENT CONCRETE PAVEMENT , 10.25 inches							
			AGGREGATE BASE , 4 inches			13-17-37 (54)				
			CLAYEY SAND WITH GRAVEL (SC) , considerable predominantly fine subangular gravel, fine to coarse subrounded sand, medium plasticity, brown, moist, hard Note: firm below 2.5 feet			14-10	7.1 9.3	103.6	25-15-10	18.0
3645	5		CLAYEY SAND (SC) , occasional fine subangular gravel, fine to coarse subrounded sand, medium plasticity, brown, moist, moderately firm to firm			6-8-11 (19)				
3640	10		SANDY CLAY (CL) , considerable predominantly fine sand, medium plasticity, brown, moist, moderately firm to firm			6-7-8 (15)				
3635	15					7-12-15 (27)				
3630	20					6-10				
3625	25					16-6-7 (13)				
	26.5									

Auger stopped at 25 feet. Sampler stopped at 26.5 feet. Backfilled with cuttings. Capped with 12 inches of nonshrink rapidset grout.

	PROJECT NAME: San Simon Port of Entry		BORING ID: P-1	
	PROJECT LOCATION: San Simon, Arizona		AGENCY PROJECT NUMBER: ADOT TRACS No. F0728 01D	
PROJECT NUMBER: 2024114	CLIENT NAME: Kimley-Horn & Associates, Inc.		DATE STARTED: 01/31/2024	DATE COMPLETED: 01/31/2024
DRILLING METHOD(S): Hollow Stem Auger	TOOLING: 6-5/8" OD Hollow Stem Auger		HAMMER TYPE: Auto	HAMMER EFFICIENCY: 84%
SURFACE ELEVATION: 3653'	STATION: -	OFFSET AND OFFSET DIRECTION: --		
DRILLING FIRM: ACS Drilling Services, LLC	DRILLER: N. Zamora	FIELD ENGINEER: K. Baker	RIG TYPE: CME-75	RIG NUMBER: 51
REPORTED DEPTH: 25.0'	GROUNDWATER DEPTH: N/A	REVIEWED BY: P. Garza	LATITUDE: 32.257600	LONGITUDE: -109.17920

Elevation (feet)	Depth (feet)	Graphic Log	Soil Description and Remarks	Samples			Laboratory Results			
				Bulk	Driven	Blow Counts/6"	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (LL-PL-Pi)	Fines (%)
3650	5		CLAYEY SAND WITH GRAVEL (SC), some fine subrounded gravel, considerable fine sand, medium plasticity, brown, slightly moist, soft			4-5-3 (8)				
3645						2-2-4 (6)				
3640	10		SANDY CLAY (CL), occasional fine subrounded gravel, considerable fine sand, medium plasticity, brown, moist, firm to very firm			7-9-13 (22)	9.6		25-15-10	60.0
3635	15					13-17-24 (41)				
3630	20					6-12-18 (30)				
	25					5-8-9 (17)				

Auger stopped at 25 feet. Sampler stopped at 26.5 feet. Backfilled with cuttings.

APPENDIX B

Laboratory Test Results

TABLE B-1: SUMMARY OF LABORATORY TEST RESULTS

Boring Number	Sample Depth [feet]		USCS/Group Symbol (ASTM D2487)	Percent Fines (minus #200) (ASTM C-136)	Liquid Limit (ASTM D4318)	Plasticity Index (ASTM D4318)	Moisture Content [%] (ASTM D2216/T265)	In-Place Dry Density [pcf] (ASTM D2937)	Consolidation Performed (ASTM D2435)	Collapse [%] (ASTM D2435)	R-Value (ASTM D2844)	pH (AZ 236)	Resistivity [ohm-cm] (AZ 236)	Sulfates [ppm] (AZ 733)	Chlorides [ppm] (AZ 736)
	Begin	End													
B-1	1.3	4.3									71				
B-1	15.0	16.0	CL	68	30	14	11.5	95.4							
B-2	0.9	1.9					7.6	105.8							
B-2	1.4	4.4	SC	26	26	15	6.9				11	9.5	2,960		
B-2	10.0	11.0							X	3.1					
B-3	1.2	4.2	SC	18	25	10	7.1							198	5
B-3	2.5	3.5					9.3	103.6							
P-1	10.0	11.5	CL	60	25	10	9.6								
Average				43.0	26.5	12.3	8.7	101.6	--	3.1	41.0	9.5	2960	198	5
Standard Deviation				24.7	2.4	2.6	1.8	5.5	--	--	42.4	--	--	--	--
Maximum				68.0	30.0	15.0	11.5	105.8	--	3.1	71.0	9.5	2960	198	5
Minimum				18.0	25.0	10.0	6.9	95.4	--	3.1	11.0	9.5	2960	198	5
Count				4	4	4	6	3	1	1	2	1	1	1	1

Notes: pcf = pounds per cubic foot; ohm-cm = ohm-centimeters; ppm = parts per million

¹ Values do not include rock correction.

ACS SERVICES LLC

Laboratory Soil Test Results

ACS PROJECT # 2501436

ACS Lab # 25-3210-1

Client: Ethos Engineering, LLC

Project Name: San Simon POE

Project Address: SR95 to SR195

Project City: San Luis

Sample Location: B-1 @ 15 - 16

Material Type: Soils

Supplier: Client

Sample Date: 7/11/2025

Sampled By: Client

Test Date: 7/14/2025

Tested By: Austin Archibald

Reviewed By: Keagen Mayfield

Sieve Analysis (ASTM C-136 / AASHTO T 27 / ARIZ 201)

Sieve Size	% Retained	% Passed	Specs
6"	0	100	
3"	0	100	
2 1/2"	0	100	
2"	0	100	
1 1/2"	0	100	
1"	0	100	
3/4"	0	100	
1/2"	0	100	
3/8"	0	100	
1/4"	0	100	
#4	0	100	
#8	0	100	
#10	0	99	
#16	0	99	
#30	0	99	
#40	1	98	
#50	2	96	
#100	11	86	
#200	17	68	

Liquid Limit
(ASTM D4318)

30

Plastic Limit
(ASTM D4318)

16

Plasticity Index
(ASTM D4318)

14

Moisture Content
(ASTM D2216)

USCS Soil
Classification

CL

Group Name (ASTM D2487)

Sandy lean CLAY

Keagen Mayfield

Laboratory Manager

Keagen Mayfield

Signature

ACS SERVICES LLC

Laboratory Soil Test Results

ACS PROJECT # 2501436

ACS Lab # 25-3210-2

Client: Ethos Engineering, LLC

Project Name: San Simon POE

Project Address: SR95 to SR195

Project City: San Luis

Sample Location: B-2 @ 1 - 3

Material Type: Soils

Supplier: Client

Sample Date: 7/11/2025

Sampled By: Client

Test Date: 7/14/2025

Tested By: Austin Archibald

Reviewed By: Keagen Mayfield

Sieve Analysis (ASTM C-136 / AASHTO T 27 / ARIZ 201)

Sieve Size	% Retained	% Passed	Specs
6"	0	100	
3"	0	100	
2 1/2"	0	100	
2"	0	100	
1 1/2"	0	100	
1"	0	100	
3/4"	2	98	
1/2"	7	91	
3/8"	6	86	
1/4"	10	76	
#4	6	70	
#8	11	59	
#10	2	57	
#16	6	51	
#30	6	45	
#40	3	42	
#50	3	38	
#100	7	32	
#200	5	26	

Liquid Limit
(ASTM D4318)

26

Plastic Limit
(ASTM D4318)

11

Plasticity Index
(ASTM D4318)

15

Moisture Content
(ASTM D2216)

6.9

USCS Soil
Classification

SC

Group Name (ASTM D2487)

Clayey SAND with gravel

Keagen Mayfield

Laboratory Manager

Keagen Mayfield

Signature

ACS SERVICES LLC

Laboratory Soil Test Results

ACS PROJECT # 2501436

ACS Lab # 25-3210-5

Client: Ethos Engineering, LLC

Project Name: San Simon POE

Project Address: SR95 to SR195

Project City: San Luis

Sample Location: B-3 @ 1 - 3

Material Type: Soils

Supplier: Client

Sample Date: 7/11/2025

Sampled By: Client

Test Date: 7/14/2025

Tested By: Mahalia Davis

Reviewed By: Keagen Mayfield

Sieve Analysis (ASTM C-136 / AASHTO T 27 / ARIZ 201)

Sieve Size	% Retained	% Passed	Specs
6"	0	100	
3"	0	100	
2 1/2"	0	100	
2"	0	100	
1 1/2"	0	100	
1"	1	99	
3/4"	2	98	
1/2"	8	90	
3/8"	8	81	
1/4"	12	70	
#4	7	62	
#8	11	51	
#10	2	49	
#16	7	41	
#30	8	34	
#40	3	30	
#50	3	27	
#100	5	22	
#200	4	18	

Liquid Limit
(ASTM D4318)

25

Plastic Limit
(ASTM D4318)

15

Plasticity Index
(ASTM D4318)

10

Moisture Content
(ASTM D2216)

7.1

USCS Soil
Classification

SC

Group Name (ASTM D2487)

Clayey SAND with gravel

Keagen Mayfield

Laboratory Manager

Keagen Mayfield

Signature

ACS SERVICES LLC

Laboratory Soil Test Results

ACS PROJECT # 2401097
ACS Lab # 24-1511-2
Client: Ethos Engineering, LLC
Project Name: Port of Entries
Project Address: Various locations
Project City: Various
Sample Location: P-1 San Simon @ 10.0 - 11.5

Material Type: Soils
Supplier: -
Sample Date: 2/2/2024
Sampled By: Client
Test Date: 2/9/2024
Tested By: Keagen Mayfield
Reviewed By: Fernando Montero

Sieve Analysis (ASTM C-136 / AASHTO T 27 / ARIZ 201)

Sieve Size	% Retained	% Passed	Specs
6"	0	100	
3"	0	100	
2 1/2"	0	100	
2"	0	100	
1 1/2"	0	100	
1"	0	100	
3/4"	0	100	
1/2"	2	98	
3/8"	1	97	
1/4"	1	96	
#4	1	95	
#8	2	93	
#10	1	93	
#16	2	91	
#30	4	87	
#40	2	85	
#50	4	81	
#100	9	73	
#200	13	60	

Liquid Limit
(AASHTO T-89)

25

Plastic Limit
(AASHTO T-90)

15

Plasticity Index
(AASHTO T-90)

10

Moisture Content
(AASHTO T-265)

9.6

USCS Soil
Classification

CL

Group Name (ASTM D2487)

Sandy lean CLAY

Testing sizes reduced from standard minimums due to lack of material

Fernando Montero

Laboratory Manager

Fernando Montero

Signature

ACS Services LLC

Job #	2501436	Material Type:	Soils
Lab #	25-3210	Extraction Date:	7/11/2025
Client:	Ethos Engineering, LLC	Extracted By:	Client
Project Name:	San Simon POE	Laboratory Test Date	7/14/2025
Project Address:	SR95 to SR195	Laboratory Tested By:	Colin Eggebrecht
Project City:	San Luis	Reviewed By:	Keagen Mayfield
Material Source:	-		

Density of Soil in Place by the Drive-Cylinder Method (ASTM D2937)

[illegible]

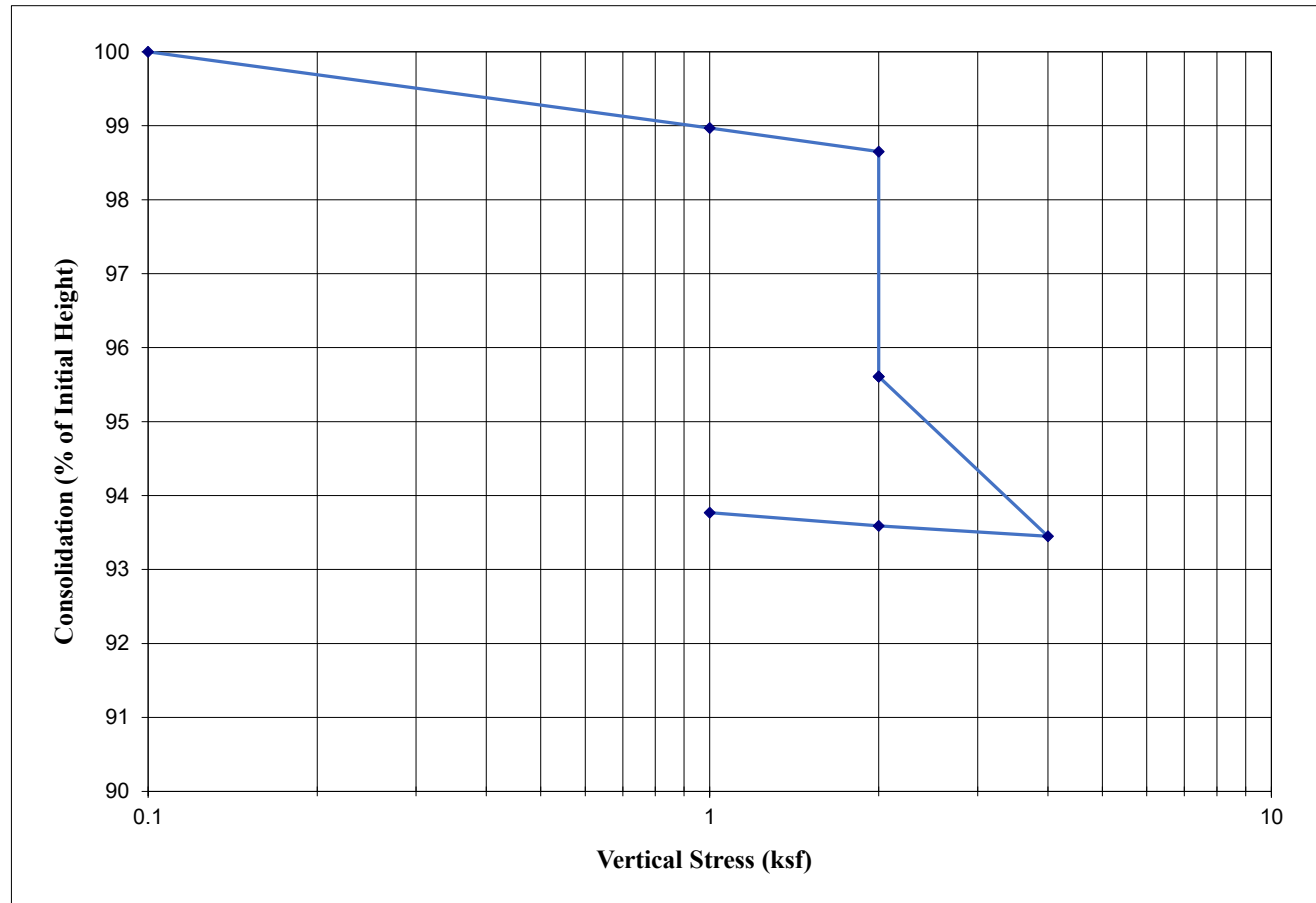
ACS SERVICES LLC

ENGINEERING DESIGN • MATERIAL TESTING • CONSTRUCTION INSPECTION

* ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

ACS Project No.:	2501436		
Lab No.:	25-3210-4	Material Type:	Soils
Client:	Ethos Engineering, LLC	Date of Extraction:	7/11/2025
Project Name:	San Simon POE	Extracted By:	Client
Project Address:	SR95 to SR195	Date of Lab Test:	7/14/2025
Project City:	San Luis	Lab Tested By:	Mahalia Davis
Sample Location:	B-2 @ 10 - 11	Reviewed By:	Keagen Mayfield

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.30
INITIAL MOISTURE CONTENT	11.3%	FINAL MOISTURE CONTENT	19.6%
INITIAL DRY DENSITY(pcf)	97.4	FINAL DRY DENSITY(pcf)	104.2
INITIAL DEGREE OF SATURATION	43%	FINAL DEGREE OF SATURATION	89%
INITIAL VOID RATIO	0.7	FINAL VOID RATIO	0.6
ESTIMATED SPECIFIC GRAVITY	2.65	SATURATED AT	2 ksf



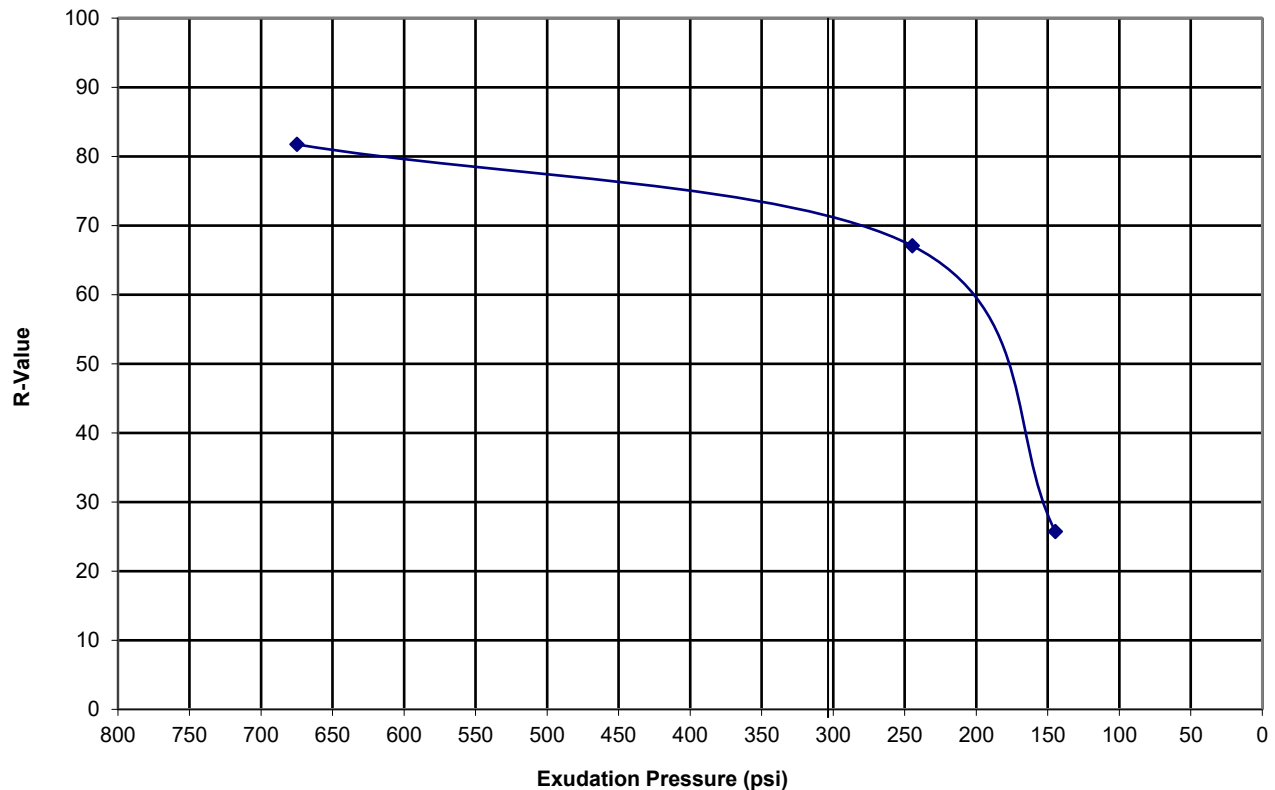


PROJECT: ACS Services
LOCATION: Project #No Number Lab #25-3210-7
MATERIAL: See boring log
SAMPLE SOURCE: B-1 @ 1.3-4.3

JOB NO: US-EI-1720234239
WORK ORDER NO: 131
LAB NO: 25-1169
DATE SAMPLED: Not Noted

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN ID	A	B	C
Moisture Content	10.2%	9.3%	8.4%
Compaction Pressure (psi)	50	50	75
Specimen Height (inches)	2.45	2.46	2.57
Dry Density (pcf)	129.0	127.1	124.7
Horiz. Pres. @ 1000lbs (psi)	45.0	15.0	10.0
Horiz. Pres. @ 2000lbs (psi)	103.0	34.0	17.0
Displacement	3.99	4.55	5.05
Expansion Pressure (psi)	-0.2	0.0	0.2
Exudation Pressure (psi)	145	245	675
R Value	26	67	82



R Value at 300 PSI = 71

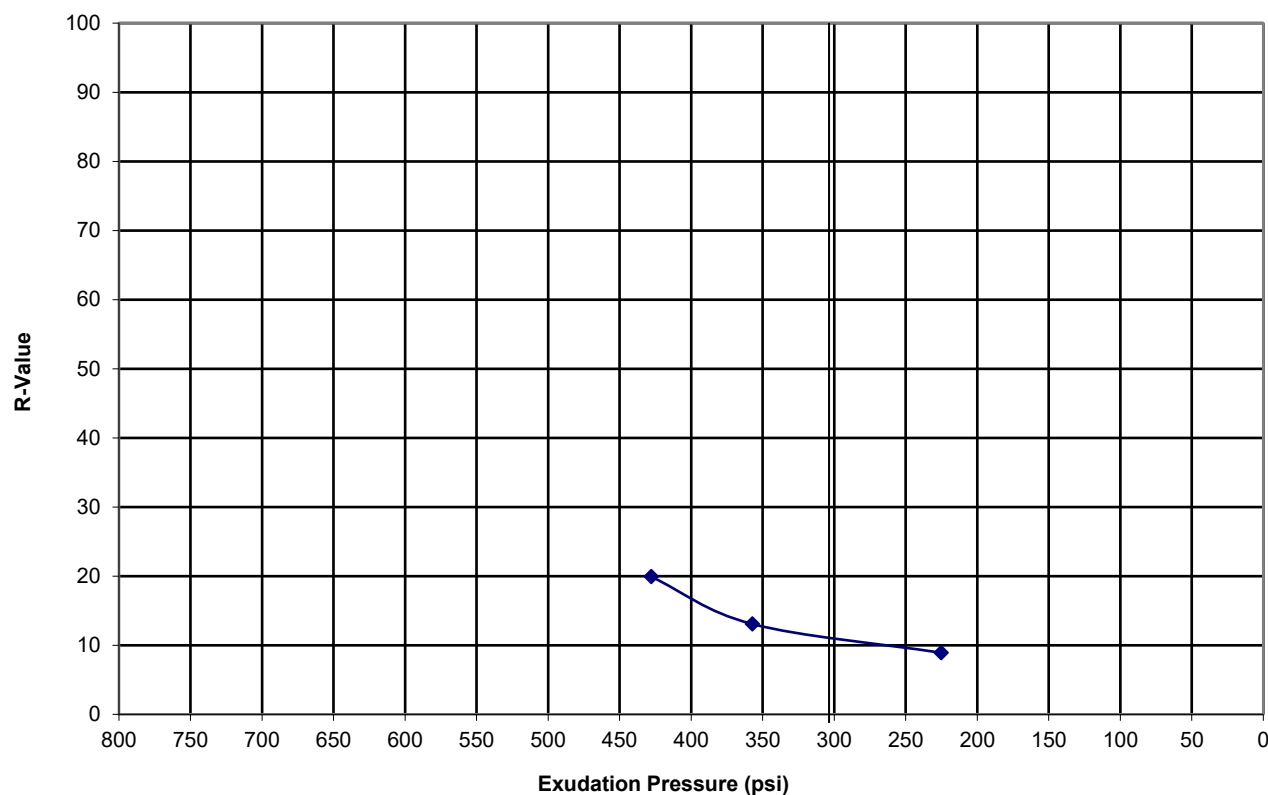


PROJECT: ACS Services
LOCATION: Project #No Number Lab #25-3210-2
MATERIAL: See boring log
SAMPLE SOURCE: B-2 @ 1.4-4.4

JOB NO: US-EI-1720234239
WORK ORDER NO: 131
LAB NO: 25-1168
DATE SAMPLED: Not Noted

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN ID	A	B	C
Moisture Content	14.1%	15.0%	16.4%
Compaction Pressure (psi)	25	25	25
Specimen Height (inches)	2.53	2.52	2.57
Dry Density (pcf)	119.8	117.2	114.8
Horiz. Pres. @ 1000lbs (psi)	45.0	54.0	61.0
Horiz. Pres. @ 2000lbs (psi)	120.0	131.0	140.0
Displacement	3.35	3.68	3.91
Expansion Pressure (psi)	0.3	0.6	0.3
Exudation Pressure (psi)	428	357	225
R Value	20	13	9



R Value at 300 PSI =

11

ACS Services LLC

Soil pH and Resistivity Determination

AASHTO T-289 AASHTO T-288 / ARIZ 236

Project # 2501436
 Lab # 25-3210-2
 Client: Ethos Engineering, LLC
 Project Name: San Simon POE
 Project Address: SR95 to SR195
 Project City: San Luis
 Sample Source: B-2 @ 1 - 3

Material Type: Soils
 Supplier: Client
 Sample Date: 7/11/2025
 Sampled By: Client
 Test Date: Tuesday, July 15, 2025
 Tested By: Colin Eggebrecht
 Resistivity Box:
 Reviewed By: Keagen Mayfield

pH Reading = 9.5

$$P = (SBF) \times R \times M$$

Where:

SBF = Soil Box Factor, cm

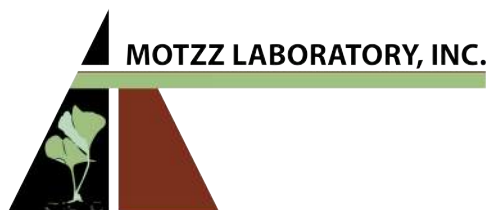
R = Dial Reading, OHMS

M = Multiplier

Water Added	SBF (cm)	Dial Reading (OHMS)	Multiplier	P (OHM-cm)
200	7.22	4.1	100	2960
50	7.22	5.2	100	3750

Colin Eggebrecht
 Lab Supervisor

Keagen Mayfield
 Laboratory Manager



Report: 956576
Reported: 7/20/2025
Received: 7/15/2025
PO: 2501436

Laboratory Analysis Report

ACS Services LLC
Keagen Mayfield
2235 W Broadway Road
Mesa, AZ 85202

Project: 2501436

Lab Number	Sample ID
956576-1	25-3210-5 B-3 (1-3')

Test Parameter

<i>Test</i>	<i>Method</i>	<i>Result</i>	<i>Units</i>
Sulfate	ARIZ 733b	198	ppm
Chloride	ARIZ 736b	5	ppm

APPENDIX C

Bearing Resistance Charts

