ADDENDUM #1
for
INVITATION FOR BID
IFB-032023-074
AIRPORT DRIVE REHABILITATION

MAY 17, 2023

NOTICE TO ALL BIDDERS AND PLAN HOLDERS

The Solicitation is amended by the following clarifications/changes/additional information. If any provision in this Addendum conflicts with any existing provisions in the Solicitation, this Addendum will control. All other terms, conditions, and provisions of the Solicitation remain in effect as published.

By signing and submitting a Bid or Proposal, the Bidder/Proposer is acknowledging that they will abide by all Addenda issued prior to the opening of the Bids/Proposals and agreeing that all pricing takes into account all such Addenda.

PROPOSAL SUBMITTAL DEADLINE

The submittal due date and time **remains** 2:00 PM, LOCAL TIME, JUNE 6, 2023 and is NOT CHANGED BY THIS ADDENDUM.

CHANGES AND CLARIFICATIONS

The following contains revised and or clarification information together with Questions received to date with responses provided herein. The Questions were submitted within the Questions Due Date period outlined in this solicitation.

1) **Question**: What is the engineers estimate for this project?

   Answer: *The Engineer's Estimate will not be provided at this time.*

2) **Question**: Is it the intent of the owner to remove and replace the existing aggregate base course material on the southern end of the project or just scarify, rework and blend in new aggregate material as needed to achieve the desired aggregate base course thickness and compaction needs in regards to bid item 7 - Prepare Aggregate Base Course?

   Answer: *The intent is to scarify, rework, and compact the existing aggregate base course in preparation for a uniform 4-inch asphalt overlay. Project Specifications, Section SP-100-1.21 details this effort.*

3) **Question:** Is there a defined area on the plans of known unsuitable subgrade which must be removed and replaced or is this a contingency based item that may or may not be utilized?

Answer: *There is no defined area on the plans for unsuitable subgrade, the line item shall be utilized during construction at the direction of the Engineer. The Geotechnical Evaluation Report indicates moisture content between 9% - 14% from thew three borings taken on the southern portion of the road. See attached Geotechnical Evaluation Report, attached hereto and marked Attachment A.*

END OF ADDENDUM #1

ATTACHMENT A

Western Technologies Inc.

GEOTECHNICAL EVALUATION REPORT

SCOTTSDALE AIRPORT
AIRPORT DRIVE REHABILITATION

WT Reference No. 2122JA118

PREPARED FOR:

Mead & Hunt
8800 East Raintree Drive, Suite 285
Scottsdale, Arizona 85260

Attn: Mr. Brad Mikulecky, P.E.

September 16, 2022

Registered Professional Engineer (Civil)
CERTIFICATE NO. 32310
ARMANDO DE LA ROCHA
Date Signed 9/16/2022
ARIZONA, U.S.A.

Armando de la Rocha, P.E.
Senior Geotechnical Engineer

Randolph Marwig, P.E.
Senior Geotechnical Engineer

September 16, 2022

Mead & Hunt, Inc.
8800 East Raintree Drive, Suite 285
Scottsdale, Arizona 85260

Attn: Brad Mikulecky, P.E.
Project Manager

Re: Geotechnical Evaluation — Job. No. 2122JA118
Scottsdale Airport – Airport Drive Pavement Rehabilitation
Scottsdale, Arizona

INTRODUCTION

Western Technologies Inc. (WT) has performed geotechnical engineering and pavement design services at Scottsdale Airport for the pavement rehabilitation of Airport Drive in accordance with our proposal (Ref. No. 2122PA150) dated June 30, 2022. A field exploration consisting of subsurface exploration (coring of asphalt concrete layer and soil borings) was conducted on July 12, 2022. The results of that work and subsequent laboratory testing of soils were used to develop this report.

PROJECT DESCRIPTION

Based on information provided by Client, the project will consist of the rehabilitation of the existing pavement on Airport Drive at Scottsdale Airport in Scottsdale, AZ. The total length of the roadway to be evaluated is about 3,150 ft. It is understood that the Airport Authority is interested on alternatives for the pavement rehabilitation/reconstruction of this roadway. The Client will notify WT should any of our information or assumptions not be correct.

The purpose of our geotechnical/pavement engineering services was to perform coring to measure thickness of the existing pavement structural section (asphalt concrete and aggregate base course layers) and to perform subsurface exploration and laboratory testing on collected subgrade soils for pavement analysis purposes. In addition, Dynamic Cone Penetration (DCP) testing was performed at selected boring locations to determine the in-situ CBR value; this parameter was then used on the pavement structural analysis under native conditions (for rehabilitation alternatives not considering full reconstruction of the existing pavement section) to convert from CBR to Resilient Modulus, M_R.

The subsoil exploration and design was based in accordance to Federal Aviation Administration (FAA) Advisory Circular 150/5320-6G and City of Scottsdale's Design Standards and Policies Manual. WT is familiar and has experience with the procedures presented on that Advisory Circular.

SUBSURFACE EXPLORATION

The subsurface exploration consisted of coring the asphalt concrete layer at five (5) locations and advancing soils borings at 4 locations to a depth of 11.5 feet below existing site grade. A soil boring could not be advanced at one of the locations due to conflict with underground utilities.

The approximate locations of the cores and soil borings are shown on Plates 2 entitled Boring Location Diagram. The logs of the borings are included in Appendix A of this report. In addition, Dynamic Cone Penetrometer (DCP) measurements were performed at selected boring location to obtain correlated CBR values from established correlations between DCP measurements and CBR. The field work was performed in one night.

Strata encountered during the subsurface exploration were identified and logged. Asphalt concrete cores and loose and relatively undisturbed samples of subgrade samples were taken and submitted to the WT materials laboratory for testing. The borings were backfilled with native material at each boring and the removed asphalt concrete slabs were replaced with nonshrinking grout. Coring of the asphalt concrete pavement was performed before advancing the soil borings.

Soils encountered in the borings located along Airport Drive consisted predominantly of low to medium plasticity Sandy CLAY (CL), and Silty Clayey SAND (SC-SM). Soil strata and classifications are shown on the attached boring logs.

The pavement structural sections encountered at the borings locations are presented in the following table:

Boring No.	AC (in.)	ABC (in.)	Total Thickness (in.)
B-1	3.0	3.0	6.0
B-2	3.0	3.0	6.0
B-3	4.0	3.0	7.0
B-4	4.0	3.0	7.0
Mean	3.5	3.0	6.5
St. Dev	0.58	0.0	---
Mean-St.Dev	2.92	3.0	5.92

For pavement design rehabilitation purposes, the thickness of the existing AC layer will be considered to be **2.92** inches.

LABORATORY TESTING

Soil samples obtained during the subsurface exploration were tested in WT's materials laboratory. Laboratory testing on collected subgrade soil samples consisted of in-situ dry density and moisture content, grain size distribution, Atterberg limits, maximum dry density/optimum moisture content (Proctor), and R-value. All laboratory test results are presented in Appendix B, and are summarized herein.

Relatively undisturbed samples obtained from the borings indicated in-situ dry densities ranging from 101 to 123 pounds-per-cubic-foot (pcf) with an average value of 106.8 pcf and standard deviation of 6.8 pcf (Coefficient of variation, COV, of 6.4%). In-situ moisture contents ranged from 9.2 to 17.1 percent with an average value of 11.8% and standard deviation of 2.7% (COV of 22.6%). The percent material passing the No. 200 sieve ranged from 38 to 61 percent. The tested materials were predominantly low to medium plasticity Sandy CLAY (CL) and Slity Clayey SAND (SC-SM) with liquid limit (LL) ranging from 20 to 25 and plasticity index (PI) ranging from 6 to 10.

Two maximum dry density and optimum moisture content (Proctor test) were performed on combined samples from Borings No. 1 and 2, and from Borings No. 3 and 4, respectively. Maximum dry density values ranged from 125.1 pcf to 130.8 pcf with optimum moisture contents ranging from 9.9% to 10.3%. Two R-value tests were also performed on the same samples tested for Proctor yielding values ranging from 24 to 25.

DYNAMIC CONE PENETROMETER

The Dynamic Cone Penetrometer (DCP) is a simple device for measuring the stiffness, penetration resistance of unbound materials. The DCP works by driving a steel rod into bases and soil with a preset amount of energy; the stiffness of unbound materials at different depths can be measured by continuously monitoring the rate of penetration, yielding a stiffness profile. DCP testing consists of using the DCP's free-falling hammer to strike the cone, causing the cone to penetrate the base or subgrade soil, and then measuring the penetration per blow, also called the penetration rate (PR), in mm/blow. This measurement denotes the stiffness of the tested material, with a smaller PR number indicating a stiffer material. In other words, the PR is a measurement of the penetrability of the subgrade soil and/or base course material.

Base, subgrade soil, and paving material strength values derived from cone penetration resistance can be converted into CBR, Limestone Bearing Ratio (LBR), subgrade modulus k, resilient modulus E, and Soil Support Value (SSV). The most common conversion is expressed in the form of equations for CBR as a function of PR (in mm/blow). The literature has been examined for a correlation between penetration by the dynamic cone penetrometer and a strength parameter such as California Bearing Ratio (CBR). The most widely accepted relationship was given by Moshe Livneh, Ilan Ishai and Noam Livneh in Transportation Research Record 1473 and also by the U.S. Army Corps of Engineers (USACE) (Webster, Grau and Williams, 1992). The relationship given was:

$$\log CBR = 2.46 - 1.12(\log DCP)$$

or the one recommended on FAA AC 150/5320-6G for all soils except CL soils below CBR of 10 and CH soils:

$$CBR = 292/DCP^{1.12}$$

where DCP is the penetration in millimeters/blow. Recommended correlations between CBR and DCP for CH soils and CL soils with CBR less than 10 are also presented on that FAA AC reference.

Two DCP tests were performed at the locations of Borings No. 2 and 3 indicating that for 30 blows, the DCP penetrated about 11 inches (279.4 mm) yielding a penetration rate of about 9.3 mm/blow, and consequently a CBR value of **24**. Using the correlation expression between Resilient Modulus and CBR value of (FHWA NHI-05-037 "Geotechnical Aspects of Pavement," 2006):

$$M_R \text{ (psi)} = 2{,}555 * (CBR)^{0.64}$$

Yields a M_R value of approximately **19,500 psi**.

PAVEMENT DESIGN

R-Values and Resilient Modulus (M_R) for Pavement Design

Two R-value tests were performed on combined samples collected from Borings No. 1 and 2, and from Borings No. 3 and 4 yielding values of **25** and **24**, respectively.

The measured percentages passing the No. 200 sieve and PIs of the collected subgrade samples from Borings No. 1 to 4 were entered into the equations on Section 10.2.2.1.1.*2 Initial Evaluation of Sieve Analysis and Plasticity Index* (page 10-11) in the MCDOT *Roadway Design Manual* to obtain correlated R-values which are shown on the table below.

Test Boring	Depth (feet)	USCS	Minus 200	Plasticity Index	R-values	
					Correlated	Tested
B-1	0.5 - 5	CL	51	10	32	---
B-2	0.5 - 5	CL	51	9	34	---
B-3	0.5 - 5	SC-SM	38	6	48	---
B-4	0.5 - 5	CL	61	8	32	---
B-1&2	0.5 – 5	CL	---	---	---	25
B-3&4	0.5 - 5	CL/SC-SM	---	---	---	24
Number					4	2
Mean					36.7	24.5
Standard Deviation					7.6	0.7

Laboratory measurement of R-value for site soils yielded values of 24 and 25. Correlated R-values yielded values ranging from 32 to 48. The overall mean R-value was calculated to be 25, using the means and standard deviations of the respective measured and correlated R-values according to the equation on Section 10.2.2.1.1.3 *R-value Analysis* (page 10-13) of the MCDOT manual. When this mean R-value was entered into the MCDOT equation for converting between R-value and resilient modulus (M_R), with the Seasonal Variation Factor (SVF) of 1.0 for Scottsdale (ADOT Manual), the result was an M_R of **14,673 psi**. This value is practically close to the resilient modulus (M_R) obtained using the traditional correlation between resilient modulus and R-value:

$$M_R = 1{,}155 + 555*(\text{R-value}) = 1{,}155 + 555*(24) = \mathbf{14{,}475\ psi}$$

The in-situ M_R value obtained with the DCP (native conditions) is about **19,500 psi** (see previous section). For rehabilitation alternatives (not full reconstruction), the in-situ M_R value will be utilized.

Equivalent Single Axle Load (ESAL) calculations

Traffic data was obtained from the City of Scottsdale's Traffic Count April 2020 web page which shows a volume (traffic count) of **11,488** for the east bound traffic on Butherus Road at the intersection with Scottsdale Rd. Estimations provided by Client indicates that about 75% of that traffic count goes to the Scottsdale Quarter, 15% goes to private business/residential areas in the vicinity, and about **10%** goes to the airport. This would yield an average daily traffic (ADT) of about **1,149** for Airport Drive in the year 2020. Assuming a traffic growth rate in the area of about 3%, yield an ADT value for the year 2022 of about **1,219**. It was also assume that about 96% of that traffic would be Automobiles and about 4% would be Heavy Trucks with an ESAL Factor of 1.2. Some other factors used to estimate the total ESALs to use Airport Drive are:

- Directional Distribution (DD) Factor = 0.5
- Number of Lanes/Direction = 1
- Lane Factor for 1-Lane/Direction = 1.0
- Design Life = 20 Years

The total vehicles trafficking Airport Drive during the design life, 20-Year, is obtained by multiplying the initial (Year 2022) Average Daily Traffic (ADT) value of 1,219 times 365 days/year times the Growth Factor for a Growth Rate of 3% and design life of 20 years which would be 26.87 times the Direction Distribution factor of 0.5 times the Labe Factor for 1-Lane direction of 1.0 yielding a total vehicles values trafficking the design laneof 5,977,658. This value along with the traffic composition and ESAL factors mentioned above were used to compute values for the total 18-kip Equivalent Single Axle Load (ESAL).

Design ESALs: SDL Airport Drive

Vehicle Type	Total Vehicles	Percent	ESAL Factor	Design ESAL
Automobiles	5,977.658	96.0	0.0008	4,591
Heavy Trucks	5,977,658	4.0	1.2	286,928
Total ESAL				**291,518**

Other parameters utilized in the pavement design as recommended on the City of Scottsdale's Design Standards & Policies Manual (2018) are presented below. The selection of the parameters was based on a functional classification for Airport Drive corresponding to a Local Collector roadway.

Level of Reliability, R (%)	90
Initial Serviceability Index, Po	5.0
Terminal Serviceability Index, Pt	2.5
Overall Standard Deviation	0.45
Seasonal Variation Factor – Scottsdale	1.0
Drainage Coefficient	1.0

PAVEMENT DESIGN RECOMMENDATIONS

Two pavement section alternatives were considered for rehabilitation purposes:

1) AC Overlay
2) AC Surface over Full Depth Reclamation (FDR)

Alternative No. 1: AC Overlay

This alternative considered placing an overlay directly on top of the existing pavement section. Due to the geometric constraint of the existing curbs and gutters, it would require milling approximately the thickness of the recommended overlay adjacent to the curbs/gutters and decreasing the milling depth as approaching the center line of Airport Drive.

In order to estimate the thickness of the overlay to place on top of the existing pavement section, it is necessary to estimate the Structural Number (SN) of the existing section. For this purpose, the recommended structural layer coefficients presented on Table 5-44 “Suggested layer coefficients for existing flexible pavement layer materials (AASHTO, 1993)” presented on FHWA-NHI-05-037 “Geotechnical Aspects of Pavements” (attached to this report) were used. It was estimated that the existing pavement section corresponds to about <10% low-severity alligator cracking and/or <5% medium- and high severity transverse cracking which yields layer coefficients between 0.25 to 0.35.For this pavement design, a layer coefficient of **0.30** for the AC layer was selected. For the Granular Base and no evidence of pumping, degradation, or contamination by fines, layer coefficient between 0.10 to 0.14 are recommended. For this design, a layer coefficient of **0.10** was selected.

Based on the boring log information, the existing section of 2.92” AC over 3” ABC with the selected structural layer coefficients of 0.30 and 0.10, respectively yield a SN for the existing section of **1.18.**

An AASHTO Flex pavement analysis with the design parameters indicated above yields a required SN of approximately **1.93**.

The thickness for the OL is obtained by subtracting the SN of the existing pavement section (1.18) to the required SN (1.93) and dividing this value by the structural layer coefficient of an Asphaltic Concrete (Plant Mix) of **0.39** as recommended by the City of Scottsdale. This analysis indicates that the required OL thickness would be **2.0 inches.** Due to construction concerns, matching the rehabilitated section to the existing curbs, some locations might require an overlay section ranging in thickness from **1.0 to 2.0 inches**.

This alternative requires that the existing fatigue (alligator) cracking areas be repaired, the existing transverse and longitudinal cracks be sealed/filled, and it would also require the application of a tack coat prior to placing the OL.

Alternative No. 2: AC Surface over Full Depth Reclamation (FDR)

The advantage of this alternative is that the existing pavement section is reused; the existing AC is pulverized and blended with the existing base course and portions of the subgrade (if needed) to form the new base course. It might also require the addition of a chemical stabilization agent; based on the laboratory test results, the most likely agent to be used for the type of subgrade soils at this location would be cement or emulsified foam asphalt. Because the native subgrade is left in place, the pavement analysis was performed using M_R values for the native subgrade condition. The surface layer was fixed at 3-inch of newly placed Asphaltic Concrete layer (the minimum recommended by City of Scottsdale for Local Collectors) and the program determined the thickness of the FDR layer.

Structural layer coefficient for the FDR layer, as reported in the literature, can range from about 0.14 for unstabilized FDR layer up to about 0.42 for foamed asphalt/asphalt emulsion stabilized FDR layers (Diefenderder, B.K and Apeagyei, A.K. “Analysis of Full-Depth Reclamation Trial Sections in Virginia,” Virginia Center for Transportation, VCTIR 11-R23, 2011). For this analysis, a conservative value of 0.12 was used for the FDR layer coefficient.

The results of the analysis are presented in the following table:

M_R Native Subgrade (psi)	**AC (in.)**	**FDR (in.)**	**Total Thickness (in.)**
19,500	3	6	9

If this alternative is selected, it is recommended to perform a FDR mix design to determine the percent of cement or emulsified foam asphalt to be added to the mix before going into construction.

If this alternative is selected and for specification purposes, the new FAA Advisory Circular AC-150-5370-10H, Item P-207 “In-Place Full Depth Reclamation (FDR) Recycled Asphalt Aggregate Base Course” could be utilized.

Appendix C shows the output results of the AASHTO 1993 pavement design procedure.

CLOSURE

This report concludes our scope of services for the Scottsdale Airport – Airport Drive Pavement Rehabilitation project. The boring logs and related information included in this report are indicators of subsurface conditions only at the specific locations and times noted. The recommendations presented are based in part upon data derived from a limited number of samples obtained from widely spaced subsurface explorations. Variations from the field conditions represented by the borings may become evident during construction. If variations appear, we should be contacted to re-evaluate our recommendations.

We prepared this report as an aid to the designers of the proposed project. The comments, statement, recommendations and conclusions set forth in this report reflect the opinions of the authors. These opinions are based upon conditions at the location of specific tests, observations and data developed to satisfy the scope of services defined by the contract documents.

Work on your project was performed in accordance with generally accepted industry standards and practices by professionals providing similar services in this locality. No other warranty, express or implied, is made.

Sincerely,
WESTERN TECHNOLOGIES INC.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
32310
ARMANDO
DE LA ROCHA
Date Signed 9/26/2022
ARIZONA, U.S.A.

Armando de la Rocha, P.E.
Senior Geotechnical Engineer

Randolph H. Marwig, P.E.
Senior Geotechnical Engineer

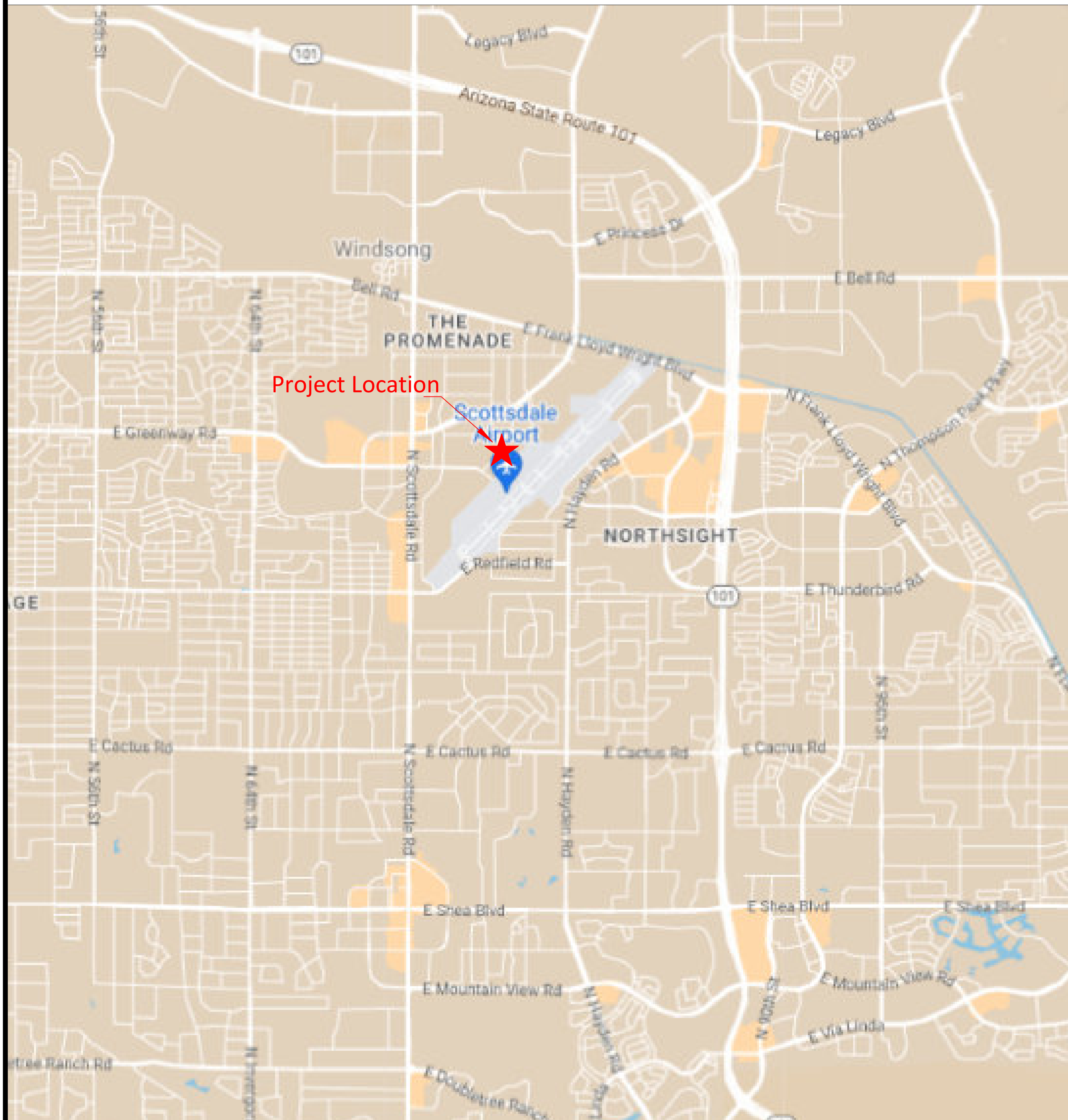
Attachments: Boring Location Diagram
Boring Log Notes and Boring Logs, Appendix A
Laboratory Test Results, Appendix B
AASHTO – Pavement Design Method–Flexible Output sheet, Appendix C
Photos, Appendix D

Copies to: Addressee (email)

G:\2022\2122JA118\DOCUMENTS\

NORTH

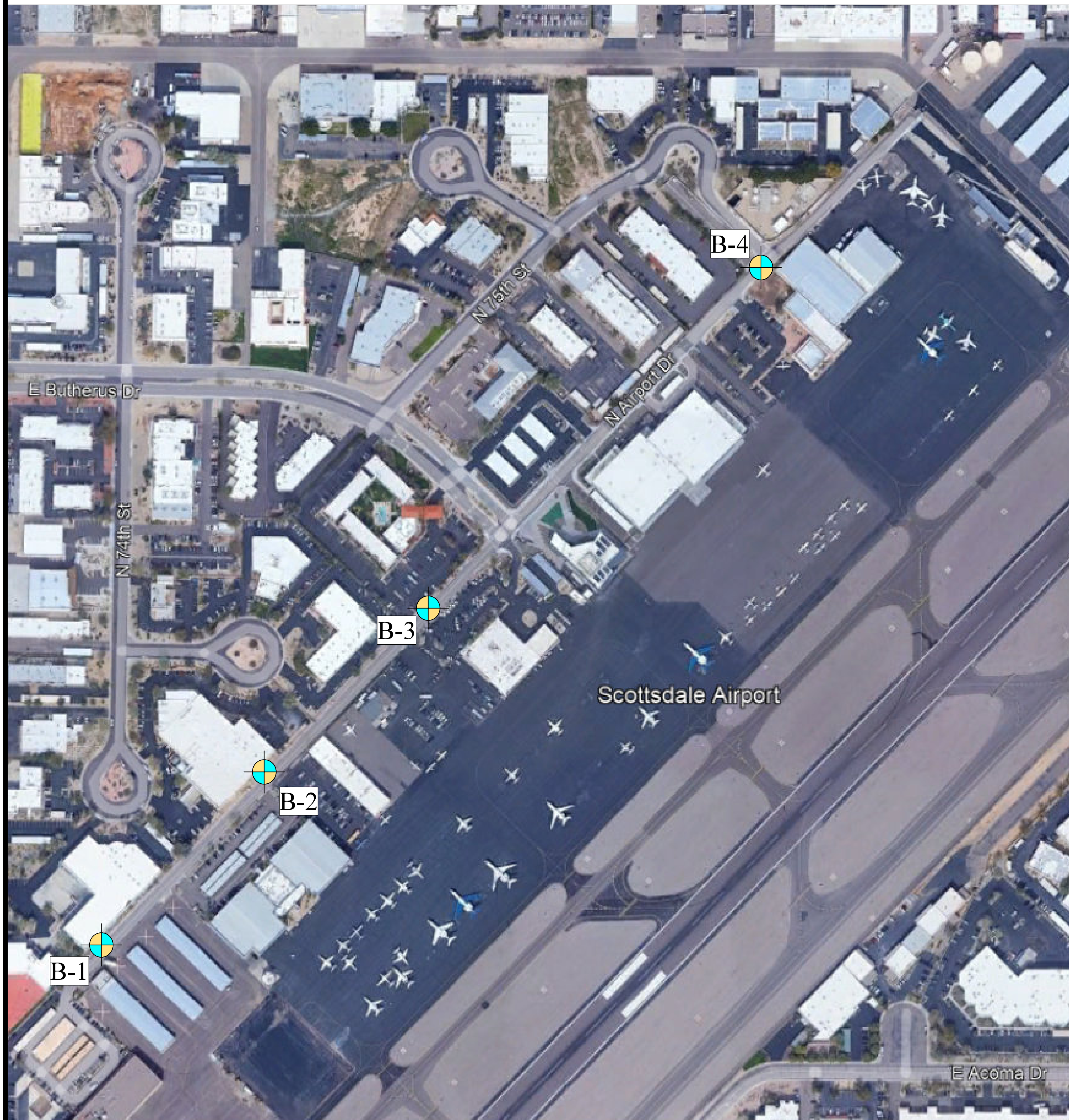
NOT TO SCALE



Geotechnical Environmental Inspections Materials — Western Technologies Inc. The Quality People Since 1955	**PROJECT VICINITY MAP** SDL-AIRPORT DRIVE REHABILITION SCOTTSDALE AIRPORT SCOTTSDALE, ARIZONA WT Job No. 2122JA118	**PLATE 1**

NORTH

NOT TO SCALE



LEGEND

Approximate Boring Location

Geotechnical Environmental Inspections Materials — Western Technologies Inc. The Quality People Since 1955	BORING LOCATION DIAGRAM SDL-AIRPORT DRIVE REHABILITION SCOTTSDALE AIRPORT SCOTTSDALE, ARIZONA WT Job No. 2122JA118	PLATE 2

APPENDIX A

Allowable Soil Bearing Capacity	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
Backfill	A specified material placed and compacted in a confined area.
Base Course	A layer of specified aggregate material placed on a subgrade or subbase.
Base Course Grade	Top of base course.
Bench	A horizontal surface in a sloped deposit.
Caisson/Drilled Shaft	A concrete foundation element cast in a circular excavation which may have an enlarged base (or belled caisson).
Concrete Slabs-On-Grade	A concrete surface layer cast directly upon base course, subbase or subgrade.
Crushed Rock Base Course	A base course composed of crushed rock of a specified gradation.
Differential Settlement	Unequal settlement between or within foundation elements of a structure.
Engineered Fill	Specified soil or aggregate material placed and compacted to specified density and/or moisture conditions under observations of a representative of a soil engineer.
Existing Fill	Materials deposited through the action of man prior to exploration of the site.
Existing Grade	The ground surface at the time of field exploration.
Expansive Potential	The potential of a soil to expand (increase in volume) due to absorption of moisture.
Fill	Materials deposited by the actions of man.
Finished Grade	The final grade created as a part of the project.
Gravel Base Course	A base course composed of naturally occurring gravel with a specified gradation.
Heave	Upward movement.
Native Grade	The naturally occurring ground surface.
Native Soil	Naturally occurring on-site soil.
Rock	A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
Sand and Gravel Base Course	A base course of sand and gravel of a specified gradation.
Sand Base Course	A base course composed primarily of sand of a specified gradation.
Scarify	To mechanically loosen soil or break down existing soil structure.
Settlement	Downward movement.
Soil	Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.
Strip	To remove from present location.
Subbase	A layer of specified material placed to form a layer between the subgrade and base course.
Subbase Grade	Top of subbase.
Subgrade	Prepared native soil surface.

COARSE-GRAINED SOILS

LESS THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVEL OR WELL-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE
GP	POORLY-GRADED GRAVEL OR POORLY-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	
GM	SILTY GRAVEL OR SILTY GRAVEL WITH SAND, MORE THAN 12% FINES	
GC	CLAYEY GRAVEL OR CLAYEY GRAVEL WITH SAND, MORE THAN 12% FINES	
SW	WELL-GRADED SAND OR WELL-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE
SP	POORLY-GRADED SAND OR POORLY-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	
SM	SILTY SAND OR SILTY SAND WITH GRAVEL, MORE THAN 12% FINES	
SC	CLAYEY SAND OR CLAYEY SAND WITH GRAVEL, MORE THAN 12% FINES	

NOTE: Coarse-grained soils receive dual symbols if they contain 5% to 12% fines (e.g., SW-SM, GP-GC).

FINE-GRAINED SOILS

MORE THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
ML	SILT, SILT WITH SAND OR GRAVEL, SANDY SILT, OR GRAVELLY SILT	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50
CL	LEAN CLAY OF LOW TO MEDIUM PLASTICITY, SANDY CLAY, OR GRAVELLY CLAY	
OL	ORGANIC SILT OR ORGANIC CLAY OF LOW TO MEDIUM PLASTICITY	
MH	ELASTIC SILT, SANDY ELASTIC SILT, OR GRAVELLY ELASTIC SILT	SILTS AND CLAYS LIQUID LIMIT MORE THAN 50
CH	FAT CLAY OF HIGH PLASTICITY, SANDY FAT CLAY, OR GRAVELLY FAT CLAY	
OH	ORGANIC SILT OR ORGANIC CLAY OF HIGH PLASTICITY	
PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

NOTE: Fine-grained soils may receive dual classification based upon plasticity characteristics (e.g. CL-ML).

SOIL SIZES

COMPONENT	SIZE RANGE
BOULDERS	Above 12 in.
COBBLES	3 in. – 12 in.
GRAVEL	No. 4 – 3 in.
Coarse	¾ in. – 3 in.
Fine	No. 4 – ¾ in.
SAND	No. 200 – No. 4
Coarse	No. 10 – No. 4
Medium	No. 40 – No. 10
Fine	No. 200 – No. 40
Fines (Silt or Clay)	Below No. 200

NOTE: Only sizes smaller than three inches are used to classify soils

CONSISTENCY

CLAYS & SILTS	BLOWS PER FOOT
VERY SOFT	0 – 2
SOFT	3 – 4
FIRM	5 – 8
STIFF	9 – 15
VERY STIFF	16 – 30
HARD	OVER 30

RELATIVE DENSITY

SANDS & GRAVELS	BLOWS PER FOOT
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

NOTE: Number of blows using 140-pound hammer falling 30 inches to drive a 2-inch-OD (1⅜-inch ID) split-barrel sampler (ASTM D1586).

PLASTICITY OF FINE GRAINED SOILS

PLASTICITY INDEX	TERM
0	NON-PLASTIC
1 – 7	LOW
8 – 20	MEDIUM
Over 20	HIGH

DEFINITION OF WATER CONTENT

DRY
SLIGHTLY DAMP
DAMP
MOIST
WET
SATURATED

Geotechnical
Environmental
Inspections
Materials

Western Technologies Inc.
The Quality People
Since 1955

wt-us.com

METHOD OF CLASSIFICATION

PLATE

A-2

090414

The number shown in **"BORING NO."** refers to the approximate location of the same number indicated on the "Boring Location Diagram" as positioned in the field by pacing or measurement from property lines and/or existing features, or through the use of Global Positioning System (GPS) devices. The accuracy of GPS devices is somewhat variable.

"DRILLING TYPE" refers to the exploratory equipment used in the boring wherein **HSA = hollow stem auger**, and the dimension presented is the outside diameter of the HSA used.

"N" in "BLOW COUNTS" refers to a 2-inch outside diameter split-barrel sampler driven into the ground with a 140 pound drop-hammer dropped 30 inches repeatedly until a penetration of 18 inches is achieved or until refusal. The number of blows, or "blow count", of the hammer is recorded for each of three 6-inch increments totaling 18 inches. The number of blows required for advancing the sampler for the last 12 inches (2nd and 3rd increments) is defined as the Standard Penetration Test (SPT) "**N**"-Value. Refusal to penetration is considered more than 50 blows per 6 inches. (Ref. ASTM D1586).

"R" in "BLOW COUNTS" refers to a 3-inch outside diameter ring-lined split barrel sampler driven into the ground with a 140 pound drop-hammer dropped 30 inches repeatedly until a penetration of 12 inch is achieved or until refusal. The number of blows required to advance the sampler 12 inches is defined as the "**R**" blow count. The "**R**" blow count requires an engineered conversion to an equivalent SPT N-Value. Refusal to penetration is considered more than 50 blows per foot. (Ref. ASTM D3550).

"CS" in "BLOWS/FT." refers to a 2½-in. outside diameter California style split-barrel sampler, lined with brass sleeves, driven into the ground with a 140-pound hammer dropped 30 inches repeatedly until a penetration of 18 inches is achieved or until refusal. The number of blows of the hammer is recorded for each of the three 6-inch increments totaling 18 inches. The number of blows required for advancing the sampler for the last 12 inches (2nd and 3rd increments) is defined as the "CS" blow count. The "CS" blow count requires an engineered conversion to an equivalent SPT N-Value. Refusal to penetration is considered more than 50 blows for a 6-inch increment. (Ref. ASTM D 3550)

"SAMPLE TYPE" refers to the form of sample recovery, in which **N** = Split-barrel sample, **R** = Ring-lined sample, **"CS"** = California style split-barrel sample, **G** = Grab sample, **B** = Bucket sample, **C** = Core sample (ex. diamond bit rock coring).

"DRY DENSITY (LBS/CU FT)" refers to the laboratory-determined dry density in pounds per cubic foot. The symbol **"NR"** indicates that no sample was recovered.

"WATER (MOISTURE) CONTENT" (% of Dry Wt.) refers to the laboratory-determined water content in percent using the standard test method ASTM D2216.

"USCS" refers to the "Unified Soil Classification System" Group Symbol for the soil type as defined by ASTM D2487 and D2488. The soils were classified visually in the field, and where appropriate, classifications were modified by visual examination of samples in the laboratory and/or by appropriate tests.

These notes and boring logs are intended for use in conjunction with the purposes of our services defined in the text. Boring log data should not be construed as part of the construction plans nor as defining construction conditions.

Boring logs depict our interpretations of subsurface conditions at the locations and on the date(s) noted. Variations in subsurface conditions and characteristics may occur between borings. Groundwater levels may fluctuate due to seasonal variations and other factors.

The stratification lines shown on the boring logs represent our interpretation of the approximate boundary between soil or rock types based upon visual field classification at the boring location. The transition between materials is approximate and may be more or less gradual than indicated.

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **7-12-22**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. 1

EQUIPMENT TYPE: **CME-75**
DRILLING TYPE: **8" H.S.A**
FIELD ENGINEER: **S. Wells**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	BLOWS/FT.	DEPTH (FEET)	USCS	SOIL DESCRIPTION
		B		0		Surface: 3-inches of Asphalt Concrete over 3-inches of Aggregate Base Course
					CL	Sandy Lean CLAY; brown, damp
11.0	105	R	4			soft
12.3	106	R	4	5		
					SC	Clayey SAND with Gravel; light brown, slightly damp
		N	25	10		loose
						Boring Terminated at 11.5-feet

N- STANDARD SAMPLER
R- RING SAMPLER
B- BUCKET SAMPLE
G- GRAB SAMPLE
M- OPEN SAMPLER - (no rings)

NOTES: **Groundwater Not Encountered**

Geotechnical
Environmental
Inspections
Materials

Western Technologies Inc.
The Quality People
Since 1955

PROJECT: **SDL- AIRPORT DRIVE REHABILITATION**
LOCATION: **SCOTTSDALE, ARIZONA**
PROJECT NO.: **2122JA118**

PLATE **A-4**

BORING LOG

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **7-12-22**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. 2

EQUIPMENT TYPE: **CME-75**
DRILLING TYPE: **8" H.S.A**
FIELD ENGINEER: **S. Wells**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	BLOWS/FT.	DEPTH (FEET)	USCS	SOIL DESCRIPTION
		B		0		Surface: 3-inches of Asphalt Concrete over 3-inches of Aggregate Base Course
					CL	Sandy Lean CLAY with Gravel; brown, damp
9.3	123	R	21			stiff
17.1	103	R	4	5		soft
		N	25	10	SC	Clayey SAND with Gravel; light brown, medium dense, slightly damp
						Boring Terminated at 11.5-feet

N- STANDARD SAMPLER
R- RING SAMPLER
B- BUCKET SAMPLE
G- GRAB SAMPLE
M- OPEN SAMPLER - (no rings)

NOTES: **Groundwater Not Encountered**

Geotechnical
Environmental
Inspections
Materials

Western Technologies Inc.
The Quality People
Since 1955

PROJECT: **SDL- AIRPORT DRIVE REHABILITATION**
LOCATION: **SCOTTSDALE, ARIZONA**
PROJECT NO.: **2122JA118**

BORING LOG

PLATE **A-5**

DATE DRILLED: **7-12-22**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. 3

EQUIPMENT TYPE: **CME-75**
DRILLING TYPE: **8" H.S.A**
FIELD ENGINEER: **S. Wells**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	BLOWS/FT.	DEPTH (FEET)	USCS	SOIL DESCRIPTION
		B		0		Surface: 4-inches of Asphalt Concrete over 3-inches of Aggregate Base Course
9.2	107	R	3	1	SC-SM	Silty Clayey SAND with Gravel; brown, damp very loose
10.2	104	R	5	5		loose
		N	15	10		medium dense
				11.5		**Boring Terminated at 11.5-feet**

N- STANDARD SAMPLER
R- RING SAMPLER
B- BUCKET SAMPLE
G- GRAB SAMPLE
M- OPEN SAMPLER - (no rings)

NOTES: **Groundwater Not Encountered**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

Geotechnical Environmental Inspections Materials
Western Technologies Inc.
The Quality People
Since 1955

PROJECT: **SDL- AIRPORT DRIVE REHABILITATION**
LOCATION: **SCOTTSDALE, ARIZONA**
PROJECT NO.: **2122JA118**

BORING LOG

PLATE **A-6**

DATE DRILLED: **7-12-22**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. 4

EQUIPMENT TYPE: **CME-75**
DRILLING TYPE: **8" H.S.A**
FIELD ENGINEER: **S. Wells**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
		B						Surface: 4-inches of Asphalt Concrete over 3-inches of Aggregate Base Course
14.1	105	R		2		CL		Sandy Lean CLAY with Gravel; brown, damp very soft
11.3	101	R		4	5			soft
		N		18	10	SC		Clayey SAND with Gravel; light brown, medium dense, slightly damp
								Boring Terminated at 11.5-feet

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

N- STANDARD SAMPLER
R- RING SAMPLER
B- BUCKET SAMPLE
G- GRAB SAMPLE
M- OPEN SAMPLER - (no rings)

NOTES: **Groundwater Not Encountered**

Geotechnical
Environmental
Inspections
Materials

Western Technologies Inc.
The Quality People
Since 1955

PROJECT: **SDL- AIRPORT DRIVE REHABILITATION**
LOCATION: **SCOTTSDALE, ARIZONA**
PROJECT NO.: **2122JA118**

PLATE
A-7

BORING LOG

APPENDIX B

Boring No.	Depth (ft)	USCS Class.	Particle Size Distribution (%) Passing by Weight						Atterberg Limits		Moisture-Density Relationship			R-Value	Remarks
			3”	¾”	#4	#10	#40	#200	LL	PI	Dry Density (pcf)	Optimum Moisture (%)	Method		
1	0.5 – 5	CL	100	100	86	75	63	51	25	10					2
2	0.5 - 5	CL	100	100	93	79	65	51	24	9					2
3	0.5 - 5	SC-SM	100	97	72	65	50	38	20	6					2
4	0.5 - 5	CL	100	98	87	82	74	61	24	8					2
1&2	0.5 - 5	CL									125.1	10.3	A	25	2, 4
3&4	0.5 - 5	SC-SM/CL									130.8	9.9	A	24	2, 4

NOTE: NP = Non-plastic

REMARKS

Classification / Particle Size / Moisture-Density Relationship

1. Visual
2. Laboratory Tested
3. Minus #200 Only
4. Test Method ASTM D698/AASHTO T99
5. Test Method ASTM D1557/AASHTO T180
6. From the ADOT Family of Curves for Maricopa County

Geotechnical
Environmental
Inspections
Materials

Western Technologies Inc.
The Quality People
Since 1955
wt-us.com

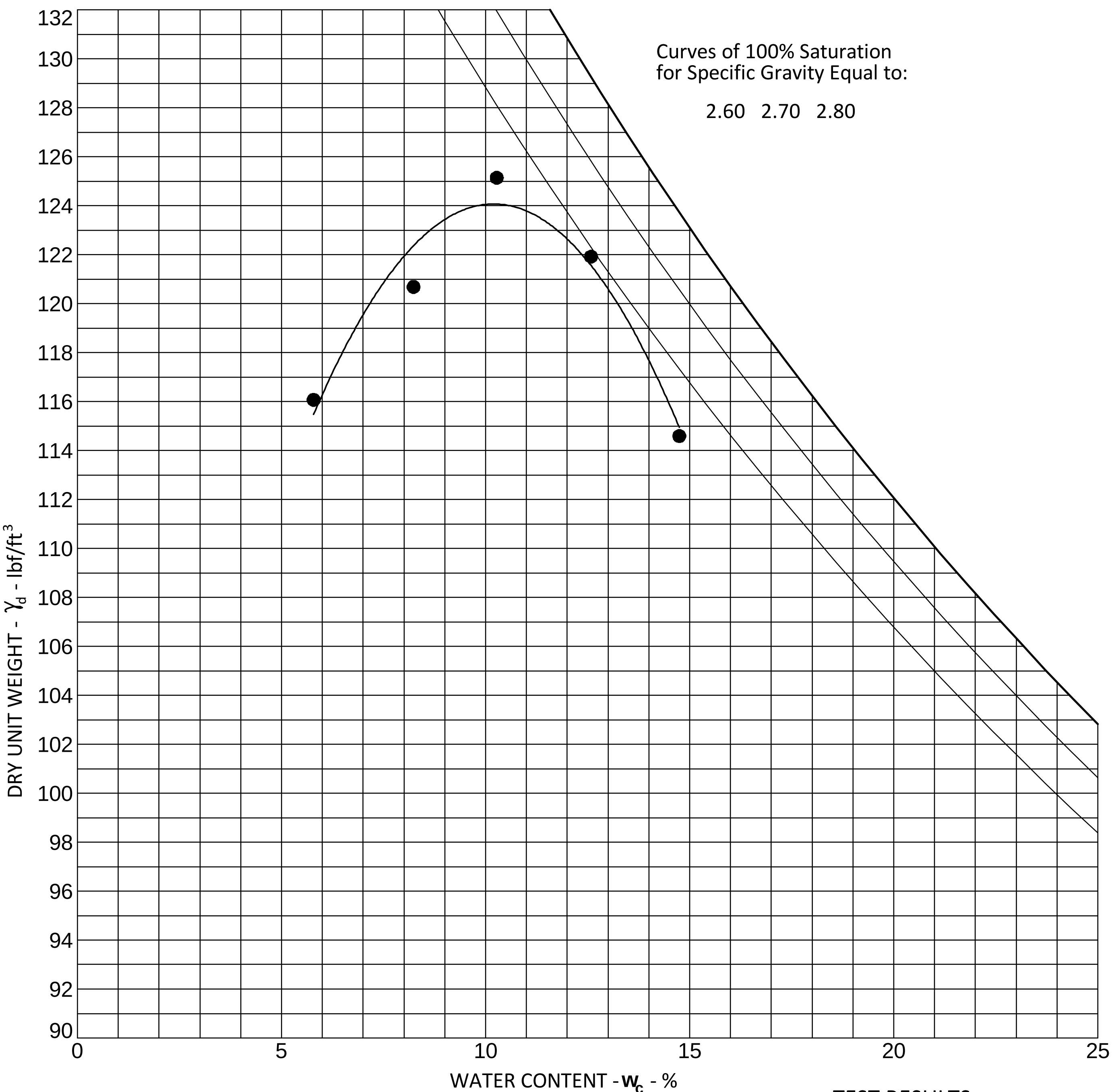
PROJECT: SDL – AIRPORT DRIVE REHABILITATION

JOB NO.: 2122JA118

PLATE **B-1**

SOIL PROPERTIES

LABORATORY COMPACTION CHARACTERISTICS - STANDARD EFFORT



TEST RESULTS

Source of Material: **B-1 at 2.5 ft**

Description of Material: **Sandy Lean CLAY**

Percent Passing US Standard No. 200 Sieve = 52%

Test Method: **ASTM D698 Method A**

ATTERBERG LIMITS

LL	PL	PI
25	**15**	**10**

Maximum Dry Density **125.1** PCF

Optimum Water Content **10.3** %

ASTM Rock Corrected Maximum Dry Density = 129.6 pcf at = 8.9% Moisture Content

***Source of Material B-1 & B-2**

Geotechnical
Environmental
Inspections
Materials

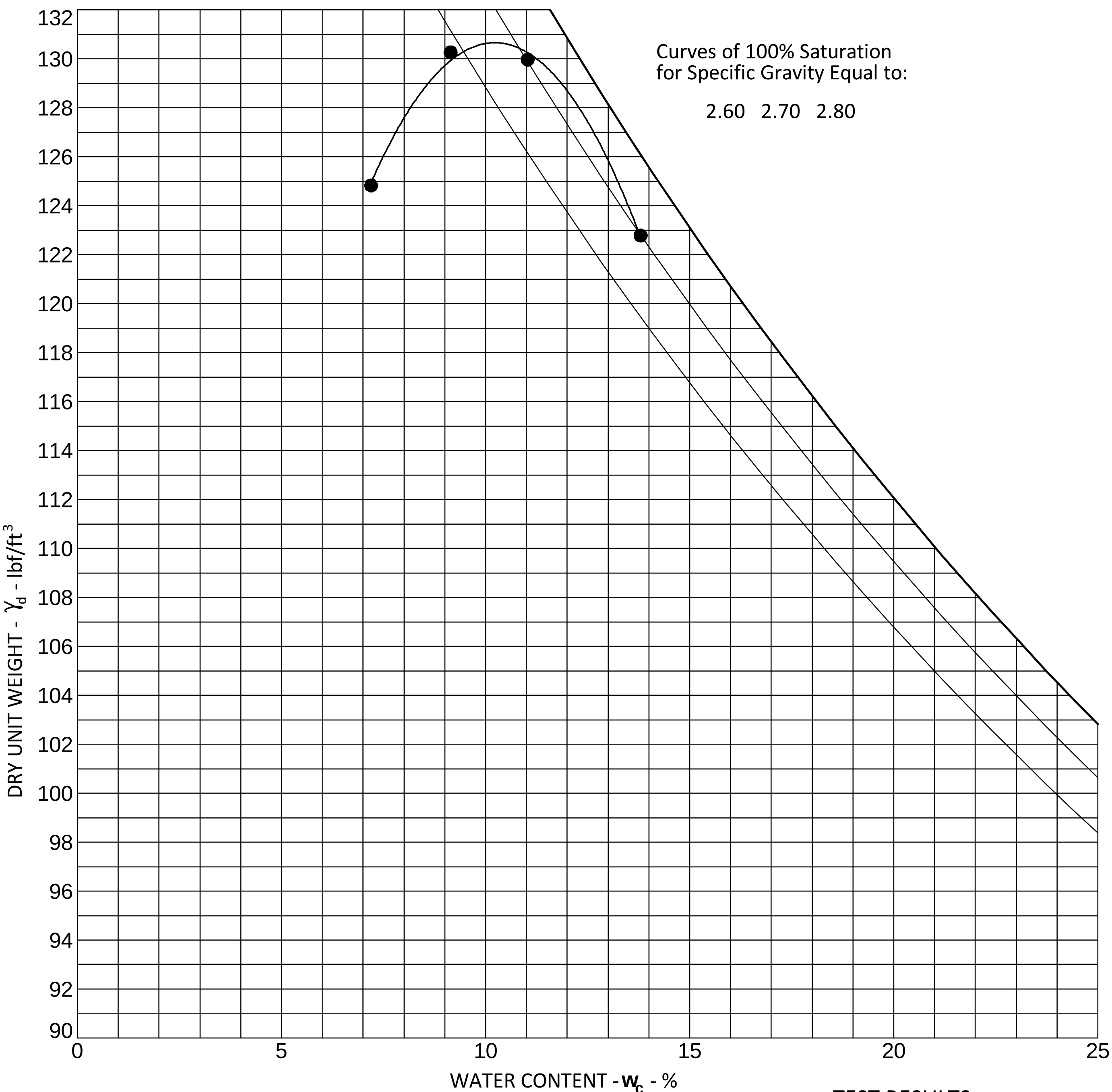
Western Technologies Inc.
The Quality People
Since 1955

PROJECT: **SDL- AIRPORT DRIVE REHABILITATION**
LOCATION: **SCOTTSDALE, ARIZONA**
PROJECT NO.: **2122JA118**

COMPACTION CURVE

PLATE
B-2

LABORATORY COMPACTION CHARACTERISTICS - STANDARD EFFORT



TEST RESULTS

Source of Material	**B-3 at 2.5 ft**
Description of Material	**Silty Clayey SAND with gravel**
	Percent Passing US Standard No. 200 Sieve = 38%
Test Method	**ASTM D698 Method A**

Maximum Dry Density **130.8** **PCF**

Optimum Water Content **9.9** **%**

ASTM Rock Corrected Maximum Dry Density = 136.6 pcf at 7.9% Moisture Content

***Source of Material B-3 & B-4**

ATTERBERG LIMITS

LL	PL	PI
20	**14**	**6**

Geotechnical
Environmental
Inspections
Materials

Western Technologies Inc.
The Quality People
Since 1955

PROJECT: **SDL- AIRPORT DRIVE REHABILITATION**
LOCATION: **SCOTTSDALE, ARIZONA**
PROJECT NO.: **2122JA118**

COMPACTION CURVE

PLATE **B-3**

APPENDIX C

AASHTO - PAVEMENT DESIGN METHOD - Flexible

Scottsdale Airport: Airport Drive Rehabilitation

This program solves for either EAL or SN

Choice	Description	Value
(0)	Number of EALs/day (5 - 9,999)	39.93
(1)	Total Number of EALs (10,000 - 99,999,999)	291,518.00
(2)	Structural Number (1.0 - 10.0)	1.93
(3)	Resilient Modulus (1,000 - 40,000 psi)	19,500.00
(4)	Present Serviceability (2.5 - 5.0)	5.00
(5)	Terminal Serviceability (1.5 - 4.1)	2.50
(6)	Design Life (1 - 30 years)	20.00
(7)	Traffic Growth Rate (%)	0.00
(8)	Overall Standard Deviation (0.2 - 0.6)	0.45
(9)	Reliability (%)	90.00

Alternative No. 1. Overlay – New AC over Existing Pavement Section.

LAYER	DESCRIPTION	S.C.	D.C.	THICK.	SN
Surface	OL-AC	0.39		2.00	0.78
Existing	AC	0.30	1.00	2.92	0.88
Existing	ABC	0.10	1.00	3.00	0.30
TOTAL				**7.92**	**1.96**
TARGET SN					**1.93**

DELTA SN (pos.==> too thick, neg.==> too thin) 0.03

Alternative No. 2. AC over Full Depth Reclamation (FDR) Base

LAYER	DESCRIPTION	S.C.	D.C.	THICK.	SN
Surface	Surface Course Material - AC	0.39		3.00	1.17
Base	FDR (Blended 3.0"AC+3.0" ABC+SG)	0.14	1.00	6.00	0.84
Subbase	Subbase Course not Defined	0.00	0.00	0.00	0.00
TOTAL				**9.00**	**2.01**
TARGET SN					**1.93**

DELTA SN (pos.==> too thick, neg.==> too thin) 0.08

APPENDIX D

PHOTOGRAPHIC LOG

SCOTTSDALE AIRPORT – AIRPORT DRIVE REHABILITATION

MEAD & HUNT
8800 EAST RAINTREE DRIVE, SUITE 285
SCOTTSDALE, ARIZONA 85260

WT Job No.: 2122A118 **August 18, 2022**

Picture 1 - Core No. 1 - Side

Picture 2 - Core No. 1 - Top

PHOTOGRAPHIC LOG

SCOTTSDALE AIRPORT – AIRPORT DRIVE REHABILITATION

MEAD & HUNT
8800 EAST RAINTREE DRIVE, SUITE 285
SCOTTSDALE, ARIZONA 85260

WT Job No.: 2122A118 **August 18, 2022**

Picture 3 - Core No. 2. Side

Picture 4 - Core No. 2: Top

PHOTOGRAPHIC LOG

SCOTTSDALE AIRPORT – AIRPORT DRIVE REHABILITATION

MEAD & HUNT
8800 EAST RAINTREE DRIVE, SUITE 285
SCOTTSDALE, ARIZONA 85260

WT Job No.: 2122A118 **August 18, 2022**

Picture 5 - Core No. 3: Side

Picture 6 - Core No. 3 Top

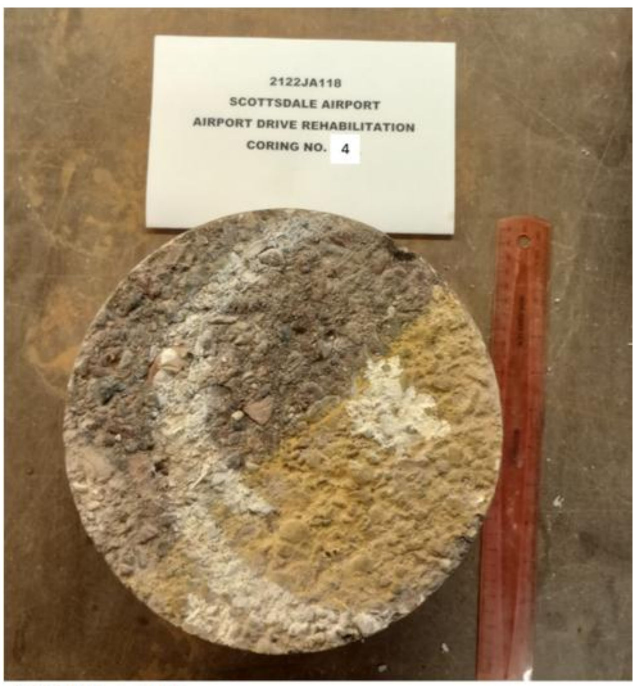
PHOTOGRAPHIC LOG

SCOTTSDALE AIRPORT – AIRPORT DRIVE REHABILITATION

MEAD & HUNT
8800 EAST RAINTREE DRIVE, SUITE 285
SCOTTSDALE, ARIZONA 85260

WT Job No.: 2122A118 **August 18, 2022**

Picture 1 - Core No. 4- Side



Picture 2 - Core No. 4- Top