GEOTECHNICAL REPORT

ADOT Project No. 377 NA 008 F0661 01D

Federal Reference Project No. FA-377-A(203)T

MP8 - Phoenix Park Wash, S of Dry Lake

Omied Arianejad

October 10, 2024

Prepared by

Omied Arianejad, P.E.

ARIZONA DEPARTMENT OF TRANSPORTATION

BRIDGE GROUP

GEOTECHNICAL SERVICES

October 10, 2024

Subject:
Geotechnical Report
MP8 - Phoenix Park Wash, S of Dry Lake
ADOT Project No. 377 NA 008 F0661 01D

This report presents the results of our geotechnical engineering services to support the construction of the shoulder widening on State Route 377 (SR-377) at mileposts (MP) 8 to MP 13. The project is located north of the community of Heber-Overgaard within the Arizona Department of Transportation (ADOT) Northeast District.

The project involves widening the existing shoulders an additional five feet, and extending the drainage features to match the widening of the shoulders and is programmed for construction in fiscal year 2026.

The geotechnical field investigation included excavating 16 backhoe and 6 hand-dug test pits to depths ranging from approximately one to five feet below the ground surface. The results of the field and laboratory investigation as well as design recommendations for the proposed construction are presented in this report.

Should there be any questions regarding the contents of this report or its appropriate incorporation into designs, please do not hesitate to contact us.

Sincerely,

Omied Arianejad

Registered Professional Engineer (Civil)
CERTIFICATE NO.
81587
OMIED
ARIANEJAD
Date Signed 10/10/2024
ARIZONA, U.S.A.

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Transportation Engineering Associate

Reviewed by:

Patrice Brun, P.E.
Geotechnical Services Manager

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1.0 INTRODUCTION

This report presents the results of our geotechnical engineering services to support the construction of the shoulder widening on State Route 377 (SR-377) at mileposts (MP) 8 to MP 13. The project is located north of the community of Heber-Overgaard within the Arizona Department of Transportation (ADOT) Northeast District.

The purpose of this report is to provide information and recommendations regarding:

- pavement design
- earthwork factors

1.1 Project Description

The project involves widening the existing shoulders an additional five feet, and extending the drainage features to match the widening of the shoulders and is programmed for construction in fiscal year 2026.

1.2 Site Description

The project site for the geotechnical exploration areas is located within the existing ADOT right of way of SR-377 between MP 8 to MP 13. The general project area is described as level, with elevations ranging from 5,839 to 5,960 feet mean sea level (MSL). Vegetation at the site consists of generally sparse native grasses, and bushes.

1.3 Site Geology

The Geologic Map of Arizona (AGS, 2000) indicates that the project lies on three different geological areas.

Along the northern portion of the project area the geological feature is generally from the Quaternary period and contains 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 (0-2 Ma).

The southern portion of the project generally consists of two geological features. One is Pliocene to middle Miocene deposits (Middle Miocene to Pliocene) and contains moderately to strongly consolidated conglomerate and sandstone deposited in basins during and after late Tertiary faulting. Includes lesser amounts of mudstone, siltstone, limestone, and gypsum. These deposits are generally light gray or tan. They commonly form high rounded hills and ridges in modern basins, and locally form prominent bluffs. Deposits of this unit are widely exposed in the dissected basins of southeastern and central Arizona (2-16 Ma). The other geological feature is Permian sedimentary rocks, and contains gray to tan, cherty limestone of Kaibab and Toroweap Formations, and underlying white to tan, fine-grained Coconino Sandstone. Limestone was

deposited in a shallow sea, and sandstone was deposited in near-shore dunes and beach settings (270-280 Ma).

2.0 SUBSURFACE INVESTIGATION

2.1 Subsurface Test Pit Investigation

A geotechnical field investigation was performed on August 13, 14, and 20 of 2024. The field investigation included the completion of 16 backhoe test pits (designated TP-01 through TP-16) and 6 hand-dug test pits (designated HS-01 through HS-06). The backhoe test pits were excavated to a depth of five feet below the ground surface (bgs) and the hand-dug test pits to a depth of one foot bgs off the roadway along SR-377. The test pits were excavated with a CAT 420 backhoe using a two-foot wide bucket. The investigation was performed by the ADOT Geotechnical Operations field crew.

The test pits were located in the field using a hand-held, global positioning system (GPS) instrument in conjunction with Google Earth images, and project plans. A site plan showing the test pits are presented in Appendix A of this report. The test pit logs are presented in Appendix B of this report.

In-place density and moisture tests were performed at the TP-02, TP-06, TP-09, TP-12, and TP-15 to compare the in-situ conditions versus the laboratory tested maximum dry density and optimum moisture results. The tests were performed using the nuclear density (ASTM D6938) method. The in-situ density test location and results are included in the Laboratory Testing Summary under Field Tests in Appendix C.

2.2 Laboratory Testing

The soil samples obtained during the field investigation were delivered to ADOT Construction and Materials Group Central Laboratory. Select samples were tested in general conformance with the procedures listed in the following table.

Table 1: Laboratory Test Methods Applied for Representative Soil Samples

Geotechnical Test	Test Procedure	Number of Tests
Sieve Analysis (Grain Size)	ARIZ 201d	22
Atterberg Limits (Plasticity)	AASHTO T 89 and T 90	22
Maximum Density and Optimum Moisture of Soils	ARIZ 225b	5
R-Value	AASHTON T 190	5
pH & Minimum Resistivity	ARIZ 236	6

A summary of all laboratory test results is presented in Appendix C of this report.

3.0 SUBSURFACE CONDITIONS

3.1 Soil Conditions

The subsurface investigation encountered native soils consisted of varying amounts of sand, gravel, and fined grained soils (clay/silts) detailed in the boring logs in Appendix B. The soils had plasticity's in the non-plastic to high range, and calcium carbonate cementation (caliche) was not evident.

3.2 Groundwater Conditions

No free groundwater was observed in any of the test pits at the time of our investigation. The observed moisture conditions indicated on the logs are as recorded at the time of our subsurface exploration. These moisture conditions may vary considerably, with time, according to the seasonal variations in rainfall, snow melt, or other factors and are otherwise dependent upon the duration of and methods used in the exploration program.

4.0 RECOMMENDATIONS

4.1 General Discussion

From Station 523+40 to Station 709+00 the soil conditions are generally suitable for the construction of the shoulder. The site surface and subsurface conditions consisted of native soils.

From Station 709+00 to Station 788+48 the soil conditions are generally not suitable for the construction of the shoulder. It is recommended to over-excavate and replace the upper three feet with suitable fill materials. The replacement material should meet a construction R-Value of 20.

4.2 Pavement Design Information

Test pit samples were retrieved and tested according to the ADOT Geotechnical Project Development Manual (GPDM, 2024). The laboratory test results are tabulated in Appendix C. Statistical analyses of the laboratory correlated R-Values were performed in accordance with the procedure presented in Section 202.02(G) of the ADOT Pavement Design Manual (PD, 2017).

From Station 523+40 to 709+00 the correlated R-value results ranged from 24 to 95 with an average value of 52. The tested R-value results ranged from 16 to 24 with an average value of 21.

From Station 709+00 to Station 788+48 the correlated R-value results ranged from 12 to 46 with an average value of 26. The tested R-value results ranged from 9 to 11 with an average value of 10.

The recommended R-values are presented in the table below. It is recommended to over-excavate and replace the upper three feet with suitable fill materials. The imported material should meet a construction R-Value of 20.

Table 2: Recommended R-Values

Location	R-mean	R-control
Station 523+40 to Station 709+00	20	20
Station 709+00 to Station 788+48	20 with imported material	20 with imported material

R-mean should be used to design pavement structure. R-control values should be used to develop the Subgrade Acceptance Chart. Material that is excavated within the project limits and is used as a fill material within three feet below the finished subgrade elevation shall meet the Subgrade Acceptance Chart. Recommendations for pavement design are presented in separate Materials Design Report (MDR) and Pavement Design Summary (PDS) prepared by ADOT Roadway Group - Pavement Design Section.

4.3 Earthwork Factors

Earthwork factors are dependent on the existing soil conditions, contractor methods of handling the materials, wind losses, and compaction achieved during construction. Potential bidders should consider these factors in preparing the estimates and are encouraged to review all available data and make their own conclusions regarding excavation conditions. For the purpose of design volume estimation, Earthwork Factors are recommended in the table below.

Table 3: Earthwork Factors

Station	Ground Compaction	Excavation Factor
Entire project	0.10 feet	10% shrink

4.4 Fill Requirements

It is anticipated that any fill required will be constructed using locally available materials derived from borrow sources.

4.5 Water Requirements

Approximately 75 gallons of water per cubic yard may be estimated for compaction of base and subgrade materials. This estimate is based on the tested optimum compaction moisture content and includes a conservative overrun for losses due to seepage, evaporation, inadequate mixing, spillage, etc. Precipitation before and/or during construction may also reduce the required amount of water significantly.

4.6 Pipe Extensions and Corrosion Potential

Laboratory test results indicate the on-site soils have pH ranging from 7.4 to 7.6 and minimum resistivity values ranging from 1,141 to 3,342 ohm-centimeters. These values should be used for the selection of various pipe installations for this project. The complete test results are listed in the Laboratory Test Summary of this report in Appendix C.

4.7 Borrow Information

There is no Department-furnished source for borrow on this project. Borrow shall be as specified in Section 203-9 of the Standard Specifications. Borrow placed within three feet of finished subgrade shall meet the following requirements. The Plasticity Index (PI) and the percent passing the #200 sieve (Minus 200), when used in the equation below, shall give a value of X that does not exceed 116.

$$X = (\text{Minus } 200) + [2.83\ (PI)]$$

5.0 TEST PIT (SUBGRADE) LOG LIMITATIONS

General soil strata descriptions and indicated boundaries are based on engineering interpretation of available subsurface information by the geotechnical engineer and may not reflect actual variation in subsurface conditions between test pit locations. The locations of the contacts between strata shown on the logs are approximate, and changes between material types may be gradual rather than abrupt. Classification of soil materials is in general accordance with ASTM D2488 and is based on field observation unless accompanied by mechanical analysis.

If encountered the observed groundwater levels and/or moisture conditions indicated on the logs are as recorded at the time of exploration. These groundwater levels and/or moisture conditions may vary considerably, with time, according to the prevailing climate, rainfall or other factors and are otherwise dependent upon the duration of and methods used in the exploration program.

Sound engineering judgment was exercised in preparing the subsurface information presented on the subgrade logs. This information was prepared for and is intended for design and preliminary quantity estimate purposes. Its presentation on the plans or elsewhere is for the purpose of providing intended users with access to the same information as the State and its designers. This subsurface information and interpretation is presented in good faith and is not intended as a substitute for independent investigation, interpretation or judgment of the contractor or other users of this report.

6.0 REFERENCES

AASHTO (2011). **Standard Specifications for Transportation Materials and Methods of Sampling and Testing, 31st Edition**. American Association of State Highway and Transportation Officials, Washington, D.C.

ADOT (2016). **Materials Testing Manual, Sampling and Testing Procedures.** Arizona Department of Transportation, Phoenix, AZ.

ADOT (2017). **Pavement Design Manual**. Arizona Department of Transportation, Phoenix, AZ

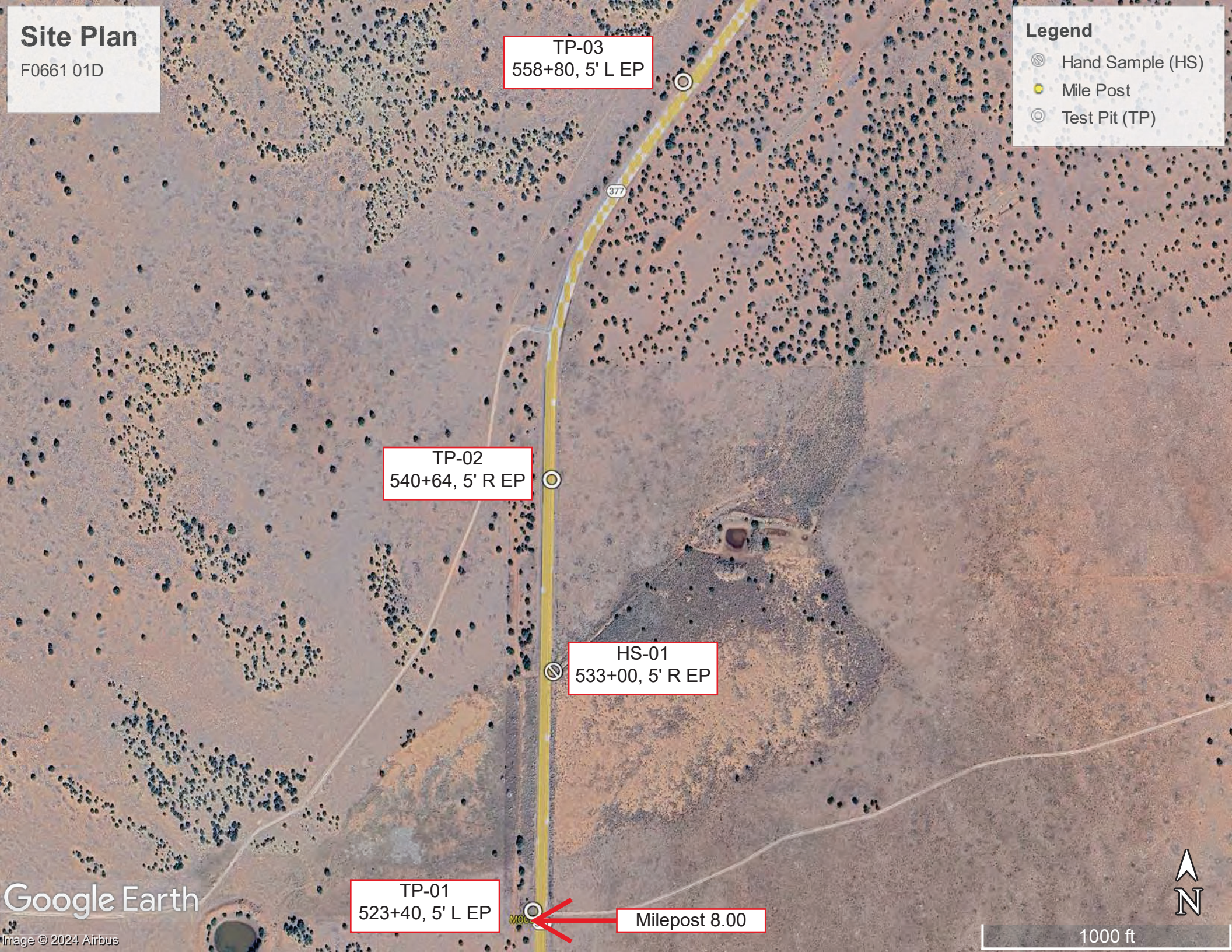
ADOT (2021). **Standard Specifications for Road and Bridge Construction**. Arizona Department of Transportation, Phoenix, AZ.

ADOT (2024). **Geotechnical Project Development Manual**. Arizona Department of Transportation, Phoenix, AZ.

AGS (2000). **Geologic Map of Arizona - Map 35**. Arizona Geological Survey, Tucson, AZ.

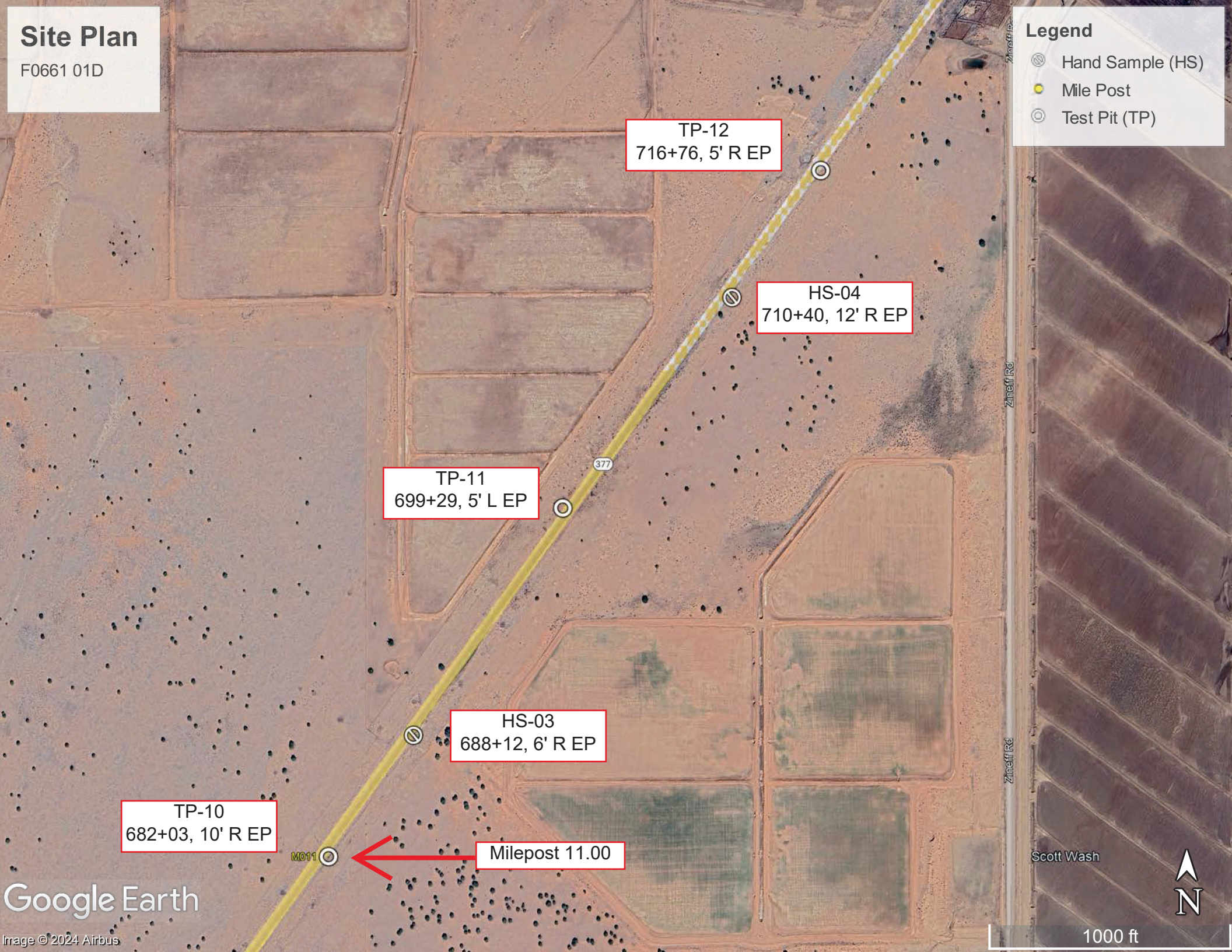
APPENDIX A

Site Plan


Site Plan
F0661 01D
Legend
Hand Sample (HS)
Mile Post
Test Pit (TP)
TP-03
558+80, 5' L EP
377
TP-02
540+64, 5' R EP
HS-01
533+00, 5' R EP
TP-01
523+40, 5' L EP
Milepost 8.00
N
1000 ft
Google Earth
Image © 2024 Airbus


Site Plan
F0661 01D
Legend
Hand Sample (HS)
Mile Post
Test Pit (TP)
TP-06
610+26, 10' R EP
TP-05
593+00, 5' L EP
HS-02
577+30, 15' R EP
TP-04
576+20, 10' R EP
Milepost 9.00
Arizona State Route 377
377
N
1000 ft
Google Earth
Image © 2024 Airbus


Site Plan
F0661 01D
Legend
Hand Sample (HS)
Mile Post
Test Pit (TP)
TP-09
663+70, 10' L EP
TP-08
646+15, 10' R EP
TP-07
629+24, 10' L EP
Milepost 10.00
Arizona State Route 377
Duck Lake Rd
Google Earth
Image © 2024 Airbus
N
1000 ft


Site Plan
F0661 01D
Legend
Hand Sample (HS)
Mile Post
Test Pit (TP)
TP-12
716+76, 5' R EP
HS-04
710+40, 12' R EP
TP-11
699+29, 5' L EP
HS-03
688+12, 6' R EP
TP-10
682+03, 10' R EP
Milepost 11.00
M011
377
Zineff Rd
Zineff Rd
Zineff Rd
Scott Wash
N
1000 ft
Google Earth
Image © 2024 Airbus


Site Plan
F0661 01D
Legend
Hand Sample (HS)
Mile Post
Test Pit (TP)
TP-16
788+48, 15' R EP
Milepost 13.00
HS-06
779+05, 20' R EP
TP-15
769+54, 15' L EP
HS-05
755+68, 15' R EP
TP-14
752+08, 10' R EP
TP-13
735+00, 12' L EP
Milepost 12.00
377
M013
M012
N
Google Earth
Image © 2024 Airbus

APPENDIX B

Test Pit Logs

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 8.00	**TP-01**	
Station, Offset	523+40, 5' L EP		
Lat/Long, elev	34.56394, -110.41404 at 5958'		
Field Engineer	Omied Arianejad	Date	08/13/2024
Field Operator	ADOT Geotechnical Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab: % Gravel	Lab: % Sand	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)
1 2 3 4 5	5955		Bulk	**SANDY LEAN CLAY** (**CL**): brown; medium plasticity; no cementation; damp. 5.0	4	32	64	27-15-12

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 8.33	**TP-02**	
Station, Offset	540+64, 5' R EP		
Lat/Long, elev	34.56867, -110.41379 at 5959'		
Field Engineer	Omied Arianejad	Date	08/13/2024
Field Operator	ADOT Geotechnical Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab				Samples	
					% Gravel	% Sand	% Fines	Atterberg Limits (LL-PL-PI)	In-Situ Moisture Content (%)	In-Situ Dry Density (PCF)
1 2 3 4 5	5955		Bulk	**CLAYEY SAND WITH GRAVEL** (**SC**): dark brown; medium plasticity; no cementation; damp. 5.0	40	43	17	32-15-17	6	103.8

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 8.66	**TP-03**	
Station, Offset	558+80, 5' L EP		
Lat/Long, elev	34.57303, -110.41204 at 5960'		
Field Engineer	Omied Arianejad	Date	08/13/2024
Field Operator	ADOT Geotechnical Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab: % Gravel	Lab: % Sand	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)
0	5955		Bulk	**POORLY GRADED GRAVEL WITH CLAY AND SAND** (**GP-GC**): brown; high plasticity; weak cementation; slightly damp.	62	25	9	38-17-21
5				5.0				

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 9.00	**TP-04**	
Station, Offset	576+20, 10' R EP		
Lat/Long, elev	34.57703, -110.40830 at 5942'		
Field Engineer	Omied Arianejad	Date	08/13/2024
Field Operator	ADOT Geotechnical Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab: % Gravel	Lab: % Sand	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)
0	5940		Bulk	**POORLY GRADED GRAVEL WITH CLAY AND SAND** (**GP-GC**): dark brown to brown; medium plasticity; no cementation; slightly damp.	64	26	10	33-16-17
5				5.0				

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 9.32	**TP-05**	
Station, Offset	593+00, 5' L EP		
Lat/Long, elev	34.58086, -110.40518 at 5929'		
Field Engineer	Omied Arianejad	Date	08/13/2024
Field Operator	ADOT Geotechnical Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab			
					% Gravel	% Sand	% Fines	Atterberg Limits (LL-PL-PI)
1 2 3 4 5	5925		Bulk	**SILTY SAND** (**SM**): brown; non-plastic; no cementation; slightly damp. 5.0	7	65	28	NP

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 9.64	**TP-06**	
Station, Offset	610+26, 10' R EP		
Lat/Long, elev	34.58462, -110.40169 at 5920'		
Field Engineer	Omied Arianejad	Date	08/14/2024
Field Operator	ADOT Geotechnical Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab				Samples	
					% Gravel	% Sand	% Fines	Atterberg Limits (LL-PL-PI)	In-Situ Moisture Content (%)	In-Situ Dry Density (PCF)
1			Bulk	**CLAYEY SAND** (**SC**): dark brown to brown; medium plasticity; no cementation; damp. 2.0	9	55	36	26-14-12	5.8	112.2
2			Bulk	**WELL-GRADED GRAVEL WITH SILT AND SAND** (**GW-GM**): light brown to tan; non-plastic; no cementation; slightly damp. 5.0	57	37	6	NP		
3										
4										
5	5915									

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 10.00	**TP-07**	
Station, Offset	629+24 10' L EP		
Lat/Long, elev	34.58893, -110.39815 at 5915'		
Field Engineer	Omied Arianejad	Date	08/14/2024
Field Operator	ADOT Geotechnical Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab: % Gravel	Lab: % Sand	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)
0	5910		Bulk	**POORLY GRADED GRAVEL WITH SILT AND SAND** (**GP-GM**): brown; non-plastic; no cementation; slightly damp.	48	44	8	NP
5				5.0				

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 10.32	**TP-08**	
Station, Offset	646+15, 10' R EP		
Lat/Long, elev	34.59263, -110.39474 at 5896'		
Field Engineer	Omied Arianejad	Date	08/14/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab: % Gravel	Lab: % Sand	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)
1	5895		Bulk	**CLAYEY SAND** (**SC**): brown; medium plasticity; no cementation; damp. 2.0	1	52	47	31-16-15
2			Bulk	**SANDY LEAN CLAY** (**CL**): light brown to tan; medium plasticity; weak cementation; damp. 4.0	4	46	50	28-15-13
4			Bulk	**POORLY GRADED GRAVEL WITH SAND** (**GP**): light brown; non-plastic; no cementation; slightly damp. 5.0	62	34	4	NP
5								

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 10.66	**TP-09**	
Station, Offset	663+70 10' L EP		
Lat/Long, elev	34.5966, -110.39143 at 5887'		
Field Engineer	Omied Arianejad	Date	08/14/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab				Samples	
					% Gravel	% Sand	% Fines	Atterberg Limits (LL-PL-PI)	In-Situ Moisture Content (%)	In-Situ Dry Density (PCF)
1	5885		Bulk	**SILTY, CLAYEY SAND** (**SC-SM**): dark brown to brown; low plasticity; no cementation; damp. 2.0	11	67	22	22-16-6	6.4	121
2				**CLAYEY SAND** (**SC**): light brown to tan; medium plasticity; weak cementation; slightly damp. 5.0	12	52	36	24-16-8		
3										
4										
5										

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 11.00	**TP-10**	
Station, Offset	682+03 10' R EP		
Lat/Long, elev	34.6006, -110.38773 at 5870'		
Field Engineer	Omied Arianejad	Date	08/14/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab: % Gravel	Lab: % Sand	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)
0	5865		Bulk	**CLAYEY SAND WITH GRAVEL** (**SC**): brown to tan; medium plasticity; weak cementation; slightly damp.	17	52	31	26-14-12
5				5.0				

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 11.33	**TP-11**	
Station, Offset	699+29 5' L EP		
Lat/Long, elev	34.60453, -110.38452 at 5866'		
Field Engineer	Omied Arianejad	Date	08/14/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab: % Gravel	Lab: % Sand	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)
0	5865		Bulk	**SILTY, CLAYEY SAND WITH GRAVEL** (**SC-SM**): light brown; low plasticity; weak cementation; damp.	19	64	17	21-17-4
3.0			Bulk	**SANDY LEAN CLAY** (**CL**): brown; high plasticity; no cementation; slightly damp.	8	42	50	42-23-19
5.0								

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 11.66	**TP-12**	
Station, Offset	716+76 5' R EP		
Lat/Long, elev	34.60834, -110.38098 at 5862'		
Field Engineer	Omied Arianejad	Date	08/14/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab				Samples	
					% Gravel	% Sand	% Fines	Atterberg Limits (LL-PL-PI)	In-Situ Moisture Content (%)	In-Situ Dry Density (PCF)
1	5860		Bulk	**LEAN CLAY WITH SAND** (**CL**): light brown; high plasticity; weak cementation; slightly damp.	1	24	75	38-18-20	5.3	115.8
2										
3										
4				4.0						
			Bulk	**LEAN CLAY** (**CL**): red brown; high plasticity; no cementation; damp.	0	15	85	42-17-25		
5				5.0						

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 12.00	**TP-13**	
Station, Offset	735+00, 12' L EP		
Lat/Long, elev	34.61250, -110.37760 at 5845'		
Field Engineer	Omied Arianejad	Date	08/20/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

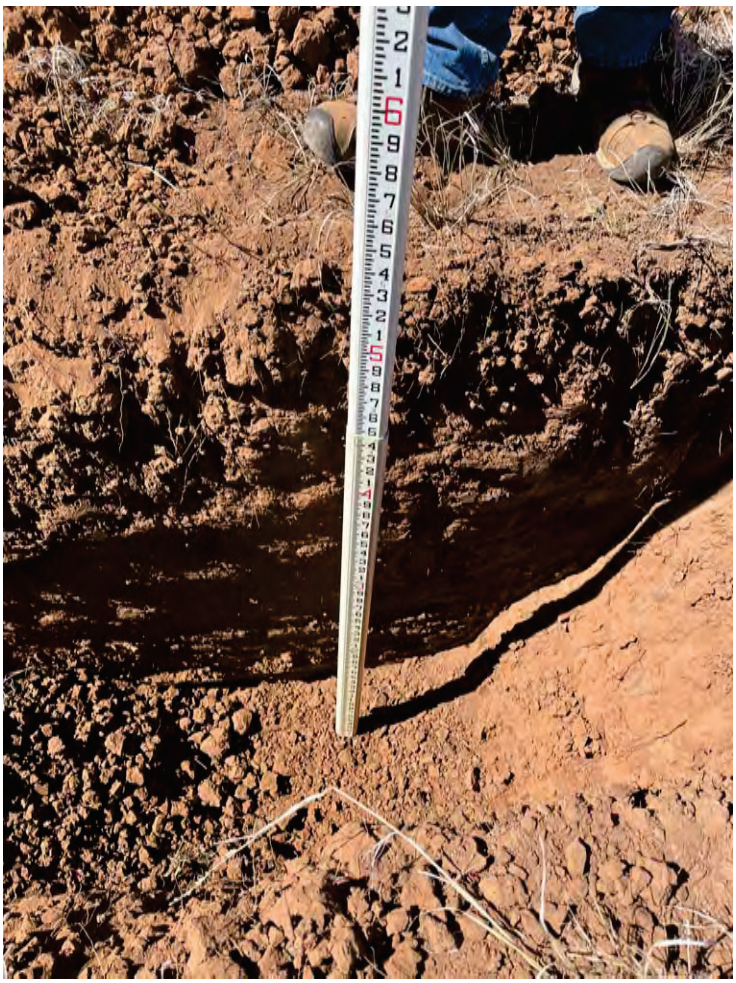
Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab: % Gravel	Lab: % Sand	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)
0	5840			**LEAN CLAY** (**CL**): brown; high plasticity; no cementation; slightly damp.				
5				5.0				

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 12.32	**TP-14**	
Station, Offset	752+08, 10' R EP		
Lat/Long, elev	34.61620, -110.37410 at 5843'		
Field Engineer	Omied Arianejad	Date	08/20/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab: % Gravel	Lab: % Sand	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)
1 2 3 4 5	5840		Bulk	**LEAN CLAY** (**CL**): brown; high plasticity; no cementation; slightly damp. 5.0	0	13	87	43-19-24

Stopped test pit excavation at 5'. No groundwater encountered in test pit.



Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 12.66	**TP-15**	
Station, Offset	769+54, 15' L EP		
Lat/Long, elev	34.62020, -110.37090 at 5839'		
Field Engineer	Omied Arianejad	Date	08/20/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab				Samples	
					% Gravel	% Sand	% Fines	Atterberg Limits (LL-PL-PI)	In-Situ Moisture Content (%)	In-Situ Dry Density (PCF)
1 2 3 4 5	5835		Bulk	**SANDY LEAN CLAY** (**CL**): dark brown to brown; high plasticity; no cementation; slightly damp. 5.0	8	28	64	35-17-18	6.7	96.6

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Test Pit**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 13.01	**TP-16**	
Station, Offset	788+48, 15' R EP		
Lat/Long, elev	34.62430, -110.36700 at 5859'		
Field Engineer	Omied Arianejad	Date	08/20/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab: % Gravel	Lab: % Sand	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)
1 2 3 4 5	5855		Bulk	**SANDY LEAN CLAY** (**CL**): dark brown to brown; medium plasticity; no cementation; slightly damp. 5.0	0	48	52	27-13-14

Stopped test pit excavation at 5'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Hand Sample**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 8.18	**HS-01**	
Station, Offset	533+00, 5' R EP		
Lat/Long, elev	34.56657, -110.41377 at 5955'		
Field Engineer	Omied Arianejad	Date	08/13/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab: % Gravel	Lab: % Sand	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)
1			Hand	**CLAYEY SAND** (**SC**): brown; medium plasticity; no cementation; damp. 1.0	11	40	49	24-13-11

Stopped test pit excavation at 1'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Hand Sample**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 9.02	**HS-02**	
Station, Offset	577+30, 15' R EP		
Lat/Long, elev	34.57727, -110.40808 at 5940'		
Field Engineer	Omied Arianejad	Date	08/13/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab: % Gravel	Lab: % Sand	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)
1			Hand	**CLAYEY SAND WITH GRAVEL** (**SC**): brown; medium plasticity; no cementation; slightly damp. 1.0	20	49	31	22-13-9

Stopped test pit excavation at 1'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Hand Sample**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 11.12	**HS-03**	
Station, Offset	688+12, 6' R EP		
Lat/Long, elev	34.60197, -110.38657 at 5866'		
Field Engineer	Omied Arianejad	Date	08/14/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab: % Gravel	Lab: % Sand	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)
1	5865		Hand	**CLAYEY SAND WITH GRAVEL** (**SC**): brown; medium plasticity; no cementation; damp. 1.0	20	56	24	31-17-14

Stopped test pit excavation at 1'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Hand Sample**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 11.54	**HS-04**	
Station, Offset	710+40, 12' R		
Lat/Long, elev	34.60691, -110.38220 at 5862'		
Field Engineer	Omied Arianejad	Date	08/14/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab: % Gravel	Lab: % Sand	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)
1			Hand	**CLAYEY SAND** (**SC**): red brown to brown; medium plasticity; no cementation; slightly damp. 1.0	5	53	42	27-15-12

Stopped test pit excavation at 1'. No groundwater encountered in test pit.

Project Name	Shoulder Improvements	**Hand Sample**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 12.39	**HS-05**	
Station, Offset	755+68, 15' R EP		
Lat/Long, elev	34.61700, -110.37340 at 5843'		
Field Engineer	Omied Arianejad	Date	08/20/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab			
					% Gravel	% Sand	% Fines	Atterberg Limits (LL-PL-PI)
0			Hand	**LEAN CLAY WITH SAND** (**CL**): dark brown to brown; medium plasticity; no cementation; slightly damp. 1.0	0	27	73	33-18-15
1				Stopped test pit excavation at 1'. No groundwater encountered in test pit.				

Project Name	Shoulder Improvements	**Hand Sample**	
Project No.	377 008 F0661 01D		
Location	SR 377, MP 12.83	**HS-06**	
Station, Offset	779+05, 20' R EP		
Lat/Long, elev	34.62217, -110.36880 at 5841'		
Field Engineer	Omied Arianejad	Date	08/20/2024
Field Operator	ADOT Geotechncial Operations	Backhoe	CAT 420

Depth (ft)	Elevation (ft)	Graphic Log	Sample Type	Visual Classification	Lab			
					% Gravel	% Sand	% Fines	Atterberg Limits (LL-PL-PI)
0	5840		Hand	**SANDY LEAN CLAY** (**CL**): dark brown to brown; medium plasticity; no cementation; slightly damp. 1.0	0	33	67	33-19-14
1								

Stopped test pit excavation at 1'. No groundwater encountered in test pit.

APPENDIX C

Laboratory Test Summary

377 008 F0661 01D, Shoulder Improvements

LABORATORY TEST SUMMARY

Test Location	Station, Offset	Depth (feet)	Sample Source	MECHANICAL PROPERTIES																FIELD TESTS		PARTICLE SIZE PERCENTAGE				Test Location
				Percent Passing							PI	LL	USCS	R-Value		Corrosivity		Moisture/Density		In-situ Moisture/Density		Particle Type				
				3"	1½"	¾"	#4	#8	#40	#200				Corr.	Tested	pH	Minimum Resistivity (ohm-cm)	Max. Dry Density (pcf)	Opt. Moisture Content (%)	Dry Density (pcf)	Moisture Content (%)	Cobbles	Gravel	Sands	Fines (Clay/Silt)	
TP-01	523+40, 5' L	0' - 5'	Bulk	100	100	98	96	95	90	64.1	12	27	CL	26								0	4	32	64	TP-01
TP-02	540+64, 5' R	0' - 5'	Bulk	100	99	88	60	47	30	17	17	32	SC	41	16			122.6	11.1	103.8	5.97	0	40	43	17	TP-02
TP-03	558+80, 5' L	0' - 5'	Bulk	95	79	62	33	25	15	8.5	21	38	GP-GC	39								5	62	25	9	TP-03
TP-04	576+20, 10' R	0' - 5'	Bulk	100	83	64	36	30	19	10	17	33	GP-GC	45								0	64	26	10	TP-04
TP-05	593+00, 5' L	0' - 5'	Bulk	100	97	96	93	92	77	28.3	NP		SM	68								0	7	65	28	TP-05
TP-06	610+26, 10' R	0' - 2'	Bulk	100	100	99	91	87	73	36.2	12	26	SC	38	24			120.5	12.6	112.2	5.80	0	9	55	36	TP-06
TP-06	610+26, 10' R	2' - 5'	Bulk	100	89	73	43	31	15	6.4	NP		GW-GM	92								0	57	37	6	TP-06
TP-07	629+24, 10' L	0' - 5'	Bulk	100	88	75	52	43	24	7.7	NP		GP-GM	90								0	48	44	8	TP-07
TP-08	646+15, 10' R	0' - 2'	Bulk	100	100	100	99	98	88	47.2	15	31	SC	29								0	1	52	47	TP-08
TP-08	646+15, 10' R	2' - 4'	Bulk	100	100	99	96	94	82	50	13	28	CL	30								0	4	46	50	TP-08
TP-08	646+15, 10' R	4' - 5'	Bulk	100	84	66	38	31	16	4	NP		GP	95								0	62	34	4	TP-08
TP-09	663+70, 10' L	0' - 2'	Bulk	100	100	98	89	84	59	21.8	6	22	SC-SM	59	22			125	9.7	121.0	6.40	0	11	67	22	TP-09
TP-09	663+70, 10' L	2' - 5'	Bulk	100	98	96	88	85	72	36.2	8	24	SC	44								0	12	52	36	TP-09
TP-10	682+03, 10' R	1' - 5'	Bulk	100	100	97	83	78	65	30.8	12	26	SC	41								0	17	52	31	TP-10
TP-11	699+29, 5' L	0' - 3'	Bulk	100	100	99	81	73	45	16.9	4	21	SC-SM	68								0	19	64	17	TP-11
TP-11	699+29, 5' L	3' - 5'	Bulk	100	100	100	92	87	69	50.2	19	42	CL	24								0	8	42	50	TP-11
TP-12	716+76, 5' R	0' - 4'	Bulk	100	100	100	99	98	93	74.8	20	38	CL	16	9			108.6	16.8	115.8	5.25	0	1	24	75	TP-12
TP-12	716+76, 5' R	4' - 5'	Bulk	100	100	100	100	99	98	84.8	25	42	CL	12								0	0	15	85	TP-12
TP-14	752+08, 10' R	0' - 5'	Bulk	100	100	100	100	100	99	87	24	43	CL	12								0	0	13	87	TP-14
TP-15	769+54, 15' L	0' - 5'	Bulk	100	100	99	92	89	85	64.4	18	35	CL	20	11			108.7	16.6	96.6	6.67	0	8	28	64	TP-15
TP-16	788+48, 15' R	0' - 5'	Bulk	100	100	100	100	100	94	52.4	14	27	CL	28								0	0	48	52	TP-16
HS-01	533+00, 5' R	0' - 1'	Hand	100	100	97	89	86	80	49.2	11	24	SC	33		7.6	2,046					0	11	40	49	HS-01
HS-02	577+30, 15' R	0' - 1'	Hand	100	100	94	80	76	63	31.1	9	22	SC	46		7.5	3,342					0	20	49	31	HS-02
HS-03	688+12, 6' R	0' - 1'	Hand	100	100	98	80	72	52	24	14	31	SC	41		7.3	2,660					0	20	56	24	HS-03
HS-04	710+40, 12' R	0' - 1'	Hand	100	100	100	95	93	81	41.9	12	27	SC	35		7.4	2,523					0	5	53	42	HS-04
HS-05	755+68, 15' R	0' - 1'	Hand	100	100	100	100	100	97	73.2	15	33	CL	20		7.5	1,342					0	0	27	73	HS-05
HS-06	779+05, 20' R	0' - 1'	Hand	100	100	100	100	99	95	66.9	14	33	CL	23		7.4	1,141					0	0	33	67	HS-06