Technical Provision Attachments (TPAs)

for

010 MA 161 F0721 01C
010-C-NFA

Phoenix – Casa Grande Highway (I-10)
SR 202L (Santan/South Mountain) to Gila River Bridge

Design-Build Capacity Improvements

between

ARIZONA
DEPARTMENT OF
TRANSPORTATION

and

Coffman Specialties, Inc./Fisher Sand & Gravel Co. Joint Venture (CFJV)

Dated as of: December 5, 2025

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TPA 105-1 Maintenance During Construction

No.	Description	Performance Requirement	Repair Response
1.	Graffiti	Maintain all surfaces including barriers, abutments, walls, concrete channels, curbs, cabinets, and poles within the Project Limits free of graffiti. Area shall be repainted to match exiting color.	24 hours for profanity, areas visible to traveling public, and for specific call outs. 72 hours for other graffiti discovered in the course of maintenance activities.
2.	Debris and Obstruction	Maintain paved surfaces and roadway free from debris and obstructions that present a hazard to motorists.	One hour for paved surface. 48 hours for other areas.
3.	Litter and Trash	Maintain Project Limits in a neat condition. Remove and dispose of litter and trash regularly.	One hour for significant incidents of litter/trash deposit on paved surfaces. 48 hours for other significant incidents of litter/trash withing the Project Limits. Seven Days for all others.
4.	Sweeping	Maintain all roadways including shoulders and gore areas within the Project Limits. Use only PM-10 certified street sweepers capable of picking up the material without coming to a complete stop, equipped with the standard safety equipment and delineations.	Bi-weekly or sooner if warranted by traffic safety conditions or construction activities.
5.	Barrier and Attenuator	Repair or replace guardrail, cable barrier, concrete barrier, glare screen, and crash attenuator. Replacements must be MASH compliant.	Immediately remove hazards to public or protect in place. Repair or replace within seven Days.
6.	Drainage System	Repair and clean drainage features including pipes, headwall, catch basins, and drain inlets.	Repair drainage features A. If warranted by traffic safety conditions, protect in place within 24 hours; repair within seven Days. B. 21 Days for all others.
7.	Lighting System	Repair or replace lighting components.	Not later than seven Days after notification.
8.	Pavement Striping	Maintain all roadway striping such that it is clearly visible under mid-day sunlight or full roadway lighting.	Not later than 30 Days after notification.

No.	Description	Performance Requirement	Repair Response
9.	Fencing	Control of Access limits to be maintained at all times.	Temporary repairs within 24 hours. Permanent repairs within five Days.
10.	Signs	Repair or replace	Immediately remove hazards to public or protect in place. A temporary sign must be in place within two hours for any regulatory signs. Repair or replace within seven Days.
11.	Homeless Removal	Vacate homeless from the Work area with the assistance of law enforcement. Remove belongings/debris and hazardous items if encountered. Sanitize area as needed.	Within seven Days after notification.
12.	Traffic Signals	All signals including cabinets, signal supports, wiring, lenses, and detection loops must be functional, aligned, structurally sound, and must have a continuous power supply. Cabinet electronics are not included.	Temporary repairs within two hours, N/A for detection loops. Repair or replace within two weeks.
13.	CCTV Cameras	CCTV cameras are operating and functioning as designed and the electrical supply is maintained.	Temporary repairs within 24 hours for restoration of electrical supply or communications, N/A for cameras. Permanent repairs within 72 hours.
14.	Fiber	The network including fiber optic communications, Ethernet switches, and power conductors to field devices are functioning as designed and providing necessary communications.	Temporary repairs within 24 hours for restoration of fiber communications, switches, or electrical supply. Permanent repairs within 72 hours.
15.	Pull boxes	Electrical supply is maintained from point of service provider.	Temporary repairs within 48 hours. Permanent repair within one month.

1

TPA 112-1 Quality Assurance Program

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TPA 112-1.1 ADOT Quality Assurance Program

See attached

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Arizona Department of Transportation

Quality Assurance Program

Projects Utilizing Contractor Performed Acceptance



November 24, 2020

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Appendix A
Federal Regulations and Guidance:
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Non-Regulatory Supplement NS 23 CFR Part 637B
FHWA Technical Advisory 6120.3
FHWA-HRT-12-039

Appendix B
Abbreviations and Definitions

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Letter to Users

The Arizona Department of Transportation has developed this Quality Assurance Program for Projects utilizing Contractor performed acceptance. This Program addresses how ADOT will deliver construction quality assurance when the Contractor, or an Independent Quality Firm hired by the Contractor, performs frontline Quality Acceptance inspection and testing with ADOT performing Owner Verification. It provides a systematic and consistent approach to achieving quality on these Projects through the implementation of Contractor Quality Control, Contractor Quality Acceptance, ADOT Owner Verification, ADOT Independent Assurance, and ADOT referee functions on a Project.

Sincerely,
Jesús A. Sandoval-Gil, MS, PhD, PE
State Materials Engineer

Please Note: Information pertaining to updates, changes to this document and reference materials being hyperlinked throughout the document should be included here.

Formal references may be included in this document as needed.

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Approval

DocuSigned by: Jesus A Sandoval-Gil F9A6FBCB94A8460...	DocuSigned by: Ammon Heier FEF6E4414BAF4AE...
Signature	Signature
Jesús A. Sandoval-Gil, MS, PhD, PE	Ammon Heier, PE
Name	Name
State Materials Engineer	Area Engineer
Title	Title
ADOT	FHWA
Agency	Agency
11/24/2020	11/24/2020
Date	Date

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Chapter 1

Scope

1.1 General

The Arizona Department of Transportation (ADOT) has developed this Quality Assurance Program (QAP) for Projects utilizing Contractor performed inspection and testing in the acceptance decision. This Program has been established to be compliant with the Code of Federal Regulations (CFR) 23 CFR 637, Subpart B – "Quality Assurance Procedure for Construction", Federal Highway Administration (FHWA) Technical Advisory 6120.3, and other guidance documents listed in Appendix A.

This Program provides our customers with products and services that meet mutually agreed upon requirements. The intent of this Program is to ensure all materials and workmanship incorporated into ADOT Projects satisfy specification requirements and to provide the highest degree of confidence in the reliability of tests and inspections for ADOT Projects. The purpose of this Program is to provide statewide consistency for Projects when the Contractor's test results are used in the acceptance decision, regardless of how the Project is funded. It presents requirements relating to Quality Acceptance (QA) procedures and Owner Verification (OV) procedures.

This Program is administered by the ADOT Materials Group Quality Assurance Section through the authority of the ADOT State Materials Engineer. Revisions to this Program will be issued by the ADOT Materials Group Quality Assurance Section through the authority of the ADOT State Materials Engineer. Any modification to this QAP requires review and approval by the ADOT Materials Group Quality Assurance Section through the authority of the ADOT State Materials Engineer and FHWA.

Appendix B shows the list of abbreviations and definitions used in this Program.

1.2 Program Components

This Program is comprised of two major components. These are the Acceptance Program and the Independent Assurance (IA) program. The Acceptance Program includes QA performed by the Contractor and OV performed by ADOT, or its designee. The Program allows the use of Contractor performed QA as part of the Acceptance Program, when Contractor QA test results are verified by ADOT's OV test results. The IA program consists of IA performed by ADOT, or its designee, to evaluate the equipment and personnel performing acceptance testing.

23 CFR 637, Subpart B defines quality control as: All contractor/vendor operational techniques and activities that are performed or conducted to fulfill the contract requirements. 23 CFR 637, Subpart B also allows for quality control, as defined in the CFR, sampling and testing results to be used as part of the acceptance decision. This Program differentiates Contractor QA from

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Contractor Quality Control (QC). Within this Program, Contractor QC cannot be used as part of the Acceptance Program and is not subject to the IA program. Figure 1.2 shows the relationship between the different components of this QAP.

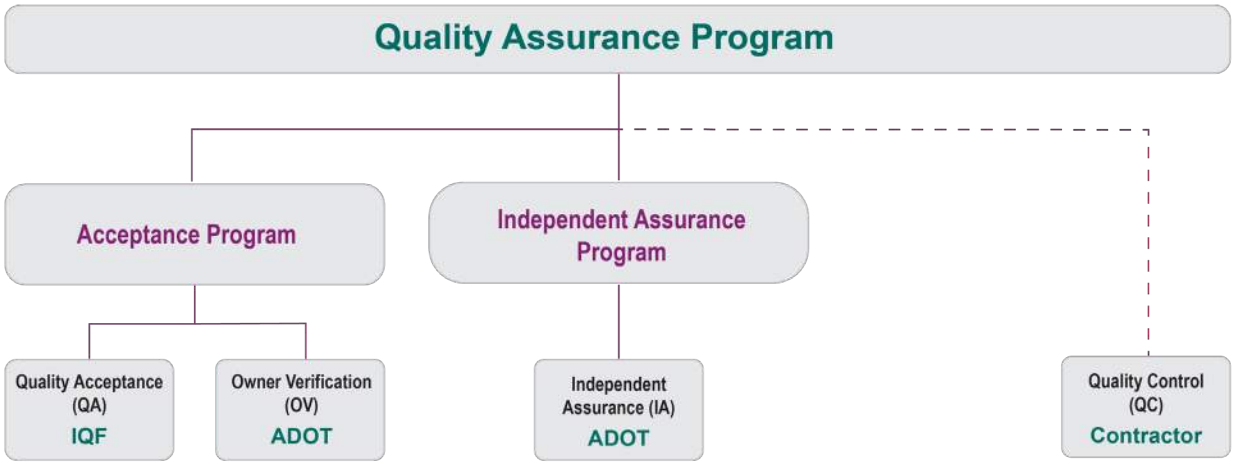


Figure 1.2: Components of this Quality Assurance Program

Chapter 2 addresses the Contractor QC and includes a brief description of the approach to QC. The Contract Documents will provide detailed QC requirements that shall be included in the Contractor's Construction Quality Management Plan (CQMP). Chapter 3 addresses the Acceptance Program and includes detailed Contractor QA requirements and the approach to ADOT OV. The Contract Documents will provide detailed Contractor QA requirements that shall be included in the CQMP. Chapter 4 provides detailed requirements for the ADOT IA program.

1.3 Construction Quality Management Plan

The Contractor shall create a CQMP that describes the policies, procedures, and staffing required to manage construction quality in accordance with the Contract Documents. The Contractor shall define all QC processes and procedures in the CQMP that will achieve compliance with the Contract Documents. The Contractor, or an Independent Quality Firm (IQF) hired by the Contractor, shall also define Contractor QA processes and procedures for both materials testing and comprehensive product inspection which will be used in acceptance decisions as described in this Program. The CQMP is required to be approved by ADOT prior to the start of any construction activities.

1.4 Owner Verification Testing and Inspection Plan

ADOT will develop an Owner Verification Testing and Inspection Plan (OVTIP) that describes the processes and procedures for ADOT to perform OV of the Contractor's QA inspection and testing. Detailed ADOT OV criteria are in section 3.11.

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1.5 Conflict of Interest

There are six functions identified in the QAP, these functions and the responsible parties are shown below:

- Production; Contractor
- Quality Control; Contractor
- Quality Acceptance; Contractor, or Independent Quality Firm
- Owner Verification; ADOT, or Owner Verification Firm
- Independent Assurance; ADOT
- Referee; ADOT

To avoid a conflict of interest, each Contractor function shall be performed by separate groups or entities, and each ADOT function will be performed by separate ADOT groups. Production, Quality Control, and Quality Acceptance shall be separated by reporting structure, and any additional requirements of the Contract Documents. The OV, IA, and referee functions will only be performed by an ADOT group or an entity contracted directly by ADOT.

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Chapter 2

Quality Control

2.1 General

The Contractor is responsible for the quality of the Work. Project quality will be enhanced through the daily efforts of all workers involved with the Work as described in the CQMP. The Contractor's entire workforce shall actively participate in quality efforts to minimize/eliminate re-Work.

The QC program shall be sufficient in scope to produce only Work compliant with the Contract Documents. The QC program shall also be sufficient in scope to avoid repeated discoveries of Nonconforming Work. Repeated discoveries of Nonconforming Work by the Contractor QA staff, the IQF, ADOT, or an excessive use of Engineering Judgment according to ADOT, will be considered a breakdown of the QC program. Corrective action shall be documented and implemented by the Contractor if there is a breakdown of the QC program. Corrective action may include the revision of existing QC procedures, addition of new QC procedures, re-training of QC personnel, removal and replacement of QC personnel, or other such actions necessary per ADOT, to restore the effectiveness of the QC program.

QC efforts are not part of the Acceptance Program.

2.2 Contractor's Quality Control Requirements

The Contractor's CQMP shall comply with the QC requirements of this Program and the Contract Documents.

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Chapter 3

Acceptance Program

3.1 General

The Acceptance Program includes both the Contractor's QA and ADOT's OV functions. Regarding materials testing, Contractor QA test results are only allowed to be used in the acceptance decision if they are verified by ADOT's OV test results. Regarding workmanship and other inspection-driven features of the Work, Contractor QA inspection observations and conclusions shall only be used in the acceptance decision if the processes, procedures, and documentation, per the approved CQMP, are verified by ADOT's OV functions. Only Contractor QA performed per the approved CQMP may be used in any acceptance decisions.

Contractor QA shall be performed by Contractor staff or an IQF hired by the Contractor as defined in the Contract Documents. Only an independent group of Contractor staff may perform the Contractor QA role. The independent group of Contractor staff is subject to approval by ADOT. In this Program, it is assumed that the Contractor has hired an IQF to perform the Contractor QA function and that firm is led by a Construction Independent Quality Manager (CIQM). If the Contractor QA is being performed in-house, then the same requirements would apply to the Contractor's in-house Contractor QA team and their in-house Contractor QA manager.

3.2 Qualification of Personnel

All personnel performing sampling and testing shall meet the qualification requirements shown below for the appropriate field in which sampling and testing is being performed.

Soils and Aggregate	
<u>Field</u> Arizona Technical Testing Institute (ATTI) "Field" certification.	<u>Laboratory</u> Arizona Technical Testing Institute (ATTI) "Laboratory Soils/Aggregate" certification.
Asphaltic Concrete	
<u>Field</u> Arizona Technical Testing Institute (ATTI) "Field" certification.	<u>Laboratory</u> Arizona Technical Testing Institute (ATTI) "Asphalt" certification.
Concrete	
<u>Field</u> American Concrete Institute (ACI) "Concrete Field Testing Technician Grade I" certification.	<u>Laboratory</u> American Concrete Institute (ACI) "Concrete Strength Testing Technician" certification.

All personnel performing sampling and testing shall be supervised by an individual meeting the

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requirements below for the appropriate field in which sampling and testing is being supervised.

<table>
<tr><td colspan="2">Soils and Aggregate</td></tr>
<tr><td><u>Field</u>
Arizona Technical Testing Institute (ATTI) “Field” certification plus one of (a) through (g) below</td><td><u>Laboratory</u>
Arizona Technical Testing Institute (ATTI) “Laboratory Soils/Aggregate” certification plus one of (a) through (g) below.</td></tr>
<tr><td colspan="2">Asphaltic Concrete</td></tr>
<tr><td><u>Field</u>
Arizona Technical Testing Institute (ATTI) “Field” certification plus one of (a) through (g) below.</td><td><u>Laboratory</u>
Arizona Technical Testing Institute (ATTI) “Asphalt” certification plus one of (a) through (g) below.</td></tr>
<tr><td colspan="2">Concrete</td></tr>
<tr><td><u>Field</u>
American Concrete Institute (ACI) “Concrete Field Testing Technician Grade I” certification plus one of (a) through (g) below.</td><td><u>Laboratory</u>
American Concrete Institute (ACI) “Concrete Strength Testing Technician” certification plus one of (a) through (g) below.</td></tr>
<tr><td colspan="2">(a) Professional Engineer, registered in the State of Arizona, with one year of highway materials sampling and testing experience acceptable to ADOT.

(b) Engineer-In-Training, certified by the State of Arizona, with two years of highway materials sampling and testing experience acceptable to ADOT.

(c) Obtained a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology, Construction, or related field acceptable to ADOT; and with three years of highway materials sampling and testing experience acceptable to ADOT.

(d) Certified by the National Institute for Certification in Engineering Technologies (NICET) in the Construction Materials Testing field as an Engineering Technician (Level III) or higher in the appropriate subfield in which sampling and testing is being performed.

(e) Certified by NICET in the Transportation Engineering Technology field as an Engineering Technician (Level III) or higher in the Highway Materials subfield.

(f) Certified by NICET as a Certified Engineering Technologist, or higher, in Civil Engineering Technology with five years of highway materials sampling and testing experience acceptable to ADOT.

(g) An individual with eight years of highway materials sampling and testing, and construction, experience acceptable to ADOT.</td></tr>
</table>

In the absence of ATTI certification, individuals who currently possess active certification(s)

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under another state's certification program may be allowed to perform Project activities that would normally be covered by ATTI certification as part of the acceptance decision on a provisional basis. This provisional status requires prior approval by ADOT on a case-by-case basis, and is only applicable to the individual Project. To request provisional approval, the following information shall be submitted to ADOT a minimum of 14 Days before the individual starts sampling and testing on the Project:

- Name of the individual.
- Name of the appropriately certified person who will be supervising the individual's Work.
- Description of the Work to be performed by the individual, including the type of sampling and testing the individual is expected to perform.
- List of applicable certifications currently held under another state's certification program and expiration dates.
- Differences between the other state certifications and the corresponding ATTI certifications.
- Description of how these differences will be managed to avoid errors.

Any authorized provisional approval will be in effect for a maximum of six (6) months from the time the individual begins working on the Project. By the time this six-month period has elapsed, the individual shall have obtained the appropriate ATTI certification(s) to be allowed to continue sampling and testing or materials related inspection on the Project. While in provisional status, such individuals shall be under the direct supervision of someone who has the appropriate ATTI certification(s). The IQF shall obtain this provisional approval from ADOT, document the certification status of these individuals, and ensure the individuals obtain the appropriate ATTI certification(s) within the time allotted. Individuals receiving provisional allowance to perform acceptance Work shall be observed by ADOT's IA program within the first 14 days from the time the individual begins sampling and testing on the Project.

Inspectors performing acceptance inspections on precast concrete Elements shall have Precast Concrete Institute (PCI) Level II certification.

Inspectors performing acceptance inspections on either Freeway Management System (FMS), lighting, or signals shall have both International Municipal Signal Association (IMSA) Traffic Signals Technician Level II and IMSA Fiber Optic Technician Level II certifications.

Inspectors accepting traffic control set ups shall have American Traffic Safety Services Association (ATSSA) Traffic Control Supervisor (TCS) certification.

Any person accepting asphaltic concrete binder shall have the National Binder Technician Certification (NBTC).

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3.3 Qualification of Laboratories

All laboratories are required to be approved by ADOT prior to performing sampling and testing activities for an ADOT Project. The "ADOT System for the Evaluation of Testing Laboratories" details the requirements that laboratories shall satisfy in order to be considered for approval by ADOT. Laboratories which have been approved to perform sampling and testing activities on ADOT Projects are listed in the ADOT "Directory of Approved Materials Testing Laboratories". Included in that directory are the individual tests for which a laboratory has been approved. In addition to the R18 Quality Management System Criteria, laboratories performing sampling and testing activities for an ADOT Project under this Program shall also obtain American Association of State Highway and Transportation Officials (AASHTO) re:source accreditation for the following Quality Management Systems:

- C1077 (Aggregate)
- C1077 (Concrete)
- D3666 (Aggregate)
- D3666 (Asphalt Mixture)
- D3740 (Soil)
- E329 (Aggregate)
- E329 (Asphalt Mixture)
- E329 (Concrete)
- E329 (Soil)

Both AASHTO re:source accreditation and ADOT approval must be received for all test methods that are to be performed on an ADOT Project.

In this Program, laboratories are not required to participate in the ADOT Proficiency Sample Program. This is due to the already required AASHTO re:source and Cement and Concrete Reference Laboratory (CCRL) proficiency sample programs, as well as the ongoing ADOT verification per this Program.

3.3.1 ADOT Laboratory Inspection

All independent, Contractor, materials supplier, government, and other testing laboratories desiring to perform testing activities for ADOT shall submit to an ADOT inspection as specified in the "ADOT System for the Evaluation of Testing Laboratories". The inspection considers those elements of service that the respective laboratory proposes to offer to ADOT. This requirement includes laboratories submitting asphaltic concrete mix designs and those performing acceptance and referee testing for ADOT. A current (within 18 months) passing ADOT inspection is one of the initial and ongoing conditions required for, and to maintain, ADOT approval.

ADOT inspections include both an equipment inspection and a procedural inspection.

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A written inspection report will be issued by ADOT to the laboratory that has been inspected. The laboratory shall provide ADOT with satisfactory responses to the noted deficiencies within 30 days of the report issuance. The responses shall provide satisfactory evidence that all significant deficiencies were corrected or that corrective action is in progress. The laboratory's inspection and responses will be considered when evaluating ADOT eligibility.

3.3.1.1 ADOT Laboratory Equipment Inspection

The equipment inspection will consist of checking dimensional, calibration, and specification conformance of all apparatus and equipment required by the test procedures contained in "ADOT's Materials Testing Manual", and in other applicable specifications. Equipment related documentation, required by AASHTO R18, is also checked during this inspection. This inspection is not a calibration service for non-ADOT laboratories. Any equipment found unacceptable shall be repaired, properly calibrated, or removed from service at the expense of the owner laboratory. Laboratory facilities will also be checked for compliance with applicable standards, such as, proper temperature and humidity control. Documentation of the calibration and verification of equipment used in field testing which is not available during the inspection will be reviewed for compliance with applicable requirements.

3.3.1.2 ADOT Procedural Inspection

The procedural inspection serves as a tool to evaluate the performance of laboratory technicians when performing tests in accordance with the "ADOT Materials Testing Manual" or other applicable specifications. ADOT, AASHTO, and American Society for Testing and Materials (ASTM) test methods referenced in the "ADOT Materials Testing Manual" will be observed. If ADOT's test methods deviate from those given in a similar AASHTO or ASTM procedure, ADOT's Materials Testing Manual will govern.

The inspection formats will generally conform to the techniques employed by AASHTO re:source and the CCRL, as appropriate. When a departure from the requirements of a test method is observed by the inspectors, they will point it out to the laboratory personnel so that immediate corrections can be made if possible. The inspectors will present a summary of their findings and identify deficiencies requiring corrective action at an informal exit review where any deficiencies discovered can be discussed openly. It is requested that the laboratory manager and supervising engineer be present at the exit review.

3.4 Qualification of Equipment

All equipment used by any technician shall be in the active inventory of an AASHTO accredited and ADOT approved laboratory. Actual calibration records for each specific inventory item shall be current and provided upon request. All equipment and apparatus shall be inspected and found acceptable. All equipment and apparatus shall be maintained in good working order.

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All equipment and apparatus shall be inspected, calibrated, and verified per the requirements of this Program, and the requirements of ADOT's "Equipment Calibration and Verification" document located in the "ADOT Material Testing Manual".

Inspection of equipment and apparatus shall be performed by either:

- An AASHTO accredited laboratory that has been approved by ADOT, or:
- An individual or company who, as a business, performs inspection and calibration of sampling and testing equipment.

Inspections and calibrations shall be performed in accordance with established ADOT, AASHTO, ASTM, and National Institute of Standards and Technology (NIST) specifications. Proper calibration equipment that is traceable to NIST standards shall be used.

3.5 Quantities of Material and Work Elements

The IQF shall continuously track and record the quantities of all materials and Work Elements incorporated into the Project. The IQF shall also continuously track and record the number of all samples and tests performed on the Project. Monthly, the IQF shall reconcile their accepted quantities with the quantities of all materials and Work Elements incorporated into the Project. Monthly, the IQF shall submit a detailed report to ADOT that, at a minimum, includes:

- The total (current month and Project total to date) number of samples and tests performed, the total (current month and Project total to date) number of required samples and tests, the total (current month and Project total to date) quantity of material incorporated into the project, the minimum sampling frequency, unit of measurement, and the sampling point, all for each individual combination of: specification section, material, type of test required, and Material Code. An example of one of these combinations is shown below:

Spec.	Mat.	Mat. Code	Type Code	Type of Test	Samp. Point	Min Samp. Freq.	Unit of Meas.	Quant. this Month	Tests Req. This Month	Tests Perf. This Month	Total Quant. to Date	Total Tests Req. to Date	Total Tests Perf. to Date
501	Bedding Material for Concrete Pipe	BM	CP	Compaction	In-Place	One per 50 Cubic Yards	Cubic Yards	#	#	#	#	#	#

- The total quantities (current month and Project total to date) of each and every Work Element incorporated into the Project. For this report, these Work Elements are individual bid items typically found on ADOT projects, and any additional, or more detailed, Project specific items.

ADOT will use the report to verify the compliance of both the IQF and ADOT testing

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frequencies. The CQMP shall define how the IQF will accurately track, record, and report the quantities of all materials and Work Elements incorporated into the Project. At the beginning of the Project, and included in the CQMP, the IQF shall submit the formats and detailed examples of the report listed above to ADOT, for ADOT's review and approval.

3.6 Sampling and Testing

This section provides requirements for acceptance sampling and testing.

3.6.1 Types and Uses

Sampling is either random or fixed, depending on whether the location was selected randomly (random) or if a specific location was subjectively identified (fixed). Sampling is also either independent or dependent, based on whether the location was independently selected (independent) or whether it is based on the location of another sample, e.g. a split sample (dependent). Only ADOT and IQF samples selected randomly and independently shall be used to meet the acceptance testing minimum frequency requirements of the sampling Guide Schedule. This includes both the items shown in Appendix D, as well as any Project specific sampling and testing frequency requirements. A failing IQF random independent test requires both a passing fixed test at the original failing location and an additional passing random independent test within the unit or quantity of material being accepted.

The IQF shall perform additional fixed tests when the quality of material is questionable. If these additional fixed tests fail, they shall be addressed in the same manner as a failing random independent test. Fixed tests do not count towards meeting the Guide Schedule testing frequencies.

A comparison process for performing and analyzing split samples between ADOT and IQF is required during the initial implementation of, and throughout, this Program to ensure that ADOT and IQF equipment and testing procedures are in alignment. ADOT will determine how many and which type of tests will be used during this comparison process. These test results will be analyzed by ADOT and shared with the IQF to assure laboratory and technician test results compare favorably. This process will help provide initial alignment of the ADOT and IQF laboratories and testing procedures. The IQF shall commit the resources and sample material necessary to accommodate splitting alignment activities described in the Program. When the allowable variation limits in Appendix C of this Program are exceeded, corrective actions for either or both parties will be identified and incorporated as appropriate.

Split samples may also be performed throughout the life of the Project to investigate non-validating material categories and to verify or realign testing equipment and personnel.

3.6.2 Frequencies, Labeling, and Representative Quantities

The quality of materials and construction incorporated into the Project are controlled by

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acceptance sampling, acceptance testing, and acceptance inspection activities. Acceptance test results and acceptance inspection results shall be accepted based on compliance with the specifications and the Contract Documents. The IQF shall randomly sample at prescribed frequencies, based on the sampling Guide Schedule, that meet or exceed those presented in the Appendix D. The Project's sampling Guide Schedule shall be published in the CQMP.

The IQF's sampling Guide Schedule shall apply to sampling frequencies only for acceptance sampling and testing. It shall indicate the material type to be sampled, the controlling specification(s), the frequency of sampling, the location where sampling will occur, the testing to be performed, and the acceptance criteria. The IQF's acceptance samples shall be obtained randomly. The Contractor and IQF shall use the Material Codes as shown in Appendix E. All Material Codes and material types to be used on the Project shall be included in the CQMP. The Contractor or IQF may request to modify Material Codes or material types based on specific Project needs. This request is subject to ADOT's approval. ADOT may alter the Material Codes in Appendix E at any time to accommodate the separation of materials into appropriate categories for statistical validation or verification. The IQF shall also label samples and sample tickets in accordance with the example sample ticket in Appendix E. At the beginning of the Project, and included in the CQMP, the IQF shall submit the formats and detailed examples of sample tickets to be used to ADOT, for ADOT's approval.

Every IQF sample is a representative sample that represents quality of a larger quantity of material or Element of Work. The test result for each individual test performed shall be applied to the larger quantity of material or Work that the individual test result represents. This applies to all sampling and testing per the Guide Schedule, as well as any sampling, testing, or activities with required frequencies, identified in the CQMP or Contract Documents.

The CQMP shall define the methodology that is used by the IQF to define the specific quantity of material or Work that each representative sample represents from the larger quantity of material or Work.

This includes, but is not limited to materials that are sampled on a time designated lot basis. The CQMP shall define the methodology to estimate the relationship between the production quantity and the time required to produce such quantity. This relationship is required for the IQF to determine the recommended number of acceptance samples. The CQMP shall also define how the sampling times are determined, and quantity of material each sample represents.

3.6.3 Notification

Every week, the Contractor shall update and provide the IQF and ADOT with an accurate rolling 3 week look ahead schedule consistent with the current complete Project schedule. This complete Project schedule is often referred to as the Project's complete critical path method schedule. The look ahead schedule shall include all offsite fabrication activities, all offsite inspection activities, and all offsite sampling and testing activates. The look ahead schedule

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shall also include all onsite fabrication activities, all onsite inspection activities, and all onsite sampling and testing activities.

Every day, the Contractor shall provide the IQF and ADOT with an accurate and complete hourly schedule, for any and all sampling and testing that will occur the following day. All sampling and testing requires at a minimum one complete business day notification. The hourly schedule shall include all offsite inspection, sampling, and testing activities. The hourly schedule shall include all onsite inspection, sampling, and testing activities.

3.7 Status of Material Quality

All material incorporated into the Project shall adhere to the Contract Documents. If material is to remain incorporated into the Project that does not adhere to the Contract Documents, Engineering Judgment shall be utilized and properly documented, or the Nonconformance Report (NCR) process shall be completed by the Contractor.

With regard to ADOT and IQF test results, there are multiple possible combinations of passing and failing results. The following describes the process that shall be followed based on the different possible combinations:

3.7.1 Both the IQF and ADOT test results are within specification limits. The material represented by the samples is considered acceptable and may be left in place.

3.7.2 The IQF test results are outside of the specification limits (No ADOT test result or ADOT test results are within the specification limits). The material may be accepted and left in place only if one of the following occurs:

3.7.2.1 The NCR process is completed by the Contractor.

3.7.2.2 The IQF test result indicates reasonable conformance with specification requirements and the IQF exercises Engineering Judgment to accept the material.

3.7.2.3 The IQF test results do not indicate reasonable conformance with specification requirements. The material shall be removed, reworked, or repaired. The failing IQF test result is replaced by two additional IQF passing test results. The first additional passing test shall be a fixed IQF test at the same location as the original failing sample, and the second sample shall be a random independent IQF test within the quantity of material that the initial failing test represented.

Random independent test results representing material prior to any replacement, rework, or repair will be excluded from new statistical analyses.

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3.7.3 The IQF test results are within the specification limits and the ADOT test results are outside of specification limits. The material may be accepted and left in place only if one of the following occurs:

3.7.3.1 The NCR process is completed by the Contractor.

3.7.3.2 The ADOT test result indicates reasonable conformance with the specification requirements and both the IQF exercises Engineering Judgment to accept the material and ADOT concurs with the acceptance of the material based on the IQF's Engineering Judgment.

3.7.3.3 ADOT test results do not indicate reasonable conformance with specification requirement in ADOT's Sole Discretion:

The material shall be removed, reworked, or repaired. The failing ADOT test result is addressed with two additional passing IQF test results. The first additional sample shall be an IQF fixed test at the same location as the original ADOT failing sample, and the second sample shall be a new IQF random sample within the quantity of material that the initial failing ADOT sample represented (the test shall not be any previous IQF test result). Any failing IQF test results during this process shall initiate the start of the process in Section 3.7.2 "The IQF test results are outside of the specification limits (No ADOT test result or ADOT test results are within the specification limits)…". ADOT may conduct an additional tests or samples at any time during this process. Any failing ADOT test result shall require two new additional IQF test results (Section 3.7.3.3 starts from the beginning for each failing result).

Random independent test results representing material prior to any replacement, rework, or repair will be excluded from new statistical analyses.

3.7.4 Both the IQF and ADOT test results are outside of the specification limits. The material may accepted and left in place if one of the following occurs:

3.7.4.1 The NCR process is completed by the Contractor.

3.7.4.2 The IQF and ADOT test result indicates reasonable conformance with the specification requirements and both:

The IQF exercises Engineering Judgment to accept the material (the IQF must exercise Engineering Judgment on both the IQF and ADOT results)

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and ADOT concurs with the acceptance of the material based on the IQF's Engineering Judgment.

3.7.4.3 The ADOT test result indicates reasonable conformance with the specification requirements and the IQF test results do not indicate reasonable conformance with specification requirements:

The material shall be removed, reworked, or repaired. The failing IQF test result is replaced by two additional IQF passing test results. The first additional passing test shall be a fixed IQF test at the same location as the original failing sample, and the second sample shall be a random independent IQF test within the quantity of material that the initial failing test represented.

Random independent test results representing material prior to any replacement, rework, or repair will be excluded from new statistical analyses.

3.7.4.4 The IQF test result indicates reasonable conformance with the specification requirements and the ADOT test results do not indicate reasonable conformance with specification requirements in ADOT's Sole Discretion:

The IQF exercises Engineering Judgment to accept the failing IQF test result material.

The material shall be removed, reworked, or repaired. The failing ADOT test result is addressed with two additional passing IQF test results. The first additional sample shall be an IQF fixed test at the same location as the original ADOT failing sample, and the second sample shall be a new IQF random sample within the quantity of material that the initial failing ADOT sample represented (the test shall not be any previous IQF test result). Any failing IQF test results during this process shall initiate the start of the process Section 3.7.2 "The IQF test results are outside of the specification limits (No ADOT test result or ADOT test results are within the specification limits)…". ADOT may conduct an additional tests or samples at any time during this process. Any failing ADOT test result shall require two new additional IQF test results (Section 3.7.4.4 starts from the beginning for each failing result).

Random independent test results representing material prior to any replacement, rework, or repair will be excluded from new statistical analyses.

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3.7.4.5 The IQF and ADOT test results do not indicate reasonable conformance with specification requirements in ADOT's Sole Discretion:

The material shall be removed, reworked, or repaired. The failing IQF test result is replaced by two additional IQF passing test results. The first additional passing test shall be a fixed IQF test at the same location as the original failing sample, and the second sample shall be a random independent IQF test within the quantity of material that the initial failing test represented.

All random independent test results representing material prior to any replacement, rework, or repair will be excluded from new statistical analyses.

3.8 Engineering Judgment

The use of Engineering Judgment is part of the Acceptance Program and the IQF needs the ability to render decisions in the field regarding the quality of Work performed. Engineering Judgment is accepting any testing result or Work that does not adhere to the Contract Documents. The CQMP shall list any specific Element / characteristic of Work or test attribute that the IQF will be allowed to exercise Engineering Judgment on when accepting test results or Work. ADOT recognizes that the IQF is a section of the Contractor's team working with the Contractor to check for, and determine, compliance with the Contract Documents. ADOT also recognizes that the IQF should be afforded the opportunity, in concert with their independent role, to render Engineering Judgment with respect to appropriate documents for inspection and testing provided that the following criteria are met:

- Engineering Judgment will only be made by the CIQM and / or ADOT. Authority for Engineering Judgment may be delegated with the approval of ADOT.
- Engineering Judgment will be made by a Professional Engineer in the State of Arizona.
- Engineering Judgment to accept material or Work failing to meet the Contract Documents will never be applied solely to promote "partnering" or to help the Contractor. The Project schedule will not be a consideration with respect to the quality delivery of the Project.
- Engineering Judgment to accept materials or Work failing to meet specification requirements will be applied only in cases that will otherwise meet the intent of the design or in cases where the rejection of material would compromise the quality of a more significant item (e.g. by rejecting a load of concrete a structural Element is subject to a cold joint).
- Engineering Judgment will only be applied to individual test results or specific Elements of Work. Patterns of failure will not be accepted and shall be considered a breakdown in QC program. Recurring use of Engineering Judgment for the same plan or specification deviation shall result in process corrections to

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the construction operations to assure material and Work is conforming Contract Documents. Engineering Judgment cannot be used to widen a specification requirement on a continuing basis.

- The individual exercising Engineering Judgment will apply good engineering practices to ensure the quality of accepted material. This may include performing additional tests, an engineering analysis, etc. and will be justified and documented in the Engineering Judgment log.
- Engineering Judgment will be technically sound and justified in the Engineering Judgment log. Engineering Judgment will only utilize localized conditions. Engineering Judgment will not be utilized to waive specifications for conditions that have Project wide implications. The acceptance of material or Work not meeting the Contract Documents in a single instance, at a specific location, will not become a Project wide decision. Each situation will be judged on the merits of its unique characteristics.
- ADOT may, at any time, remove or limit Engineering Judgment authority from any CIQM, or person delegated by the CIQM, if his/her Engineering Judgment is inappropriately exercised, as determined by ADOT.
- ADOT and FHWA have oversight agreements in place that requires specific documentation relating to Nonconforming Work that may remain in place. Any application of Engineering Judgment will be accompanied by appropriate documentation as defined in the CQMP.
- The IQF is encouraged but not required to consult with ADOT prior to making acceptance decisions based on Engineering Judgment.
- IQF personnel shall not be pressured by the Contractor to exercise Engineering Judgment. Nor shall IQF personnel be placed under duress in making their acceptance determinations.

Any of the IQF's acceptance decisions that utilize Engineering Judgment may be rejected by ADOT. ADOT may exercise Engineering Judgment at its Sole Discretion.

3.9 Referee Testing

While expected to occur very rarely, disputes over specific IQF and ADOT test results may be resolved, in a reliable, unbiased manner by referee testing and evaluation performed by ADOT's Materials Group or an independent third-party testing laboratory as appointed by ADOT's Materials Group. The decision by ADOT, or its designee, is final. Referee testing is solely an owner function. Referee testing shall only be allowed when it is specified in the Contract Documents.

The Contractor shall pay for the referee testing of IQF test results. The party whose original test results do not compare with the referee testing results will pay for the referee testing of ADOT test results.

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3.10 Additional Quality Acceptance Requirements

The CQMP shall comply with the requirements in the Contract Documents and this Program.

Monthly, and on a day of the month determined by ADOT, the IQF shall submit to ADOT a certification form. The certification form shall certify that all Elements of Work incorporated in the Project adheres to the Contract Documents. It shall also certify that the monthly Contractor payment amounts whether based on quantities or percent complete is accurate. At the beginning of the Project, and included in the CQMP, the IQF shall submit the format and detailed example of the IQF monthly certification form to ADOT, for ADOT's review and approval. The IQF monthly certification form shall be professionally signed and sealed by the CIQM. The form shall clearly certify that:

- Work incorporated into the Project adheres to the Contract Documents, unless specifically listed on the certification form.
- The IQF is compliant with certification, calibration, and accreditation requirements of the CQMP.
- Work was sampled, tested, inspected, and accepted per the approved CQMP.
- Quantities represented in Contractor's monthly payment request are accurate
- Percentages represented in Contractor's monthly payment request are accurate.

"Certificates of Compliance" and "Certificates of Analysis" are required for certain materials prior to their incorporation into the Project. Certificates shall adhere to the requirements of section 106.05 ADOT Standard Specifications and ADOT's "Series 1000 Certificates". At a minimum, all items listed in Figure 3 of "Series 1000 Certificates" and the items requiring certificates per Appendix D, shall require certificates. The Project specific sampling and testing Guide Schedule shall reflect the specific items or components, in addition to those in Appendix D, that are to be accepted based by certification. The CQMP shall define a clear and detailed process defining how the IQF will accurately track, record, and report the acceptance of materials based on certificates and how they accurately will match the certificates to all materials being accepted. Monthly, the IQF shall submit a detailed report to ADOT that, at a minimum, includes:

- The total quantities (current month and Project total to date) of items incorporated into the Project that require certificates of compliance or certificates of analysis, for each individual: Work Element, and Guide Schedule combination of specification and material.
- The total quantities (current month and Project total to date) of items

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incorporated into the Project that require certificates of compliance or certificates of analysis, for each individual: Work Element, and Guide Schedule combination of specification and material, that a certificate of compliance or certificate of analysis was received.

- Each individual certification for that month, ordered by Work Element, and Guide Schedule combination of specification and material.

At the beginning of the Project, and included in the CQMP, the IQF shall submit the formats and detailed examples of all items listed above to ADOT, for ADOT's review and approval.

The IQF shall ensure and monthly certify that the Project is compliant with the "Buy America" requirements of 23 CFR 635.410. The CQMP shall define a clear and detailed process defining how the IQF will accurately track, record, and report the compliance with the "Buy America" requirements. Monthly, the IQF shall submit a detailed report to ADOT that clearly demonstrates and justifies compliance with the "Buy America" requirements.

At the beginning of the Project, and included in the CQMP, the IQF shall submit the format and detailed example of the report listed above to ADOT, for ADOT's review and approval.

Unless addressed elsewhere in the Contract Documents, the IQF shall adhere to all inspection, sampling, testing, and acceptance criteria addressed in ADOT's Practice and Procedure Directives (PPD) Manual. A list of ADOT's current PPD's can be found online under "ADOT's Construction and Materials Manuals."

3.11 ADOT Owner Verification Requirements

ADOT, or its designee, will perform OV functions to verify IQF inspections, test results and conclusions.

For materials testing, verification will be achieved through comparisons between IQF test results and ADOT test results, or the observation of IQF test performances. To verify IQF test results, ADOT's testing will be programmatically performed at the levels shown in Appendix F, Owner Verification Levels of Testing Verification, subject to Project specific recommendations or changes made by ADOT. The different levels correspond to different verification requirements of this Program.

For workmanship and inspection activities, ADOT will verify that the IQF is performing the inspection procedures adequately and that the IQF is documenting the results in accordance with the CQMP. In addition to real-time evaluations, ADOT will also conduct audits to verify the Contractor's compliance with the approved CQMP.

ADOT will develop a comprehensive OVTIP for the Project. ADOT's OVTIP will include internal procedures used by ADOT to ensure that the IQF's frontline acceptance activities are performed

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in accordance with the approved CQMP and to verify the IQF's adherence to the CQMP. ADOT will complete the development of the OVTIP in parallel with approval of Contractor's CQMP.

The OVTIP will address following items:

- Methods and procedures that define the authority and responsibility for the administration of the OVTIP.
- Procedures for overseeing the inspection of the Work and procedures for overseeing the IQF's overall compliance with the CQMP and Contract Documents.
- Procedures to ensure that the education, training, and certification of personnel performing OV activities are achieved and maintained.
- Procedures to oversee the status and disposition of any identified Nonconforming Work or any item or process that does not conform to the Contract Documents.
- Measures to ensure that ADOT tools, gauges, instruments, and other measuring and testing devices used in activities affecting quality are properly maintained, controlled, calibrated, certified, and adjusted at specified periods to maintain accuracy within industry standards.
- A system of planned and periodic audits of Contractor's CQMP to determine adherence to and the effectiveness of the CQMP. Audit results will be documented, reviewed, and sent to the Contractor. Follow-up action, including re-audit of deficient areas following corrective action, will be taken where needed.
- A system of planned and periodic audits to determine adherence to and the effectiveness of the OVTIP. Audit results will be documented and reviewed. Follow-up action, including re-audit of deficient areas following corrective action, will be taken where needed.
- Procedures for performing periodic inspections of Work and periodic inspections the IQF inspectors to verify that the Work and IQF are in compliance with the Contract Documents. The procedure will identify a target oversight inspection frequency and methods for performing verification inspections for IQF inspectors.
- Procedures on how ADOT's material sampling and testing will be performed. This includes the process for generating random test locations, tracking material samples, processing material samples, review and approval of test records, and tracking compliance with material testing frequency.
- Procedures for reviewing IQF and ADOT test results for compliance with mutually agreed upon processes and naming conventions to ensure data integrity for accurate statistical analyses.
- Procedures for verifying that only tests performed by qualified IQF testing personnel are submitted to ADOT.
- Procedures for auditing of QC and IQF records, documentation, procedures, and

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processes to verify compliance with the Contract Documents and approved CQMP.

- Procedures for reviewing Portland cement concrete mix designs and hot-mix asphaltic concrete mix designs.
- Target frequencies for the independent sampling and testing that are to be conducted as a part of OV. The initial target frequency may include a higher frequency of testing at the beginning of the Project and may be adjusted, as appropriate, throughout the Project, based on: the observed consistency of the product, the statistical comparison between ADOT and IQF test results, and ADOT's engineering determinations.
- Procedures for ensuring that ADOT testing is performed at the frequencies stipulated in the OVTIP.
- Identification of the platform and data structure of the data management system that will be used to collect, store, and retrieve ADOT test result data.
- Identification of a strategy to coordinate test result data communication between the IQF and ADOT.
- Procedures for performing statistical analyses in compliance with procedures outlined in this Program.
- Procedures for satisfying System Basis IA obligations of this Program.
- The parameters and guidelines used to accept any statistically non-validating material.

3.12 Validation and Verification

IQF sampling, testing, and inspection results are only valid if verification is achieved by ADOT.

Prior to beginning construction, a Project specific risk analysis will be conducted and each material testing procedure expected to be performed by the IQF, and verified by ADOT, will be assigned an ADOT materials testing verification level of 1, 2, or 3. In general, test results that have a stronger correlation with material performance and Elements of construction with greater residual risk to ADOT will utilize a more vigorous verification approach. Test results that do not have a strong correlation to performance and Elements of construction with lower residual risk to ADOT will utilize a less vigorous verification approach. Appendix F lists the programmatic ADOT levels of verification associated with each test method. ADOT may change these verification levels based on specific Project needs. The IQF and Contractor shall comply with any verification levels changed from Appendix F. The IQF shall adhere to the data transfer requirements of Appendix H. Proper and efficient data transfer between the IQF and ADOT is required as part of the Program. Prior to any verification by ADOT, and included in the CQMP, data transfer formats and processes must be submitted by the IQF, and approved by ADOT prior to the start of construction activities.

3.12.1 Level 1 - Statistical Validation and Verification

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When test procedures are performed in the context of construction Elements with high ADOT residual risk, those procedures that are considered primary indicators of performance are assigned materials verification Level 1. For Level 1 procedures, the ADOT testing frequency will be approximately 10%, but not less than 5%, of the IQF's testing frequency. At a minimum, ADOT will perform three tests per quarter per analysis category with at least nine IQF test results.

For Level 1 test procedures, verification is achieved by ADOT through regular and frequent test result validation. Validation involves statistical analyses using test result comparison packages that have been prepared for specific materials during specific time frames. The F-test is used to determine if the ADOT and IQF data population variances are equal, and the t-test is used to determine if their means are equal. From the F- and t- tests, p-values ranging from 0 to 1 are calculated. Appendix F establishes the critical p-value, known as alpha (α), or "Level of Significance", for each material type. When the calculated p-value is above the alpha (α) value shown in appropriate category of Appendix F, the IQF test data has been statistically validated.

Statistical analysis will be reported utilizing only data sets from within a defined time frame. The effective ADOT testing volume for a Level 1 test procedure is intended to represent approximately ten percent (10%) of the respective IQF testing volume; however, this percentage may vary.

Where IQF test data validation is achieved, ADOT will document that the IQF test results have been verified for the given analysis category. Where ADOT test data validation is not achieved, ADOT and the IQF shall jointly investigate the source of the non-validation event.

If the joint investigation finds the quality requirements of the Project have been met, ADOT and the IQF will take the necessary steps to bring the material category into a verified status. It will be ADOT's discretion as to if the IQF test results are valid in these cases, and how they will document the verification.

If the joint investigation finds the quality requirements of the Project have not been met, ADOT and the IQF will use Engineering Judgment or the NCR process to address the quality requirements and take the necessary steps to bring the material category into a verified status.

3.12.2 Level 2 - Independent Verification

When test procedures are performed in the context of construction Elements with high ADOT residual risk, those procedures that are only considered secondary indicators of performance are assigned materials verification Level 2. Test procedures may also be assigned verification Level 2 when testing is performed in the context of construction Elements with lower residual ADOT risk. For Level 2 procedures, the ADOT testing is generally conducted at least once per quarter depending on the IQF's testing frequency and ADOT's residual risk. In some cases, low IQF test frequencies and the timing of construction operations may affect ADOT's ability to conduct Level 2 testing as planned. Depending on actual circumstances, when Level 2 testing

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cannot be conducted as planned, compensatory testing will be conducted at the next practical opportunity. At a minimum, ADOT will perform at least one test per quarter if the IQF has more than 10 tests.

For Level 2 test procedures, verification is achieved by ADOT by obtaining independent ADOT samples and comparing ADOT test results with the corresponding IQF test results. Test result verification is accomplished on a quarterly basis or as dictated by actual construction operations and schedule. If the IQF test results cannot be verified, ADOT and the IQF shall jointly investigate the root cause and bring it back into verification status.

3.12.3 Level 3 - Observation Verification

When test procedures are performed in the context of construction Elements with low ADOT residual risk, or when test procedures will be conducted very infrequently, these procedures are assigned materials verification Level 3. ADOT's OV will be performed through observation of the IQF's test performance once per Project.

For Level 3 test procedures, verification is achieved by ADOT observing the IQF performing the specific test methods. This type verification will occur once per test method, unless otherwise determined necessary by ADOT. If the test procedure cannot be verified, ADOT and the IQF shall jointly investigate the root cause and bring it back into verification status.

3.13 FHWA Reporting

ADOT will submit both quarterly reports, as well as a final certification package, to FHWA.

3.13.1 Quarterly Reports

ADOT will submit quarterly reports to FHWA to demonstrate compliance with this Program. The reporting period for specific pay items or materials is dependent on the pace of construction, the number of tests performed in each analysis category, the time period of the sampling, and the specification and quality requirements.

The FHWA quarterly report will address the following areas:

- Statistical analysis and verification results.
- Non-validation investigations.
- Split sample test results.
- Engineering Judgment log.
- Nonconformance log.
- Certifications and Buy America log.

Monthly, the IQF shall submit all data, results, investigations, results, and logs listed above to

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ADOT, on the day of the month directed by ADOT. At the beginning of the Project, and included in the CQMP, the IQF shall submit the formats and detailed examples of all items listed above to ADOT, for ADOT's Sole Discretion review and approval.

3.13.2 Final Certification of Material Incorporated to the Project

The IQF shall submit a final certification package to ADOT. The final certification package shall include:

- A signed and professionally sealed letter from the CIQM certifying that all sampling, testing, acceptance activities, acceptance documentation, and the Work adheres to this Program, the Contract Documents, and all required Federal Regulations (exceptions per the bullet below).

- An organized and detail report of any and all sampling, testing, acceptance activities, acceptance documentation, and Work that does not adhere to this Program, the Contract Documents, and all required Federal Regulations.

- An organized and detailed report summarizing the total quantities, required number of samples, required number of tests, number of samples taken, and number of tests performed for each combination (per the Guide Schedule) of: specification, material, and type of test(s) required; that is incorporated into the Project.

- An organized and detailed report summarizing: (1) all materials, and their corresponding quantities, incorporated into the Project that required certificates of compliance or certificates of analysis, and (2) the total quantity of each material incorporated into the Project that have documented certificates of compliance or certificates of analysis as part of the quality records.

At the beginning of the Project, and included in the CQMP, the IQF shall submit the formats and detailed examples of all items listed above to ADOT, for ADOT's Sole Discretion review and approval.

ADOT will submit a separate final materials certification package to FHWA that certifies ADOT's compliance with the Program. The final materials certification report will include:

- A certification letter certifying that all ADOT sampling, testing, and acceptance activities were performed in accordance with this Program.
- A summary of the total number of ADOT samples and tests.
- A summary of the statistical analysis and verification results.

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Chapter 4

Independent Assurance Program

4.1 General

23 CFR 637, Subpart B requires the implementation of an IA program. ADOT, or its designee, will implement the IA program as described in this section.

The IA program evaluates the sampling/testing personnel and testing equipment used in acceptance of materials. The CFR allows observations, split sample results, and proficiency sample results as means of evaluating testing personnel within the state's IA program. The IA program allows for the inclusion of calibration checks, split sample results, and proficiency sample results for evaluating acceptance testing equipment. The IA program does not directly determine the acceptability of materials but evaluates all personnel and equipment involved in the acceptance decision.

4.2 ADOT Independent Assurance for Sampling and Testing Personnel

The Program will utilize a "System Basis" IA which is based on evaluating and verifying satisfactory performance by the individuals performing acceptance sampling and testing, and the equipment utilized, for a twelve-month period. The IA program in this Program will be implemented as follows:

Each ADOT and IQF individual who will perform acceptance sampling and testing in the field shall be observed and evaluated on a System Basis, in which ADOT IA personnel verify that sampling and testing is being conducted properly in accordance with the appropriate test methods. Except as approved, in writing, by ADOT in its Sole Discretion, such evaluation shall occur within 30 days of initial service on the Project and every 12 months thereafter.

Each ADOT and IQF individual who will perform acceptance sampling and testing in the laboratory shall be evaluated on a System Basis, in which ADOT IA personnel verify that sampling and testing is being conducted properly in accordance with the appropriate test methods. Except as approved, in writing, by ADOT in its Sole Discretion, such evaluation shall occur within 30 days of initial service and every 12 months thereafter.

ADOT and the IQF shall track the qualification status of all their respective technicians and proactively request and schedule all evaluations. Following the end of each calendar year, ADOT will submit a report to the FHWA documenting activities of the IA "System Basis" program for the Project. The report will include the following information:

- Names and number of technicians performing acceptance sampling and testing the Project.

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- Number of such technicians evaluated by the IA program.
- Number of such technicians that had deviations, as determined by the evaluation.
- Summary of how the deviations were addressed, along with any potential systematic solutions to recurring deficiencies.
- Goals for the upcoming twelve-month period.

Test methods requiring IA sampling and testing are shown in Appendix G.

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Appendix A

Federal Regulations and Guidance:

FEDERAL-AID POLICY GUIDE
October 5, 1995, Transmittal 14

23 CFR 637B
OPI: HNG-23

SUBCHAPTER G - ENGINEERING AND TRAFFIC OPERATIONS
PART 637 - CONSTRUCTION INSPECTION AND APPROVAL

Subpart A - [Reserved]

Subpart B - Quality Assurance Procedures for Construction

Sec.
637.201 Purpose.
637.203 Definitions.
637.205 Policy.
637.207 Quality assurance program.
637.209 Laboratory and sampling and testing personnel qualifications.

Appendix A to Subpart B-Guide Letter of Certification by State Engineer

Authority: 23 U.S.C. 109, 114, and 315; 49 CFR 1.48(b).
Source: 51 FR 40417, Nov. 7, 1986, unless otherwise noted.

Subpart A-[Reserved]

Subpart B-Quality Assurance Procedures for Construction

Sec. 637.201 Purpose.

To prescribe policies, procedures, and guidelines to assure the quality of materials and construction in all Federal-aid highway projects on the National Highway System

Sec. 637.203 Definitions.

(a) Acceptance program. All factors that comprise the State highway agency's (SHA) determination of the quality of the product as specified in the contract requirements. These factors include verification sampling, testing, and inspection and may include results of quality control sampling and testing.

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(b) Independent assurance samples and tests. Activities that are an unbiased and independent evaluation of all the sampling and testing procedures used in the acceptance program. Test procedures used in the acceptance program which are performed in the SHA's central laboratory would not be covered by an independent assurance program.

(c) Proficiency samples. Homogeneous samples that are distributed and tested by two or more laboratories. The test results are compared to assure that the laboratories are obtaining the same results.

(d) Qualified laboratories. Laboratories that are capable as defined by appropriate programs established by each SHA. As a minimum, the qualification program shall include provisions for checking test equipment and the laboratory shall keep records of calibration checks.

(e) Qualified sampling and testing personnel. Personnel who are capable as defined by appropriate programs established by each SHA.

(f) Quality assurance. All those planned and systematic actions necessary to provide confidence that a product or service will satisfy given requirements for quality.

(g) Quality control. All contractor/vendor operational techniques and activities that are performed or conducted to fulfill the contract requirements.

(h) Random sample. A sample drawn from a lot in which each increment in the lot has an equal probability of being chosen.

(I) Vendor. A supplier of project-produced material that is not the contractor.

(j) Verification sampling and testing. Sampling and testing performed to validate the quality of the product.

Sec. 637.205 Policy.

(a) Quality assurance program. Each SHA shall develop a quality assurance program which will assure that the materials and workmanship incorporated into each Federal-aid highway construction project on the NHS are in conformity with the requirements of the approved plans and specifications, including approved changes. The program must meet the criteria in Sec. 637.207, and be approved by the FHWA.

(b) SHA capabilities. The SHA shall maintain an adequate, qualified staff to administer its quality assurance program. The State shall also maintain a central laboratory. The State's central laboratory shall meet the requirements in Sec. 637.209(a)(2).

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(c) Independent assurance program. Independent assurance samples and tests or other procedures shall be performed by qualified sampling and testing personnel employed by the SHA or its designated agent.

(d) Verification sampling and testing. The verification sampling and testing are to be performed by qualified testing personnel employed by the SHA or its designated agent, excluding the contractor and vendor.

(e) Random samples. All samples used for quality control and verification sampling and testing shall be random samples.

Sec. 637.207 Sampling and testing program.

(a) Each SHA's quality assurance program shall provide for an acceptance program and an independent assurance (IA) program consisting of the following:

(1) Acceptance program.

(I) Each SHA's acceptance program shall consist of the following:

(A) Frequency guide schedules for verification sampling and testing which will give general guidance to personnel responsible for the program and allow adaptation to specific project conditions and needs.

(B) Identification of the specific location in the construction or production operation at which verification sampling and testing is to be accomplished. Identification of the specific attributes to be inspected which reflect the quality of the finished product.

(ii) Quality control sampling and testing results may be used as part of the acceptance decision provided that:

(A) The sampling and testing has been performed by qualified laboratories and qualified sampling and testing personnel.

(B) The quality of the material has been validated by the verification testing and sampling. The verification sampling shall be performed on samples that are taken independently of the quality control samples.

(c) The quality control sampling and testing is evaluated by an IA program.

(iii) If the results from the quality control sampling and testing are used in the acceptance program, the SHA shall establish a dispute resolution system. The dispute resolution system shall address the resolution of discrepancies occurring between the verification sampling and

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testing and the quality control sampling and testing. The dispute resolution system may be administered entirely within the SHA.

(2) The IA program shall evaluate the qualified sampling and testing personnel and the testing equipment. The program shall cover sampling procedures, testing procedures, and testing equipment. Each IA program shall include a schedule of frequency for IA evaluation. The schedule may be established based on either a project basis or a system basis. The frequency can be based on either a unit of production or on a unit of time.

(I) The testing equipment shall be evaluated by using one or more of the following: Calibration checks, split samples, or proficiency samples.

(ii) Testing personnel shall be evaluated by observations and split samples or proficiency samples.

(iii) A prompt comparison and documentation shall be made of test results obtained by the tester being evaluated and the IA tester. The SHA shall develop guidelines including tolerance limits for the comparison of test results.

(iv) If the SHA uses the system approach to the IA program, the SHA shall provide an annual report to the FHWA summarizing the results of the IA program.

(3) The preparation of a materials certification, conforming in substance to Appendix A of this subpart, shall be submitted to the FHWA Division Administrator for each construction project which is subject to FHWA construction oversight activities.

(b) [Reserved]

Sec. 637.209 Laboratory and sampling and testing personnel qualifications.

(a) Laboratories.

(1) After June 29, 2000, all contractor, vendor, and SHA testing used in the acceptance decision shall be performed by qualified laboratories.

(2) After June 30, 1997, each SHA shall have its central laboratory accredited by the AASHTO Accreditation Program or a comparable laboratory accreditation program approved by the FHWA.

(3) After June 29, 2000, any non-SHA designated laboratory which performs IA sampling and testing shall be accredited in the testing to be performed by the AASHTO Accreditation Program or a comparable laboratory accreditation program approved by the FHWA.

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(4) After June 29, 2000, any non-SHA laboratory that is used in dispute resolution sampling and testing shall be accredited in the testing to be performed by the AASHTO Accreditation Program or a comparable laboratory accreditation program approved by the FHWA.

(b) Sampling and testing personnel. After June 29, 2000,all sampling and testing data to be used in the acceptance decision or the IA program shall be executed by qualified sampling and testing personnel.

(c) Conflict of interest. In order to avoid an appearance of a conflict of interest, any qualified non-SHA laboratory shall perform only one of the following types of testing on the same project: Verification testing, quality control testing, IA testing, or dispute resolution testing.

Appendix A to Subpart B - Guide Letter of Certification by State Engineer

Date
Project No.

This is to certify that:

The results of the tests used in the acceptance program indicate that the materials incorporated in the construction work, and the construction operations controlled by sampling and testing, were in conformity with the approved plans and specifications. (The following sentence should be added if the IA testing frequencies are based on project quantities. All independent assurance samples and tests are within tolerance limits of the samples and tests that are used in the acceptance program.)

Exceptions to the plans and specifications are explained on the back hereof (or on attached sheet).

Director of SHA Laboratory or other appropriate SHA Official.

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Formerly Federal-aid Policy Guide Non-Regulatory Supplement NS 23 CFR, Part 637B, July 19, 2006, Transmittal 36

See Order 1321.1C FHWA Directives Management

1. **POLICY (23 CFR 637.205).** The Division Administrator shall provide appropriate oversight to ensure that the State's quality assurance program is being implemented as approved. At a minimum the oversight should cover:

    a. Materials sampling and testing issues,

    b. Construction inspection issues covering the specific attributes which reflect the quality of the finished product, and

    c. State capabilities - maintaining an adequate, qualified staff to administer the quality assurance program and qualified laboratories.

2. **QUALITY ASSURANCE PROGRAM (23 CFR 637.207)**

    a. The State's acceptance program should provide a reasonable level of inspection to adequately assess the specific attributes which reflect the quality of the finished product. Acceptance inspection should include inspection of the component materials at the time of placement or installation, as well as the workmanship and quality of the finished product.

    b. Samples used in the acceptance decision should be taken as close as possible to where the material is incorporated into the project.

    c. The State should retain control of the verification sampling locations and timing until immediately prior to sampling.

    d. Sampling and testing frequencies may vary from State to State as the quality and uniformity of the material varies. The State may reduce its testing frequency for materials with a history of accurate, uniform test results that consistently meet specification requirements. The rate of testing should be higher on newly developed material sources, sources with questionable quality, sources with a wide range of test results, and sources with failing test results.

    e. When contractor's tests are used in the acceptance decision and the State and contractor test results do not compare, the frequency of verification testing should be increased.

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f. The State should obtain the contractor's test data as soon as it is available, no later than 24 hours after sampling is completed. The State's test results should not be given to the contractor until after the contractor results are received.

g. The State should review the contractor's source documentation as part of the State's quality assurance program.

h. Test results should not be discarded unless it is known that the sampling or testing was flawed. It may be appropriate to perform additional testing when the quality of the material is in question. However, in cases where additional tests are performed, the acceptance and pay criteria need to be adjusted to account for the additional test results.

i. If project materials are used in the Independent Assurance (IA) program, the IA samples should be split samples when possible, or in close proximity to the same location as the samples used in the acceptance decision.

j. Observation of sampling and testing procedures should be included as part of an IA system to evaluate sampling and testing personnel and ensure that test procedures are performed correctly.

k. When using the project approach for IA, the frequency should be approximately 10 percent of the frequency of the tests used in the acceptance decision.

l. When using the system approach for IA, each inspector should be covered once or twice a year.

m. The State is encouraged to develop a Qualified Products List for manufactured materials.

n. The State is encouraged to perform a risk analysis when developing an acceptance program for manufactured items. When performing a risk analysis, the State should consider the use of the product, safety, cost, and historical quality of the product.

o. The State should consider the data from the National Transportation Product Evaluation Program (NTPEP) when developing qualified product lists. See http://www.ntpep.org/.

p. The State is encouraged to report the evaluation of new products to the American Association of State Highway and Transportation Officials Product Evaluation List (APEL). See http://apel.transportation.org/.

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q. The State should consider visual inspection and/or the manufacturer's certification as a basis for accepting small quantities of non-critical material.

3. **LABORATORY AND SAMPLING AND TESTING PERSONNEL QUALIFICATION (23 CFR 637.209)**

a. All test procedures used in the acceptance decision should be in the scope of accreditation for the States central laboratory.

b. The National Cooperation for Laboratory Accreditation (NACLA) "Recognition Procedure" and the National Institute of Standards and Technology (NIST) Interagency Report 7012 (NISTIR 7012), "Technical Requirements for Construction Materials Testing", is the criteria required for the approval of comparable laboratory accreditation programs as indicated in a Notice in the Federal Register on September 22, 2004. The accreditation bodies will be evaluated against the NACLA Recognition Procedure and the Technical Requirements for Construction Materials Testing, and they must be recognized by NACLA with the Technical Requirements for Construction Materials Testing listed within its scope before the accreditation bodies will be approved by the Federal Highway Administration (FHWA). To meet the quality assurance requirements in 23 CFR 637.209(a)(2), (3), and (4), the laboratories' scope of accreditation must indicate that the laboratory was assessed according to the requirements in NISTIR 7012. The NACLA Recognition Procedure is available at http://www.nacla.net/Pdf/Evaluation%20Procedure%20RevA.pdf. The Technical Requirements for Construction Materials Testing is available at http://ts.nist.gov/ts/htdocs/210/gsig/pubs/ir7012.pdf.

c. The following should be used as guidance for reviewing and revising laboratory qualification programs for non-accredited laboratories that provide test results and information used in the acceptance decision:

1. **Personnel**

a. **Supervisors**. Supervisors of testing personnel should have a minimum of 3 years experience in testing of highway construction materials.

b. **Technicians**. Guidance for technician qualification programs is listed in paragraph 3d.

2. **Documentation**. State DOT's should develop test procedures and/or test manuals referencing standard testing procedures. These procedures should also cover handling, identification, conditioning, storage, retention and disposal of test samples.

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3. **Proficiency In Testing**. Testing personnel should be routinely evaluated by observations and split samples or proficiency samples.

4. **Frequency of Assessments**

   a. Laboratory assessments should be made on a 3- to 5-year cycle.

   b. Data from the IA program along with observations during IA tests should be used as part of the ongoing evaluation of the laboratory.

d. The following should be used as guidance for reviewing and revising a technician qualification program:

1. Formal training of personnel including all sampling and testing procedures with instructions on the importance of proper procedures and the significance of test results.

2. Hands-on training to demonstrate proficiency of all sampling and testing to be performed.

3. A period of on-the-job training with a qualified individual to assure familiarity with State DOT procedures.

4. A written examination and demonstrated proficiency of the various sampling and testing methods.

5. Requalification at 3- to 5-year intervals (data from the IA program can be used as one element of requalification).

6. A documented process for retraining or removing personnel that perform the sampling and testing procedures incorrectly.

7. The following are not appropriate criteria for achieving or maintaining qualification status: Grandfathering, the acceptance of a Professional Engineer or Engineer-in-Training certificate, or lifetime qualification.

4. **MATERIALS CERTIFICATE (23 CFR 637 APPENDIX A).** The intent of the material certification is to ensure that the quality of all materials incorporated into the project is in conformance with the plans and specifications, thus ensuring a service life equivalent to the design life. Any material represented by an acceptance test that does not meet the criteria contained in the plans and specifications is considered an exception.

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Exceptions should be investigated to determine if in fact the material is in reasonably close conformity with the plans and specifications.

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Use of Contractor Test Results in the Acceptance Decision, Recommended Quality Measures, and the Identification of Contractor/Department Risks

T 6120.3

August 9, 2004

Par.

1. What is the purpose of this Technical Advisory?
2. Does this Technical Advisory supersede other Federal Highway Administration (FHWA) guidance?
3. What is FHWA's policy on the use of contractor's quality control test results for acceptance?
4. Is there any existing FHWA guidance regarding 23 CFR 637B, the use of quality measures, and the identification of contractor and department risks?
5. What is the background on quality assurance and quality assurance specifications?
6. Where can I find definitions for the terms used within this Technical Advisory?
7. Do any of the terms need additional explanation?
8. What are the requirements for the use of independent samples?
9. Who is required to perform verification sampling and testing?
10. What are the validation procedures performed on independent samples?
11. What are the test method comparison procedures performed on split samples?
12. When should split samples be used?
13. Can contractor split sample test results be used in the acceptance decision?
14. What are the recommended quality measures?
15. What quality measures are not recommended?
16. What are contractor and department risks?
17. Are there any conflicts between American Association of State Highway and Transportation Officials (AASHTO) quality assurance publications and FHWA regulations?
18. Are there any reference materials on quality assurance, risks, and statistics?

1. **What is the purpose of this Technical Advisory?** This Technical Advisory provides guidance and recommendations for the use and validation of contractor's test results for acceptance, the use of quality measures, and the identification of contractor and department risks.

2. **Does this Technical Advisory supersede other Federal Highway Administration (FHWA) guidance?** Yes. This Technical Advisory supersedes previous guidance provided in the following:

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a. *Memorandum from Director, Office of Engineering, to Regional Administrators,* "INFORMATION: Quality Assurance Procedures for Construction - 23 CFR 637 - Sampling for Verification Testing," March 28, 1997.

b. *Memorandum from Chief, Highway Operations Division, to Regional Administrators, Division Administrators, Federal Lands Highway Program Administrator,* "INFORMATION: Quality Assurance Guide Specification and Implementation Manual for Quality Assurance," August 2, 1996.

3. **What is FHWA's policy on the use of contractor's quality control test results for acceptance?** The FHWA policy on the use of contractor's quality control test results for acceptance requires validation of all data not generated by the State transportation department (STD) or its designated agent if used in the acceptance decision. The requirements are codified in Title 23 Code of Federal Regulations Part 637 Subpart B (23 CFR 637B), located at http://www.access.gpo.gov/nara/cfr/waisidx_03/23cfr637_03.html. (Note that the use of STD is in line with 23 CFR 637 B, as of April 1, 2003. In this Technical Advisory, all references to State Highway Agency (SHA) or "agency" have been replaced with STD or "department.")

4. **Is there any existing FHWA guidance regarding 23 CFR 637B, the use of quality measures, and the identification of contractor and department risks?** Yes. Existing FHWA guidance is provided in the following:

a. *FHWA Materials Notebook: Chapter 1 - Materials Sampling and Testing* 23 CFR 637, "23 CFR 637 ACTION: Final Rule and Questions & Answers on the Regulation," https://www.fhwa.dot.gov/pavement/materials_notebook/1sec1.htm.

b. *Publication No. FHWA-RD-02-095* "Optimal Procedures for Quality Assurance Specifications" (see paragraph 18b), http://www.tfhrc.gov/pavement/pccp/pubs/02095/.

c. *Memorandum from Chief, Highway Operations Division, to Resource Center Directors, Division Administrators,* "INFORMATION: Laboratory Qualification," October 9, 1998, https://www.fhwa.dot.gov/pavement/labqual.htm.

d. *Memorandum from Chief, Highway Operations Division, to Resource Center Directors, Division Administrators, Acting Federal Lands Highway Program Administrator,* "INFORMATION: Technician Qualification," July 17, 1998, https://www.fhwa.dot.gov/pavement/techqual.htm.

5. **What is the background on quality assurance and quality assurance specifications?**

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a. One of the fundamental concepts in quality assurance (QA) specifications is the separation of the functions of quality control (QC) and acceptance. In QA specifications, the contractor is responsible for the QC and the STD is responsible for obtaining and conducting verification tests and making the acceptance decision. Although QA is a combination of QC and acceptance, the separation of these two functions is important.

b. Due to the evolutionary nature of QA specifications, QC and acceptance functions often have been combined or intermingled. This has been a major source of confusion. The intermingling of QC and acceptance can be traced to the first statistically based specifications that were used at a time when STDs had technicians at the contractor's materials plants. The STD technicians did testing and determined when the product was acceptable. Contractors rarely did their own QC testing, and they often made changes to the process when necessary based on the STD's test results. Although QC was often recognized as a separate item from acceptance, in reality, little separation occurred.

c. With the downsizing that took place within many STDs in the 1990s, inspection and testing personnel positions were reduced significantly and many technicians were removed from the contractors' materials plants. Although STDs often took it upon themselves to control most aspects of production and construction, reductions in staff made it more important to assign QC where it rightfully belonged so the STD could focus on acceptance testing and inspection. This resulted in the contractor having to conduct the QC tests and the STD examining options for requiring more of its functions to be undertaken by the contractor. Many STDs found ways to include contractor test results in the acceptance decision, and some have questioned why the regulations prohibit the contractor from conducting acceptance testing.

d. The Federal regulations on sampling and testing of materials for construction appear in 23 CFR 637B (see paragraph 18a). These regulations were revised on June 29, 1995. This revision included clarification on the use of contractor test results in an acceptance program. The regulations most recent revision occurred in the *Federal Register* on December 10, 2002.

e. Further evolution of QA specifications has introduced the use of incentive/disincentive provisions and pay adjustment systems that utilize pay factors to adjust the amount paid to a contractor based on the level of quality of the product provided. Several different statistical quality measures were developed and used in order to determine this level of quality. Some examples of quality measures are: percent within limits, percent defective, average deviation, average absolute deviation, conformal index, and moving average. Some of these quality measures have been implemented without fully

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understanding how they apply to acceptance or whether they conform to sound statistical principles.

f. Statistical QA specifications and acceptance procedures have been implemented without fully understanding the risks involved to both the STD and the contractor. The acceptable level of STD risk and contractor risk is a subjective decision that often varies between departments. It is estimated that few departments have developed and evaluated the risk levels associated with their acceptance plans.

g. State planning and research pooled fund study SPR-2(199) "Optimal Acceptance Procedures for Statistical Construction Specifications" was conducted in order to investigate the current use of QA specifications and provide recommendations for statistically sound QA procedures and balancing of risks. The pooled fund study was administered by FHWA and the results provided in publication no. FHWA-RD-02-095, "Optimal Procedures for Quality Assurance Specifications" (see paragraph 18b). This publication provides a guide for developing new or modifying existing acceptance plans and QA specifications.

6. **Where can I find definitions for the terms used within this Technical Advisory?** The definitions for terms used in this Technical Advisory are taken from the following sources (listed in order of precedence), unless otherwise specified:

a. 23 CFR 637 (see paragraph 18a).

b. AASHTO R10 (see paragraph 18e).

c. Transportation Research Board (TRB) Circular (see paragraph 18f).

7. **Do any of the terms need additional explanation?** Some additional explanations of terms are provided below:

a. **Difference Two-Sigma Limit (D2S Limit).** The D2S method compares the contractor and department results from a single split sample. The D2S Limit indicates the maximum acceptable difference between two test results obtained on test portions of the same material (and thus, applies only to split samples), and it is provided for single and multi-laboratory situations. It represents the difference between two individual test results that has approximately a five percent chance of being exceeded if the tests are actually from the same population. The value provided by this procedure is contained in many AASHTO and American Society of Testing and Materials (ASTM) test procedures and is typically listed in the precision and bias statement as "Acceptable Range of Two Test Results" at the end of each test procedure.

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b. ***F*-test.** The *F*-test provides a method for comparing the variances (standard deviations squared, σ^2) of two sets of data by assessing the size of the ratio of the variances. The hypothesis is that the department's tests and the contractor's tests are from the same population and the variability of the two data sets are equal. The intent is to determine whether the differences in the variability of the contractor's tests and the department's tests are larger than might be expected by chance if they came from the same population. The calculated *F*-value is then compared to the critical value (F_{crit}) obtained from a table of *F*-values at a chosen level of significance (α). The *F*-test can be used to compare either an equal or unequal number of contractor vs. department sample sizes.

c. **Operating Characteristics (OC) Curves**

(1) OC curves for statistical tests. OC curves can be developed to indicate the probability of rejecting a hypothesis. This type of curve shows the relation between the probability of rejecting a hypothesis that a sample belongs to a given population with a given characteristic and the actual population value of that characteristic. OC curves can also be developed to show either the probability of not detecting a difference, or detecting a difference, versus the actual difference between the two populations being compared. There are also OC curves available to provide guidance regarding the number of tests needed to achieve a certain probability of detecting a given difference when one actually exists. OC curves that plot the probability of detecting a difference are sometimes called power curves because they plot the power of the statistical test procedure to detect a given difference.

(2) OC curves for acceptance plans. OC curves can also be a graphical representation of an acceptance plan that shows a relationship between the actual quality of a lot and either (a) the probability of its acceptance (for accept/reject acceptance plans), or (b) the probability of its acceptance at various pay levels for acceptance plans that include pay adjustment provisions.

d. **Paired *t*-test.** The paired *t*-test compares contractor and department results from an equal number of split samples. When it is desirable to compare more than one pair of split sample test results, the *t*-test for paired measurements can be used. This test uses the differences between pairs of tests and determines whether the average difference is statistically different from zero. Thus, it is the difference within pairs, not between pairs, that is being tested. The calculated *t*-value is compared to the critical value (t_{crit}) obtained from a table of *t*-values at a specified level of significance and with n-1 degrees of freedom (see *t*-test in paragraph 7e).

e. ***t*-test**

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(1) The *t*-test provides a method for comparing the means of two independent data sets and is used to assess the degree of difference in the means. The null hypothesis is that the department's tests and the contractor's tests are from the same population, and the means of the two data sets are equal. The desire is to determine whether it is reasonable to assume that the contractor's tests came from the same population as the department's tests. The *t*-test can be used to compare either an equal or unequal number of contractor vs. department sample sizes.

(2) Since the values used for the *t*-test are dependent upon whether or not the variances are assumed equal for the two data sets, it is necessary to test the variances (*F*-test) before the means (*t*-test). If it is determined that the variances are assumed to be equal ($F<F_{crit}$), then the *t*-test is conducted based on the two sample sets using a pooled estimate for the variance and pooled degrees of freedom. If the sample variances are determined to be different ($F\geq F_{crit}$), then the *t*-test is conducted using the individual sample variances, the individual sample sizes, and the effective degrees of freedom. The calculated *t*-value is compared to the critical value (t_{crit}) obtained from a table of *t*-values at a specified level of significance.

8. **What are the requirements for the use of independent samples?** The regulation 23 CFR 637B requires the use of independent samples for verification sampling and testing in the acceptance program. In order to be considered independent, each sample must contain independent information reflecting all sources of variability associated with the material, process, sampling, and testing in the test results. This does not prevent split samples from being used in the acceptance decision if the data is used properly to provide validation of independent data (see paragraph 13). Some clarification of using contractor performed sampling for verification sampling and for use in the acceptance decision is found in paragraphs 9 through 13.

9. **Who is required to perform verification sampling and testing?**

a. The regulation requires STD personnel or their representatives to perform the verification sampling and testing. The regulation also specifically indicates that verification sampling and testing cannot be performed by contractor employees. However, there are situations where labor regulations, hazardous conditions, and liability issues may dictate some contractor involvement in verification sampling. In these situations, the involvement of contractor personnel should be limited so that they are not deemed to be in control of the sampling.

(1) The STD can use the services of the contractor's personnel to assist in obtaining independent verification samples when the following requirements are adhered to:

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(a) The verification sample location or time has been randomly selected by the STD and is only given to the contractor immediately prior to sampling.

(b) The contractor's personnel are used only to provide labor to assist in physically obtaining the verification sample of the material.

(c) The STD is present to witness the taking of the verification sample.

(d) Both the STD witness and contractor labor are qualified sampling personnel.

(e) The STD witness controls the sampling process by choosing the location or timing and directing the taking of the verification sample.

(f) The STD witness immediately takes possession of the verification sample.

(2) STD verification sample independence and the intent of 23 CFR 637B are maintained when the above requirements are met. However, these situations should be the exception and not the rule. The verification sampling is expected to be performed entirely by STD personnel or their representative in the majority of situations.

b. Verification testing is required to be performed by the STD or its designated agent, excluding the contractor or vendor; therefore, verification testing cannot be based on contractor performed testing witnessed by the STD.

10. **What are the validation procedures performed on independent samples?** When comparing two data sets, such as department and contractor test results, it is important to compare both the variances and the means. The tests most often used are the *F*-test (comparison of variances) and the *t*-test (comparison of means), which are used together. A procedure that compares a single department test with 4 to 10 contractor tests is sometimes used but not recommended.

a. The *F*-test and *t*-test are the recommended methods because they have more power to detect actual differences than the method that relies on a single department test for the comparison. If either the *F*-test or the *t*-test show a significant difference ($F \geq F_{crit}$ or $t \geq t_{crit}$), it is questionable whether the data does truly come from the same population.

(1) The computational method used for the *t*-test differs depending on if the variances are found to be either equal or not equal. There is a *t*-test that corresponds with finding a difference in variances, $F \geq F_{crit}$ (see paragraph 7e). This has led to instances of incorrectly validating test results by finding no differences in the means ($t < t_{crit}$) after finding differences in the variances ($F \geq F_{crit}$). When a

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difference in the variances is identified then the test results have not been validated, even if no difference in the means has been identified.

(2) The source of the difference should be identified if it is determined that a significant difference is likely between either the variances or the means. The identification of a difference between either variances or means is simply a notice that a difference exists. Therefore, the source of the difference must still be determined.

b. The method of comparing a single department test to a number of contractor tests should not be used. Although simple, it suffers from the fact that only a single department test is used when making the comparison. Any comparison method that is based on a single test result is not effective in detecting differences between data sets. This is due to the high variability that is associated with individual values, as compared with mean values.

11. **What are the test method comparison procedures performed on split samples?**

a. The comparison of a single split sample by using the D2S limits is simple and can be done for each split sample that is obtained. However, since it is based on comparing only single data values, it is not very powerful for identifying differences when they exist. Thus, it cannot detect real differences unless the results are far apart. The appeal of the D2S method lies in its simplicity rather than its power.

b. Due to D2S method limitations, it is recommended that the paired *t*-test (see paragraph 7d) be used on the total accumulated split sample results to allow for a comparison with more discerning power. If either of these comparisons indicates a difference, then an investigation to identify the cause of the difference should be initiated.

12. **When should split samples be used?** The split sampling, testing, and comparison procedures (see paragraph 11) are primarily used as a function of an Independent Assurance (IA) program as outlined in 23 CFR 637B. The use of split samples in the IA program provides a check on testing equipment and procedures. The evaluation of split samples helps to identify where the cause of any differences may occur by isolating the testing components. This complements the QA program and ensures credibility of the testing program.

13. **Can contractor split sample test results be used in the acceptance decision?**

a. In order for contractor split sample test results to be used in the acceptance decision, the contractor's test results used in the acceptance decision must be independently validated by the STD. The validation is not required if the STD

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conducts all of the verification sampling and testing and does not wish to use the contractor's test results in the acceptance decision.

b. The contractor performs QC testing using independently obtained samples. The STD can perform verification testing using its half of the split samples when sampled as required in paragraph 9. The validation is accomplished by comparing the STD verification tests with the contractor's independently sampled QC tests (see Figure 1). The contractor's splits of the verification samples cannot be used for validation purposes because they are not independent of the STD samples. If both sets of split samples are used the only component of variability that can be compared is the testing variability. The split sample components of variability associated with materials, process, and sampling are the same, having come from the same location and sampler.

c. The contractor may or may not test their portion of the split sample. The validation procedure is the same in either case because the contractor's split samples cannot be used for validation (see Figure 1).

d. When the STD uses contractor personnel as labor to take verification samples as required in paragraph 9 and the STD then performs verification testing on these samples, the verification test results may be considered independent of the contractors test results. They may be considered independent because they have been sampled with control by the STD, independently tested, and independently compared to the contractor's independent QC test results (test results that do not include the contractor's set of split samples). Again, in order to be considered independent the two sets of samples must each contain the variability associated with the material, process, sampling, and testing.

e. If the contractor's independently sampled QC test results are validated by the STD verification test results, then the material can be accepted based on either:

(1) The total test results provided by the contractor that combine their independent QC test results and their split of the verification sample test results (see 2.1 in Figure 2),

(2) A combination of independent contractor QC test results excluding their split sample test results and the STD verification split test results (see 2.2 in Figure 2), or

(3) Only the contractor independent QC test results, excluding all split sample test results (see 2.3 in Figure 2).

f. The STD test results from their split portion of the verification samples and the contractor test results from their split portion of the of the verification samples

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cannot be combined for the acceptance decision (see 2.4 in Figure 2). If the two sets of split test results are combined, they are no longer independent and the population of the contractor's independent test results will be biased and result in an invalid comparison. In essence, a double counting of test results would occur if the two sets of split test results were combined. This is true even though the two sets of test results may have different values.

g. A scenario may exist where all samples are taken by the STD and split between the STD and contractor. In this scenario the STD only performs verification tests on a specified percentage of all the split samples they have in their possession. It is important to note, the validation must still be performed on independent sample data. Again, this is accomplished by comparing the STD verification test results with the contractor's independent test results. The contractor's independent test results cannot include the split tests that match with the STD verification tests.

(1) For example, if 11 samples were split, the contractor tests all 11 samples and the STD tests only 3 samples, the 3 STD test results would be compared against the contractor's remaining 8 test results. Independence of the two sets of data is maintained by excluding the contractor's three test results that match the STD test results.

(2) In essence, the validation shown in Figure 1 has occurred when the STD does not test all of the split samples that are in its possession. By taking possession of all the split samples, the STD does have additional material for an investigation if the contractor's results do not validate or for use in a dispute resolution system.

h. Although split samples have physically been taken, it is the method which the data from these samples is analyzed that allows independent validation and their use in the acceptance decision. The independent validation is accomplished by validation procedures performed on independent samples (see paragraph 10), not by test method comparison procedures performed on split samples (see paragraph 11).

14. **What are the recommended quality measures?** The percent within limits (PWL) or percent defective (PD) are the recommended quality measures to be used. It is necessary to measure both the center and spread when characterizing a lot of material. These quality measures use the mean and standard deviation to measure center and spread and then estimate the percentage of the lot that is within, PWL, or outside of, PD, the specification limits. Since PD and PWL can easily be converted to one another simply by subtracting from 100, they are equivalent quality measures. The preference on which of the two quality measures to use, PWL or PD, is typically based on the department's preference to highlight how much of the material meets the requirements as described with PWL, rather than how much is defective as described with PD.

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15. **What quality measures are not recommended?**

a. The average deviation from the target value should not be used as the quality measure for QA acceptance plans. This approach often encourages the contractor to manipulate its process during the production of a lot. In effect, the contractor increases process variability by making frequent adjustments to the process in order to get the average of the test results to be at or near the target value.

b. The average absolute deviation (AAD) from the target value should not be used as the quality measure for QA acceptance plans. To avoid the problem of over-adjusting the process in response to early test results, the average absolute deviation from the target has been used instead of the average deviation. By taking the absolute value of the deviation from the target, the contractor cannot benefit by any strategy other than aiming for the target value. However, the variability of the material may not be adequately measured. Very different sets of test results can give identical AAD values. Not only must it be questioned if equal pay is appropriate for these widely different conditions, the use of AAD fails to document these differences that should be used for future modifications of the specification. Specifically, the means and populations may vary considerably for different sets of test results that can give identical AAD values. These mean and variability differences are disregarded with acceptance based on AAD.

c. The conformal index (CI) should not be used as the quality measure for QA acceptance plans. The CI is very similar in practice to the AAD and has the same disadvantages of not being appropriate for a one-sided specification and potentially having the same CI value for very different test results.

d. The moving average should not be used as the quality measure for QA acceptance plans. The moving average was developed as a QC measure and not developed for use as an acceptance approach. The use of the moving average is not consistent with the use of lot-by-lot acceptance. When acceptance is based on a lot, it is assumed that the various lots are independent of one another. Since each individual test result appears in several moving average calculations, the moving averages are correlated and the results of one average are not independent of the next; therefore, it is difficult to determine when or where a lot begins or ends. In addition, it is not easy to determine pay factors on a lot-by-lot basis since the successive moving averages are correlated and individual lots are not well defined. As a result, acceptance procedures based on moving averages often result in production shut downs and plant adjustments rather than determining appropriate pay factors for specific production lots.

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16. **What are contractor and department risks?**

a. The two types of risks discussed in this section are the seller's (contractor) risk (α) and the buyer's (department) risk (β). The acceptable level of α and β risks is a subjective decision that can vary from department to department. A properly developed QA acceptance plan takes these risks into consideration in a manner that is fair to both the department and contractor. Too large a risk for either party undermines credibility.

(1) Table 1 of the AASHTO Material's Specification R 9-97(2000), "Acceptance Sampling Plans for Highway Construction" (see paragraph 18d), has suggestions for risk levels for both the seller and buyer that range from 0.001 (0.1 percent) to 0.200 (20 percent). It should be noted that large sample quantities, on the order of 10 to 20 or more, are needed to achieve some of the risk levels provided in this table. Larger sample quantities will provide this lower level of risk to both the department and contractor. The selection of the number of samples required by a department may need to be modified based on an analysis of risks.

(2) The sample size is the number of test results used to judge the quality of a lot, and therefore it is directly related to the lot size. One reason to use larger lot sizes is the potential resultant increase in sample size. This tends to provide a much lower level of risk to both the contractor and department. However, an assumption that all of the material and construction processes remain consistent throughout the lot is required. Small lot sizes may not be compatible with large sample sizes due to a large amount of required testing. Larger sample sizes can be used with large lot sizes to decrease risks of making incorrect acceptance decisions. However, the possibility of combining materials from different populations must be taken into consideration. The final decision regarding sample size per lot cannot be made until an evaluation of risks has been completed. An attempt should be made to balance the risk between the contractor and department while holding the risk to a reasonable level. This means that a large number of samples may be required. If the risks cannot be held to a reasonable level for both, the department may have to accept a disproportionate level of risk.

b. The α and β risks are very narrowly defined to occur at only two specific quality levels. The α risk is the probability of rejecting material that is exactly at the acceptable quality level (AQL), while β is the probability of accepting material that is exactly at the rejectable quality level (RQL). Therefore, they do not provide a very good indication of the risks over a wide range of possible quality levels that a contractor may operate. It is necessary to construct an OC curve that illustrates the probability of acceptance for any quality level for the acceptance plan under consideration (see Figure 3) to evaluate how the acceptance plan will actually perform in practice. Another step that is necessary

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to fully evaluate the risks for a pay adjustment acceptance plan is to plot OC curves associated with receiving various pay factors (see Figure 4).

c. The concept of α and β risks derives from statistical hypothesis testing where there is either a right or wrong decision. When α and β risks are applied to materials or construction, they are only truly appropriate for the case of a pass/fail or accept/reject decision. This may lead to considerable confusion if an attempt is made to apply them to the pay adjustment case.

(1) The evaluation of risks becomes more complicated when the acceptance system includes pay adjustment provisions. The α and β risks discussed do not fully incorporate the concept of pay adjustments. By itself, the α risk, defined as the probability that an acceptance plan will incorrectly reject acceptable quality material or construction, cannot reflect the fact that the material or construction may be accepted at any of the possible pay adjustments (full pay, increased or decreased pay). When working with a pay adjustment system, the contractor's risk may also be interpreted as the probability of acceptable material or construction being accepted at less than 100 percent pay. In order to avoid confusion in the terms when the contractor's risk is used in this manner, the risk is here called α_{100}. However, it is computed in the same manner as α at the AQL. In addition, the β risk, defined as the probability that the owner incorrectly accepts rejectable quality material or construction, cannot reflect the impact of pay adjustments on determining the department's risk. When working with a pay adjustment plan, the department's risk may also be interpreted as the probability of accepting rejectable quality material or construction at 100 percent pay or greater. In order to avoid confusion in the terms when the department's risk is used in this manner, it is here called β_{100}. There are α and β type risks (α_{PF} and β_{PF}) associated with any given level of pay adjustment or pay factor (PF) from zero through the bonus chosen by the STD. For example, at a pay factor of 0.90 (90 percent payment) the alpha and beta risks can be represented by α_{90} and β_{90}. Likewise, at a pay factor of 1.05 (bonus of 5 percent) alpha and beta can be represented by α_{105} and β_{105}.

(2) The use of α and β risks alone to evaluate pay adjustment acceptance plans is simply not sufficient. When developing a pay adjustment system the contractor's risk α_{PF} and the department's risk β_{PF} must also be considered for the entire range of risks associated with the system. If only one level of risk is evaluated alone, for example at 100 percent pay, some other risks associated with the system may be too high. Making any change to the system will change all risks involved.

d. An additional method to properly evaluate the risks when pay adjustments are added to the acceptance decision is the expected pay (EP) curve (see Figure 5).

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The EP curve has the advantage of combining all of the possible levels into a single expected or long-term average pay for each given level of quality.

e. The EP curve can also be used to ensure that a department's acceptance plan will pay 100 percent for material that is accepted at the AQL. It is generally agreed that the average pay for AQL material should be 100 percent. An average pay of 100 percent cannot be achieved unless a bonus is allowed. If the department's pay equations or tables are not properly developed, the average pay factor may be above or below 100 percent at the AQL. This would result in the contractor either being underpaid or overpaid on average. If this is the case, the department should determine if an expected pay other than 100 percent is acceptable for AQL material.

f. While the average expected pay shown with an EP curve should be used in addition to considering α and β type risks, the use of EP curves alone is also not sufficient to fully evaluate an acceptance plan. The EP alone is not a complete measure of the likelihood that any individual lot will receive a correct pay factor. The variability of the individual pay factors about the EP curve must also be considered.

g. When a price adjustment acceptance plan is used, it is essential that the department develop an EP curve and multiple OC curves for the probability of receiving various pay factors over the total range of quality levels in addition to considering all levels of α and β type risks. Both OC and EP curves must be developed and analyzed to show how an acceptance plan was designed to function. In all cases, when pay adjustments are used in the acceptance decision, the OC curves should be constructed to confirm that the acceptance procedure is working as desired and, in particular, that the average pay factor at the AQL is 100 percent. The department may also want to look at computer simulation histograms of individual pay factors to obtain a picture of how much variability is associated with the pay factor determination.

h. It is important to note that for PWL or PD acceptance plans, computer simulation is almost always used to develop α and β risks, OC and EP curves. The OCPLOT computer program that was developed as a part of FHWA Demonstration Project No. 89 (see paragraph 18j) is able to develop OC and EP curves, run simulations on the effect of the variability of the individual lot pay factors on the final pay factor determination, and create histograms. This program can be found on the Federal Highway Administration Office of Pavement Technology website at https://www.fhwa.dot.gov/pavement/qasoft.htm.

17. **Are there any conflicts between American Association of State Highway and Transportation Officials (AASHTO) quality assurance publications and FHWA regulations?**

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a. The companion reports "AASHTO Implementation Manual for Quality Assurance" (see paragraph 18h) and "AASHTO Quality Assurance Guide Specification"(see paragraph 18i) were published in February 1996 as reports of the AASHTO Highway Subcommittee on Construction. The Guide Specification is not an official AASHTO Specification and the Implementation Manual is not an official guide or voluntary standard because they have not been balloted and approved by the AASHTO Standing Committee on Highways and the AASHTO Board of Directors.

b. These reports provide uniform guidance to develop and implement quality assurance standard specifications. While these reports substantially follow 23 CFR 637B, some differences exist.

(1) One significant difference is that the reports provide for the use of either paired split (see paragraph 11) or independent (see paragraph 10) sample data comparisons for validation of contractor test results, while 23 CFR 637B allows only independent sample data for validation (see paragraph 8). The use of a paired split sample data comparison only verifies the test procedures and equipment, not the quality of the material (see paragraph 12). The use of independently obtained and tested samples assesses material, process, sampling and testing variability. Therefore, an acceptance program that uses paired split sample comparisons or witnessed tests for validation does not ensure the material quality and does not meet the requirements or intent of 23 CFR 637B.

(2) On the other hand, the use of split samples in the IA program provides a check on testing equipment and procedures. This complements the QA program and ensures the credibility of the testing program. The Implementation Manual offers the option of using either split or independent samples for IA. This does not agree with the regulation that IA testing may only be performed on split samples or proficiency samples. There is value to both split and independent samples; however, they do not provide interchangeable information.

18. **Are there any reference materials on quality assurance, risks, and statistics?** Yes. The following references apply to quality assurance, risks, and statistics.

a. "23 CFR Part 637," *Subpart B - Quality Assurance Procedures for Construction*, Federal Highway Administration, Federal Register, Washington, DC, April 2003, http://www.access.gpo.gov/nara/cfr/waisidx_03/23cfr637_03.html.

b. "Optimal Procedures for Quality Assurance Specifications," *Publication No. FHWA-RD-02-095*, Federal Highway Administration, Washington, DC, April 2003, http://www.tfhrc.gov/pavement/pccp/pubs/02095/.

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c. *StatSoft, Inc., Electronic Statistics Textbook*, StatSoft, Tulsa, OK, 2003, http://www.statsoft.com/textbook/stathome.html.

d. "Acceptance Sampling Plans for Highway Construction," *AASHTO Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Part 1B Specifications: R 9-97 (2000)*, American Association of State Highway and Transportation Officials, 22nd Edition, 2002. (This is currently being evaluated and rewritten under the guidance of NCHRP Project 20-07, Task 164.)

e. "Definition of Terms for Specifications and Procedures," *AASHTO Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Part 1B Specifications: R 10-98 (2002)*, American Association of State Highway and Transportation Officials, 22nd Edition, 2002.

f. "Glossary of Highway Quality Assurance Terms," *Transportation Research Circular No. E-C037*, Transportation Research Board, Washington, DC, April 2002, http://trb.org/news/blurb_detail.asp?id=621.

g. *Introduction to Statistical Quality Control, Fourth Edition*, Douglas C. Montgomery, ISBN 0471316482, John Wiley & Sons, November 2000.

h. *AASHTO Implementation Manual for Quality Assurance*, AASHTO Construction/Materials Quality Assurance Task Force of the AASHTO Highway Subcommittee on Construction, American Association of State Highway and Transportation Officials, February, 1996.

i. *AASHTO Quality Assurance Guide Specification*, AASHTO Construction / Materials Quality Assurance Task Force of the AASHTO Highway Subcommittee on Construction, American Association of State Highway and Transportation Officials, February, 1996.

j. "Quality Assurance Software for the Personal Computer, Demonstration Project 89," *Publication No. FHWA-SA-96-026*, Federal Highway Administration, Washington, DC, May 1996, https://www.fhwa.dot.gov/pavement/qasoft.htm.

k. *Statistical Quality Control, Seventh Edition*, Eugene Grant and Richard Leavenworth, ISBN 0078443547, McGraw-Hill, January 1996.

l. *Quality Control and Industrial Statistics, Fifth Edition*, Acheson J. Duncan, ISBN 0256035350, McGraw-Hill, October 1994.

m. *Report on Limits of Use of Contractor Performed Sampling and Testing in Federal Highway Administration Programs*, Robert Bohman, et al, Federal Highway Administration, March 1993.

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n. *Materials Control and Acceptance - Quality Assurance*, NHI Course Number 134042A, Federal Highway Administration, National Highway Institute, http://www.nhi.fhwa.dot.gov.



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Associate Administrator for Infrastructure

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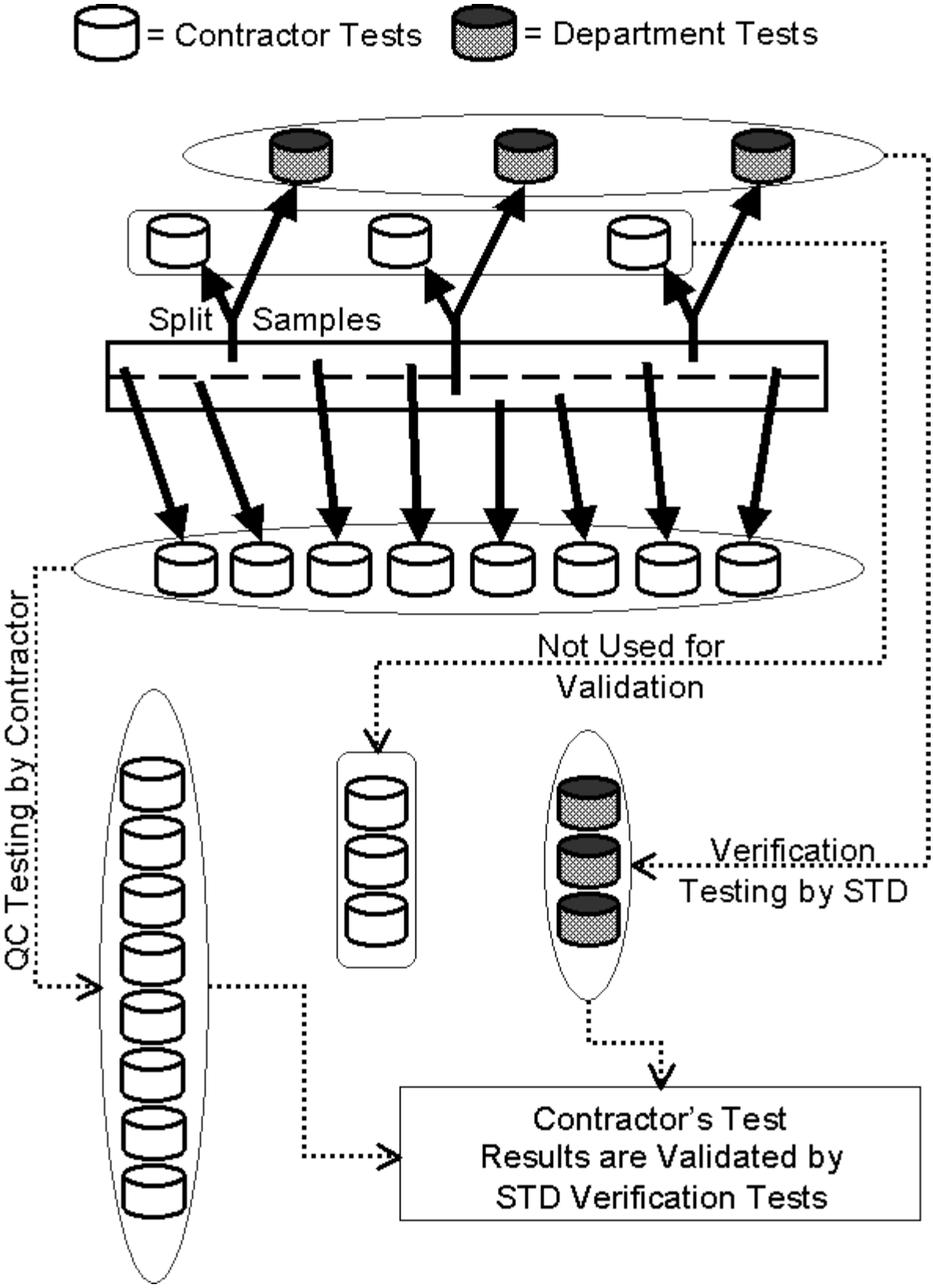


Figure 1 - Validation of Contractor's Tests

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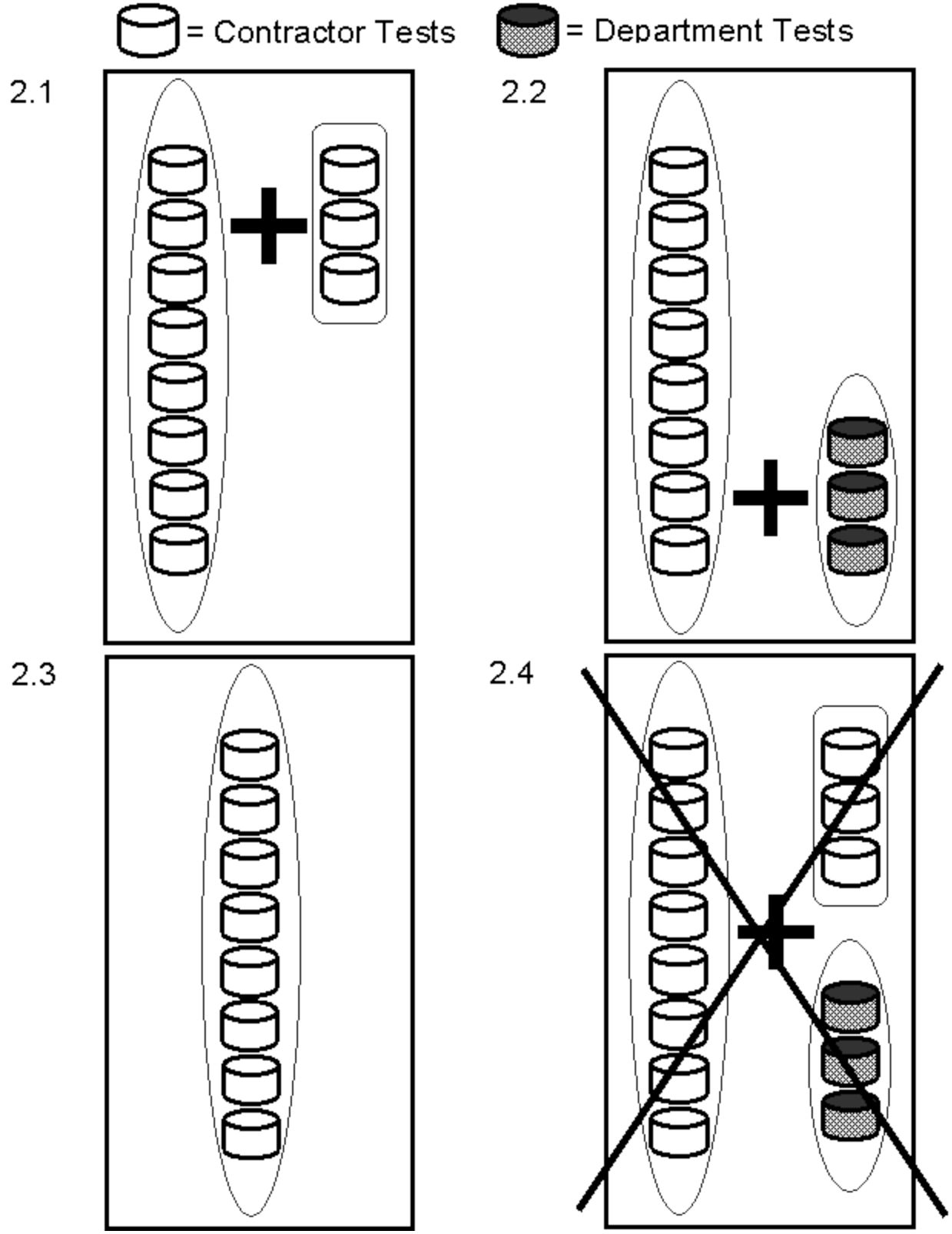


Figure 2 - Acceptance Based on Combined Test Results
(Using Sampling Plan in Figure 1)

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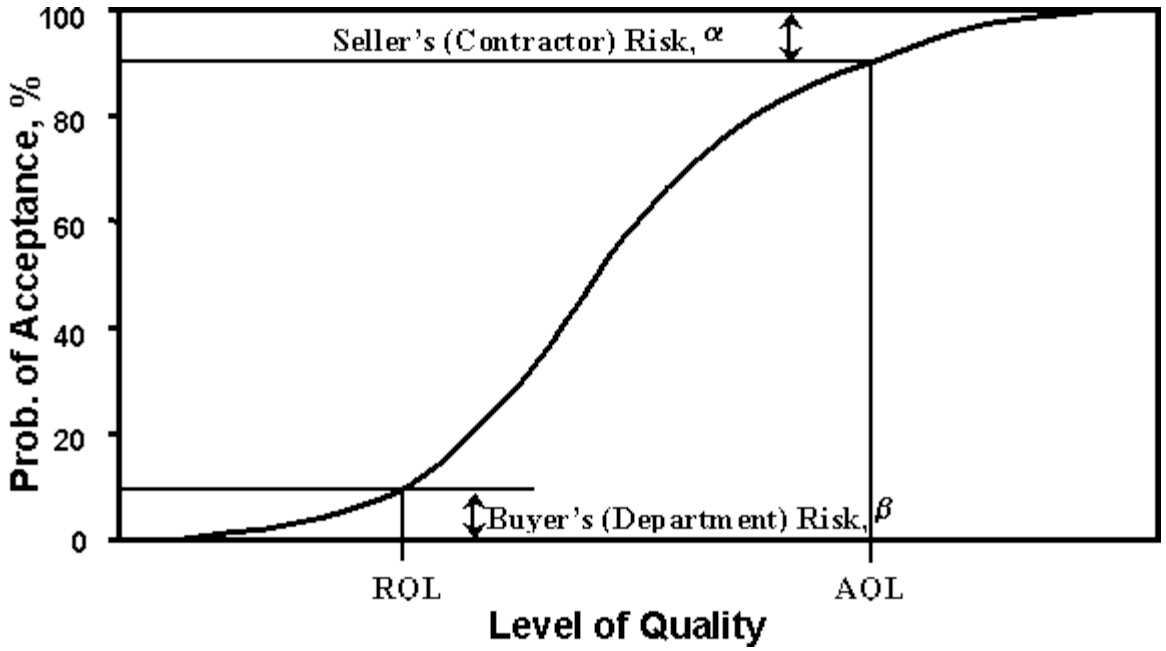


Figure 3 - Typical Operating Characteristic (OC) Curve for an Accept/Reject Acceptance

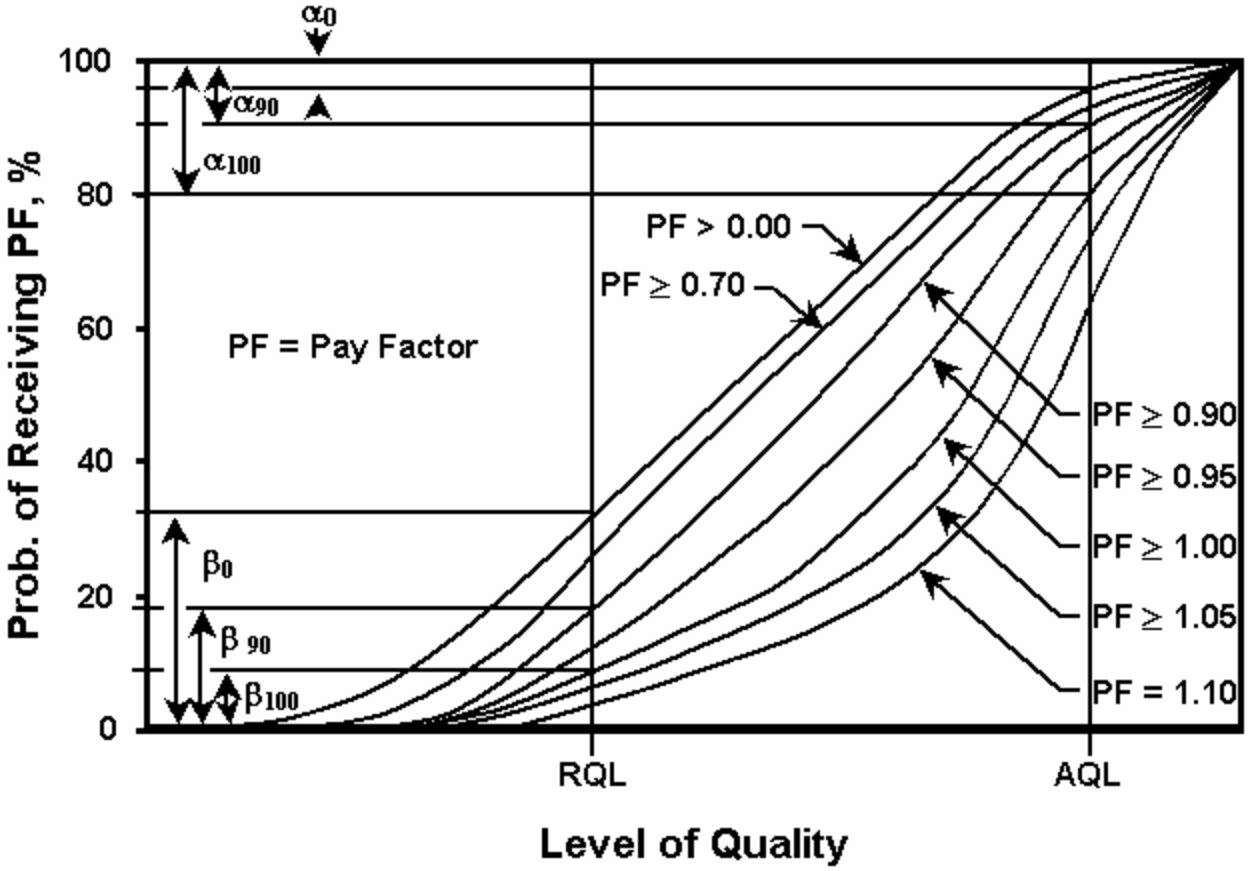


Figure 4 - Typical Operating Characteristic (OC) Curves for an Acceptance Plan with Pay Adjustments

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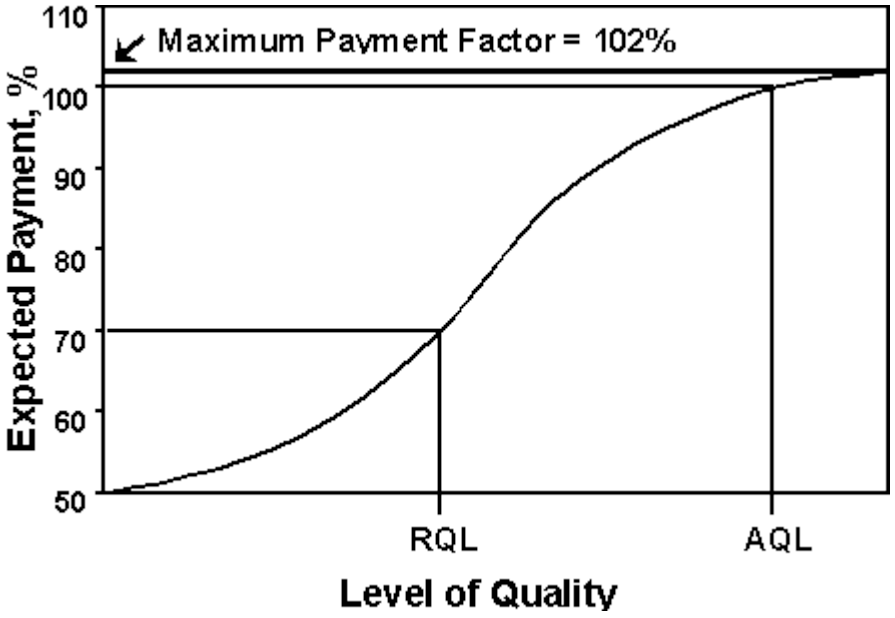


Figure 5 - Typical Expected Pay Curve

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Construction Quality Assurance for Design-Build Highway Projects

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INTRODUCTION

A majority of State transportation agencies use the design-build (DB) contracting method to deliver some transportation projects. Documented benefits of DB include faster project delivery, improved constructability, less cost growth, early cost certainty, and fewer claims.

One area of DB contracting that requires closer examination is construction quality assurance (QA). DB is believed to provide a level of project quality equal to design-bid-build (DBB), as outlined in the Federal Highway Administration's (FHWA) *Design-Build Effectiveness Study.*[(1)] However, a recent examination of State agency DB procurement packages showed that roles and responsibilities for construction quality are not clearly defined in many instances. The paper "Does Design-Build Project Delivery Affect the Future of the Public Engineer?" examined 60 DB requests for proposals (RFPs) and found 23 cases in which assignment of responsibilities for verification and acceptance could not be determined.[(2)] National Cooperative Highway Research Program (NCHRP) Synthesis 376, *Quality Assurance in Design-Build Projects*, states "With the changing quality roles found in the DB delivery method, it is imperative that quality responsibilities and the responsible parties are clearly stated in the contract documents." [(3)] However, on DB projects, there is no change in the core QA functions of contractor quality control (QC) and agency acceptance. The design-builder still has a responsibility for QC, as does the contractor with DBB projects. The agency must retain its responsibility for the acceptance function, as required by Title 23, Code of Federal Regulations, Part 637 (23 CFR 637).[(4)]

One of the attributes of the DB delivery method is the single source of responsibility for design and construction issues. When preparing the RFP and contract documents, owners must clearly define the responsibilities of the design-builder and the contracting agency. The agency performs verification tests for compliance with RFP requirements and makes progress payments under the terms of the contract. However, by doing so, the agency does not assume responsibility for any design or construction issue. The design-builder remains fully responsible for the design and the construction of the final product.

PURPOSE

The purpose of this TechBrief is to help clarify the roles, responsibilities, and activities related to construction QA on DB projects. The specific topics discussed include QA, QC, and acceptance. Related topics such as independent assurance (IA), dispute resolution, personnel qualification, laboratory qualification, and warranties are also discussed. Some RFP and contract documents for DB projects have incorrectly assigned responsibility for acceptance to the design-builder, which is not in accordance with 23 CFR 637. Additionally, because the DB

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project delivery method is often used on large, complex, fast-paced projects, it presents some unique challenges that merit discussion.

QUALITY ASSURANCE

The American Association of State Highway and Transportation Officials (AASHTO) defines *QA* as "(1) All those planned and systematic actions necessary to provide confidence that a product or facility will perform satisfactorily in service; or (2) making sure the quality of a product is what it should be."(p. 14) [5]

Historically, agencies used the term QC/QA with QC referring to the contractor's role and QA to the agency's role. This term implied that QC and QA are separate functions; in fact, QA refers to the overall system for assuring project quality, with QC being one element of a comprehensive QA program. Therefore, the transportation industry has moved away from the term QC/QA and now uses QA.

Construction QA Programs

A construction QA program consists of the following core elements:

- Contractor QC.
- Agency acceptance.
- IA.
- Dispute resolution.
- Personnel qualification.
- Laboratory accreditation/qualification.

These core elements of QA apply regardless of the project delivery method. The agency's responsibility for acceptance cannot be assigned to the design-builder (or to a consultant under contract to the design-builder) but, rather, remains with the agency. Each of the six core elements of a construction QA program for DB is discussed below.

QUALITY CONTROL

FHWA's *Transportation Construction Quality Assurance Reference Manual* defines *QC* as "The system used by a contractor party to monitor, assess, and adjust their production or placement processes to ensure that the final product will meet the specified level of quality."(Section 2.3, p. 2–6) [6]

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Use of QC Test Data in Acceptance Determination

While the primary purpose of QC sampling and testing is to provide timely information for the design-builder to monitor and guide each production or placement process, QC data for critical quality characteristics may also be used in the final acceptance determination. If QC test data are to be included in the agency acceptance decision, the QC data must be validated by agency verification test results. Lot and sublot sizes, sampling and testing methods, and sampling locations should be specified for each critical quality characteristic that will be verified by the agency. This information can be included directly in the DB contract documents, or reference can be made to the agency's standard specifications or guide schedule of sampling/testing frequencies. Not all characteristics that are monitored by QC are required to be verified by the agency. Design-builders will often perform more than the minimum level of QC, including testing of material properties beyond those critical quality characteristics that will be used in the agency acceptance decision.

QC Organization

There are different approaches to QC organizational structure on DB projects. Some agencies specify that the design-builder must demonstrate, through lines of authority in the organizational chart, that QC personnel are allowed to operate independently of DB construction forces to ensure that decisions made as part of the QC process are not influenced by schedule or budget. Another approach used by some agencies (especially on large DB projects) requires the design-builder to employ an independent testing firm to conduct sampling and testing of those critical quality characteristics that will be verified by the agency as part of the acceptance decision while a separate QC team works in close coordination with the construction forces, performing sampling and testing to monitor and guide production and placement processes.

Regardless of the approach, it is important that the DB team member in charge of construction quality report to senior management of the design-builder. This will convey support for QC and minimize potential conflicts with the production staff. Senior management must realize that superior quality will not happen without the seamless interaction between the QC teams, production/placement teams, and administration. The DB contract should clearly identify requirements for the QC organization.

Use of Consultants to Perform QC

Consultant technicians and inspectors may be used to conduct QC inspection and testing on a DB project. However, responsibility for the acceptance function cannot be relinquished to the design-builder per the requirements of 23 CFR 637.207(b).[4] Use of a consultant firm hired by the design-builder for sampling, testing, and inspecting does not relieve the agency of its responsibility for verification testing.

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QC Documentation and Records

The agency should specify the minimum level of QC documentation that must be provided by the design-builder as well as the timeframe and format for providing the information. This typically includes all QC test results intended for inclusion in the agency acceptance decision. QC test results that are used strictly for process control may not need to be submitted but should be available for review by the agency as part of monitoring the design-builder's QC system.

Design-Builder Quality Management Plans

It is good practice to require the design-builder to provide a comprehensive quality management plan (QMP) that outlines the overall quality system for both design and construction of the project. The construction QC section of the QMP should describe all of the QC activities that will be conducted to assure that the completed items of work will meet the specified level of quality. If a QMP is required, the DB contract should specify the format and minimum content requirements as well as the procedure for agency review and acceptance of the QMP, including any updates and changes submitted by the design-builder following initial plan acceptance. During construction, the agency and the design-builder should monitor adherence to and effectiveness of the QMP. Any weaknesses discovered in the QC system should be corrected, including revisions to the QMP. Some agencies specify that failure by the design-builder to follow the QMP will result in actions such as suspension of work or withholding of payment.

ACCEPTANCE

FHWA-NHI-08-067 defines *acceptance* as "All factors used by the Agency (i.e., sampling, testing, and inspection) to evaluate the degree of compliance with contract requirements and to determine the corresponding value for a given product."(Section 2.3, p. 2–9) [6]

Agency Responsibility for Acceptance

According to 23 CFR 637.207(b), the agency's responsibility for acceptance does not change when using the DB delivery method. [4] While the design-builder is fully responsible for design, construction, and material selection, the agency is responsible for verifying RFP compliance and making progress payments by the acceptance of the work. As stated in FHWA-NHI-08-067, "All acceptance activities must be carried out by the agency or their designated agent (i.e., consultant under direct contract with the agency), independent of the contractor."(Section 2.3, p. 2–9) [6] This does not preclude the inclusion of design-builder QC data in the acceptance decision, provided that the QC data are validated by the agency's independently obtained verification data. It is important that the agency acceptance responsibilities be clearly defined in the DB contract documents.

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Verification Sampling and Testing

23 CFR 637 defines *verification sampling and testing* as "Sampling and testing performed to validate the quality of the product." [4]

The highway agency (or its designated agent) is responsible for conducting verification sampling and testing to provide an assessment of product quality that is completely independent of the design-builder's QC process. As required in 23 CFR 637, "The verification testing shall be performed on samples that are taken independently of the quality control samples." [4] Splits of design-builder QC samples cannot be used for verification.

Verification sampling and testing may be performed at a lower frequency than the design-builder's QC testing, particularly on DB projects where QC data are included in the acceptance determination. On some large DB projects, agencies have used frequencies of 1 verification test for every 10 or more QC tests. In order for mathematical validation procedures to be reliable, it is suggested that a minimum of 7–10 agency verification results be obtained and used to validate the design-builder's QC data.

It may be necessary to adjust the frequency of verification testing to reflect the estimated number of QC tests for each item of work. Rates of verification testing may also differ based on the risks involved. For example, verification testing may be more frequent for structural concrete than for embankment materials.

On some DB projects, it may be challenging to conduct verification testing at the specified rate due to the quantities of material being placed and the fast-paced nature of the work. In addition, because DB projects are typically bid as a single lump sum amount or using a small number of lump sum pay items, agency tracking of material quantities can be more difficult than on DBB projects that use standard unit price items. This can make it more difficult to schedule verification activities and determine random sample locations. Agencies should take this into consideration when determining staffing levels for DB projects so as to provide sufficient verification testing. The agency and design-builder must work cooperatively to find solutions to these issues because quality cannot be sacrificed due to large material quantities or fast-paced work.

Validation of QC Data

Agencies that have not included QC data in the acceptance decision on DBB projects may choose to do so on DB projects. As previously stated, if the design-builder's random QC test data are to be included in the acceptance decision, the QC data must be mathematically "validated" against the agency verification test results for each lot of material. By including validated QC data in the acceptance decision, the frequency of verification testing by the agency (or its designated agent) can be reduced.

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The DB contract documents should clearly outline the decision making process that will be used for validation of the QC data. It is important to specify the validation method (such as *F*- and *t*-tests), as well as actions that will be taken in the event that the design-builder QC test results are not validated by the agency verification results. There should be a well-defined process in place to resolve such an issue, including an investigation into the cause of the non-validation and increasing the rate of verification testing for the item. It is important to recognize that in some cases, even though the QC test data are not statistically validated, the material may be completely acceptable. In these cases, further investigation to determine the underlying cause of the non-validation is warranted. Also, it is necessary to specify the quality characteristics to which tests will be applied. Performing *F*- and *t*-tests on numerous quality characteristics for a particular material could make the analysis needlessly cumbersome. It is important that the agency identify the critical quality characteristics subject to the validation analysis for each material or work item.

Some materials, due to the small quantity being used, may not have a sufficient number of QC and verification tests to perform a statistical comparison. In these instances, use of an alternate method of acceptance may be necessary. To accept items requiring very few tests, it may be advisable to use only the agency's verification testing.

Quality Measures for Acceptance

Statistical quality measures used for acceptance, such as percent-within-limits (PWL), are well suited to DB projects, especially projects with work items having large quantities of materials. Agencies currently using PWL for work items on their DBB projects can easily incorporate it as the quality measure for the same items on DB projects. For agencies that do not use PWL, it may not be appropriate to utilize it on DB projects without first developing statistical specification limits that will provide a fair measure of quality. Statistical specification limits are typically developed by means of pilot projects completed over several years. Employing specification limits or procedures developed by another agency without proper evaluation could lead to unnecessary disputes.

The acceptable quality level (AQL) applied to each work item should be specified in the DB contract documents along with requirements for appropriate corrective action (rework or replacement) when the quality level is not met. The AQL can be set at different levels for different work items based on the risk associated with lower-quality material. Since most DB projects do not utilize unit price pay items, pay adjustments for material quality are often not applied. However, some agencies do apply pay adjustments either by including a typical unit price in the DB contract for the work item being evaluated or by requiring in the RFP that proposers submit a breakdown of work items with a unit price for each item subject to pay adjustment. When pay adjustment for quality is included in the DB contract, it is important that the agency monitor and measure material quantities. For work items not suited for PWL as the quality measure, such as items with small quantities, the agency's verification test results should be evaluated against engineering limits to determine acceptance.

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Inspection

Just as on DBB projects, visual inspection is a key part of agency acceptance on DB projects. Acceptance inspection must be performed by the agency or its designated agent, not the design-builder. "The State's acceptance program should provide a reasonable level of inspection to adequately assess the specific attributes which reflect the quality of the finished product. Acceptance inspection should include inspection of the component materials at the time of placement or installation, as well as the workmanship and quality of the finished product." (7)

INDEPENDENT ASSURANCE

23 CFR 637 defines *IA* as "Activities that are an unbiased and independent evaluation of all the sampling and testing procedures used in the acceptance program." (4)

The purpose of the IA system is to assure the reliability of all data used by the agency in the acceptance determination. This includes the agency's verification data and the design-builder's QC data when validated QC data are to be included in the final acceptance determination. IA is intended to confirm that the sampling and testing activities performed by the agency and the design-builder are conducted by qualified personnel using proper procedures and properly calibrated and functioning equipment. The results of IA testing should never be used to evaluate material quality.

The responsibility for IA lies with the agency. IA sampling and testing is performed by agency personnel (or by personnel of a designated agent directly contracted by the agency) that are independent of the project. IA personnel, whether employed by the agency or a designated agent, cannot perform both IA and acceptance activities. For agencies that do not routinely include QC test results in the acceptance determination, using this approach on DB projects may create new challenges for the IA system. The design-builder may not be familiar with IA requirements. The need for the design-builder QC staff to cooperate with IA personnel should be clearly stated in the DB contract. Scheduling IA activities to obtain the required level of IA evaluations is often a challenge, and keeping track of ongoing QC and verification activities and personnel on large DB projects can magnify this problem. Using the system approach to IA is an effective strategy for DB projects, since IA frequency is based on covering all active testers and equipment over a period of time, independent of the number of QC and verification tests completed on a project.

It is important that all parties involved be aware of the role that IA plays in the overall QA program and work cooperatively to assure that IA staff is kept informed of project testing schedules and personnel. Some agencies include language in the DB contract requiring the design-builder to provide the agency's project staff with updated schedules and lists of QC personnel for upcoming QC sampling and testing so that IA activities can be scheduled.

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DISPUTE RESOLUTION

If QC testing data will be included in the acceptance determination, agencies are required under 23 CFR 637 to have a dispute resolution system in place to resolve possible discrepancies between the design-builder's QC data and the agency's acceptance data. [4] While not required on projects where agency verification results will be used exclusively to determine acceptance, a dispute resolution system is highly recommended.

The dispute resolution process should be unbiased and timely. To address testing-related disputes, use of retained splits of samples used in the acceptance decision, alternate or third party laboratories, and a well-defined decision process to determine the outcome of the dispute are advisable. When retained splits are used, it is important that the dispute resolution split samples are properly labeled and that either the agency takes immediate possession of the dispute resolution split or proper sample security techniques, such as tamper-proof containers or security seals, are used.

PERSONNEL QUALIFICATION

All personnel performing sampling and testing for QC used in the acceptance decision, verification, or IA are required to be qualified, per 23 CFR 637.209. [4] Agencies participate in State, regional, or national technician qualification or certification programs to ensure that technicians and inspectors are properly qualified. The DB contract documents should specify the minimum qualifications for DB personnel performing QC sampling, testing, and inspection. Minimum qualifications for the design-builder's quality management personnel should also be clearly stated to ensure they have a thorough understanding of QA principles and experience working under QA specifications.

LABORATORY QUALIFICATION

Any laboratory used by the agency (or its designated agent) to perform verification testing and all design-builder laboratories that perform QC testing included in the acceptance decision must be qualified, as outlined in 23 CFR 637.209.[4] Laboratories that conduct QC testing only for process control are not covered by the regulation, but some agencies require these laboratories to meet a minimum standard such as approval by the agency or a certification organization. Laboratories operated by a designated agent of the agency that are used for IA or dispute resolution must be accredited by AASHTO, through a comparable program approved by FHWA, or by an accreditation body approved by the National Cooperation for Laboratory Accreditation.[8]

NON-CONFORMING MATERIALS AND WORKMANSHIP

The DB contract should describe the process for documentation and disposition of non-conforming work. Whether discovered by the design-builder or the agency, materials or

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workmanship that do not meet the specified level of quality should be properly documented, including the nature of the non-conformance, location, extent, and disposition (e.g., removed and replaced, reworked, accepted based on engineering judgment, etc.). The authority to approve the final disposition of non-conforming materials or workmanship cannot be assigned to the design-builder. The agency's role in approving the disposition of non-conforming work should be clearly identified in the contract.

WARRANTIES

Some DB contracts include warranty provisions for some items of work. Contract language should specify the warranty period and the enforcement process, including a detailed description of the measures that will be used to determine warranty compliance. These measures are typically maximum levels of various distress types that, when exceeded during the warranty period, require correction by the design-builder. Some warranty provisions also include specific corrective action for each distress type. The inspection procedure for determining warranty compliance should be clearly outlined and include provisions for notification so that a design-builder representative can observe the warranty inspections. A process for dispute of warranty inspection findings should also be included. Use of warranty provisions does not remove the need for an effective design-builder QC system; on projects where the warranty does not provide coverage for the anticipated life of the warranted product, some level of agency acceptance is still required. The requirements for warranties on DB projects are covered under 23 CFR 635.413.[9]

SUMMARY

The DB project delivery system offers several documented benefits over the traditional DBB method on certain projects. While DB offers the design-builder more control over design, materials, and construction methods than DBB, the agency still has an important role in assuring quality. As agencies develop DB procurement documents, it is important that roles and responsibilities for design-builder QC and agency acceptance be clearly defined. The responsibility for acceptance by the agency (or their designated agent) is applicable regardless of the project delivery method used.

DB is often used on large, fast-paced projects, which can create challenges for conducting QA activities. Coordination and communication between the design-builder and the agency is essential for effective quality management. By working together within a well-defined QA program, the agency and design-builder can meet the goal of delivering a high quality project to the travelling public.

FURTHER INFORMATION

The following resources provide further information on this topic:

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- National Highway Institute Course 134064, "Transportation Construction Quality Assurance".

- Office of Pavement Technology. (2012). *Independent Assurance Programs*, TechBrief, Publication No. FHWA-HIF-12-001, Federal Highway Administration, Washington, DC.

REFERENCES

1. SAIC, AECOM, and University of Colorado. (2006). *Design-Build Effectiveness Study*, Federal Highway Administration, Washington, DC.

2. Gransberg, D. and Molenaar, K. (2008). "Does Design-Build Project Delivery Affect the Future of the Public Engineer?" *Transportation Research Record 2081*, Transportation Research Board, Washington, DC.

3. Gransberg, D., Datin, J., and Molenaar, K. (2008). *NCHRP Synthesis 376: Quality Assurance in Design-Build Projects*, Transportation Research Board, Washington, DC.

4. *Quality Assurance Procedures for Construction*, Code of Federal Regulations, Title 23, Part 637, Subpart B, U.S. Government Printing Office, Washington, DC.

5. American Association of State Highway and Transportation Officials. (2006). *Standard Recommended Practice for Definition of Terms Related to Quality and Statistics As Used in Highway Construction*, Washington, DC.

6. Federal Highway Administration. (2008). *Transportation Construction Quality Assurance Reference Manual*, Report No. FHWA-NHI-08-067, Arlington, VA.

7. Federal Highway Administration. (2006). "Non-Regulatory Supplement for 23 CFR Part 637, Subpart B." Accessed online: March 20, 2012. (https://www.fhwa.dot.gov/pavement/0637bsup.cfm)

8. Federal Highway Administration. (2011). "Non-Regulatory Guidance on Approval of Comparable Accreditation Bodies." Accessed online: March 20, 2012. (https://www.fhwa.dot.gov/pavement/materials/111007.cfm)

9. *Construction and Maintenance*, Code of Federal Regulations, Title 23, Part 635, U.S. Government Printing Office, Washington, DC.

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Appendix B

Abbreviations and Definitions

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADOT	Arizona Department of Transportation
ASTM	American Society for Testing and Materials
ATTI	Arizona Technical Testing Institute
CCRL	Cement and Concrete Reference Laboratory
CFR	Code of Federal Regulations
CIQM	Construction Independent Quality Manager
CQMP	Construction Quality Management Plan
FHWA	Federal Highway Administration
FMS	Freeway Management System
IA	Independent Assurance
IMSA	International Municipal Signal Association
IQF	Independent Quality Firm
NCR	Nonconformance Report
NIST	National Institute of Standards and Technology
OV	Owner Verification
OVTIP	Owner Verification Testing and Inspection Plan
PCI	Precast Concrete Institute
PPD	Practice and Procedure Directive
QA	Quality Acceptance
QAP	Quality Assurance Program
QC	Quality Control

Acceptance Program means all factors that comprise ADOT's determination of the quality of the Work as specified in the Contract Documents. These factors include QA and OV sampling, testing, and inspection.

ADOT means the Arizona Department of Transportation, a public agency as constituted under the laws of the State of Arizona.

ADOT Standard Specifications means the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction, adopted by the Arizona State Transportation Board, including all revisions thereto applicable on the setting date.

Contract Documents means contract between ADOT and Contractor, including all exhibits attached hereto, as such contract or any such exhibits may be amended, supplemented, restated or otherwise modified, from time to time, and the executed originals of exhibits that are contracts.

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Contractor means the individual, partnership, firm, corporation, or any acceptable combination thereof, or joint venture, contracting with ADOT for performance of the Work.

Construction Independent Quality Manager means the individual appointed by the IQF who is responsible for management of construction Quality Acceptance functions, as more particularly described the Program and the Contract Documents.

Construction Quality Management Plan means the plan that establishes QC and QA procedures for the Work as more particularly described in the Contract Documents.

Element means (a) a discrete portion of the Project (e.g., a sign) or (b) a discrete condition to be inspected and measured as set forth in the Contract Documents.

Engineering Judgment means accepting any testing result or Work that does not adhere to the Contract Documents.

Guide Schedule means the Project specific sampling and testing guide schedule from the CQMP. This Project specific guide schedule is the required acceptance sampling and testing parameters as defined in this Program and the Contract Documents. The minimum sampling guide schedule is defined in Appendix D of this Program.

Independent Assurance means activities that are an unbiased and independent evaluation of all the sampling and testing (or inspection) procedures used in the Acceptance Program. The results of IA testing or inspection are not to be used as a basis of acceptance.

Independent Quality Firm means the independent firm identified in the Proposal (or such other firm approved by ADOT in ADOT's sole discretion) responsible for performing independent quality assurance material testing, inspection, and audits of the Construction Work and the Construction Quality Management Plan.

Material Code means each combination of material code and type code listed in Appendix E

Nonconformance Report is a defined resolution process for addressing any and all Nonconforming Work, as well as any meaning set forth in the Contract Documents.

Nonconforming Work means Work that does not conform to the requirements of the Contract Documents, any governmental approvals, any applicable law, or the released-for-construction drawings.

Owner Verification means inspection, sampling and testing performed by ADOT or ADOT's representatives to verify that the Project is constructed and accepted in compliance with the Contract Documents.

Owner Verification Firm means the firm hired by ADOT to perform OV.

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Owner Verification Testing and Inspection Plan means project specific planned processes for performing OV per this Program and the Contract Documents.

Professional Engineer means a person who has been granted registration in one or more branches of engineering by the Arizona State Board of Technical Registration, and is authorized to practice professionally in the State of Arizona. If a branch of engineering is included in the title, such as Professional Civil Engineer, registration in that branch shall be required.

Project means facilities and all related structures, improvements and system to be developed, design, constructed, operated and maintained, or any of the foregoing, pursuant to the terms of the Contract Documents.

Program means the ADOT Quality Assurance Program - Projects Utilizing Contractor Performed Acceptance.

Quality Acceptance means all planned and systematic processes and actions performed by the IQF, as defined in the Contract Documents, for their portion of the Acceptance Program.

Quality Assurance Program means the FHWA required quality assurance program.

Quality Control means processes undertaken by the Contractor to produce Work compliant with the Contract Documents. Quality Control efforts are not part of the Acceptance Program.

Sole Discretion has the same meaning as set forth in the Contract Documents. If there is not a definition listed elsewhere in the Contract Documents, Sole Discretion means the right and power to decide a matter, which right may be exercised arbitrarily at any time and from time to time.

Work means all of the work required under the Contract Documents, including all administrative, design, engineering, right of way acquisition, support services, utility adjustment Work to be furnished or provided by the Contractor, procurement, professional, manufacturing, supply, installation, construction, supervision, management, testing, verification, labor, materials, equipment, maintenance, documentation, and other duties and services to be furnished and provided by the Contractor as required by the Contract Documents, including all efforts necessary or appropriate to achieve final acceptance, except for those efforts that the Contract Documents expressly specify will be performed by persons other than the Contractor.

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Appendix C

Split Sample Tolerances

INDEPENDENT ASSURANCE AND CORRELATION TESTING ALLOWABLE VARIATIONS (±)
(See Notes 1 and 2 below.)

PORTLAND CEMENT CONCRETE	
TEST	SAMPLE RESULT vs. SPLIT RESULT (See Note 3 below.)
Coarse Aggregate Gradation:	
+1"	4
1"	4
3/4"	4
1/2"	4
3/8"	4
1/4"	4
No. 4	4
No. 8	4
Fine Aggregate Gradation:	
No. 4	4
No. 16	3
No. 50	3
No. 100	3
No. 200	1.5
28-Day Compressive Strength: (Class P, S, and B) (See Note 4 below.)	15% of the mix design strength

BITUMINOUS MIXTURES	
TEST	SAMPLE RESULT vs. SPLIT RESULT (See Note 3 below.)
Mineral Aggregate Gradation:	
+3/4"	4
3/4"	4
1/2"	4
3/8"	4
No. 4	4
No. 8	4
No. 30	2
No. 40	2
No. 200	1.0
Percent Asphalt	0.4
Bulk Density, pounds/cu. ft.	2.0
Rice Density, pounds/cu. ft.	2.0
Voids, percent	1.5
Marshall Stability, pounds	1200

SOILS AND AGGREGATES	
TEST	SAMPLE RESULT vs. SPLIT RESULT (See Note 3 below.)
Gradation, except for Portland Cement Concrete and Bituminous Mixtures:	
+1"	4
1"	4
3/4"	4
1/2"	4
3/8"	4
1/4"	4
No. 4	4
No. 8	4
No. 16	4
No. 40	3
No. 200	1.5
Sand Equivalent	6
Flakiness Index	3
Uncompacted Void Content	1.0
pH	0.4
Optimum Moisture, percent	2.0
Proctor Density, pounds/cu. ft.	4.0
Fractured Coarse Aggregate Particles (See Note 5 below.)	15% of the mean of the results
Plasticity Index: (See Note 5 below.)	
Liquid Limit (LL)	13% of the mean of the results
Plastic Limit (PL)	18% of the mean of the results

Note 1: Use applicable test characteristics specified for material being tested.
Note 2: Regional Materials Engineer to determine allowable variations for test characteristics not shown.
Note 3: Allowable variations apply for both independent assurance testing and correlation testing comparisons.
Note 4: Allowable variations based on a percentage of the mix design strength shall be rounded if necessary to the nearest whole number.
Note 5: Allowable variations based on a percentage of the mean of the results shall be rounded if necessary to the nearest whole number.

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Appendix D

Independent Quality Firm Minimum Sampling Guide Schedule

The minimum acceptance sampling and testing requirements are listed in the tables contained in this appendix.

Index of Materials Listed in Tables 1 through 8

Table 1 Soils
Table 2 Aggregates
Table 3 Bituminous Materials
Table 4 Portland Cement Concrete
Table 5 Materials Used With Portland Cement Concrete
Table 6 Stabilized Soils and Bases
Table 7 Bituminous Mixtures
Table 8 Miscellaneous Materials

Some tables are larger than a single page.

Within these tables, some rows and / or columns extend onto the following page. If an individual row or column is blank, see the corresponding row or column directly above, on the previous page.

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INDEX OF MATERIALS LISTED IN TABLES 1 THROUGH 8
Admixtures for Portland Cement Concrete
Aggregate for Arrestor Bed
Aggregate for Cement Stabilized Alluvium
Aggregate for Cement Treated Base
Aggregate for Lean Concrete Base
Aggregate for Soil-Cement Bank Protection
Aggregate Base
Aggregate Subbase
Asphalt Cement (PG XX-XX)
Asphalt Cement (PG XX-XX) for Asphalt-Rubber
Asphaltic Concrete (Asphalt-Rubber) [AR-AC]
Asphaltic Concrete (Asphalt-Rubber) - End Product [AR-AC]
Asphaltic Concrete - End Product
Asphaltic Concrete (End Product) SHRP Volumetric Mix
Asphaltic Concrete Friction Course (ACFC)
Asphaltic Concrete Friction Course (Asphalt-Rubber) [AR-ACFC]
Asphaltic Concrete Friction Course (ACFC) - Miscellaneous
Asphaltic Concrete - Miscellaneous Paving
Asphaltic Concrete (Miscellaneous Structural)
Asphaltic Concrete (Miscellaneous Structural - Special Mix)
Asphalt-Rubber (CRA)
Bank Protection Fabric
Barbed Wire
Barbless Wire
Bearing Pads
Bedding Material for Pipe
Bedding Material for Polyvinyl Chloride (PVC) Irrigation Pipe
Bituminous Treated Base
Blotter Material
Borrow
Brick for Manholes
Cement Stabilized Alluvium
Cement Treated Base
Cement Treated Subgrade
Chain Link Fabric
Cinder Block
Coarse Aggregate for Portland Cement Concrete (PCC)
Cover Material
Crash Barrel Sand
Crumb Rubber for Asphalt-Rubber
Curing Compound
Decomposed Granite
Dual Component Pavement Markings
Embankment

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INDEX OF MATERIALS LISTED IN TABLES 1 THROUGH 8
Emulsified Asphalt
Emulsified Asphalt Special Type
Emulsified Asphalt for Cold Recycled Asphaltic Concrete
Emulsified Recycling Agent (ERA)
Fence Hardware, Miscellaneous
Fence Post and Rails
Fence Stays
Filter Material for Perforated Pipe
Fine Aggregate for Portland Cement Concrete (PCC)
Fly Ash and Natural Pozzolan
Geocomposite Edge Drain System
Geocomposite Wall Drain System
Geogrid
Geomembrane
Geosynthetics
Glass Beads
Granite Mulch
Guardrail Elements
Guardrail Fasteners
Guardrail Posts and Blocks
High Strength Bolts, Nuts, Washers, or Anchor Bolts
Hydrated Lime (for use as mineral admixture in asphaltic concrete mixes)
Hydraulic Cement
Hydraulic Cement (for use in soil stabilization, mortar, and grout)
Joint Materials
Lean Concrete Base
Lime (for use in soil stabilization, mortar, and grout)
Lime Treated Subgrade
Liquid Asphalt [Cutback Asphalt - (Medium Curing Type)]
Mineral Aggregate for Asphaltic Concrete (Asphalt-Rubber) [AR-AC]
Mineral Aggregate for Asphaltic Concrete (Asphalt-Rubber) – End Product [AR-AC]
Mineral Aggregate for Asphaltic Concrete - End Product [without reclaimed asphaltic pavement (RAP)]
Mineral Aggregate for Asphaltic Concrete – End Product [with reclaimed asphaltic pavement (RAP)]
Mineral Aggregate for Asphaltic Concrete (End Product) SHRP Volumetric Mix [without reclaimed asphalt pavement (RAP)]
Mineral Aggregate for Asphaltic Concrete (End Product) SHRP Volumetric Mix [without reclaimed asphalt pavement (RAP)]
Mineral Aggregate for Asphaltic Concrete Friction Course (ACFC)
Mineral Aggregate for Asphaltic Concrete Friction Course (Asphalt-Rubber) [AR-ACFC]
Mineral Aggregate for Asphaltic Concrete Friction Course (ACFC) - Miscellaneous
Mineral Aggregate for Asphaltic Concrete - Miscellaneous Paving
Mineral Aggregate for Asphaltic Concrete (Miscellaneous Structural)
Mineral Aggregate for Asphaltic Concrete (Miscellaneous Structural – Special Mix)
Mineral Aggregate for Micro-Surfacing

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INDEX OF MATERIALS LISTED IN TABLES 1 THROUGH 8
Natural Ground
Paint
Pavement Fabric
Paving Brick
Permanent Pavement Markings (Painted)
Pipe Backfill
Pipe, Corrugated Metal (CMP) [Coated or Non-coated]
Pipe, Non-Reinforced Cast-in-Place Concrete
Pipe, Polyvinyl Chloride (PVC) for Electrical Conduit
Pipe, Polyvinyl Chloride (PVC) for Water
Pipe, Precast Reinforced or Non-Reinforced Concrete
Pipe, Vitrified Clay
Plating Material for Pipe Ends
Portland Cement and Blended Hydraulic Cement (for use as mineral admixture in asphaltic concrete mixes)
Portland Cement Concrete (PCC) (Class P)
Portland Cement Concrete (PCC) (Class S) (with a compressive strength requirement less than 4,000 psi)
Portland Cement Concrete (PCC) (Class S) (with a compressive strength requirement equal to or greater than 4,000 psi)
Portland Cement Concrete (PCC) (Class B)
Portland Cement Structural Concrete for Minor Precast Structures
Post Clips and Hog Rings
Post-Tensioning Steel
Preformed Plastic Pavement Marking
Prestressed Concrete
Prestressing Steel
Raised Pavement Markers
Recycling Agent
Reinforcement Bars
Retroreflective Sheeting
Rock
Shotcrete
Sign Panel Silk-Screened Characters
Silica Fume
Slump Block
Soil for Shoulder Build-up
Soil-Cement Bank Protection
Separation Geotextile Fabric
Structure Backfill
Subgrade
T-Post
Thermoplastic Pavement Markings
Tie Wire and Tension Wire
Top Soil
Trench Backfill

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INDEX OF MATERIALS LISTED IN TABLES 1 THROUGH 8
Utility Concrete
Water
Welded Wire Fabric (Smooth)
Welded Wire Fabric (Deformed)
Wire Rope
Woven Wire Fabric

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TABLE 1
ACCEPTANCE SAMPLING GUIDE FOR SOILS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
203	Borrow (within 3 ft. of finished subgrade elevation)	Gradation [1] PI [1]	In-Place	One per 1500 ft.
203	Embankment	Proctor Density Optimum Moisture	In-Place	One per soil type, and as needed.
		Compaction	In-Place	One per 1500 ft. per lift.
	Embankment for Metal Pile Location only	pH Resistivity	In-Place or Source	One per source.
203	Natural Ground for Embankment 5 ft. or less in height	Proctor Density Optimum Moisture	In-Place	One per soil type, and as needed.
		Compaction	In-Place	One per 1500 ft.

[1] Independent Assurance Sampling and Testing required.

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TABLE 1 (continued)
ACCEPTANCE SAMPLING GUIDE FOR SOILS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
203	Subgrade	Proctor Density Optimum Moisture	Roadway	One per soil type, and as needed.
		Compaction	Roadway	One per 1500 ft.
		Gradation [1]	Roadway	One per 1500 ft. or change in material.
		PI [1]		
203	Soil for Shoulder Build-up	Gradation	In-Place or Source	One per soil type.
		PI		
		pH		
		Soluble Salts		
		Compaction	In-Place	One per 1500 ft. or as directed by the Engineer.
501	Trench Backfill	Proctor Density Optimum Moisture	In-Place	One per soil type, and as needed.
		Compaction	In-Place	One per 100 CY.

[1] Independent Assurance Sampling and Testing required.

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TABLE 1 (continued)
ACCEPTANCE SAMPLING GUIDE FOR SOILS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
803	Granite Mulch or Decomposed Granite	Gradation	In-Place or Source	One per 10,000 CY.
804	Top Soil	Gradation [(1)]	In-place	Written soil analysis per source and six samples per lot [a lot is considered approximately 20,000 CY per source].
		PI [(1)]		
		pH [(1)]		
		Soluble Salts		
		Calcium Carbonate		
		Exchange-able Sodium in percent and parts per million		

[(1)] Independent Assurance Sampling and Testing required.

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TABLE 2
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
203 501 (When Contractor Quality Control **is not** a bid item.)	Structure Backfill or Pipe Backfill	Proctor Density Optimum Moisture	Stockpile	One per source, and as needed.
		Compaction	In-Place	One per 75 CY.
		Resistivity(1)	Source or Stockpile	One per source.
		pH(1)		
		Gradation (1)	On Job Site	One per 500 CY per source.
		PI (1)		
203 501 (When Contractor Quality Control **is** a bid item.)	Structure Backfill or Pipe Backfill	Proctor Density Optimum Moisture	Stockpile	One per source, and as needed.
		Compaction	In-Place	One per 100 CY.
		Resistivity(1)	Source or Stockpile	One per source.
		pH(1)		
		Gradation (1)	On Job Site	One per 1500 CY per source.
		PI (1)		

(1) Independent Assurance Sampling and Testing required.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
303 (When Contractor Quality Control **<u>is not</u>** a bid item.)	Aggregate Base Class 1, Class 2, and Class 3	Abrasion [2]	Source	One per source.
		Proctor Density	Crusher Belt or Stockpile	At start of production, then as material changes.
		Optimum Moisture		
		Compaction	Roadway	One per lift per 1000 ft.
		Fractured Coarse Aggregate Particles [1]	Stockpile	One per 10,000 tons.
		Gradation [1]	Windrow	One per 2000 tons, minimum one per shift.
		PI [1]		

[1] Independent Assurance Sampling and Testing required.

[2] Provided Construction & Materials Group concurs, historical abrasion values may be used.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
303 (When Contractor Quality Control **is** a bid item.)	Aggregate Base Class 1, Class 2, and Class 3	Abrasion [2]	Source	One per source.
		Proctor Density	Crusher Belt or Stockpile	At start of production, then as material changes.
		Optimum Moisture		
		Compaction	Roadway	One per lift per 1500 ft.
		Fractured Coarse Aggregate Particles [1]	Stockpile	One per 10,000 tons.
		Gradation [1]	Windrow	One per 2000 tons, minimum one per shift.
		PI [1]		

[1] Independent Assurance Sampling and Testing required.

[2] Provided Construction & Materials Group concurs, historical abrasion values may be used.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
303 (When Contractor Quality Control **is not** a bid item.)	Aggregate Subbase Class 4, Class 5, and Class 6	Proctor Density	Crusher Belt or Stockpile	At start of production, then as material changes.
		Optimum Moisture		
		Compaction	Roadway	One per lift per 1000 ft.
	Class 4	Fractured Coarse Aggregate Particles (1)	Stockpile	One per 10,000 tons.
		Gradation (1)	Windrow	One per 2000 tons, minimum one per shift.
		PI (1)		
		Abrasion (2)	Source	One per source.
	Class 5 and Class 6	Gradation (1)	Windrow	One per 2000 tons, minimum one per shift.
		PI (1)		

(1) Independent Assurance Sampling and Testing required.

(2) Provided Construction & Materials Group concurs, historical abrasion values may be used.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
303 (When Contractor Quality Control **is** a bid item.)	Aggregate Subbase Class 4, Class 5, and Class 6	Proctor Density	Crusher Belt or Stockpile	At start of production, then as material changes.
		Optimum Moisture		
		Compaction	Roadway	One per lift per 1500 ft.
	Class 4	Fractured Coarse Aggregate Particles [1]	Stockpile	One per 10,000 tons.
		Gradation [1]	Windrow	One per 2000 tons, minimum one per shift.
		PI [1]		
		Abrasion [2]	Source	One per source.
	Class 5 and Class 6	Gradation [1]	Windrow	One per 2000 tons, minimum one per shift.
		PI [1]		

[1] Independent Assurance Sampling and Testing required.

[2] Provided Construction & Materials Group concurs, historical abrasion values may be used.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
304 305	Aggregate for Cement Treated Base or Lean Concrete Base	Gradation [1]	Stockpile	One per 2000 tons, minimum one per shift.
		Fractured Coarse Aggregate Particles [1]	Stockpile	One per 10,000 tons.
		Abrasion [2]	Source	One per source.
	for Cement Treated Base	PI [1]	Stockpile	One per 2000 tons, minimum one per shift.
	for Lean Concrete Base	Sand Equivalent [1]	Stockpile	One every other day of Lean Concrete Base production.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Construction & Materials Group concurs, historical abrasion values may be used.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
404	Cover Material	Abrasion [2]	Source or Stockpile	One per source.
		Bulk O.D. Specific Gravity	Stockpile	One per source.
		Percent Carbonates		
		Dry Unit Weight		
		Fractured Coarse Aggregate Particles	Stockpile	One per 600 tons.
		Flakiness Index		
		Gradation [1]	Final Stockpile	One per 300 tons.
		Moisture Content	Trucks at Scale	One per 300 tons.
404 412 413 415	Blotter Material	Gradation [1]	Final Stockpile	One per stockpile.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Construction & Materials Group concurs, historical abrasion values may be used.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
Refer to Special Provisions	Mineral Aggregate for Micro-Surfacing	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates	Stockpile	One per source.
		Gradation [1]	Final Stockpile	One prior to start of Micro-Surfacing production, and one per 300 tons
		Sand Equivalent	Stockpile	One prior to start of Micro-Surfacing production, and one per 600 tons
		Fractured Coarse Aggregate Particles		
		Uncompacted Void Content		
		Moisture Content	Trucks at Scale	One per 300 tons.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Construction & Materials Group concurs, historical abrasion values may be used.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
407	Mineral Aggregate for Asphaltic Concrete Friction Course (ACFC)	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates		
		Specific Gravity		
		Gradation	Cold Feed	One prior to the start of ACFC production.
		Sand Equivalent [1]	Cold Feed or Stockpile	One prior to the start of ACFC production and one per each two days of ACFC production, minimum of two per project.
		Flakiness Index [1]		
		Fractured Coarse Aggregate Particles [1]		
		Moisture Content	Prior to mixing with mineral admixture	
		Gradation [1]	Cold Feed or Hot Bins	One per 500 tons of ACFC production, minimum of one per shift.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Construction & Materials Group concurs, historical abrasion values may be used.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
409	Mineral Aggregate For Asphaltic Concrete (Miscellaneous Structural) [For Special Mix, see below.]	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates (if required)		
		Sand Equivalent	Stockpile	One per source.
		Fractured Coarse Aggregate Particles		
		Moisture Content	Prior to mixing with mineral admixture	One per each two days of asphaltic concrete production.
		Gradation	Cold Feed or Hot Bins	At discretion of the Engineer.
409	Mineral Aggregate for Asphaltic Concrete (Miscellaneous Structural – Special Mix)	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates (if required)		
		Sand Equivalent [1]	Stockpile	One per source.
		Uncompacted Void Content [1]	Stockpile	One prior to start of asphaltic concrete production.
		Fractured Coarse Aggregate Particles [1]	Cold Feed or Stockpile	One per each two days of asphaltic concrete production, minimum of two per project.
		Moisture Content	Prior to mixing with mineral admixture	One per each two days of asphaltic concrete production.
		Gradation	(See Bituminous Mixture requirements for Asphaltic Concrete (Miscellaneous Structural - Special Mix) on Page 45.)	

[1] Independent Assurance Sampling and Testing required.

[2] Provided Construction & Materials Group concurs, historical abrasion values may be used.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
411	Mineral Aggregate for Asphaltic Concrete Friction Course (ACFC) - Miscellaneous	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates		
		Sand Equivalent	Stockpile	One per source.
		Flakiness Index		
		Fractured Coarse Aggregate Particles		
		Moisture Content	Prior to mixing with mineral admixture	One per each two days of ACFC production.
		Gradation	Cold Feed or Hot Bins	At the discretion of the Engineer.
413	Mineral Aggregate for Asphaltic Concrete (Asphalt-Rubber) [AR-AC]	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates (if required)		
		Specific Gravity	Stockpile	One per source.
		Gradation	Cold Feed	One prior to the start of AR-AC production.
		Sand Equivalent [1]	Cold Feed or Stockpile	One prior to the start of AR-AC production and one per each two days of AR-AC production, minimum of two per project.
		Fractured Coarse Aggregate Particles [1]		
		Moisture Content	Prior to mixing with mineral admixture	One per each two days of AR-AC production.
		Gradation [1]	Cold Feed or Hot Bins	One per 500 tons of AR-AC production, minimum of one per shift.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Construction & Materials Group concurs, historical abrasion values may be used.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
414	Mineral Aggregate for Asphaltic Concrete Friction Course (Asphalt-Rubber) [AR-ACFC]	Abrasion [2]	Source or Stockpile	One per source.
		Specific Gravity	Stockpile	One per source.
		Percent Carbonates		
		Gradation	Cold Feed	One prior to the start of AR-ACFC production.
		Sand Equivalent [1]	Cold Feed or Stockpile	One prior to the start of AR-ACFC production and one per each two days of AR-ACFC production, minimum of two per project.
		Fractured Coarse Aggregate Particles [1]		
		Flakiness Index [1]		
		Moisture Content	Prior to mixing with mineral admixture	
		Gradation [1]	Cold Feed or Hot Bins	One per 500 tons of AR-ACFC production, minimum of one per shift.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Construction & Materials Group concurs, historical abrasion values may be used.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
415	Mineral Aggregate for Asphaltic Concrete (Asphalt-Rubber) - End Product [AR-AC]	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates (if required)		
		Sand Equivalent	Stockpile	One at least five working days prior to start of AR-AC production.
		Fractured Coarse Aggregate Particles		
		Uncompacted Void Content		
		Ignition Furnace Calibration		
		Sand Equivalent [1]	Cold Feed or Stockpile	One per each two days of AR-AC production, minimum of two per project.
		Fractured Coarse Aggregate Particles [1]		
		Uncompacted Void Content [1]		
		Moisture Content	Prior to mixing with mineral admixture	
		Gradation	(See Bituminous Mixture requirements for Asphaltic Concrete (Asphalt-Rubber) - End Product on Page 46.)	

[1] Independent Assurance Sampling and Testing required.

[2] Historical abrasion values may be used provided testing was conducted within the past two years.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
416	Mineral Aggregate for Asphaltic Concrete - End Product **[without reclaimed asphalt pavement (RAP)]** (See Page 18 for mixes with RAP.)	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates (if required)		
		Sand Equivalent	Stockpile	One at least five days prior to start of asphaltic concrete production.
		Fractured Coarse Aggregate Particles		
		Uncompacted Void Content **(Special Mix only)**		
		Ignition Furnace Calibration		
		Sand Equivalent [1]	Cold Feed or Stockpile	One per each two days of asphaltic concrete production, minimum of two per project.
		Fractured Coarse Aggregate Particles [1]		
		Uncompacted Void Content [1] **(Special Mix only)**		
		Moisture Content	Prior to mixing with mineral admixture	
		Gradation	(See Bituminous Mixture requirements for Asphaltic Concrete - End Product on Page 47.)	

[1] Independent Assurance Sampling and Testing required.

[2] Historical abrasion values may be used provided testing was conducted within the past two years.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
416	Mineral Aggregate for Asphaltic Concrete - End Product **[with reclaimed asphalt pavement (RAP)]** See PPD [3]. (See Page 17 for mixes without RAP.)	Abrasion [2] (Virgin Agg. and RAP Agg. separately)	Source or Stockpile	One per source.
		Percent Carbonates (if required) (Composite of Virgin Agg. and RAP Agg.)		
		Sand Equivalent (Virgin Agg. only)	Stockpile	One at least five days prior to start of asphaltic concrete production.
		Fractured Coarse Aggregate Particles (Composite of Virgin Agg. and RAP Agg.)		
		Uncompacted Void Content **(Special Mix only)** (Virgin Agg. only)		
		Ignition Furnace Calibration (Virgin Agg., RAP Agg., and RAP material)		
		Gradation, Binder Content [1], and Moisture Content of RAP material	Individual stockpiles (belt cut may be used for single stockpile)	One per each lot of asphaltic concrete production.
		Sand Equivalent [1] (Virgin Agg. only)	Cold Feed or Stockpile	One per each two days of asphaltic concrete production, minimum of two per project.

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		Fractured Coarse Aggregate Particles [1] (Composite of Virgin Agg. and RAP Agg. obtained from Arizona Test Method 428)		
		Uncompacted Void Content [1] **(Special Mix only)** (Virgin Agg. only)		
		Moisture Content	Prior to mixing with mineral admixture	
		Gradation	(See Bituminous Mixture requirements for Asphaltic Concrete - End Product on Page 47.)	

[1] Independent Assurance Sampling and Testing required.

[2] Historical abrasion values may be used provided testing was conducted within the past two years.

[3] ADOT Materials Practice and Procedure Directive.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
417	Mineral Aggregate for Asphaltic Concrete (End Product) SHRP Volumetric Mix **[without reclaimed asphalt pavement (RAP)]** (See Page 20 for mixes with RAP.)	Abrasion [2]	Source or Stockpile	One per source.
		Percent Carbonates (if required)		
		Sand Equivalent	Stockpile	One at least five days prior to start of asphaltic concrete production.
		Fractured Coarse Aggregate Particles		
		Uncompacted Void Content		
		Ignition Furnace Calibration		
		Sand Equivalent [1]	Cold Feed or Stockpile	One per each two days of asphaltic concrete production, minimum of two per project.
		Fractured Coarse Aggregate Particles [1]		
		Uncompacted Void Content [1]		
		Moisture Content	Prior to mixing with mineral admixture	
		Gradation	(See Bituminous Mixture requirements for Asphaltic Concrete (End Product) SHRP Volumetric Mix on Page 48.)	

[1] Independent Assurance Sampling and Testing required.

[2] Historical abrasion values may be used provided testing was conducted within the past two years.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
417	Mineral Aggregate for Asphaltic Concrete (End Product) SHRP Volumetric Mix **[with reclaimed asphalt pavement (RAP)]** See PPD [3]. (See Page 19 for mixes without RAP.)	Abrasion [2] (Virgin Agg. and RAP Agg. separately)	Source or Stockpile	One per source.
		Percent Carbonates (if required) (Composite of Virgin Agg. and RAP Agg.)		
		Sand Equivalent (Virgin Agg. only)	Stockpile	One at least five days prior to start of asphaltic concrete production.
		Fractured Coarse Aggregate Particles (Composite of Virgin Agg. and RAP Agg.)		
		Uncompacted Void Content (Virgin Agg. only)		
		Ignition Furnace Calibration (Virgin Agg., RAP Agg., and RAP material)		
		Gradation, Binder Content [1], and Moisture Content of RAP material	Individual stockpiles (belt cut may be used for single stockpile)	One per each lot of asphaltic concrete production.
		Sand Equivalent [1] (Virgin Agg. only)	Cold Feed or Stockpile	One per each two days of asphaltic concrete production, minimum of two per project.

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		Fractured Coarse Aggregate Particles [1] (Composite of Virgin Agg. and RAP Agg. obtained from Arizona Test Method 428)		
		Uncompacted Void Content [1] (Virgin Agg. only)		
		Moisture Content	Prior to mixing with mineral admixture	
		Gradation	(See Bituminous Mixture requirements for Asphaltic Concrete (End Product) SHRP Volumetric Mix on Page 48.)	

[1] Independent Assurance Sampling and Testing required.

[2] Historical abrasion values may be used provided testing was conducted within the past two years.

[3] ADOT Materials Practice and Procedure Directive.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
Refer to Special Provisions	Mineral Aggregate for Asphaltic Concrete - Miscellaneous Paving	Abrasion [2]	Source or Stockpile	One per source.
		Sand Equivalent	Stockpile	One per source.
		Gradation	Cold Feed or Hot Bins	At discretion of the Engineer.
501	Bedding Material for Pipe	Gradation [1]	Source or Stockpile	One per 300 CY per source.
		PI [1]		
		pH [1]		One per source.
		Resistivity [1]		
		Proctor Density	Source or Stockpile	One per source, and as needed.
		Optimum Moisture		
		Compaction	In-Place	One every 50 CY.
501	Filter Material for Perforated Pipe	Gradation [1]	Source or Stockpile	One per 300 CY per source.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Construction & Materials Group concurs, historical abrasion values may be used.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
501	Plating Material for Pipe Ends	Gradation	Source or Stockpile	One per source, and as needed.
		PI		
		Proctor Density		
		Optimum Moisture		
		Compaction	In-Place	One every 50 CY.
702	Crash Barrel Sand	Gradation	Plant or Site	One per each attenuator system location.
		Dry Unit Weight per cubic foot		
		Moisture Content		
	Sand and Rock Salt Mixture (when Sand Barrel Crash Cushions are installed at elevations above 3,000 feet)	Percent Rock Salt		
808	Bedding Material for Polyvinyl Chloride (PVC) Irrigation Pipe	Gradation	Source or Stockpile	One per source.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
913	Rock for Wire Tied Riprap, Gabions, Riprap (Slope Mattress), and Rail Bank Protection	Specific Gravity	Source	One per source.
		Gradation (visual)	Project	One per 1/2 shift.
	Rock for Grouted Riprap and Dumped Riprap	Specific Gravity	Source	One per source.
		Gradation	Project	One per 1/2 shift.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1006	Fine Aggregate for Portland Cement Concrete (PCC) Classes P, S, and B	Gradation [1]	Batch Plant Conveyer Belt or Stockpile	Once per week of production.
		Sand Equivalent [1]		
		Soundness [when used in concrete over 4500 ft. elevation]	Stockpile	One per source. For evaluation of concrete aggregate sources, see PPD [3].
		Organic Impurities		
		Mortar Strength		
		Deleterious Substances [Clay Lumps and Friable Particles; Lightweight Particles]	Stockpile	At the discretion of Materials Group. For evaluation of concrete aggregate sources, see PPD [3].

[1] Independent Assurance Sampling and Testing required.

[3] ADOT Materials Practice and Procedure Directive.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1006	Coarse Aggregate for Portland Cement Concrete (PCC) Classes P, S, and B	Gradation [1]	Batch Plant Conveyer Belt or Stockpile	Once per week of production.
		Soundness [when used in concrete over 4500 ft. elevation]	Stockpile	One per source. For evaluation of concrete aggregate sources, see PPD [3].
		Abrasion [2]		
		Deleterious Substances [Clay Lumps and Friable Particles; Lightweight Particles; Material Passing No. 200 Sieve]	Stockpile	With the exception of "Material Passing No. 200 Sieve", at the discretion of Materials Group. For evaluation of concrete aggregate sources, see PPD [3].
		Fractured Coarse Aggregate Particles	Stockpile	One per source.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Construction & Materials Group concurs, historical abrasion values may be used.

[3] ADOT Materials Practice and Procedure Directive.

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TABLE 2 (continued)
ACCEPTANCE SAMPLING GUIDE FOR AGGREGATES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
Refer to Special Provisions	Aggregate for Arrestor Bed	Abrasion [2] Specific Gravity	Screen Belt or Stockpile	One per source.
		Gradation [1] Fractured Coarse Aggregate Particles [1] Flakiness Index [1]	Screen Belt or Stockpile	One per shift.
Refer to Special Provisions	Aggregate for Soil-Cement Bank Protection or Cement Stabilized Alluvium	Gradation [1] PI [1]	Source or Stockpile	One per 2000 tons, minimum of one per day.

[1] Independent Assurance Sampling and Testing required.

[2] Provided Construction & Materials Group concurs, historical abrasion values may be used.

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TABLE 3
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1005	Recycling Agent RA-1 RA-5 RA-25 RA-75	Per Specifications	Circulation Line Recom-mended [4]	Certificate of Compliance required and duplicate samples (each one gallon in a metal can) per 1/2 shift.
1005 404	Liquid Asphalt [Cutback Asphalt - (Medium Curing Type)] MC-70 MC-250 MC-800 MC-3000 for Prime Coat	Per Specifications	Distributor Recom-mended [4]	Certificate of Compliance required and duplicate samples (each one gallon in a metal can) per delivery unit.

[4] Point of sampling specified by Engineer.

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

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TABLE 3 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1005	Emulsified Asphalt RS-1 CRS-1 RS-2 CRS-2 SS-1 CSS-1 CRS-2P	Per Specifications	Supplier (For pre-approval of material.)	See PPD [3].
		Residue	Distibutor Recom-mended [4]	See PPD [3].
				For preapproved emulsions, Certificate of Compliance required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.
404	for Chip Seal Coat, Tack Coat, and Fog Coat			For emulsions not preapproved, Certificate of Analysis required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.

[3] ADOT Materials Practice and Procedure Directive.

[4] Point of sampling specified by Engineer.

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

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TABLE 3 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1005 404	Emulsified Asphalt Special Type (Diluted SS-1 or CSS-1) for Tack Coat and Fog Coat	Residue	Distributor Recom-mended [4]	See PPD [3]. For preapproved undiluted emulsions, Certificate of Compliance required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit. For undiluted emulsions not preapproved, Certificate of Analysis required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.

[3] ADOT Materials Practice and Procedure Directive.

[4] Point of sampling specified by Engineer.

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

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TABLE 3 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1005	Asphalt Cement (PG XX-XX)	Per Specifications		
404	for Tack Coat			Certificate of Compliance required.
416 417	for Asphaltic Concrete		Supplier or Project	A two gallon sample (two full one-gallon metal cans) at least five days prior to start of asphaltic concrete production (for calibration of ignition furnace).
			Circulation Line Recom-mended [4]	
404	for Chip Seal Binder Coat		Distributor Recom-mended[4]	Certificate of Compliance required and duplicate samples (each one gallon in a metal can) per 1/2 shift.
407 409 411 416 417	for Asphaltic Concrete, or ACFC		Circulation Line Recom-mended [4]	

[4] Point of sampling specified by Engineer.

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

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TABLE 3 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1005		Per Specifications	Supplier (For pre-approval of material)	See PPD [3].
	Emulsified Recycling Agent (ERA) ERA-1 ERA-5 ERA-25 ERA-75	Residue	Distributor Recom-mended [4]	See PPD [3].
				For preapproved ERA, Certificate of Compliance required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.
				For ERA not preapproved, Certificate of Analysis required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.
404	ERA (Diluted) for Fog Coat	Residue	Distributor Recom-mended [4]	See PPD [3].
				For preapproved undiluted ERA, Certificate of Compliance required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.
				For undiluted ERA not preapproved, Certificate of Analysis required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.

[3] ADOT Materials Practice and Procedure Directive.

[4] Point of sampling specified by Engineer.

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

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TABLE 3 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1005 1009 410	Asphalt Cement (PG XX-XX) for Asphalt - Rubber (Sprayed Applications)	Per Specifications	Delivery Unit or Terminal (if blended at terminal)	Certificate of Compliance required and duplicate samples (each one gallon in a metal can) for each shipment - not less than one set of duplicate samples for each 40 tons.
1005 1009 413 414 415	Asphalt Cement (PG XX-XX) for Asphalt - Rubber for AR-AC or AR-ACFC	Per Specifications	Delivery Unit or Terminal (if blended at terminal) [(4)]	Certificate of Compliance required and duplicate samples (each one gallon in a metal can) per 1/2 shift.
1009	Crumb Rubber for Asphalt - Rubber Type A or Type B	Gradation	Project (or Terminal (if blended at terminal)	Certificate of Compliance required and one sample [approximately 1500 grams (one gallon) per Arizona Test Method 714] per lot per type.
1009 410	Asphalt - Rubber [CRA [(5)]] Type 1, Type 2, or Type 3 (Sprayed Applications)	Per Special Provisions.	Distributor Recom-mended [(4)]	Certificate of Compliance required and a one gallon sample in a metal can per delivery unit.

[(4)] Point of sampling specified by Engineer.

[(5)] CRA = Crumb Rubber Asphalt

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

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TABLE 3 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1009 413 414 415	Asphalt - Rubber [CRA [5]] Type 1, Type 2, or Type 3 For AR-AC or AR-ACFC			Certificate of Compliance required.
		Penetration	Circulation Line Recom-mended [4]	Duplicate samples (each one gallon in a metal can) per 1/2 shift.
		Softening Point		
		Resilience		
		Rotational Viscosity		
		Rotational Viscosity (at plant)		One sample (one gallon in a metal can) per batch.
415	for AR-AC		Supplier or Project	A two gallon sample (two full one-gallon metal cans) at least five days prior to start of asphaltic concrete production (for calibration of ignition furnace).
			Circulation Line Recom-mended [4]	

[4] Point of sampling specified by Engineer.

[5] CRA = Crumb Rubber Asphalt

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

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TABLE 3 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MATERIAL

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
Refer to Special Provisions	Emulsified Asphalt for Cold Recycled Asphaltic Concrete HFE-150P HFE-300P	Per Special Provisions.	Supplier (for pre-approval of material.)	See PPD [3].
		Residue	Distibutor Recom-mended [4]	See PPD [3].
				For preapproved emulsions, Certificate of Compliance required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.
				For emulsions not preapproved, Certificate of Analysis required and duplicate samples (each 1/2 gallon in a plastic container) per delivery unit.

[3] ADOT Materials Practice and Procedure Directive.

[4] Point of sampling specified by Engineer.

Note: During production, samples of bituminous material shall be taken by the contractor and witnessed by the Engineer.

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TABLE 4
ACCEPTANCE SAMPLING GUIDE FOR PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
402	Dowel Bar	Epoxy Coating		Certificate of Compliace required for each shipment from the coating manufacturer. Certificate of Anaysis required for each shipment from the coating applicator.
401 1006	Portland Cement Concrete (PCC) Class P	Compressive Strength [1]	Immediately before going into paver or forms, or as otherwise directed by the Engineer.	Five samples per lot.
		Slump		(For compressive strength, one set of three cylinders per sample.)
		Air Content (when Required)		
		Temperature		
		Thickness	Roadway	10 cores per lot.
1006	Portland Cement Concrete (PCC) Class S **(with a compressive strength requirement less than 4,000 psi)**	Compressive Strength [1]	At Discharge [6]	One sample for each 100 CY, or fraction thereof, of continuously placed concrete per day from each batch plant. For daily placements of 10 CY or less, at the discretion of the Engineer.
		Slump		
		Temperature		(For compressive strength, one set of two cylinders per sample.)
		Air Content (when Required)	At Discharge [6]	Sample for air content every 50 CY when elevation is above 3000 ft. For daily placements of 10 CY or less, at the discretion of the Engineer.

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(1) Independent Assurance Sampling and Testing required.

(6) Concrete pumped to facilitate placement will be sampled for acceptance at the final point of placement. Samples will be taken during continuous discharge of concrete that has been pumped beyond the pump hopper without interruption at the normal production rate. Where freeze-thaw durability is of concern (such as in bridge decks, overlays, approach slabs, and barrier walls), the concrete shall also be sampled at the truck to determine air loss through the pump. In accordance with Subsection 601-3.03(C), if the loss of air as measured between the supply truck and the point of placement exceeds two percent, the contractor shall employ measures acceptable to the Engineer to reduce the loss of air to less than two percent. If sampling at the point of placement is not practical, as determined by the Engineer, or creates a safety concern, the concrete shall be sampled for acceptance at the truck. When acceptance sampling can only be performed at the truck, the acceptable range of air content of the supplied mix will be adjusted to not less than five percent nor more than eight percent in accordance with Subsection 1006-3.01.

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TABLE 4 (continued)
ACCEPTANCE SAMPLING GUIDE FOR PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1006	Portland Cement Concrete (PCC) Class S **(with a compressive strength requirement equal to or greater than 4,000 psi)**	Compressive Strength [1]	At Discharge [6]	One sample for each 50 CY, or fraction thereof, of continuously placed concrete per day from each batch plant. For daily placements of 10 CY or less, at the discretion of the Engineer.
		Slump		
		Temperature		(For compressive strength, one set of three cylinders per sample.)
		Air Content (when Required)	At Discharge [6]	Sample for air content every 50 CY when elevation is above 3000 ft. For daily placements of 10 CY or less, at the discretion of the Engineer.

[1] Independent Assurance Sampling and Testing required.

[6] Concrete pumped to facilitate placement will be sampled for acceptance at the final point of placement. Samples will be taken during continuous discharge of concrete that has been pumped beyond the pump hopper without interruption at the normal production rate. Where freeze-thaw durability is of concern (such as in bridge decks, overlays, approach slabs, and barrier walls), the concrete shall also be sampled at the truck to determine air loss through the pump. In accordance with Subsection 601-3.03(C), if the loss of air as measured between the supply truck and the point of placement exceeds two percent, the contractor shall employ measures acceptable to the Engineer to reduce the loss of air to less than two percent. If sampling at the point of placement is not practical, as determined by the Engineer, or creates a safety concern, the concrete shall be sampled for acceptance at the truck. When acceptance sampling can only be performed at the truck, the acceptable range of air content of the supplied mix will be adjusted to not less than five percent nor more than eight percent in accordance with Subsection 1006-3.01.

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TABLE 4 (continued)
ACCEPTANCE SAMPLING GUIDE FOR PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1006	Portland Cement Concrete (PCC) Class B	Compressive Strength [1]	At Discharge [6]	One sample for each 100 CY of concrete placed from each batch plant For daily placements of 10 CY or less, at the discretion of the Engineer.
		Slump		
		Temperature		(For compressive strength, one set of two cylinders per sample.)
		Air Content (when Required)	At Discharge [6]	Sample for air content every 50 CY when elevation is above 3000 ft. For daily placements of 10 CY or less, at the discretion of the Engineer.

[1] Independent Assurance Sampling and Testing required.

[6] Concrete pumped to facilitate placement will be sampled for acceptance at the final point of placement. Samples will be taken during continuous discharge of concrete that has been pumped beyond the pump hopper without interruption at the normal production rate. Where freeze-thaw durability is of concern (such as in bridge decks, overlays, approach slabs, and barrier walls), the concrete shall also be sampled at the truck to determine air loss through the pump. In accordance with Subsection 601-3.03(C), if the loss of air as measured between the supply truck and the point of placement exceeds two percent, the contractor shall employ measures acceptable to the Engineer to reduce the loss of air to less than two percent. If sampling at the point of placement is not practical, as determined by the Engineer, or creates a safety concern, the concrete shall be sampled for acceptance at the truck. When acceptance sampling can only be performed at the truck, the acceptable range of air content of the supplied mix will be adjusted to not less than five percent nor more than eight percent in accordance with Subsection 1006-3.01.

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TABLE 4 (continued)
ACCEPTANCE SAMPLING GUIDE FOR PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
601 1006	Portland Cement Structural Concrete for Minor Precast Structures (Manholes, Cattle Guards, Utility Vaults, Catch Basins, Flared Ends, etc.)	Rebound Hammer	At Fabrication Yard	One set of readings per precast unit.
601 1006	Prestressed Concrete	Compressive Strength Slump Temperature	At Discharge (6)	One sample per member or for each day's production. (For compressive strength, a minimum of two sets of 3 cylinders for detensioning, and one set of 3 cylinders for 28-day breaks.)
912	Shotcrete	Compressive Strength	Test Panels	Three cores from a test panel every 100 CY or fraction thereof, per day.
		Slump	At Mixer Discharge	One per 50 CY or fraction thereof, per day.
		Air Content (For Shotcrete placed at an elevation of 3,000 feet or above)	For wet-mix process, just prior to pumping For dry-mix process, from in-place material	
922 1006	Utility Concrete	None		

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(6) Concrete pumped to facilitate placement will be sampled for acceptance at the final point of placement. Samples will be taken during continuous discharge of concrete that has been pumped beyond the pump hopper without interruption at the normal production rate. Where freeze-thaw durability is of concern (such as in bridge decks, overlays, approach slabs, and barrier walls), the concrete shall also be sampled at the truck to determine air loss through the pump. In accordance with Subsection 601-3.03(C), if the loss of air as measured between the supply truck and the point of placement exceeds two percent, the contractor shall employ measures acceptable to the Engineer to reduce the loss of air to less than two percent. If sampling at the point of placement is not practical, as determined by the Engineer, or creates a safety concern, the concrete shall be sampled for acceptance at the truck. When acceptance sampling can only be performed at the truck, the acceptable range of air content of the supplied mix will be adjusted to not less than five percent nor more than eight percent in accordance with Subsection 1006-3.01.

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TABLE 5
ACCEPTANCE SAMPLING GUIDE FOR MATERIALS USED WITH
PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
402	Dowel Bar	Epoxy Coating		Certificate of Compliace required for each shipment from the coating manufacturer. Certificate of Anaysis required for each shipment from the coating applicator.
602 1003	Prestressing Steel (Spiral, Bars, Strand Wire, or Wire)	Tensile Strength	Project or Fabrication Plant	Certificate of Compliance required and one 6 ft. piece from each bar size, heat, reel, or coil.
602 1003	Post-Tensioning Steel	Tensile Strength	Project	Certificate of Compliance required and one 6 ft. piece from each bar size, heat, reel, or coil.
605 1003	Reinforcement Bars (Epoxy Coated or Uncoated)	Yield Strength, Tensile Strength, Bend Test, Elongation, Weight/Foot, and Coating Thickness (if applicable)		
	Phoenix and Tucson Sources		Fabrication Plant or Supplier's Yard	Certificate of Compliance required and samples as per PPD [(3)].
			Project	Certificate of Compliance required and one 7 ft. bar per shipment. See PPD [(3)].
	Other sources		Project	Certificate of Compliance required and samples as per PPD [(3)].
1003	Welded Wire Fabric (Smooth)	Tensile Strength, Diameter, Spelter, Weld Shear, Reduction in Area	Supplier's Yard or Project	Certificate of Compliance required and one 2 ft. x 2 ft. sample per 25 rolls.

[(3)] ADOT Materials Practice and Procedure Directive.

TABLE 5 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MATERIALS USED WITH
PORTLAND CEMENT CONCRETE

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SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1003	Welded Wire Fabric (Deformed)	Tensile Strength, Weld Shear, Weight/Foot	Supplier's Yard or Project	Certificate of Compliance required and one 4 ft. x 4 ft. sample per 25 sheets.
1006	Admixtures			Certificate of Compliance required and must be on the Department's Approved Products List. See Subsection 1006-2.04.
1006	Curing Compound		Project	For material previously approved,Certificate of Analysis only. See Subsection 1006-6.01.
				For material <u>not</u> previously approved, Certificate of Compliance and a 1/2 gallon sample per lot. See Subsection 1006-6.01.
1006	Fly Ash and Natural Pozzolan			Material supplied from an Approved Material Source. See Subsection 1006-2.01.
1006	Silica Fume			Certificate of Compliance required with each lot. See See Subsection 1006-2.01.

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TABLE 5 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MATERIALS USED WITH
PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1006	Water	Soluble Salts pH	Source	One sample (1 pint in glass container) per source [7].
1006	Hydraulic Cement (All Types)			Material supplied from an Approved Material Source. See Subsection 1006-2.01.
1011	Joint Materials	Per Specifications		Silicone joint sealant must be on the Department's Approved Product List. In addition, a Certificate of Analysis shall accompany each lot or batch of sealant. For joint materials other than silicone joint sealant, only a Certificate of Compliance is required.

[7] No sample is necessary if water is potable and comes from a proven source.

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TABLE 5 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MATERIALS USED WITH
PORTLAND CEMENT CONCRETE

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1013 604	Bearing Pads (Preformed Fabric)	Thickness --- Compression Load	Project/ Contractor's Yard	Certificate of Analysis required and two sample pads from every 100, or fraction thereof, with a minimum of one sample pad from each lot for each type of pad. (Tested by ADOT.)
1013 604	Bearing Pads (Plain and Fabric Reinforced Elastomeric)	Per Specification Subsection 1013-2	Project/ Contractor's Yard	Certificate of Analysis required and two sample pads from every 100, or fraction thereof, with a minimum of one sample pad from each lot for each type of pad. (Not tested by ADOT) [Tested by Engineer approved testing laboratory. See Subsection 1013-3.01.]
1013 604	Bearing Pads (Steel Reinforced Elastomeric)	Per Specification Subsection 1013-2	Project/ Contractor's Yard	Certificate of Analysis required and two sample pads from every 100, or fraction thereof, with a minimum of one sample pad from each lot for each type of pad.(Not tested by ADOT) [Tested by Engineer approved testing laboratory. See Subsection 1013-3.01.]

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TABLE 6
ACCEPTANCE SAMPLING GUIDE FOR STABILIZED SOILS AND BASES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
301	Lime Treated Subgrade	Proctor Density	Roadway	One per soil type, and as needed.
		Optimum Moisture		
		Compaction	Roadway	One per lift per 1000 ft.
302	Cement Treated Subgrade	Proctor Density	Roadway	One per soil type, and as needed.
		Optimum Moisture		
		Compaction	Roadway	One per lift per 1000 ft.
304	Cement Treated Base	Proctor Density	Roadway	At start of production then one per week, and as needed.
		Optimum Moisture		
		Compaction	Roadway or Point of Placement	One per lift per 1000 ft.
		Compressive Strength [(1)]		Three random samples per shift. (Three specimens from each sample.)

[(1)] Independent Assurance Sampling and Testing required.

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TABLE 6 (continued)
ACCEPTANCE SAMPLING GUIDE FOR STABILIZED SOILS AND BASES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
305	Lean Concrete Base	Compressive Strength [1]	At Discharge	Four random samples per 4000 SY, minimum four samples per shift.
		Slump		
		Air Content (when required)		
		Thickness	Roadway	Per Specifications.
Refer to Special Provisions	Bituminous Treated Base	See Special Provisions	Roadway	At the discretion of the Engineer.
Refer to Special Provisions	Cement Stabilized Alluvium	Compressive Strength [1]	Roadway or Point of Placement	One set of three per 1500 CY, minimum one set of three per 1/2 shift.
Refer to Special Provisions	Soil-Cement Bank Protection	Compressive Strength [1]	Roadway or Point of Placement	One set of three per 1500 CY, minimum one set of three per 1/2 shift.

[1] Independent Assurance Sampling and Testing required.

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TABLE 7
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MIXTURES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
407	Asphaltic Concrete Friction Course (ACFC)	% Asphalt (1) Moisture Content (1)	Trucks at Mixing Plant	4 per shift.
409	Asphaltic Concrete (Miscellaneous Structural) [For Special Mix, see below]	% Asphalt Moisture Content Rice Marshall Density	Roadway	At the discretion of the Engineer.
409	Asphaltic Concrete (Miscellaneous Structural - Special Mix)	% Asphalt (1) Moisture Content (1) Rice (1) Marshall Density (1) Gradation (1)	Roadway	One sample per 500 tons.
411	Asphaltic Concrete Friction Course (ACFC) - Miscellaneous	% Asphalt Moisture Content	Trucks at Mixing Plant	At the discretion of the Engineer.
413	Asphaltic Concrete (Asphalt – Rubber) [AR-AC]	% Asphalt-Rubber (1) Moisture Content (1)	Roadway	4 per shift.

(1) Independent Assurance Sampling and Testing required.

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TABLE 7 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MIXTURES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
414	Asphaltic Concrete Friction Course (Asphalt – Rubber) [AR-ACFC]	% Asphalt-Rubber (1) Moisture Content (1)	Trucks at Mixing Plant	4 per shift.
415	Asphaltic Concrete (Asphalt-Rubber) - End Product [AR-AC]	% Asphalt-Rubber (1) Moisture Content (1) Gradation (1) Marshall Density (1) Rice (1)	Roadway	4 per lot.
		Compaction	Roadway	20 cores per lot (10 locations/2 cores per location).

(1) Independent Assurance Sampling and Testing required.

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TABLE 7 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MIXTURES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
416	Asphaltic Concrete - End Product [For mixes containing reclaimed asphalt pavement (RAP), see PPD [3].]	% Asphalt [1]	Roadway	4 per lot.
		Moisture Content [1]		
		Gradation [1]		
		Marshall [1] [Density, Stability, and Flow]		
		Rice [1]		
		Compaction, unless otherwise specified. (Courses > 1½ inch in nominal thickness)	Roadway	20 cores per lot (10 locations/2 cores per location).

[1] Independent Assurance Sampling and Testing required.

[3] ADOT Materials Practice and Procedure Directive.

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TABLE 7 (continued)
ACCEPTANCE SAMPLING GUIDE FOR BITUMINOUS MIXTURES

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
417	Asphaltic Concrete (End Product) SHRP Volumetric Mix [For mixes containing reclaimed asphalt pavement (RAP), see PPD [3].]	% Asphalt [1]	Roadway	4 per lot.
		Moisture Content [1]		
		Gradation [1]		
		Gyratory Density [1]		
		Rice [1]		
		Compaction (Courses > 1½ inch in nominal thickness)	Roadway	20 cores per lot (10 locations/2 cores per location).
Refer to Special Provisions	Asphaltic Concrete - Miscellaneous Paving			Tested at the discretion of the Engineer.

[1] Independent Assurance Sampling and Testing required.

[3] ADOT Materials Practice and Procedure Directive.

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TABLE 8
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
301 503 913 1010	Lime (for use in soil stabilization, mortar, and grout)	Chemical and Physical		See PPD [3].
407 409 411 413 414 415 416 417	Hydrated Lime (for use as mineral admixture in asphaltic concrete mixes)			Material supplied from an Approved Material Source. See PPD [3].
302 304 501 503 505 601 602 912 913 1010	Hydraulic Cement (for use in soil stabilization, mortar, and grout)	Chemical and Physical		See PPD [3].
407 409 411 413 414 415 416 417	Portland Cement and Blended Hydraulic Cement (for use as mineral admixture in asphaltic concrete mixes)			Material supplied from an Approved Material Source. See PPD [3].

[3] ADOT Materials Practice and Procedure Directive.

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TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
501	Corrugated Metal Pipe (CMP) [Coated or Non-coated]			Certificate of Compliance required.
501 1006	Non-Reinforced, Cast-in-Place Concrete Pipe	Compressive Strength Slump Air Content (when required) Temperature	At Discharge [6]	Per Specifications.
		Wall Thickness	Site	
501 1010	Precast Reinforced or Non-Reinforced Concrete Pipe	Compression (D-Load) Wall Thickness	Supplier's Yard	Certificate of Compliance required and one sample for each 100 sections per size per type.
Refer to Special Provisions	Vitrified Clay Pipe	Compression	Project	One sample for each 100 sections per size per type.
505	Brick for Manholes	Compression	Project	One sample (6 bricks of like kind and size) per project.

[6] Concrete pumped to facilitate placement will be sampled for acceptance at the final point of placement. Samples will be taken during continuous discharge of concrete that has been pumped beyond the pump hopper without interruption at the normal production rate. Where freeze-thaw durability is of concern (such as in bridge decks, overlays, approach slabs, and barrier walls), the concrete shall also be sampled at the truck to determine air loss through the pump. In accordance with Subsection 601-3.03(C), if the loss of air as measured between the supply truck and the point of placement exceeds two percent, the contractor shall employ measures acceptable to the Engineer to reduce the loss of air to less than two percent. If sampling at the point of placement is not practical, as determined by the Engineer, or creates a safety concern, the concrete shall be sampled for acceptance at the truck. When acceptance sampling can only be performed at the truck, the acceptable range of air content of the supplied mix will be adjusted to not less than five percent nor more than eight percent in accordance with Subsection 1006-3.01.

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TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
Refer to Special Provisions	Paving Brick	Compression --- Absorption	Project	One sample (6 paving bricks of like kind and size) per project.
Refer to Special Provisions	Cinder Block	Compression --- Absorption	Project	One sample (6 cinder blocks of like kind and size) per project.
Refer to Special Provisions	Slump Block	Compression --- Absorption	Project	One sample (6 slump blocks of like kind and size) per project.
601	Vertical Restrainer	Tensile	Project	1 test loop/40 assembly per type 1 , and Certificate of Analysis required.
604 731 1004 1012	High Strength Bolts, Nuts, Washers, or Anchor Bolts	Rockwell Hardness --- Wedge Tensile Strength	Project	Certificate of Analysis required and three samples per lot, or 0.1% of lots in excess of 3000, for each bolt diameter, including nuts and washers.
608 1007	Retroreflective Sheeting	Per Specifications		Certificate of Compliance required and also must be on the Department's Approved Products List
608	Sign Panel Silk-Screened Characters			Certificate of Compliance required.

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TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
704 708 709	Glass Beads	Roundness Gradation Refractive Index Moisture Resistance Heavy Metal Concentration (if required)	Supplier's Yard (Recom-mended) or Project	See PPD [3]. = = = = = = = = = = = = = = = = = = = For other than Dual Component Pavement Markings: - Certificate of Compliance required*, and if preapproved, a copy of the Central Lab test results. - If <u>not</u> preapproved by Central Lab, Certificate of Compliance required*, and a gallon sample when material is supplied in a "super sack." - *If required, a Certificate of Analysis must also be submitted (certifying that the Heavy Metal Concentration meets the specifications). = = = = = = = = = = = = = = = = = = = For Dual Component Pavement Markings: - Certificate of Analysis required**, and if preapproved, a copy of the Central Lab test results. - If <u>not</u> preapproved by Central Lab, Certificate of Analysis required**, and a gallon sample when material is supplied in a "super sack. - **The Certificate of Analysis shall also include a Material Safety Data Sheet (MSDS).

[3] ADOT Materials Practice and Procedure Directive.

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TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
704	Thermoplastic Pavement Markings	Per Specifications	Manufac-turer	For precertification, the manufacturer shall prepare a metal can powder sample per specifications.
			Project	Certificate of Compliance and a copy of the Central Materials Chemistry Lab test results are required. Also must be on the Department's Approved Products List.
				In-place field verification checks for thickness or sampling for composite testing will be made at the discretion of the Engineer . Material shall be sampled utilizing a 4 inch x 12 inch galvanized sheet metal plate without additional application of glass beads.
705	Preformed Plastic Pavement Marking			Certificate of Compliance required*, and also must be on the Department's Approved Products List. *A Certificate of Analysis is also required (certifying that the Heavy Metal Concentration of the glass beads meets the specifications).

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TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
706	Raised Pavement Markers	Per Specifications	Project	Certificate of Compliance required for markers and adhesive.
				Adhesive must be on the Department's Approved Products List.
				For non-reflective pavement markers, one sample (one marker) per lot per type.
				For reflective pavement markers, one sample (three markers) per lot per type.
708	Permanent Pavement Markings (Painted)	Per Specifications	Supplier, Contractor, or Manufac-turer	For precertification: The Supplier, Contractor, or Manufacturer shall prepare a one-gallon powder sample per specifications.
			Project	Certificate of Compliance and a copy of the Central Materials Chemistry Lab test results are required.
				Check-samples of finished paint while being applied, at intervals determined by the Engineer.

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TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
709	Dual Component Pavement Markings	Per Specifications	Project	Certificate of Analysis required and must be on the Department's Approved Projects List. Random spot checks for thickness.
732	Polyvinyl Chloride (PVC) Pipe for Electrical Conduit	Resistance to Crushing	Project	One sample per 5000 ft.
808	Polyvinyl Chloride (PVC) Pipe for Water	Wall Thickness Burst Pressure Diameter	Project	One sample per 10,000 ft.
902	Chain Link Fabric			Certificate of Compliance required.
902	Fence Post and Rails			Certificate of Compliance required.
902 903	Miscellaneous Fence Hardware			Certificate of Compliance required.
902 903	Post Clips, Hog Rings, Tie Wire, or Tension Wire			Certificate of Compliance required.

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TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
903	Barbed Wire or Barbless Wire	Tensile Strength Spelter Diameter	Supplier's Yard or Project	Certificate of Compliance[8] required and one 4 ft. sample per 50 rolls.
903	Fence Stays			Certificate of Compliance required.
903	T-Post	Weight/Foot Length	Supplier's Yard or Project	Certificate of Compliance[8] required and one post per 500 posts, or fraction thereof, per lot.
903	Woven Wire Fabric	Spelter Diameter Tensile Strength	Supplier's Yard or Project	Certificate of Compliance[8] required and one sample [3 feet long, the full height (width) of the fabric] per 50 rolls.
904 913	Wire Rope			Certificate of Compliance required.

[8] Certifying that manufacturing processes and application of coating occurred in the United States. (This certification required for Federal-Aid projects only. See Special Provisions for exception based on quantity being used.)

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TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1002	Paint	Per Specifications	Project	Paint for use on structural steel and other metallic surfaces: - Certificate of Compliance is required and the system must be on the Department's Approved Products List.
			= = = = = = = =	= = = = = = = = = = = = = = = = = =
			Supplier or Contractor	Paint for use on concrete or masonry surfaces: - A sample (one quart in a metal can) of the material from each batch must be submitted to Central Lab for testing prior to use.
			Project	- Certificate of Compliance and a copy of the Central Materials Chemistry Lab test results are required. Also must be on the Department's Approved Products List.
			= = = = = = = =	= = = = = = = = = = = = = = = = = =
			Project	Paint for use on other than structural steel and other metallic surfaces, concrete surfaces, or masonry surfaces: - Certificate of Compliance is required and one sample (one quart in a metal can) per batch submitted to Central Lab for testing.

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TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1012	Guardrail Elements			Certificate of Compliance required.
1012	Guardrail Fasteners	Rockwell Hardness Tensile Strength	Project	For other than High Strength Anchor Bolts, Certificate of Compliance required and three samples per lot, or 0.1% of lots in excess of 3000, for each bolt diameter, including nuts and washers. For High Strength Anchor Bolts, see Page 51.
1012	Guardrail Posts and Blocks	None		Certificate of Compliance required. For timber guardrail posts and blocks, see PPD [3].

[3] ADOT Materials Practice and Procedure Directive.

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TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
1014	Geosynthetics		Supplier and Project	If material has been preapproved, Certificate of Compliance required and one sample for every 10 rolls per lot. (Minimum of one sample per lot.) Samples shall not be taken within 5 feet from either end of the roll, and shall be at least 6 feet long by the full width of the roll.
			Project	If material has not been preapproved, Certificate of Analysis required and one sample for every 10 rolls per lot. (Minimum of one sample per lot.) Samples shall not be taken within 5 feet from either end of the roll, and shall be at least 6 feet long by the full width of the roll.
NOTE: Information on Geosynthetics continued on next page.				

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TABLE 8 (continued)
ACCEPTANCE SAMPLING GUIDE FOR MISCELLANEOUS MATERIALS

SPECIFI-CATION SECTION	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
NOTE: Information on Geosynthetics continued from previous page.				
1014 412	Pavement Fabric	Per Specification Subsection 1014-2		
1014 306	Geogrid	Per Specification Subsection 1014-3		
1014 208	Separation Geotextile Fabric	Per Specification Subsection 1014-4		
1014 913	Bank Protection Fabric	Per Specification Subsection 1014-5		
1014 203	Geocomposite Wall Drain System	Per Specification Subsection 1014-6		
1014 307	Geocomposite Edge Drain System	Per Specification Subsection 1014-7		
208	Geomembrane	See Special Provisions.		

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Appendix E

Example Material Identification Codes

Material codes and type codes are used to identify what a material is used for. Each code combination in each line below makes up an individual Material Code allowed to be used on the Project. For example, the Material Code for Aggregate Base Class 2 is: AB-2. The Material Code for Decomposed Granite is: DG.

Soils, Aggregates, Stabilized Soils and Bases

The source of the material (supplier or segment) should also be document.

Portland Cement Concrete

Portland cement concrete mixes should be identified by mix design and plant number.

Hot-Mix Asphalt Concrete

Hot-mix asphalt cement concrete mixes should be identified by mix design and plant number.

Material Code Combinations			
Material	Code	Type	Code
Admix	AD		
Aggregate	AG	Bituminous Treated Base	BB
Aggregate	AG	Cement Treated Base	CB
Aggregate	AG	Cement Treated Subgrade	CS
Aggregate	AG	Lean Concrete Base	LC
Aggregate	AG	Lime Treated Subgrade	LS
Aggregate	AG	Road Mix	RM
Aggregate	AG	Soil Cement	SC
Aggregate Base	AB	Class 1	1
Aggregate Base	AB	Class 2	2
Aggregate Base	AB	Class 3	3
Aggregate Subbase	AS	Class 4	4
Aggregate Subbase	AS	Class 5	5
Aggregate Subbase	AS	Class 6	6
Arrestor Bed Aggregate	AA		
Asphaltic Concrete	AC	1/2" Asphaltic Concrete	12
Asphaltic Concrete	AC	1/2" Fine Band 417 AC	12F
Asphaltic Concrete	AC	1/2" Coarse Band 417 AC	12K
Asphaltic Concrete	AC	3/4" Asphaltic Concrete	34

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Material Code Combinations			
Material	Code	Type	Code
Asphaltic Concrete	AC	3/4" Fine Band 417 AC	34F
Asphaltic Concrete	AC	3/4" Coarse Band 417 AC	34K
Asphaltic Concrete	AC	Asphaltic Concrete Friction Course (ACFC)	FC
Asphaltic Concrete	AC	Asphalt-Rubber Asphaltic Concrete (AR-AC)	RD
Asphaltic Concrete	AC	Asphalt-Rubber Asphaltic Concrete Friction Course (AR-ACFC)	RF
Asphaltic Concrete	AC	Base Mix	BM
Asphaltic Concrete	AC	Bituminous Treated Base	BB
Asphaltic Concrete	AC	AZ409 Miscellaneous Structural	409MI
Asphaltic Concrete	AC	AZ409 Miscellaneous Structural (Special Mix)	409SP
Asphaltic Concrete	AC	Other	OT
Asphaltic Concrete	AC	Recycled Asphaltic Concrete	RC
Asphaltic Concrete	AC	Road Mix	RM
Asphaltic Concrete Friction Course (ACFC)	FC		
Asphalt-Rubber Asphaltic Concrete (AR-AC)	RD		
Asphalt-Rubber Asphaltic Concrete Friction Course (AR-ACFC)	RF		
Backfill	BF	Aluminum Pipe	AP
Backfill	BF	Concrete Pipe	CP
Backfill	BF	Metal Pipe	MP
Backfill	BF	Plastic Pipe	PP
Backfill	BF	Slurry	SL
Backfill	BF	Special	SP
Backfill	BF	Trench	TR
Bedding Material	BM	Concrete Pipe	CP
Bedding Material	BM	Corrugated Metal Pipe	MP
Bedding Material	BM	PVC Pipe	PV
Bedding Material	BM	Slurry	SL
Blotter Material	BL		
Borrow	BW		
Cement Stabilized Alluvium	CS		
Coarse Aggregate	CA	Size 1	1

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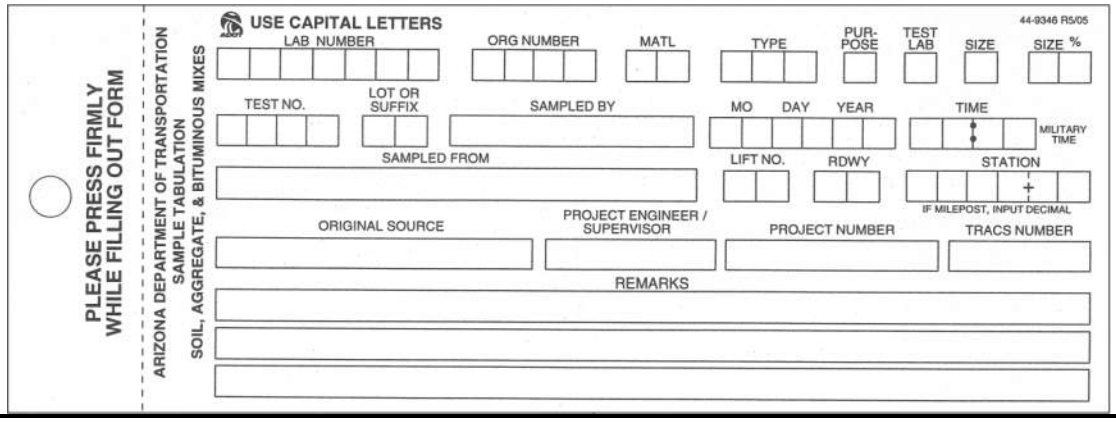
Material Code Combinations			
Material	Code	Type	Code
Coarse Aggregate	CA	Size 2	2
Coarse Aggregate	CA	Size 3	3
Coarse Aggregate	CA	Size 4	4
Coarse Aggregate	CA	Size 5	5
Coarse Aggregate	CA	Size 6	6
Coarse Aggregate	CA	Size 7	7
Coarse Aggregate	CA	Size 8	8
Coarse Aggregate	CA	Size 9	9
Coarse Aggregate	CA	Size 10	10
Coarse Aggregate	CA	Size 24	24
Coarse Aggregate	CA	Size 56	56
Coarse Aggregate	CA	Size 57	57
Coarse Aggregate	CA	Size 67	67
Coarse Aggregate	CA	Size 68	68
Coarse Aggregate	CA	Size 78	78
Coarse Aggregate	CA	Size 89	89
Coarse Aggregate	CA	Size 357	357
Coarse Aggregate	CA	Size 467	467
Coarse Aggregate	CA	Composite Samples	NA
Cover Material	CM		
Crash Barrel Sand	CB		
Decomposed Granite	DG		
Embankment	EM		
Embankment	EM	Requiring 95% Compaction	95
Embankment	EM	Requiring 100% Compaction	100
Entrained Air (Air Content)	ET		
Filter Material	FM		
Fine Aggregate	FA		
Fly Ash	FF		
Granite Mulch	GM		
Granulated (Crumb) Rubber	GR		
Grout	GT		
Maintenance	MT		
Membrane Seal	MS		
Mineral Aggregate	MA		
Mineral Aggregate	MA	½” Asphaltic Concrete	12
Mineral Aggregate	MA	½” Fine Band 417 AC	12F
Mineral Aggregate	MA	½” Coarse Band 417 AC	12K
Mineral Aggregate	MA	¾” Asphaltic Concrete	34

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Material Code Combinations			
Material	Code	Type	Code
Mineral Aggregate	MA	¾" Fine Band 417 AC	34F
Mineral Aggregate	MA	¾" Coarse Band 417 AC	34K
Mineral Aggregate	MA	AZ409 Miscellaneous Structural	409MI
Mineral Aggregate	MA	AZ409 Misc. Structural Special Mix	409SP
Mineral Aggregate	MA	Asphaltic Concrete Friction	FC
		Course (ACFC)	
Mineral Aggregate	MA	Asphalt-Rubber Asphaltic	RD
		Concrete (AR-AC)	
Mineral Aggregate	MA	Asphalt-Rubber Asphaltic	RF
		Concrete Friction Course	
		(AR-ACFC)	
Mineral Aggregate	MA	Base Mix	BM
Mineral Aggregate	MA	Other	OT
Mineral Aggregate	MA	Recycled Asphaltic Concrete	RC
Mechanically Stabilized Earth	ME	Reinforced Zone Material	R1
Mechanically Stabilized Earth	ME	Retained Zone Material	R2
Natural Ground	NG		
Natural Ground	NG	Requiring 95% Compaction	95
Other	OT		
Pipe Plating	PM		
Pneumatically Placed Mortar	NM		
Reclaimed Asphalt Pavement	RP	Coarse	C
Reclaimed Asphalt Pavement	RP	Fine	F
Reclaimed Asphalt Pavement	RP	Other	O
Rip Rap	RR		
Rock Mulch	RM		
Slurry	SL	3/8" Aggregate	38
Slurry	SL	#4 Aggregate	4
Structure Backfill	SB		
Subgrade	SG		
Subgrade	SG	Requiring 95% Compaction	95
Subgrade	SG	Requiring 100% Compaction	100
Subgrade Seal	SS		
Top Soil	TS		
Water	HO		
Winter Cinders	WC		

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Example Sample Ticket



Purpose Codes:

A	Acceptance
M	Miscellaneous
C	Control
P	Independent Assurance
I	Informational

Testing Lab Codes:

C	Central Lab
R	Regional Lab
P	Project Lab

Size Codes – Stockpiles:

B	Blend
F	Fine
I	Intermediate
C	Coarse
K	Coarsest

Roadway Codes:

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NB	Northbound
SB	Southbound
EB	Eastbound
WB	Westbound
RA	Ramp A
RB	Ramp B, etc.
FR	Frontage Road
XR	Crossroad

Bins:

9	Composite of Bins
1	Bin #1
2	Bin #2, etc.

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Appendix F

Owner Verification Levels of Testing Verification

Level 1 **Level 2** **Level 3**

Soils

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
SOILS (For this Material Category, the Level 1 Analysis uses α = 0.01)			
Embankment (any depth)	Proctor Density	ARIZ 225a or 245	**3**
	Optimum Moisture	ARIZ 225a or 245	**3**
	Compaction	ARIZ 230a or 235	**1**
Embankment for Metal Pile	pH	ARIZ 236c	**3**
	Resistivity	ARIZ 236c	**3**
Natural Ground below Embankment	Proctor Density	ARIZ 225a or 245	**3**
	Optimum Moisture	ARIZ 225a or 245	**3**
	Compaction	ARIZ 230a or 235	**1**
Subgrade	Proctor Density	ARIZ 225a or 245	**3**
	Optimum Moisture	ARIZ 225a or 245	**3**
	Compaction	ARIZ 230a or 235	**1**
Subgrade top 3' Subgrade Acceptance Chart	Gradation (-#200 only)	ARIZ 201c	**2**
	PI	AASHTO T-89 & T-90	**2**
Soil for Shoulder Build-up	Gradation	ARIZ 201c	**3**
	PI	AASHTO T-89 & T-90	**3**
	pH	ARIZ 236c	**3**
	Soluble Salts	ARIZ 237b	**3**
	Compaction	ARIZ 230a or 235	**1**
Trench Backfill	Proctor Density	ARIZ 225a or 245	**3**
	Optimum Moisture	ARIZ 225a or 245	**3**
	Compaction	ARIZ 230a or 235	**1**
Granite Mulch	Gradation	ARIZ 201c	**3**

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Decomposed Granite	Gradation	ARIZ 201c	**3**
Top Soil	Gradation	ARIZ 201c	**3**
	PI	AASHTO T-89 & T-90	**3**
	pH	ARIZ 236c	**3**
	Soluble Salts	ARIZ 237b	**3**
	Calcium Carbonate	AASHTO T-217	**3**
	Exchangeable Sodium in % & ppm	ARIZ 729	**3**

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Aggregates

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
AGGREGATES (For this Material Category, the Level 1 Analysis uses α = 0.01)			
Structure Backfill or Pipe Backfill	Proctor Density	ARIZ 225a or 245	**3**
	Optimum Moisture	ARIZ 225a or 245	**3**
	Compaction	ARIZ 230a or 235	**1**
	Resistivity	ARIZ 236c	**3**
	pH	ARIZ 236c	**3**
	Gradation	ARIZ 201c	**2**
	PI	AASHTO T-89 & T-90	**2**
Aggregate Base Class 1, Class 2, and Class 3	Abrasion	AASHTO T-96	**3**
	Proctor Density	ARIZ 225a or 245	**3**
	Optimum Moisture	ARIZ 225a or 245	**3**
	Compaction	ARIZ 230a or 235	**1**
	Fractured Coarse Aggregate Particles	ARIZ 212	**3**
	Gradation	ARIZ 201c	**2**
	PI	AASHTO T-89 & T-90	**2**
Aggregate Subbase Class 4, Class 5, and Class 6	Proctor Density	ARIZ 225a or 245	**3**
	Optimum Moisture	ARIZ 225a or 245	**3**
	Compaction	ARIZ 230a or 235	**1**
Class 4	Fractured Coarse Aggregate Particles	ARIZ 212	**3**
	Gradation	ARIZ 201c	**2**
	PI	AASHTO T-89 & T-90	**2**
	Abrasion	AASHTO T-96	**3**
Class 5 and Class 6	Gradation	ARIZ 201c	**2**
	PI	AASHTO T-89 & T-90	**2**

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Aggregate for Cement Treated Base or Lean Concrete Base	Gradation	ARIZ 201c	**2**
	Fractured Coarse Aggregate Particles	ARIZ 212	**3**
	Abrasion	AASHTO T-96	**3**
for Cement Treated Base	PI	AASHTO T-89 & T-90	**2**
for Lean Concrete Base	Sand Equivalent	ARIZ 242a	**3**
Cover Material	Abrasion	AASHTO T-96	**3**
	Bulk O.D. Specific Gravity	ARIZ 210	**3**
	Percent Carbonates	ARIZ 238	**3**
	Dry Unit Weight	AASHTO T-19	**3**
	Fractured Coarse Aggregate Particles	ARIZ 212	**3**
	Flakiness Index	ARIZ 233	**3**
	Gradation	ARIZ 201c	**3**
	Moisture Content	AASHTO T-265	**3**
Blotter Material	Gradation	ARIZ 201c	**3**
Mineral Aggregate for Micro-Surfacing	Abrasion	AASHTO T-96	**3**
	Percent Carbonates	ARIZ 238a	**3**
	Gradation	ARIZ 201c	**3**
	Sand Equivalent	ARIZ 242a	**3**
	Fractured Coarse Aggregate Particles	ARIZ 212	**3**
	Uncompacted Void Content	ARIZ 247	**3**
	Moisture Content	AASHTO T-265	**3**
Mineral Aggregate for Asphaltic Concrete Friction Course (ACFC)	Abrasion	AASHTO T-96	**3**
	Percent Carbonates	ARIZ 238a	**3**
	Specific Gravity	ARIZ 210b	**3**
	Sand Equivalent	ARIZ 242a	**2**
	Flakiness Index	ARIZ 233	**3**
	Fractured Coarse Aggregate Particles	ARIZ 212	**3**
	Gradation	ARIZ 201c	**2**
Mineral Aggregate for Asphaltic Concrete Friction Course (Miscellaneous Structural)	Abrasion	AASHTO T-96	**3**
	Percent Carbonates (if required)	ARIZ 238a	**3**
	Sand Equivalent	ARIZ 242a	**3**

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	Fractured Coarse Aggregate Particles	ARIZ 212	**3**
	Gradation	ARIZ 201c	**3**
Mineral Aggregate for Asphaltic Concrete Friction Course (Miscellaneous Structural - Special Mix)	Abrasion	AASHTO T-96	**3**
	Percent Carbonates (if required)	ARIZ 238a	**3**
	Sand Equivalent	ARIZ 242a	**3**
	Uncompacted Void Content	ARIZ 247a	**3**
	Fractured Coarse Aggregate Particles	ARIZ 212	**3**
	Gradation	ARIZ 201c	**3**
Mineral Aggregate for Asphaltic Concrete Friction Course (ACFC) - Miscellaneous	Abrasion	AASHTO T-96	**3**
	Sand Equivalent	ARIZ 242a	**3**
	Flakiness Index	ARIZ 233	**3**
	Fractured Coarse Aggregate Particles	ARIZ 212	**3**
	Gradation	ARIZ 201c	**3**
Mineral Aggregate for Asphaltic Concrete (Asphalt-Rubber) [AR-AC]	Abrasion	AASHTO T-96	**3**
	Percent Carbonates	ARIZ 238a	**3**
	Specific Gravity	ARIZ 210b	**3**
	Sand Equivalent	ARIZ 242a	**2**
	Fractured Coarse Aggregate Particles	ARIZ 212	**3**
	Gradation	ARIZ 201c	**2**
Mineral Aggregate for Asphaltic Concrete Friction Course (Asphalt-Rubber)[AR-ACFC]	Abrasion	AASHTO T-96	**3**
	Percent Carbonates	ARIZ 238a	**3**
	Specific Gravity	ARIZ 210b	**3**
	Sand Equivalent	ARIZ 242a	**2**
	Fractured Coarse Aggregate Particles	ARIZ 212	**3**
	Flakiness Index	ARIZ 233	**3**
	Gradation	ARIZ 201c	**2**
Mineral Aggregate for Asphaltic Concrete (Asphalt-Rubber) - End Product [AR-AC]	Source or Stockpile: Abrasion	AASHTO T-96	**3**
	Source or Stockpile: Percent Carbonates	ARIZ 238a	**3**
	Stockpile: Sand Equivalent	ARIZ 242a	**3**
	Stockpile: Fractured Coarse Aggregate Particles	ARIZ 212	**3**
	Stockpile: Uncompacted Void Content	ARIZ 247a	**3**
	Stockpile: Ignition Furnace Calibration	ARIZ 427	**3**

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	Cold Feed or Stockpile	Sand Equivalent	ARIZ 242a	**2**
		Fractured Coarse Aggregate Particles	ARIZ 212	**3**
		Uncompacted Void Content	ARIZ 247a	**3**
	Mix	Gradation	ARIZ 201c	**2**
Mineral Aggregate for Asphaltic Concrete - End Product [without RAP]	Source or Stockpile	Abrasion	AASHTO T-96	**3**
		Percent Carbonates	ARIZ 238a	**3**
	Stockpile	Sand Equivalent	ARIZ 242a	**2**
		Fractured Coarse Aggregate Particles	ARIZ 212	**3**
		Uncompacted Void Content	ARIZ 247a	**3**
		Ignition Furnace Calibration	ARIZ 427	**3**
	Cold Feed or Stockpile	Sand Equivalent	ARIZ 242a	**2**
		Fractured Coarse Aggregate Particles	ARIZ 212	**3**
		Uncompacted Void Content	ARIZ 247a	**3**
	Mix	Gradation	ARIZ 201c	**2**
Mineral Aggregate for Asphaltic Concrete - End Product [with RAP]	Source or Stockpile	Abrasion	AASHTO T-96	**3**
		Percent Carbonates	ARIZ 238a	**3**
	Stockpile	Sand Equivalent	ARIZ 242a	**2**
		Fractured Coarse Aggregate Particles	ARIZ 212	**3**
		Uncompacted Void Content	ARIZ 247a	**3**
		Ignition Furnace Calibration	ARIZ 427	**3**
	Individual RAP Stockpiles	Gradation	ARIZ 201c	**2**
		Binder Content	ARIZ 427	**3**
		Moisture Content	ARIZ 427	**3**
	Cold Feed or Stockpile	Sand Equivalent	ARIZ 242a	**2**
		Fractured Coarse Aggregate Particles	ARIZ 212	**3**
		Uncompacted Void Content	ARIZ 247a	**3**
	Mix	Gradation	ARIZ 201c	**2**
Mineral Aggregate for Asphaltic Concrete- End Product (SHRP)[without RAP]	Sourceor Stockpile	Abrasion	AASHTO T-96	**3**
		Percent Carbonates	ARIZ 238a	**3**
	Stockpile	Sand Equivalent	ARIZ 242a	**2**
		Fractured Coarse Aggregate Particles	ARIZ 212	**3**
		Uncompacted Void Content	ARIZ 247a	**3**
		Ignition Furnace Calibration	ARIZ 427	**3**

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	Cold Feed or Stockpile	Sand Equivalent	ARIZ 242a	**2**
		Fractured Coarse Aggregate Particles	ARIZ 212	**3**
		Uncompacted Void Content	ARIZ 247a	**3**
	Mix	Gradation	ARIZ 201c	**2**
Mineral Aggregate for Asphaltic Concrete - End Product (SHRP) [with RAP]	Source or Stockpile	Abrasion	AASHTO T-96	**3**
		Percent Carbonates	ARIZ 238a	**3**
	Stockpile	Sand Equivalent	ARIZ 242a	**3**
		Fractured Coarse Aggregate Particles	ARIZ 212	**3**
		Uncompacted Void Content	ARIZ 247a	**3**
		Ignition Furnace Calibration	ARIZ 427	**3**
	Individual RAP Stockpiles	Gradation	ARIZ 201c	**2**
		Binder Content	ARIZ 427	**2**
		Moisture Content	ARIZ 427	**3**
	Cold Feed or Stockpile	Sand Equivalent	ARIZ 242a	**2**
		Fractured Coarse Aggregate Particles	ARIZ 212	**3**
		Uncompacted Void Content	ARIZ 247a	**3**
	Mix	Gradation	ARIZ 201c	**2**
Mineral Aggregate for Asphaltic Concrete - Miscellaneous Paving		Abrasion	AASHTO T-96	**3**
		Sand Equivalent	ARIZ 242a	**3**
		Gradation	ARIZ 201c	**3**
Bedding Material for Pipe		Gradation	ARIZ 201c	**2**
		PI	AASHTO T-89 & T-90	**2**
		pH	ARIZ 236c	**3**
		Resistivity	ARIZ 236c	**3**
		Proctor Density	ARIZ 225a or 245	**3**
		Optimum Moisture	ARIZ 225a or 245	**3**
		Compaction	ARIZ 230a or 235	**1**
Filter Material for Perforated Pipe		Gradation	ARIZ 201c	**2**
Plating Material for Pipe Ends		Gradation	ARIZ 201c	**3**
		PI	AASHTO T-89 & T-90	**3**
		Proctor Density	ARIZ 225a or 245	**3**

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	Optimum Moisture	ARIZ 225a or 245	**3**
	Compaction	ARIZ 230a or 235	**3**
Crash Barrel Sand	Gradation	ARIZ 201c	**3**
	Dry Unit Weight	AASHTO T-19	**3**
	Moisture Content	AASHTo T-265	**3**
Bedding Material for PVC Irrigation Pipe	Gradation	ARIZ 201c	**3**
Rock for Wire Tied Riprap, Gabions, Slope Mattress, Rail Bank Protection	Specific Gravity	ARIZ 210b	**3**
	Gradation (Visual)	Visual	**3**
Rock for Grouted Riprap & Dumped Riprap	Specific Gravity	ARIZ 210b	**3**
	Gradation	ARIZ 201c	**3**
Fine Aggregate for Portland Cement Concrete (PCC) Classes P, S, & B	Gradation	ARIZ 201c	**2**
	Sand Equivalent	ARIZ 242a	**2**
	Organic Impurities	AASHTO T-21	**3**
	Mortor Strength	AASHTO T-176	**3**
	Deleterious Substances	AASHTO T-112 & T-113	**3**
Coarse Aggregate for Portland Cement Concrete (PCC) Classes P, S, & B	Gradation	ARIZ 201c	**2**
	Abrasion	AASHTO T-96	**3**
	Deleterious Substances	AASHTO T-112 & T-113	**3**
	Fractured Coarse Aggregate Particles		**3**
Aggregate for Arrestor Bed	Abrasion	AASHTO T-96	**3**
	Specific Gravity	ARIZ 210b	**3**
	Gradation	ARIZ201c	**2**
	Fractured Coarse Aggregate Particles	ARIZ 212	**2**
	Flakiness Index	ARIZ 233c	**3**
Aggregate for Soil-Cement or Cement Stabilized Alluvium	Gradation	ARIZ 201c	**2**
	PI	AASHTO T-89 & T-90	**2**

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Bituminous

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
BITUMINOUS MATERIAL (NOT MIXES)			
Recycling Agent	Per Specifications	Certificate of Compliance	**3**
Liquid Asphalt (Cutback Asphalt -Medium Curing) for Prime Coat	Per Specifications	Certificate of Compliance	**3**
	Per Specifications	Certificate of Compliance	**3**
Emulsified Asphalt for Chip Seal	Per Specifications	Certificate of Compliance	**3**
	Residue	ARIZ 504	**3**
	Per Specifications	Certificate of Compliance	**3**
Emulsified Asphalt for Tack Coat and Fog Coat	Per Specifications	Certificate of Compliance	**3**
	Residue	ARIZ 504	**3**
	Per Specifications	Certificate of Compliance	**3**
Asphalt Cement PG XX-XX)	Per Specifications	Certificate of Compliance	**2**
for Tack Coat	Per Specifications	Certificate of Compliance	**3**
for Asphaltic Concrete	Per Specifications	Certificate of Compliance	**2**
for Asphaltic Concrete or ACFC	Per Specifications	Certificate of Compliance	**2**
Emulsified Recycling	Per Specifications	Certificate of Compliance	**3**
	Residue	ARIZ 504	**3**
ERA	Residue	ARIZ 504	**3**
for Fog Coat	Per Specifications	Certificate of Compliance	**3**
Asphalt Cement (PG XX-XX) for Asphalt -Rubber (Sprayed Applications)	Per Specifications	Certificate of Compliance	**2**
Asphalt Cement (PG XX-XX) for Asphalt - Rubber for AR-AC or AR-ACFC	Per Specifications	Certificate of Compliance	**2**

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Crumb Rubber for Asphalt - Rubber Type A or Type B	Gradation	ARIZ 714	**3**
Asphalt - Rubber [CRA (5)] Type 1, Type 2, or Type 3 (Sprayed Applications)	Per Specifications	Certificate of Compliance	**3**
Asphalt - Rubber [CRA (5)] Type 1, Type 2, or Type 3 For AR-AC or AR-ACFC	Penetration	ASTM D5	**3**
	Softening Point	ASTM D36	**2**
	Resilience	ASTM D5329	**2**
	Rotational Viscosity	AASHTO T-316	**3**
	Rotational Viscosity (at plant)	AASHTO T-316	**3**

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Portland Cement Concrete

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
PORTLAND CEMENT CONCRETE (For this Material Category, the Level 1 Analysis uses α = 0.025)			
Portland Cement Concrete Pavement (PCCP) Class P	Compressive Strength	ARIZ 314b	**1**
	Slump	AASHTO T-119	**2**
	Temperature	ASTM C1064	**3**
	Air Content (when Required)	AASHTO T-152	**2**
	Thickness	AASHTO T-148 & ARIZ 317a	**1**
Portland Cement Structural Concrete Class S and B	Compressive Strength	ARIZ 314b	**1**
	Slump	AASHTO T-119	**2**
	Temperature	ASTM C1064	**3**
	Air Content (when Required)	AASHTO T-152	**2**
Portland Cement Concrete (PCC) Class S (with a compressive strength req't equal to or greater than 4,000 psi)	Compressive Strength	ARIZ 314b	**1**
	Slump/Spread (for SCC)	AASHTO T-119	**2**
	Temperature	ASTM C1064	**3**
	Air Content (when Required)	AASHTO T-152	**2**
Portland Cement Concrete (PCC) Class B	Compressive Strength	ARIZ 314b	**1**
	Slump	AASHTO T-119	**2**
	Temperature	ASTM C1064	**3**
	Air Content (when Required)	AASHTO T-152	**2**
Portland Cement Structural Concrete for Minor Precast Structures	Rebound Hammer	ASTM C805	**3**
Prestressed Concrete	Compressive Strength	ARIZ 314b	**1**
	Slump	AASHTO T-119	**2**
	Temperature	ASTM C1064	**3**
Shotcrete	Compressive Strength	ARIZ 314b	**1**
	Slump	AASHTO T-119	**2**
	Air Content	ASTM C1064	**3**

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Materials Used With Portland Cement Concrete

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
MATERIALS USED WITH PORTLAND CEMENT CONCRETE			
Prestressing Steel (Spiral, Bars, Strand Wire, or Wire)	Tensile Strength	AASHTO M203 & M204	**3**
Post-Tensioning Steel	Tensile Strength	AASHTO M203 & M204	**3**
Reinforcement Bars	Tensile Strength	AASHTO M31	**3**
Welded Wire Fabric (Smooth)	Per Specifications	Certificate of Compliance	**Inspection**
Welded Wire Fabric (Deformed)	Per Specifications	Certificate of Compliance	**Inspection**
Admixtures	Per Specifications	Certificate of Compliance	**Inspection**
Curing Compound	Per Specifications	Certificate of Compliance	**Inspection**
Curing Compound	Water Loss		**Inspection**
	% Solids		**Inspection**
Fly Ash and Natural Pozzolan	Per Specifications	Certificate of Compliance	**Inspection**
Silica Fume	Per Specifications	Certificate of Compliance	**Inspection**
Water	Soluble Salts	AASHTO T-26	**Inspection**
	pH	AASHTO T-26	**Inspection**
Hydraulic Cement	Per Specifications	Certificate of Compliance	**Inspection**
Hydraulic Cement (All Type)	Chemical & Physical	ASTM C465 & ASTM C595	**Inspection**
Joint Materials	Per Specifications	Certificate of Compliance	**Inspection**
Bearing Pads (All Type)	Thickness	Measurement	**3**
	Compression Load	Certificate of Analysis	**3**

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Stabilized Soils and Bases

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
STABILIZED SOILS & BASES (For this Material Category, the Level 1 Analysis uses α = 0.01)			
Lime Treated Subgrade	Proctor Density	ARIZ 225a or 245	**3**
	Optimum Moisture	ARIZ 225a or 245	**3**
	Compaction	ARIZ 230a or 235	**1**
Cement Treated Subgrade	Proctor Density	ARIZ 225a or 245	**3**
	Optimum Moisture	ARIZ 225a or 245	**3**
	Compaction	ARIZ 230a or 235	**1**
Cement Treated Base	Proctor Density	ARIZ 225a or 245	**3**
	Optimum Moisture	ARIZ 225a or 245	**3**
	Compaction	ARIZ 230a or 235	**1**
	Compressive Strength	ARIZ 241a	**1**
Lean Concrete Base	Compressive Strength	ARIZ 314b	**1**
	Slump	AASHTO T-119	**2**
	Air Content (when required	AASHTO T-152	**2**
	Thickness	AASHTO T-148	**1**
Cement Stabilized Alluvium	Compressive Strength	ARIZ 314b	**1**
Soil-Cement Bank Protection	Compressive Strength	ARIZ 314b	**1**

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Bituminous Mixtures

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
BITUMINOUS MIXTURES (For this Material Category, the Level 1 Analysis uses α = 0.025)			
Asphaltic Concrete Friction Course [ACFC] (407)	% Asphalt	ARIZ 421	**3**
	Moisture Content	ARIZ 406c	**3**
Asphaltic Concrete [AC] Marshall Mixes Misc. Structural (409 & 409 Special)	% Asphalt	ARIZ 427	**1**
	Moisture Content	ARIZ 406c	**3**
	Rice	ARIZ 417d	**2**
	Lab Density (Marshall), Stab, Flow	ARIZ 410e	**2**
	Gradation (only 409 Special)	ARIZ 427	**2**
Asphaltic Concrete Friction Course [ACFC] - Misc. (411)	% Asphalt	ARIZ 421	**3**
	Moisture Content	ARIZ 406c	**3**
Asphaltic Concrete (Asphalt-Rubber) [AR-AC] (413)	% Asphalt Rubber	ARIZ 421	**3**
	Moisture Content	ARIZ 406c	**3**
Asphaltic Concrete Friction Course (Asphalt – Rubber) [AR-ACFC] (414)	% Asphalt Rubber	ARIZ 421	**3**
	Moisture Content	ARIZ 406c	**3**
Asphaltic Concrete (Asphalt-Rubber) [AR-AC] End Product (415)	% Asphalt Rubber	ARIZ 427	**1**
	Moisture Content	ARIZ 406c	**3**
	Rice	ARIZ 417d	**2**
	Lab Density (Marshall), Stab, Flow	ARIZ 410e	**2**
	Calculated Lab Voids	ARIZ 424	**1**
	Gradation	ARIZ 427	**2**
	Compaction (in place field voids)	ARIZ 415c	**1**
Asphaltic Concrete [AC] Marshall Mixes End Product (416)	% Asphalt	ARIZ 427	**1**
	Moisture Content	ARIZ 406c	**3**
	Rice	ARIZ 417d	**2**
	Lab Density (Marshall), Stab, Flow	ARIZ 410e	**2**
	Calculated Lab Voids	ARIZ 424	**1**
	Gradation	ARIZ 427	**2**
	Compaction (in place field voids)	ARIZ 415c	**1**

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Asphaltic Concrete SHRP Volumetric Mixes (417)	% Asphalt	ARIZ 427	**1**
	Moisture Content	ARIZ 406c	**3**
	Rice	ARIZ 417d	**2**
	Lab Density (Gyratory Compactor)	AASHTO 312	**2**
	Calculated Lab Voids	ARIZ 424	**1**
	Gradation	ARIZ 427	**2**
	Compaction (in place field voids)	ARIZ 415c	**1**

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Miscellaneous

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
MISCELLANEOUS MATERIALS (For this Material Category, the Level 1 Analysis uses α = 0.025)			
Lime	Per Specifications	Certificate of Compliance	**Inspection**
Hydrated Lime	Per Specifications	Certificate of Compliance	**Inspection**
Hydraulic Cement	Per Specifications	Certificate of Compliance	**Inspection**
Portland Cement and Blended Hydraulic Cement	Per Specifications	Certificate of Compliance	**Inspection**
Corrugated Metal Pipe (CMP)	Per Specifications	Certificate of Compliance	**Inspection**
Non-Reinforced, Cast-in-Place Concrete Pipe	Compressive Strength	ARIZ 314b	**1**
	Slump	AASHTO T-119	**2**
	Air Content (when required)	ASTM C1064	**2**
	Temperature	AASHTO T-152	**3**
	Wall Thickness		**2**
Precast Reinforced or Non-Reinforced Concrete Pipe	Compressive Strength	ARIZ 314b	**2**
	Thickness	Measurement	**2**
Vitrified Clay Pipe	Compression	ARIZ 314b	**3**
Brick for Manholes	Compression	ARIZ 314b	**3**
Paving Brick	Compression	ARIZ 314b	**3**
	Absorption	ARIZ 251	**3**
Cinder Block	Compression	ARIZ 314b	**3**
	Absorption	ARIZ 251	**3**
Slump Block	Compression	ARIZ 314b	**3**
	Absorption	ARIZ 251	**3**
High Strength Bolts, Nuts, Washers, or Anchor Bolts	Rockwell Hardness	ASTM E18	**3**
	Wedge Tensile Strength	ASTM F606	**3**
Retroreflective Sheeting	Per Specifications	Certificate of Compliance	**3**
Sign Panel Silk-Screened Characters	Per Specifications	Certificate of Compliance	**3**
Glass Beads	Roundness	ASTM D1155	**3**

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	Gradation	ASTM D1214	**3**
	Refractive Index		**3**
	Moisture Resistance		**3**
	Heavy Metal Concentration (if required)		**3**
Preformed Plastic Pavement Marking	Per Specifications	Certificate of Compliance	**3**
Thermoplastic Pavement Markings	Per Specifications	Certificate of Compliance	**3**
Raised Pavement Markers	Per Specifications	Certificate of Compliance	**Inspection**
Permanent Pavement Markings (Painted)	Per Specifications	Certificate of Compliance	**3**
Dual Component Pavement Markings	Per Specifications	Certificate of Compliance	**3**
Polyvinyl Chloride (PVC) Pipe for Electrical Conduit	Per Specifications	Certificate of Compliance	**Inspection**
Polyvinyl Chloride (PVC) Pipe for Water	Per Specifications	Certificate of Compliance	**Inspection**
Chain Link Fabric	Per Specifications	Certificate of Compliance	**Inspection**
Fence Post and Rails	Per Specifications	Certificate of Compliance	**Inspection**
Miscellaneous Fence Hardware	Per Specifications	Certificate of Compliance	**Inspection**
Post Clips, Hog Rings, Tie Wire, or Tension Wire	Per Specifications	Certificate of Compliance	**Inspection**
Barbed Wire or Barbless Wire	Per Specifications	Certificate of Compliance	**Inspection**
Fence Stays	Per Specifications	Certificate of Compliance	**Inspection**
T-Post	Per Specifications	Certificate of Compliance	**Inspection**
Woven Wire Fabric	Per Specifications	Certificate of Compliance	**Inspection**
Wire Rope	Per Specifications	Certificate of Compliance	**Inspection**
Paint	Per Specifications	Certificate of Compliance	**Inspection**
Guardrail Elements	Per Specifications	Certificate of Compliance	**Inspection**
Guardrail Fasteners	Rockwell Hardness	ASTM E18	**3**
	Tensile Strength	ASTM F606	**3**

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Guardrail Posts and Blocks	Per Specifications	Certificate of Compliance	**Inspection**
Geosynthetics	Per Specifications	Certificate of Compliance	**3**
Pavement Fabric	Per Specifications	Certificate of Compliance	**3**
Geogrid	Per Specifications	Certificate of Compliance	**3**
Separation Geotextile Fabric	Per Specifications	Certificate of Compliance	**3**
Bank Protection Fabric	Per Specifications	Certificate of Compliance	**3**
Geocomposite Wall Drain System	Per Specifications	Certificate of Compliance	**3**
Geocomposite Edge Drain System	Per Specifications	Certificate of Compliance	**3**
Geomembrane	Per Specifications	Certificate of Compliance	**3**
Grout	Compressive Strength	ARIZ 314b	**2**

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Appendix G

Independent Assurance Test Methods

The following test methods will be evaluated annually as part of the independent assurance program.

Field Sampling and Testing

1. Density of Soils
    i. ARIZ 230 – Field Density (Sand Cone)
    ii. ARIZ 235 – Field Density (Nuclear)

2. Plastic Concrete
    i. ASTM C143 – Concrete Slump
    ii. ASTM C231 – Concrete Air Content
    iii. ASTM C31 – Concrete Cylinder Fabrication

Note: Field technicians will be evaluated annually based on observation.

Laboratory Testing

1. Soil and Aggregate
    i. ARIZ 201c – Sieve Analysis of Soils & Aggregates
    ii. AASHTO T176 – Sand Equivalent
    iii. AASHTO T90 – Plastic Limit & Plasticity Index

2. Hardened Concrete
    i. ARIZ 314b – Compressive Strength of Concrete

3. Bituminous Mixture Compaction
    i. ARIZ 410e – Compaction/Testing HMA by Marshall Method
    ii. AASHTO T312 – HMA Density by Gyratory Compactor

4. Bituminous Mixture Other
    i. ARIZ 415c – Bulk Specific Gravity of Compacted Bituminous Mixtures
    ii. ARIZ 417d – Maximum Theoretical Specific Gravity of HMA (Rice Test)
    iii. ARIZ 427 – Asphalt Binder Content (Ignition)

Note: Laboratory technicians will be evaluated annually based on either observation, an individual's IA split test results (small groups), or an individual's proficiency test result (large group). Technicians will be evaluated for the test method they will perform.

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OV and IQ firms are required to request IA evaluations a minimum of two weeks in advance. ADOT will try to accommodate requests made with less than two weeks' notice.

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Appendix H

Independent Quality Firm Data Transfer Requirements

The IQF transmits their test results to ADOT to allow ADOT to perform the required owner verification (including statistical analyses). This appendix provides direction on how to transmit this data to ADOT's Uncle Sam system.

Definitions

Third party: this is the client who will provide the deliverable described in this document.

ADOT analysis project: this refers to an instance of web application along with data import tasks configured to accept data from two parties: ADOT and the third party above. The main purpose of the project is to group and aggregate imported tests based on certain attributes of the tests, resulting in statistical analyses.

Data import / sync: this refers to the scheduled task configured to perform an ETL (extract, transform, load) on the source .bacpac tables into the target (master) database.

Master database: this is the database into which the ADOT data and third-party data will sync. The ADOT analysis project utilizes this database as its backend to perform analyses on the test data, among other things.

Purpose

The purpose of this document is to provide details on the deliverable database file which a third party will need to provide for import into an ADOT analysis project. Information included in this document is: the database schema and table definitions expected to be provided by the third party; additional notes on how tables should be populated; and the delivery method to which the third party should adhere.

This document references a sample deliverable .bacpac file and an analysis configuration view (see below for more information) that should be provided in conjunction.

Deliverable and Delivery Method

The expectation is that the third party will provide a database that matches the table schema described below and contained in the sample file. The database should be compatible with Microsoft SQL Server 2016 and exported in .bacpac format.

The third party will coordinate with the administrator of the ADOT analysis project to determine the expected schedule as well as export location. There is a scheduled task that can be deployed to grab the third party's .bacpac file via FTP or SFTP.

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Tables Summary

The following is a summary of each schema in the expected deliverable. This is meant to aid the third party in understanding the purpose of the tables in addition to the table definitions provided afterward.

Configuration table (config.ConfigurationSettings):

This table is not used in the master database, it is purely for tracking purposes of the third party.

Reference data tables (schema of "ref")

These tables house reference data which the header and result tables have relations. These tables are also synced to the master database upon import.

Note that the records in these tables will need to be manually kept in sync with the records used in the same tables in ADOT's import (the records should mirror exactly the records in ADOT's import tables). The third party is not expected to add or remove any records from this table, but if absolutely necessary, the third party must coordinate with ADOT to ensure that records are properly added in both their and ADOT's imports. Properly adding a record in each database means the key value in the reference table matches as well as any other description data. If they do not match, there will almost surely be issues when the data is imported into the master database.

Sample reference data configuration from ADOT's last project import is available in the accompanying .bacpac file.

Header and result tables (schema of "test")

These tables house the test headers and accompanying results that the third party would like to import into the master database for analysis.

Versioning: Versioning is an important concept regarding these two tables. The data sync is wired to only perform inserts on new records regarding the third party's headers and results; update to existing records are not accepted. The reasoning behind this logic is that the third party must implement a new version of a header / result set to be recognized by the ADOT analysis project if an update needs to be made. Additionally, when performing analyses of the test data, only the "latest" version of the header / result sets will be evaluated.

To create the initial version of a header / result set, add a test.Header record with a new, unique Lab_Test_Nbr value; the Version value should be 1. Also, add the appropriate linked test.Result records as well.

To increment the version, add another test.Header record with the same Lab_Test_Nbr value. Increment the Version value by 1 from the previous version; you will need to add the test.Result records to be used with this latest version as well, in addition to any other data changes that may differentiate version 2 from version 1.

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See sample .bacpac file for versioning examples.

Validation: It is additionally important to understand the concept of header / result validation as only valid third-party data is applicable for analysis in the master database. For clarity, we have broken this down into two different types of validation: root data validation and analysis configuration validation.

Root validation: Certain test header fields must be "whitelisted" in the master database in order to be recognized as valid. The third party will need to coordinate with the administrator of the ADOT analysis project regarding this. These fields are denoted with "Subject to root validation" in the table notes below.

Analysis configuration validation: Not all test headers and result sets are necessarily valid for analysis; the material code / material grade, test type, and test result specifier combination must be expected so that the ADOT analysis system knows which level of verification and analysis category into which it falls. (See accompanying spreadsheet that shows a view of how these fields are joined together, and see "Analysis Configuration View" below for additional information.) The affected fields are denoted with "Subject to analysis configuration validation" in the table notes below.

Name formatting: The two fields which include technician names (test.Header.SampledBy and test.Result.TestedBy) both require a delimiter between the first name and the last name so the names are parsed correctly by the data import. The delimiter is "###" – so an example of the expected name provided is "John###Smith" for technician with a first name of John, and a last name of Smith. Additionally, for test.Result.TestedBy, there may be multiple technicians provided in one record. The technicians are delimited by "^". An example of two technicians in this field is "John###Smith^Tom###Sawyer" which would denote that two technicians – one technician with a first name of John and a last name of Smith and another technician with a first name of Tom and a last name of Sawyer.

Trace log tables (schema of "dbo")
The trace log tables are not used directly in the application for the third-party submission, but are meant to be an audit of the changes to the header and result records throughout time.

For the most part, the fields in the audit table should mirror the fields for the main table (TraceLogHeader for test.Header and TraceLogResult for test.Result) at the time of the audit, with the addition of the two audit fields, TraceLogType and TraceLogDT.

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Accompanying Data

1. Sample .bacpac

See .bacpac file (attached file to this appendix) for a mockup of the expected deliverable from the third party.

2. Analysis Configuration View

The accompanying spreadsheet provides a look at the view in the ADOT analysis project with which header and result sets must join to be considered for analysis. While we have provided additional fields that may or may not be useful in understanding the data, the columns in the view pertinent to the data import are the following: “Materials,” “TestTypeDescription,” and “TestResultSpecifiers.”

The third party should provide headers and result sets whose header materials and result test types and test result specifiers match this view, if they want the record to be used in analysis in the master database.

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Table Definitions

Table: **config.ConfigurationSettings**

Field Name	Data Type	Length	Nullable	Notes	Key / Relational
ProjectNumber	char	8	False		Primary Key

Table: **ref.AnalysisType**

Field Name	Data Type	Length	Nullable	Notes	Key / Relational
AnalysisTypeID	int		False		Primary Key
AnalysisTypeDescription	varchar	255	True	Description of the different category (type) of test (concrete, soil, and aggregates)	

Table: **ref.Feature**

Field Name	Data Type	Length	Nullable	Notes	Key / Relational
FeatureID	int		False		Primary Key
FASTFeatureCode	char	20	False	FAST code for the roadway feature	
FASTFeatureDescription	char	100	False	Full English description of the feature	

Table: **ref.Purpose**

Field Name	Data Type	Length	Nullable	Notes	Key / Relational
PurposeID	int		False		Primary Key
FASTPurposeCode	char	1	False	Code for the purpose of the sample testing	
FASTPurposeDescription	char	25	False	Full English description of the purpose	

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Table: **ref.SieveSize**

Field Name	Data Type	Length	Nullable	Notes	Key / Relational
SieveSizeSuffix	nvarchar	123	False		Primary Key
SieveSizeDescription	nvarchar	255	False		

Table: **ref.TestType**

Field Name	Data Type	Length	Nullable	Notes	Key / Relational
TestTypeID	int		False		Primary Key
TestTypeDescription	varchar	60	False	Full English description of the various types of concrete and soil and aggregate tests.	

Table: **ref.UnitOfMeasure**

Field Name	Data Type	Length	Nullable	Notes	Key / Relational
UnitOfMeasureID	int		False		Primary Key
UnitOfMeasureDescription	varchar	50	False	Description of the unit of measure.	

Table: **test.Header**

Field Name	Data Type	Length	Nullable	Notes	Key / Relational
ID	int		False		Primary Key
HeaderID	int		True		Unique key used to identify header in master database.
AnalysisTypeID	int		False		Foreign Key referencing ref.AnalysisType. AnalysisTypeID
CourseLift	char	6	True	Sample Lift Number.	
Direction	char	10	True	Travel direction.	
FeatureID	int		True		Foreign Key referencing ref.Feature.FeatureID

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Field Name	Data Type	Length	Nullable	Notes	Key / Relational
MaterialGrade	varchar	15	True	Material Grade - 2, 12A, 34B, etc. *Subject to root validation.* *Subject to analysis configuration validation.*	
MaterialCode	char	10	True	Material Code - AC, FA, BM, etc. *Subject to root validation.* *Subject to analysis configuration validation.*	
Misc	varchar	255	True	Sample Remarks	
Roadway	varchar	285	True	Project Location and/or Highway Termini Description	
SampleID	varchar	30	True	Surrogate Key / ID / Number to identify specific sample	
SampleLocation	varchar	60	True	Location where the sample is take from	
SampleTypeCode	varchar	4	True	Purpose of the sample (Acceptance, Correlation, etc.) See the [ref].[Purpose] table for the definition of the purpose code. *Subject to root validation.*	

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Field Name	Data Type	Length	Nullable	Notes	Key / Relational
SampledBy	varchar	50	True	The name of the person who took the sample. *Subject to name formatting.*	
SampledDate	date		True	The date on which the sample was taken.	
SectionID	int		True	The section ID where the sample is taken from. Corresponds to "Segment": enter 1 for "A"; 2 for "B"; 3 for "C"; 4 for "D"; 6 for "Offsite"	
SplitSampleID	varchar	30	True	Surrogate Key / ID / Number to identify the sample split from this sample.	
Station	varchar	21	True		
StructureNumber	varchar	50	True		
SupplierName	varchar	128	True	Full supplier name. *Subject to root validation.*	
PlantName	varchar	128	True		
ProductCode	varchar	50	True	*Subject to root validation.*	
Lab_Test_Nbr	varchar	20	True	*Used for versioning.*	
ProjectNumber	varchar	8	True		
SurrogateKey	int		False	Internal tracking field – not used for third party submissions.	
SurrKeySource	varchar	5	True	Internal tracking field – not used for third party submissions.	
Version	int		True	*Used for versioning.*	

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Field Name	Data Type	Length	Nullable	Notes	Key / Relational
OriginalSource	varchar	50	True	Internal tracking field – not used for third party submissions.	

Table: **test.Result**

Field Name	Data Type	Length	Nullable	Notes	Key / Relational
ResultID	int		False		Primary Key; key used to identify result in master database.
HeaderID	int		False		Foreign Key referencing test.Header.HeaderID.
TestTypeID	int		False	*Subject to analysis configuration validation.*	Foreign Key referencing ref.TestType.TestTypeID.
UnitOfMeasureID	int		True		Foreign Key referencing ref.UnitOfMeasure. UnitOfMeasureID
TestResultSpecifier	varchar	255	True	*Subject to analysis configuration validation.*	
TestResultSize	varchar	255	True	Valid values: 1", 1-1/2", 1/2", 1/4", 2", 2-1/2", 3", 3/4", 3/8", No. 10, No. 100, No. 16, No. 200, No. 30, No. 4, No. 40, No. 50, No. 8, Negative No. 4, Negative No. 200, Oversize 3, Oversize 6	
TestResultValueNumeric	float		True	When the result of the measurement is a number, this is the measurement value.	
TestResultValueString	varchar	255	True	When the result of the measurement is a string, this is the measurement result.	

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Field Name	Data Type	Length	Nullable	Notes	Key / Relational
SurrogateKey	int		True	Internal tracking field – not used for third party submissions.	
TestedBy	varchar	100	True	The name of the person(s) who performed the test. *Subject to name formatting.*	
SurrKeySource	varchar	4	True	Internal tracking field – not used for third party submissions.	
AuditKey	varchar	568	True	Internal tracking field – not used for third party submissions.	
StampCode	int		True	Enter: 1 for pass; 2 for engineer decision; 5 for fail; 9 for informational; 0 for not assigned.	

Table: **dbo.TraceLogHeader**

Field Name	Data Type	Length	Nullable	Notes	Key / Relational
TraceLogHeaderID	int		False		Primary Key
TraceLogType	char	1	False	Enter: “I” for insert; “U” for update; “D” for delete.	
TraceLogDT	smalldatetime		False	Date of audit log entry.	
HeaderID	int		True		
AnalysisTypeID	int		True		
CourseLift	char	6	True		
Direction	char	10	True		
FeatureID	int		True		
MaterialGrade	varchar	15	True		
MaterialCode	varchar	100	True		
Misc	varchar	255	True		
Roadway	varchar	285	True		

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Field Name	Data Type	Length	Nullable	Notes	Key / Relational
SampleID	varchar	30	True		
SampleLocation	varchar	250	True		
SampleTypeCode	varchar	4	True		
SampledBy	varchar	100	True		
SampledDate	date		True		
SectionID	int		True		
SplitSampleID	varchar	30	True		
Station	varchar	21	True		
StructureNumber	varchar	50	True		
SupplierName	varchar	128	True		
PlantName	varchar	128	True		
ProductCode	varchar	50	True		
Lab_Test_Nbr	varchar	20	True		
ProjectNumber	varchar	8	True		
SurrogateKey	int		True		
SurrKeySource	varchar	5	True		
Version	int		True		
OriginalSource	varchar	50	True		

Table: **dbo.TraceLogResult**

Field Name	Data Type	Length	Nullable	Notes	Key / Relational
TraceLogResultID	int		False		Primary Key
TraceLogType	char	1	False	Enter: “I” for insert; “U” for update; “D” for delete.	
TraceLogDT	smalldatetime		False	Date of audit log entry.	
ResultID	int		True		
HeaderID	int		True		
TestTypeID	int		True		
UnitOfMeasureID	int		True		
TestResultSpecifier	varchar	255	True		
TestResultSize	varchar	255	True		
TestResultValueNumeric	float		True		
TestResultValueString	varchar	255	True		
SurrogateKey	int		False		
TestedBy	varchar	100	True		
SurrKeySource	varchar	4	True		
AuditKey	varchar	568	True		
StampCode	int		True		

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Electronic Record and Signature Disclosure: Accepted: 11/24/2020 1:53:00 PM ID: 55c32fcf-9f27-4180-9826-cfc880668972		

In Person Signer Events	Signature	Timestamp

Editor Delivery Events	Status	Timestamp

Agent Delivery Events	Status	Timestamp

Intermediary Delivery Events	Status	Timestamp

Certified Delivery Events	Status	Timestamp

Carbon Copy Events	Status	Timestamp

Witness Events	Signature	Timestamp

Notary Events	Signature	Timestamp

Envelope Summary Events	Status	Timestamps
Envelope Sent	Hashed/Encrypted	11/24/2020 1:25:52 PM
Certified Delivered	Security Checked	11/24/2020 1:53:00 PM

Envelope Summary Events	Status	Timestamps
Signing Complete	Security Checked	11/24/2020 1:53:23 PM
Completed	Security Checked	11/24/2020 1:53:23 PM

Payment Events	Status	Timestamps

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Required hardware and software

Operating Systems:	Windows2000? or WindowsXP?
Browsers (for SENDERS):	Internet Explorer 6.0? or above
Browsers (for SIGNERS):	Internet Explorer 6.0?, Mozilla FireFox 1.0, NetScape 7.2 (or above)
Email:	Access to a valid email account
Screen Resolution:	800 x 600 minimum
Enabled Security Settings:	•Allow per session cookies •Users accessing the internet behind a Proxy Server must enable HTTP 1.1 settings via proxy connection

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TPA 112-1.2 Project Specific Quality Assurance Program Appendix F

Appendix F

Owner Verification Levels of Testing Verification

Level 1 **Level 2** **Level 3**

Soils

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
SOILS (For this Material Category, the Level 1 Analysis uses α = 0.01)			
Embankment (any depth)	Proctor Density	AASHTO T 99	**3**
	Optimum Moisture	AASHTO T 99	**3**
	Compaction	AASHTO T 191	**1**
Embankment for Metal Pile	pH	AASHTO T 289	**3**
	Resistivity	AASHTO T 288	**3**
Natural Ground below Embankment	Proctor Density	AASHTO T 99	**3**
	Optimum Moisture	AASHTO T 99	**3**
	Compaction	AASHTO T 191	**1**
Subgrade	Proctor Density	AASHTO T 99	**3**
	Optimum Moisture	AASHTO T 99	**3**
	Compaction	AASHTO T 191	**1**
Subgrade top 3' Subgrade Acceptance Chart	Gradation (-#200 only)	AASHTO T 27 & T 11	**2**
	PI	AASHTO T 89 & T 90	**2**
Soil for Shoulder Build-up	Gradation	AASHTO T 27 & T 11	**3**
	PI	AASHTO T 89 & T 90	**3**
	pH	AASHTO T 289	**3**
	Soluble Salts	ARIZ 237b	**3**
	Compaction	AASHTO T 191	**1**
Trench Backfill	Proctor Density	AASHTO T 99	**3**
	Optimum Moisture	AASHTO T 99	**3**
	Compaction	AASHTO T 191	**1**
Granite Mulch	Gradation	AASHTO T 27 & T 11	3
Decomposed Granite	Gradation	AASHTO T 27 & T 11	**3**

Top Soil	Gradation	AASHTO T 27 & T 11	**3**
	PI	AASHTO T-89 & T-90	**3**
	pH	AASHTO T289	**3**
	Soluble Salts	ARIZ 237b	**3**
	Calcium Carbonate	AASHTO T 217	**3**
	Exchangeable Sodium in % & ppm	ARIZ 729	**3**

1

Aggregates

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
AGGREGATES (For this Material Category, the Level 1 Analysis uses α = 0.01)			
Structure Backfill or Pipe Backfill	Proctor Density	AASHTO T 99	**3**
	Optimum Moisture	AASHTO T 99	**3**
	Compaction	AASHTO T 191	**1**
	Resistivity	AASHTO T 288	**3**
	pH	AASHTO T289	**3**
	Gradation	AASHTO T 27 & T 11	**2**
	PI	AASHTO T 89 & T 90	**2**
Aggregate Base Class 1, Class 2, and Class 3	Abrasion	AASHTO T 96	**3**
	Proctor Density	AASHTO T 99	**3**
	Optimum Moisture	AASHTO T 99	**3**
	Compaction	AASHTO T 191	**1**
	Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
	Gradation	AASHTO T 27 & T 11	**2**
	PI	AASHTO T 89 & T 90	**2**
Aggregate Subbase Class 4, Class 5, and Class 6	Proctor Density	AASHTO T 99	**3**
	Optimum Moisture	AASHTO T 99	**3**
	Compaction	AASHTO T 191	**1**
Class 4	Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
	Gradation	AASHTO T 27 & T 11	**2**
	PI	AASHTO T 89 & T 90	**2**
	Abrasion	AASHTO T 96	**3**
Class 5 and Class 6	Gradation	AASHTO T 27 & T 11	**2**
	PI	AASHTO T 89 & T 90	**2**
Aggregate for Cement Treated Base or Lean Concrete Base	Gradation	AASHTO T 27 & T 11	**2**
	Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
	Abrasion	AASHTO T 96	**3**
for Cement Treated Base	PI	AASHTO T 89 & T 90	**2**
for Lean Concrete Base	Sand Equivalent	AASHTO T176	**3**

Cover Material	Abrasion	AASHTO T 96	**3**
	Bulk O.D. Specific Gravity	AASHTO T 85	**3**
	Percent Carbonates	ARIZ 238	**3**
	Dry Unit Weight	AASHTO T 19	**3**
	Fractured Coarse Aggregate Particles	ARIZ 212	**3**
	Flakiness Index	ARIZ 233	**3**
	Gradation	AASHTO T 27 & T 11	**3**
	Moisture Content	AASHTO T 265	**3**
Blotter Material	Gradation	AASHTO T 27 & T 11	**3**
Mineral Aggregate for Micro-Surfacing	Abrasion	AASHTO T 96	**3**
	Percent Carbonates	ARIZ 238a	**3**
	Gradation	AASHTO T 27 & T 11	**3**
	Sand Equivalent	AASHTO T176	**3**
	Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
	Uncompacted Void Content	AASHTO T 304	**3**
	Moisture Content	AASHTO T 265	**3**
Mineral Aggregate for Asphaltic Concrete Friction Course (ACFC)	Abrasion	AASHTO T 96	**3**
	Percent Carbonates	ARIZ 238a	**3**
	Specific Gravity	AASHTO T 85	**3**
	Sand Equivalent	AASHTO T176	**2**
	Flakiness Index	ARIZ 233	**3**
	Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
	Gradation	AASHTO T 27 & T 11	**2**
Mineral Aggregate for Asphaltic Concrete Friction Course (Miscellaneous Structural)	Abrasion	AASHTO T 96	**3**
	Percent Carbonates (if required)	ARIZ 238a	**3**
	Sand Equivalent	AASHTO T 176	**3**
	Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
	Gradation	AASHTO T 27 & T 11	**3**

Mineral Aggregate for Asphaltic Concrete Friction Course (Miscellaneous Structural - Special Mix)	Abrasion	AASHTO T 96	**3**
	Percent Carbonates (if required)	ARIZ 238a	**3**
	Sand Equivalent	AASHTO T 176	**3**
	Uncompacted Void Content	AASHTO T 304	**3**
	Fractured Coarse Aggregate Particles	ARIZ 212	**3**
	Gradation	AASHTO T 27 & T 11	**3**
Mineral Aggregate for Asphaltic Concrete Friction Course (ACFC) - Miscellaneous	Abrasion	AASHTO T 96	**3**
	Sand Equivalent	AASHTO T176	**3**
	Flakiness Index	ARIZ 233	**3**
	Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
	Gradation	AASHTO T 27 & T 11	**3**
Mineral Aggregate for Asphaltic Concrete (Asphalt-Rubber) [AR-AC]	Abrasion	AASHTO T 96	**3**
	Percent Carbonates	ARIZ 238a	**3**
	Specific Gravity	AASHTO T 85	**3**
	Sand Equivalent	AASHTO T 176	**2**
	Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
	Gradation	AASHTO T 27 & T 11	**2**
Mineral Aggregate for Asphaltic Concrete Friction Course (Asphalt-Rubber) [AR-ACFC]	Abrasion	AASHTO T 96	**3**
	Percent Carbonates	ARIZ 238a	**3**
	Specific Gravity	AASHTO T 85	**3**
	Sand Equivalent	AASHTO T 176	**2**
	Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
	Flakiness Index	ARIZ 233	**3**
	Gradation	AASHTO T 27 & T 11	**2**

Mineral Aggregate for Asphaltic Concrete (Asphalt-Rubber) - End Product [AR-AC]	Source or Stockpile	Abrasion	AASHTO T 96	**3**
		Percent Carbonates	ARIZ 238a	**3**
	Stockpile	Sand Equivalent	AASHTO T 176	**3**
		Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
		Uncompacted Void Content	AASHTO T 304	**3**
		Ignition Furnace Calibration	AASHTO T 308	**3**
	Cold Feed or Stockpile	Sand Equivalent	AASHTO T 176	**2**
		Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
		Uncompacted Void Content	AASHTO T 304	**3**
	Mix	Gradation	AASHTO T 27 & T 11	**2**
Mineral Aggregate for Asphaltic Concrete - End Product [without RAP]	Source or Stockpile	Abrasion	AASHTO T 96	**3**
		Percent Carbonates	ARIZ 238a	**3**
	Stockpile	Sand Equivalent	AASHTO T 176	**2**
		Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
		Uncompacted Void Content	AASHTO T 304	**3**
		Ignition Furnace Calibration	AASHTO T 308	**3**
	Cold Feed or Stockpile	Sand Equivalent	AASHTO T 176	**2**
		Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
		Uncompacted Void Content	AASHTO T 304	**3**
	Mix	Gradation	AASHTO T 27 & T 11	**2**

Mineral Aggregate for Asphaltic Concrete - End Product [with RAP]	Source or Stockpile	Abrasion	AASHTO T 96	**3**
		Percent Carbonates	ARIZ 238a	**3**
	Stockpile	Sand Equivalent	AASHTO T 176	**2**
		Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
		Uncompacted Void Content	AASHTO T 304	**3**
		Ignition Furnace Calibration	AASHTO T 308	**3**
	Individual RAP Stockpiles	Gradation	AASHTO T 27 & T 11	**2**
		Binder Content	AASHTO T 308	**3**
		Moisture Content	AASHTO T 308	**3**
	Cold Feed or Stockpile	Sand Equivalent	AASHTO T 176	**2**
		Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
		Uncompacted Void Content	AASHTO T 304	**3**
	Mix	Gradation	AASHTO T 27 & T 11	**2**
Mineral Aggregate for Asphaltic Concrete-End Product (SHRP)[without RAP]	Source or Stockpile	Abrasion	AASHTO T 96	**3**
		Percent Carbonates	ARIZ 238a	**3**
	Stockpile	Sand Equivalent	AASHTO T176	**2**
		Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
		Uncompacted Void Content	AASHTO T 304	**3**
		Ignition Furnace Calibration	AASHTO T 308	**3**
	Cold Feed or Stockpile	Sand Equivalent	AASHTO T176	**2**
		Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
		Uncompacted Void Content	ARIZ 247a	**3**
	Mix	Gradation	AASHTO T 27 & T 11	**2**

Mineral Aggregate for Asphaltic Concrete - End Product (SHRP) [with RAP]	Source or Stockpile	Abrasion	AASHTO T 96	**3**
		Percent Carbonates	ARIZ 238a	**3**
	Stockpile	Sand Equivalent	AASHTO T 176	**3**
		Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
		Uncompacted Void Content	AASHTO T 304	**3**
		Ignition Furnace Calibration	AASHTO T 308	**3**
	Individual RAP Stockpiles	Gradation	AASHTO T 27 & T 11	**2**
		Binder Content	AASHTO T 308	**2**
		Moisture Content	AASHTO T 308	**3**
	Cold Feed or Stockpile	Sand Equivalent	AASHTO T176	**2**
		Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
		Uncompacted Void Content	ARIZ 247a	**3**
	Mix	Gradation	AASHTO T 27 & T 11	**2**
Mineral Aggregate for Asphaltic Concrete - Miscellaneous Paving		Abrasion	AASHTO T 96	**3**
		Sand Equivalent	AASHTO T 176	**3**
		Gradation	AASHTO T 27 & T 11	**3**
Bedding Material for Pipe		Gradation	AASHTO T27	**2**
		PI	AASHTO T- 89 & T 90	**2**
		pH	AASHTO T 288 & T 289	**3**
		Resistivity	AASHTO T 288 & T 289	**3**
		Proctor Density	AASHTO T 99	**3**
		Optimum Moisture	AASHTO T 99	**3**
		Compaction	AASHTO T 191	**1**
Filter Material for Perforated Pipe		Gradation	AASHTO T 27 & T 11	**2**
Plating Material for Pipe Ends		Gradation	AASHTO T 27 & T 11	**3**
		PI	AASHTO T 89 & T 90	**3**
		Proctor Density	AASHTO T 99	**3**
		Optimum Moisture	AASHTO T 99	**3**
		Compaction	AASHTO T 191	**3**
Crash Barrel Sand		Gradation	AASHTO T 27 & T 11	**3**
		Dry Unit Weight	AASHTO T 19	**3**
		Moisture Content	AASHTO T 265	**3**

Bedding Material for PVC Irrigation Pipe	Gradation	AASHTO T 27 & T 11	**3**
Rock for Wire Tied Riprap, Gabions, Slope Mattress, Rail Bank Protection	Specific Gravity	AASHTO T 85	**3**
	Gradation (Visual)	Visual	**3**
Rock for Grouted Riprap & Dumped Riprap	Specific Gravity	AASHTO T 85	**3**
	Gradation	AASHTO T 27 & T 11	**3**
Fine Aggregate for Portland Cement Concrete (PCC) Classes P, S, & B	Gradation	AASHTO T 27 & T 11	**2**
	Sand Equivalent	AASHTO T 176	**2**
	Organic Impurities	AASHTO T 21	**3**
	Mortar Strength	AASHTO T 176	**3**
	Deleterious Substances	AASHTO T 112 & T 113	**3**
Coarse Aggregate for Portland Cement Concrete (PCC) Classes P, S, & B	Gradation	AASHTO T 27 & T 11	**2**
	Abrasion	AASHTO T 96	**3**
	Deleterious Substances	AASHTO T 12 & T 113	**3**
	Fractured Coarse Aggregate Particles	AASHTO T 335	**3**
Aggregate for Arrestor Bed	Abrasion	AASHTO T 96	**3**
	Specific Gravity	AASHTO T 85	**3**
	Gradation	AASHTO T 27 & T 11	**2**
	Fractured Coarse Aggregate Particles	AASHTO T 335	**2**
	Flakiness Index	ARIZ 233c	**3**
Aggregate for Soil-Cement or Cement Stabilized Alluvium	Gradation	AASHTO T 27 & T 11	**2**
	PI	AASHTO T 89 & T 90	**2**

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Bituminous

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
BITUMINOUS MATERIAL (NOT MIXES)			
Recycling Agent	Per Specifications	Certificate of Compliance	**3**
Liquid Asphalt (Cutback Asphalt -Medium Curing) for Prime Coat	Per Specifications	Certificate of Compliance	**3**
	Per Specifications	Certificate of Compliance	**3**
Emulsified Asphalt	Per Specifications	Certificate of Compliance	**3**
	Residue	ARIZ 504	**3**
for Chip Seal	Per Specifications	Certificate of Compliance	**3**
Emulsified Asphalt for Tack Coat and Fog Coat	Per Specifications	Certificate of Compliance	**3**
	Residue	ARIZ 504	**3**
	Per Specifications	Certificate of Compliance	**3**
Asphalt Cement (PG XX-XX)	Per Specifications	Certificate of Compliance	**2**
for Tack Coat	Per Specifications	Certificate of Compliance	**3**
for Asphaltic Concrete	Per Specifications	Certificate of Compliance	**2**
for Asphaltic Concrete or ACFC	Per Specifications	Certificate of Compliance	**2**
Emulsified Recycling	Per Specifications	Certificate of Compliance	**3**
	Residue	ARIZ 504	**3**
ERA	Residue	ARIZ 504	**3**
for Fog Coat	Per Specifications	Certificate of Compliance	**3**
Asphalt Cement (PG XX-XX) for Asphalt -Rubber (Sprayed Applications)	Per Specifications	Certificate of Compliance	**2**
Asphalt Cement (PG XX-XX) for Asphalt – Rubber for AR-AC or AR-ACFC	Per Specifications	Certificate of Compliance	**2**
Crumb Rubber for Asphalt - Rubber Type A or Type B	Gradation	ARIZ 714	**3**
Asphalt - Rubber [CRA (5)] Type 1, Type 2, or Type 3 (Sprayed Applications)	Per Specifications	Certificate of Compliance	**3**

Asphalt - Rubber [CRA (5)] Type 1, Type 2, or Type 3 For AR-AC or AR-ACFC	Penetration	ASTM D5	**3**
	Softening Point	ASTM D36	**2**
	Resilience	ASTM D5329	**2**
	Rotational Viscosity	AASHTO T 316	**3**
	Rotational Viscosity (at plant)	AASHTO T 316	**3**

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Portland Cement Concrete

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
PORTLAND CEMENT CONCRETE (For this Material Category, the Level 1 Analysis uses α = 0.025)			
Portland Cement Concrete Pavement (PCCP) Class P	Compressive Strength	ARIZ 314b	**1**
	Slump	AASHTO T 119	**2**
	Temperature	ASTM C1064	**3**
	Air Content (when Required)	AASHTO T 152	**2**
	Thickness	AASHTO T 148 & ARIZ 317a	**1**
Portland Cement Structural Concrete Class S and B	Compressive Strength	ARIZ 314b	**1**
	Slump	AASHTO T 119	**2**
	Temperature	ASTM C1064	**3**
	Air Content (when Required)	AASHTO T 152	**2**
Portland Cement Concrete (PCC) Class S (with a compressive strength req't equal to or greater than 4,000 psi)	Compressive Strength	ARIZ 314b	**1**
	Slump/Spread (for SCC)	AASHTO T 119	**2**
	Temperature	ASTM C1064	**3**
	Air Content (when Required)	AASHTO T 152	**2**
Portland Cement Concrete (PCC) Class B	Compressive Strength	ARIZ 314b	**1**
	Slump	AASHTO T 119	**2**
	Temperature	ASTM C1064	**3**
	Air Content (when Required)	AASHTO T 152	**2**
Portland Cement Structural Concrete for Minor Precast Structures	Rebound Hammer	ASTM C805	**3**
Prestressed Concrete	Compressive Strength	ARIZ 314b	**1**
	Slump	AASHTO T 119	**2**
	Temperature	ASTM C1064	**3**
Shotcrete	Compressive Strength	ARIZ 314b	**1**
	Slump	AASHTO T 119	**2**
	Air Content	ASTM C1064	**3**

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Materials Used With Portland Cement Concrete

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
MATERIALS USED WITH PORTLAND CEMENT CONCRETE			
Prestressing Steel (Spiral, Bars, Strand Wire, or Wire)	Tensile Strength	AASHTO M 203 & M 204	**3**
Post-Tensioning Steel	Tensile Strength	AASHTO M 203 & M 204	**3**
Reinforcement Bars	Tensile Strength	AASHTO M 31	**3**
Welded Wire Fabric (Smooth)	Per Specifications	Certificate of Compliance	**Inspection**
Welded Wire Fabric (Deformed)	Per Specifications	Certificate of Compliance	**Inspection**
Admixtures	Per Specifications	Certificate of Compliance	**Inspection**
Curing Compound	Per Specifications	Certificate of Compliance	**Inspection**
Curing Compound	Water Loss		**Inspection**
	% Solids		**Inspection**
Fly Ash and Natural Pozzolan	Per Specifications	Certificate of Compliance	**Inspection**
Silica Fume	Per Specifications	Certificate of Compliance	**Inspection**
Water	Soluble Salts	AASHTO T 26	**Inspection**
	pH	AASHTO T 26	**Inspection**
Hydraulic Cement	Per Specifications	Certificate of Compliance	**Inspection**
Hydraulic Cement (All Type)	Chemical & Physical	ASTM C465 & ASTM C595	**Inspection**
Joint Materials	Per Specifications	Certificate of Compliance	**Inspection**
Bearing Pads (All Type)	Thickness	Measurement	**3**
	Compression Load	Certificate of Compliance	**3**

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Stabilized Soils and Bases

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
STABILIZED SOILS & BASES (For this Material Category, the Level 1 Analysis uses α = 0.01)			
Lime Treated Subgrade	Proctor Density	AASHTO T 99	**3**
	Optimum Moisture	AASHTO T 99	**3**
	Compaction	AASHTO T 191	**1**
Cement Treated Subgrade	Proctor Density	AASHTO T 99	**3**
	Optimum Moisture	AASHTO T 99	**3**
	Compaction	AASHTO T 191	**1**
Cement Treated Base	Proctor Density	AASHTO T 99	**3**
	Optimum Moisture	AASHTO T 99	**3**
	Compaction	AASHTO T 191	**1**
	Compressive Strength	ARIZ 241a	**1**
Lean Concrete Base	Compressive Strength	ARIZ 314b	**1**
	Slump	AASHTO T 119	**2**
	Air Content (when required	AASHTO T 152	**2**
	Thickness	AASHTO T 148	**1**
Cement Stabilized Alluvium	Compressive Strength	ARIZ 314b	**1**
Soil-Cement Bank Protection	Compressive Strength	ARIZ 314b	**1**

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Bituminous Mixtures

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
BITUMINOUS MIXTURES (For this Material Category, the Level 1 Analysis uses α = 0.025)			
Asphaltic Concrete Friction Course [ACFC] (407)	% Asphalt	AASHTO T 287	**3**
	Moisture Content	AASHTO T 329	**3**
Asphaltic Concrete [AC] Marshall Mixes Misc. Structural (409 & 409 Special)	% Asphalt	AASHTO T 308	**1**
	Moisture Content	AASHTO T 329	**3**
	Rice	AASHTO T 209	**2**
	Lab Density (Marshall), Stab, Flow	AASHTO R 68	**2**
	Gradation (only 409 Special)	AASHTO T 308	**2**
Asphaltic Concrete Friction Course [ACFC] - Misc. (411)	% Asphalt	AASHTO T 287	**3**
	Moisture Content	AASHTO T 329	**3**
Asphaltic Concrete (Asphalt-Rubber) [AR-AC] (413)	% Asphalt Rubber	AASHTO T 287	**3**
	Moisture Content	AASHTO T 329	**3**
Asphaltic Concrete Friction Course (Asphalt – Rubber) [AR-ACFC] (414)	% Asphalt Rubber	AASHTO T 287	**3**
	Moisture Content	AASHTO T 329	**3**
Asphaltic Concrete (Asphalt-Rubber) [AR-AC] End Product (415)	% Asphalt Rubber	AASHTO T 308	**1**
	Moisture Content	AASHTO T 329	**3**
	Rice	AASHTO T 209	**2**
	Lab Density (Marshall), Stab, Flow	AASHTO R 68	**2**
	Calculated Lab Voids	AASHTO T 269	**1**
	Gradation	AASHTO T 308	**2**
	Compaction (in place field voids)	AASHTO T 166	**1**
Asphaltic Concrete [AC] Marshall Mixes End Product (416)	% Asphalt	AASHTO T 308	**1**
	Moisture Content	AASHTO T 329	**3**
	Rice	AASHTO T 209	**2**
	Lab Density (Marshall), Stab, Flow	AASHTO R 68	**2**
	Calculated Lab Voids	AASHTO T 269	**1**
	Gradation	AASHTO T 308	**2**
	Compaction (in place field voids)	AASHTO T 166	**1**

Asphaltic Concrete SHRP Volumetric Mixes (417)	% Asphalt	AASHTO T 308	**1**
	Moisture Content	AASHTO T 329	**3**
	Rice	AASHTO T 209	**2**
	Lab Density (Gyratory Compactor)	AASHTO T 312	**2**
	Calculated Lab Voids	AASHTO T 269	**1**
	Gradation	AASHTO T 308	**2**
	Compaction (in place field voids)	AASHTO T 166	**1**

Miscellaneous

MATERIAL OR PRODUCT	TYPE OF TEST(S) REQUIRED	TEST METHOD	VERIFICATION LEVEL
MISCELLANEOUS MATERIALS (For this Material Category, the Level 1 Analysis uses α = 0.025)			
Lime	Per Specifications	Certificate of Compliance	**Inspection**
Hydrated Lime	Per Specifications	Certificate of Compliance	**Inspection**
Hydraulic Cement	Per Specifications	Certificate of Compliance	**Inspection**
Portland Cement and Blended Hydraulic Cement	Per Specifications	Certificate of Compliance	**Inspection**
Corrugated Metal Pipe (CMP)	Per Specifications	Certificate of Compliance	**Inspection**
Non-Reinforced, Cast-in-Place Concrete Pipe	Compressive Strength	ARIZ 314b	**1**
	Slump	AASHTO T 119	**2**
	Air Content (when required)	ASTM C1064	**2**
	Temperature	AASHTO T 152	**3**
	Wall Thickness		**2**
Precast Reinforced or Non-Reinforced Concrete Pipe	Compressive Strength	ARIZ 314b	**2**
	Thickness	Measurement	**2**
Vitrified Clay Pipe	Compression	ARIZ 314b	**3**
Brick for Manholes	Compression	ARIZ 314b	**3**
Paving Brick	Compression	ARIZ 314b	**3**
	Absorption	ARIZ 251	**3**
Cinder Block	Compression	ARIZ 314b	**3**
	Absorption	ARIZ 251	**3**
Slump Block	Compression	ARIZ 314b	**3**
	Absorption	ARIZ 251	**3**
High Strength Bolts, Nuts, Washers, or Anchor Bolts	Rockwell Hardness	ASTM E18	**3**
	Wedge Tensile Strength	ASTM F606	**3**
Retroreflective Sheeting	Per Specifications	Certificate of Compliance	**3**
Sign Panel Silk-Screened Characters	Per Specifications	Certificate of Compliance	**3**

Glass Beads	Roundness	ASTM D1155	**3**
	Gradation	ASTM D1214	**3**
	Refractive Index		**3**
	Moisture Resistance		**3**
	Heavy Metal Concentration (if required)		**3**
Preformed Plastic Pavement Marking	Per Specifications	Certificate of Compliance	**3**
Thermoplastic Pavement Markings	Per Specifications	Certificate of Compliance	**3**
Raised Pavement Markers	Per Specifications	Certificate of Compliance	**Inspection**
Permanent Pavement Markings (Painted)	Per Specifications	Certificate of Compliance	**3**
Dual Component Pavement Markings	Per Specifications	Certificate of Compliance	**3**
Polyvinyl Chloride (PVC) Pipe for Electrical Conduit	Per Specifications	Certificate of Compliance	**Inspection**
Polyvinyl Chloride (PVC) Pipe for Water	Per Specifications	Certificate of Compliance	**Inspection**
Chain Link Fabric	Per Specifications	Certificate of Compliance	**Inspection**
Fence Post and Rails	Per Specifications	Certificate of Compliance	**Inspection**
Miscellaneous Fence Hardware	Per Specifications	Certificate of Compliance	**Inspection**
Post Clips, Hog Rings, Tie Wire, or Tension Wire	Per Specifications	Certificate of Compliance	**Inspection**
Barbed Wire or Barbless Wire	Per Specifications	Certificate of Compliance	**Inspection**
Fence Stays	Per Specifications	Certificate of Compliance	**Inspection**
T-Post	Per Specifications	Certificate of Compliance	**Inspection**
Woven Wire Fabric	Per Specifications	Certificate of Compliance	**Inspection**
Wire Rope	Per Specifications	Certificate of Compliance	**Inspection**
Paint	Per Specifications	Certificate of Compliance	**Inspection**
Guardrail Elements	Per Specifications	Certificate of Compliance	**Inspection**
Guardrail Fasteners	Rockwell Hardness	ASTM E18	**3**
	Tensile Strength	ASTM F606	**3**
Guardrail Posts and Blocks	Per Specifications	Certificate of Compliance	**Inspection**
Geosynthetics	Per Specifications	Certificate of Compliance	**3**

Pavement Fabric	Per Specifications	Certificate of Compliance	**3**
Geogrid	Per Specifications	Certificate of Compliance	**3**
Separation Geotextile Fabric	Per Specifications	Certificate of Compliance	**3**
Bank Protection Fabric	Per Specifications	Certificate of Compliance	**3**
Geocomposite Wall Drain System	Per Specifications	Certificate of Compliance	**3**
Geocomposite Edge Drain System	Per Specifications	Certificate of Compliance	**3**
Geomembrane	Per Specifications	Certificate of Compliance	**3**
Grout	Compressive Strength	ARIZ 314b	**2**

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TPA 112-1.3 Project Specific Quality Assurance Program Appendix H

Independent Quality Firm Data Transfer Requirements

The IQF transmits their test results to ADOT to allow ADOT to perform the required owner verification (including statistical analyses). This appendix provides directions and information needed on how to transmit this data to ADOT's data analysis system.

Definitions

Third Party: this is the client who will provide the deliverable described in this document.

ADOT Analysis Tool: this refers to the web and desktop application along with data import tasks configured to accept data from two parties: ADOT and the third party above. The primary objective of the ADOT Analysis Tool is to group and aggregate imported tests based on attributes of the tests, resulting in statistical analyses.

Master Excel Spreadsheet: this refers to the Excel template (.xlsx or .xlsm) provided in the RIDs by ADOT which contains a variety of test attributes for the Third Party to record test data during construction.

Purpose

The purpose of this document is to specify the requirements for the Third Party's data submission to ADOT before data analysis can be conducted. It outlines the specifications of the Master Excel Spreadsheet, which will serve as the data source for the IQF of the ADOT Analysis Tool.

Deliverable and Delivery Method

The Third Party is expected to use the provided Master Excel Spreadsheet (.xlsx or .xlsm) to accurately record attributes and adhere to the required formats, including test results, sample data, and sample ID, etc. in the designated columns. The Master Excel Spreadsheet must be named in accordance with the naming convention, which will be provided by the administrator of the ADOT Analysis Tool.

The Third Party must coordinate with the administrator of the ADOT Analysis Tool to define the expected submission schedule and designated storage location. A scheduled task can be deployed to retrieve the Third Party's Master Excel Spreadsheet as needed.

Master Excel Template Attributes

The following is a summary of each test attribute in the expected deliverable. This summary is intended to assist the Third Party in understanding the purpose of each attribute, in addition to the column header definitions outlined in the provided Master Excel Spreadsheet. Note that naming convention such as testing procedure, test description, specification must be in accordance with the ADOT requirements.

Sample ID

Input a series of numerical numbers for each sample being tested.

Sampled Date

Input the date of the sample being tested in the format of mm/dd/yyyy.

Test Method

Select the applicable test method from the drop-down list, such as AASHTO T27, AASHTO T22, AASHTO R68 etc.

Test Description

Select the test type of the sample being tested, such as Air Content, Moisture Content of Agg by Drying, Specific Gravity of Coarse Aggregate, etc. Detailed content of the drop-down list will be provided by the administrator of the ADOT Analysis Tool prior to project commencement.

Result

Input the numeric test result recorded for the test, which will be used for analysis.

Specification Compliance

Select the appropriate test result from the drop-down list of pass, fail, Engineering Judgment (EJ) or informational.

Report Type

Select the appropriate test type from the drop-down list, such as Original, Retest1, Retest2, Correction1, or Correction2.

Original Sample ID

Input the original sample ID for the sample being tested. This field is used only when the report type is selected as "Retest" or "Correction" to record the original sample ID associated with the test.

Sample Type

Select the appropriate sample type from the drop-down list of Random-Independent, Random-Split, Fixed-Independent, Fixed-Split and Not-Incorporated.

Split Sample ID

Input the split sample ID, which corresponds to the same sample ID referenced in the original reports.

Sampled By

Input the name of the person who obtained the sample or performed the test.

Material Mix Design

Input the applicable material mix design number for the sample being tested.

Specification Section

Input the applicable specification section for the sample being tested.

Material Code

Input the applicable material code (e.g., AB, AC, BM) of the sample being tested.

Type Code

Input the applicable type code (e.g., 2, 57, 34F) of the sample being tested.

Supplier

Input the name of the applicable material supplier.

Supplier Source

Input the name of the applicable supplier source.

Plant Number

Input the name of the applicable plant number.

Segment

Input the project segment name where the test sample was obtained.

Project Number

Input the project number of the test sample.

Random Number

Input the random number information.

Sample Location

Input a short description of the location of the test sample.

Station

Input the station location of the test sample in reference to mainline, crossroad, or ramp.

Direction

Select direction of travel from the drop-down list of Northbound (NB), Southbound (SB), Eastbound (EB), or Westbound (WB).

Roadway

Input the roadway name where the sample was obtained or test performed.

Offset

Input the offset distance from centerline where the sample was obtained or test performed.

Miscellaneous

Input any miscellaneous information for the test sample by the person collecting the test sample or performing the test.

Tested By

Input the name of the person who performed the test.

Tested Date

Input the date when the test was performed.

Reviewed By

Input the name of the person who reviewed the test results for approval.

Completion Date

Input the date when the test was completed.

Versioning

The versioning of each test is determined by the report type: Original, Retest, or Correction, which indicates the order in which a test result is superseded in the ADOT Analysis Tool. When multiple Retest or Correction sample types exist, the value with the higher index number will override the one with the lower index number in the analysis.

For example, the screenshot below shows a sample data set of an AASHTO T27 test:

The Original failed sample with the Sample ID of 4825999008 is superseded by the Retest1 failed sample with the Sample ID of 4825999101 and later superseded by the Retest2 passed sample with the Sample ID of 4825999102. The sample is ultimately superseded by the Correction1 passed sample with the Sample ID of 4825999008.

Detailed instructions on data entry will be provided by the ADOT Analysis Tool administrator. All naming conventions, including testing procedures, test descriptions, and specifications must be complied with ADOT requirements.

SampleID	SampledDate	TestMethod	TestDescription	Result	Specificatior	ReportType	OriginalSampleID
4.826E+09	07/05/25	AASHTO T27	Sieve Analysis 1/2"	71	Fail	Original	NA
4.826E+09	07/09/25	AASHTO T27	Sieve Analysis 1/2"	73	Fail	Retest1	4825999008
4.826E+09	07/12/25	AASHTO T27	Sieve Analysis 1/2"	74	Pass	Retest2	4825999101
4.826E+09	07/14/25	AASHTO T27	Sieve Analysis 1/2"	76	Pass	Correction1	4825999102

Accompanying Data

1. Sample Master Excel Spreadsheet (.xlsx or .xlsm)

Refer to the .xlsx or .xlsm file (attached file to this appendix) for a mockup of the expected deliverable from the Third Party.

TPA 112-2 ADOT Construction Bulletins

No.	ADOT Construction Bulletins
1.	25-01: Buying Food, Catering, or Lunch for Construction or Partnering Meetings

TPA 113-1 File Naming Convention

File Name: [Submittal ID]-[Type]-[Discipline]-[Location]-[Submittal Title] **Example:** D001-A-RDW-S1-Roadway Design Plans.dgn		
"Type" Options	**"Discipline" Options**	
A – As-Built/Record Drawing D – Design File/CADD C – Certification F – Form B – Schedule M – Maps I – Meetings N – Native File Calculations P – Plan R – Report S – Specifications L – Letters	AES – Aesthetics and Landscaping BPED – Bicycles and Pedestrian Facilities DBE – Disadvantaged Business Enterprise DRA – Drainage ELE – Lighting and Signals ENV – Environmental GEO – Geotechnical/Earthwork HYD – Hydraulics ITS – Intelligent Transportation System MOT – Maintenance of Traffic OJT – On-the-Job Training PI – Public Information	RDW – Roadway ROW – Right-of-Way SPM – Signing, Striping, and Pavement Markings STR – Structures SUR – Land Surveying UTIL – Utilities

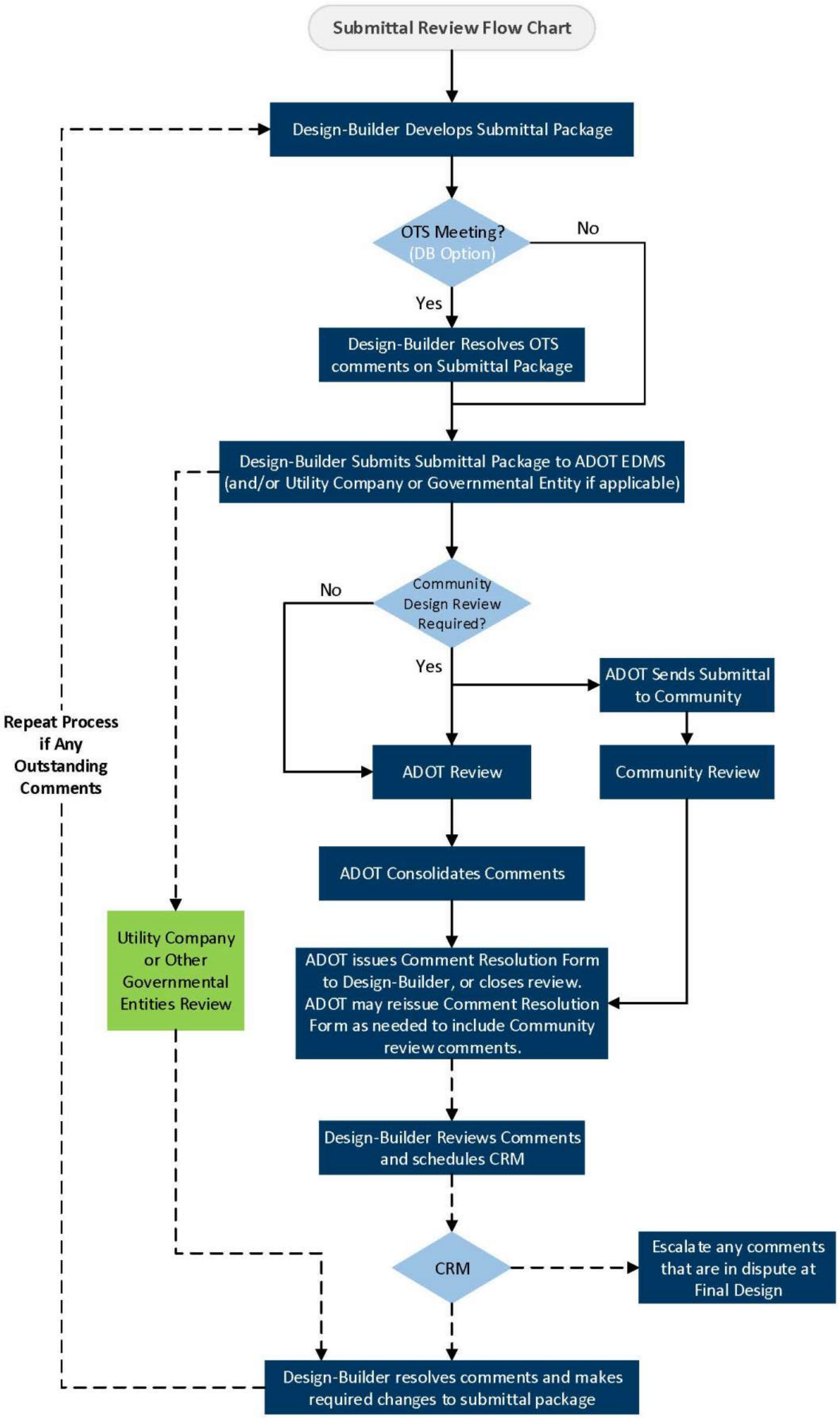
TPA 113-2 3D Drawing Elements

No.	Drawing Element	Level of Development (LOD)	DGN Level
Existing Conditions			
1.	Buildings within settlement and monitoring zones and Project ROW	100	
2.	Existing bridge superstructures, piers, and foundations	100	
3.	Existing bridge traveled way	300	
4.	Existing culverts	100	
5.	Existing drainage pipes 30” or greater in diameter	100	
6.	Existing ground surface	300	
7.	Existing utilities	100	
8.	Existing walls exposed face	300	
9.	Hydrographic Sweep Survey	300	
10.	Overhead utilities, including poles and cables	100	
11.	Survey benchmarks and construction control points	300	
Roadways			
12.	Bottom of base aggregate surface	300	
13.	Crash cushions and guard rail	100	
14.	Curb	300	
15.	Exposed grading, including bottom of ditch lines and top of berm	200	
16.	Exposed pavement, including edges of pavement and crown lines	300	
17.	Permanent barriers and rails, including bridge rail	300	
18.	Sidewalks and Multi-use paths	300	
Structures			
19.	Bridge piers and towers	300	
20.	Bridge Deck	300	
21.	Foundations, including driven pile arrays and drilled shaft arrays	200	
22.	Girders or equivalent	300	

No.	Drawing Element	Level of Development (LOD)	DGN Level
23.	Permanent ITS foundations and concrete structures	200	
24.	Permanent lighting foundations	200	
25.	Permanent sign foundations and supports, including overhead sign bridges and cantilever sign structures	200	
26.	Permanent tolling Element foundations and concrete structures	200	
27.	Stay cables and anchors	300	
28.	Superstructure finished grade, including edges of pavement and crown lines	300	
29.	Wall details, including copings; foundations; and permanent backfill	200	
30.	Walls, including MSE panels or Cast-in-place volumes, and moment slabs, where applicable	300	
31.	Permanent access systems	200	
Other			
32.	Culverts, including end-walls	300	
33.	Drainage pipes	300	
34.	Drainage structures, including catch basins and inlets	200	
35.	Exposed utilities, including poles and wires	200	
36.	Permanent ITS elements, excluding foundations and concrete structures	100	
37.	Permanent lighting, excluding foundations	100	
38.	Permanent signs, including panels and excluding foundations	100	
39.	Permanent tolling, excluding foundations and concrete structures	100	
40.	Underground utilities	100	

1

TPA 113-3 ADOT Formal Submittal Review Process



TPA 113-4 Comment Resolution Form

Comment Resolution Form												
[Logo]	Project:					Submittal Category:					Total Open (0 of 57 or 0.0%):	0
	Submittal Name:					Submittal Stage:					Total Pending (0 of 57 or 0.0%):	0
	Submittal ID No.:					Date:	8/3/2023				Total Closed (0 of 57 or 0.0%):	0
	Submittal Date:					Comments Due:						
Comment No.	Discipline	Reviewer	Doc. Ref Page/ Sheet No.	Comment Code	Comment	Reference	Response Code	Response	Backcheck Code	Backcheck Response		Status
1												
2												
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56												
Insert new rows above this row.												

Legend and Codes

No.	Discipline	Comment Codes	Response Codes	Backcheck Codes	Status	Submittal Stage	Submittal Category
1	Administration	F - Does not comply with the Contract Document	C - Complied with comment	X - Accept response. Comment closed	Open	Geometric	Administrative Document
2	Land surveying	I - Information only	W - Will comply with comment in a future Submittal (specify)	D - Disagree with response	Pending	Preliminary	Design Document
3	Geotechnical/earthwork	S - Suggested change. DB must respond	N - Disagree with comment. Discuss.	W - Comment withdrawn	Closed	Final	Construction Document
4	Pavement		R - Clarification provided. No changes required.	A - Agree with response disposition		RFC	
5	Environmental					Other	
6	Public information						
7	Utilities						
8	Roadway						
9	Drainage						
10	Aesthetics and landscaping						
11	Bicycle and pedestrian facilities						
12	Structures						
13	Hydraulics						
14	Signing, striping, and pavement markings						
15	Lighting and signals						
16	Maintenance of traffic						
17	Intelligent Transportation System						
18	Tolling						
19	Railroad						
20	Acoustics and vibration						
21	Fire life safety						
22	Vertical structures						
23	Support facilities						
24	Sitework						
25	Mechanical						
26	Electrical						
27	Plumbing						
28	Fire Protection						
29	Security system						
30	Communications						

1

TPA 113-5 Summary Index of ADOT Stored Specifications

No.	ADOT Std Specs Section No.	ADOT Stored Specifications		General Notes	Item Description
		Name	Date		
1.	N/A	AASHTOEQ	04/17/25		TRANSITION OF SELECT ARIZONA TEST METHODS TO AASHTO EQUIVALENT TEST STANDARDS
2.	101	101DEFN	04/21/22		DEFINITIONS AND TERMS
3.	104	104APA 104DUST 104MTBRN	02/26/99 11/01/95 06/04/96		SCOPE OF WORK
4.	106	106DMAT 106CMATLS	02/15/11 12/21/23		CONTROL OF MATERIALS
5.	201	201MTBRN	10/18/10		CLEARING AND GRUBBING
6.	203	203QCEW 203STRBKFL 203SHLDBU	07/15/05 10/21/21 02/17/22		EARTHWORK
7.	208	208GEOM	12/03/91		GEOMEMBRANE
8.	303	303RASBAB 303QCAB	04/18/24 07/15/05		AGGREGATE SUBBASES AND AGGREGATE BASES
9.	401	401PCCPS 401LTDA	08/17/23 05/03/16		PORTLAND CEMENT CONCRETE PAVEMENT
10.	402	402PCCPR	02/15/24		PORTLAND CEMENT CONCRETE PAVEMENT REPAIRS
11.	404	404BITUM	08/18/22		BITUMINOUS TREATMENTS
12.	409	409AGGR	07/18/24		ASPHALTIC CONCRETE (MISCELLANEOUS STRUCTURAL)
13.	416	416ACES	07/18/24		ASPHALTIC CONCRETE – END PRODUCT
14.	501	501QCDRN 501PIPE 501JACK	07/15/05 01/20/22 09/21/23		PIPE CULVERT AND STORM DRAINS

No.	ADOT Std Specs Section No.	ADOT Stored Specifications		General Notes	Item Description
		Name	Date		
15.	601	601BDCFA 601PCC 601EPOXSEAL 601MTHSEAL	04/17/25 09/21/23 12/15/22 12/15/22		CONCRETE STRUCTURES
16.	608	608PANEL	06/17/21		SIGN PANELS
17.	609	609DRSFD	09/19/24		DRILLED SHAFT FOUNDATIONS
18.	701	701TPTC	10/15/20		TEMPORARY AND PORTABLE TRAFFIC CONTROL SIGNAL
19.	704	704TPMF	10/17/24		THERMOPLASTIC PAVEMENT MARKINGS
20.	705	705PVMRK	09/21/23		PREFORMED PLASTIC PAVEMENT MARKING
21.	706	706REFPMR	11/21/24		RAISED PAVEMENT MARKERS
22.	731	731STRSUP	03/18/21		STRUCTURAL SUPPORTS AND FOUNDATIONS FOR TRAFFIC SIGNAL AND HIGHWAY LIGHTING
23.	733	733SBRB	12/21/23		SIGNAL INDICATIONS AND MOUNTING ASSEMBLIES
24.	910	910CBARR	05/16/24		CONCRETE BARRIERS
25.	912	912FIBER	06/16/22		SHOTCRETE
26.	913	913BKPRT	02/18/21		BANK PROTECTION
27.	924	924CQC	09/17/20		CONTRACTOR QUALITY CONTROL
28.	928	928LONG	09/16/21		GROUND -IN RUMBLE STRIP
29.	1001	1001MATL	06/17/21		MATERIAL SOURCES
30.	1003	1003REBAR	12/17/20		REINFORCING STEEL
31.	1005	1005PG	12/21/23		BITUMINOUS MATERIALS
32.	1006	1006PCC 1006QCPC	09/21/23 07/12/05		PORTLAND CEMENT CONCRETE
33.	1010	1010PIPE	03/16/23		DRAINAGE PIPE

No.	ADOT Std Specs Section No.	ADOT Stored Specifications		General Notes	Item Description
		Name	Date		
34.	1011	1011APEAS	07/18/24		JOINT MATERIALS
35.	1013	1013BRPD	01/20/22		BEARING PADS
36.	1014	1014GEOSYN	07/18/24		GEOSYNTHETICS
37.	1015	1015EPOX	02/16/23		EPOXY MATERIALS
38.	1017	1017NSGM	06/15/23		NONSHRINK GROUT MATERIALS

TPA 113-6 Project Specific Record Drawing Requirements

See attached

Record Drawing Requirements

for

010 MA 161 F0721 01C
010-C-NFA

Phoenix – Casa Grande Highway (I-10)
SR 202L (Santan/South Mountain) to Gila River Bridge

I-10 Gila River Community Project

Design-Build Capacity Improvements

ADOT | Arizona Department of Transportation

December 23, 2024

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   1.1 Background / Scope
   1.2 Authority
   1.3 Guidance
   1.4 References

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   2.1 Definitions

3. Record Drawing Preparation
   3.1 Transferring the field changes to the Record Drawings
   3.2 Methods to prepare Final Record Drawings

4. Record Drawing Preparation
   4.1 Creating the Final Record Drawings (EOR Requirements)

5. Record Drawing Preparation
   5.1 Final Record Drawing Review (Project Resource Office Review Requirements)

6. Record Drawing General Requirements
   6.1 Record Drawing General Requirements
   6.2 Record Drawing Deliverables
   6.3 Record Drawing File Naming Convention

7. CADD File Archiving Requirements
   7.1 CADD File Deliverables

8. Appendices
   Appendix A: Flowchart (Omitted)
   Appendix B: Project Submittal Form
   Appendix C: Face Sheet Information Block
   Appendix D: Record Drawing Preparation Estimate (Omitted)
   Appendix E: “No-Plans” Document (Omitted)
   Appendix F: Critical Structures Notice (Omitted)
   Appendix G: Record Drawing Example (Omitted)

Chapter 1

Background / Scope / Authority / Guidance / References

1.1 Background / Scope

This is intended to provide a complete and accurate explanation of the record drawing process for the I-10, SR 202L to Gila River Bridge Project, commonly known as the I-10 Gila River Indian Community Project.

Utility Record Drawings shall follow TP Section 119.04(C)(2) (*Utility Record Drawings*) and TP Section 119.04(D)(2) (*Utility Company Record Drawings*).

This guide excludes City of Chandler (COC) Record Drawings.

- City of Chandler (COC) water and sewer record drawings are not included in the ADOT Record Drawings guidelines.
- Design-Builder will prepare record drawings for COC water and sewer facilities in accordance with the municipality's process.
- Water and sewer record drawings will be prepared and submitted directly to COC for approval and acceptance.
- COC's water and sewer record drawings will be attached to the Encroachment Permit.
- COC Record Drawings will be included in the Project Record Drawings following jurisdictions approval.

Encroachment Permits drawings will not be included and follows TP Section 119 (*Utilities*) requirement.

1.2 Authority

ADOT is required by State law to keep an official record of the final plans for all construction projects which involve ADOT oversight (per Arizona Revised Statues ARS 32-152). These record drawings are required on all ADOT administered projects and must record the field changes made to the original design plans during the construction of a project.

1.3 Guidance

This record drawing guidance document supersedes any other record drawing guidance documents and as identified in the Contract Documents.

The record drawing and CADD archiving procedures described in the following chapters shall be applied. CADD files are required for archiving on all state highway system projects. CADD file deliverables are specified in Section 7.1.

1.4 References

Project Resource Office Web Page
https://azdot.gov/business/project-management-services/project-resource-office

Record Drawings Guidelines Web Page
https://azdot.gov/business/project-management-services/project-resource-office/record-drawing-

guidelines

Bridge Group Guidelines Web Page
https://azdot.gov/business/engineering-and-construction/bridge-engineering-and-construction

Dictionary of Standardized Work Tasks
https://azdot.gov/business/project-management-services/project-management-group/references- project-management-group

Repository of Online Archived Documents (ROAD) Portal
https://road.azdot.gov/

Chapter 2

Definitions

2.1 Definitions

As-Built Plans – The term or words “as-built” plans has been changed to “record drawing” plans. This new definition was adopted by ADOT on April 7th, 2015. The terms as-built or as-build are used interchangeably but the official term on all ADOT documentation is or will be changed to record drawing(s). As-Built information recorded from the I-10 Gila River Indian Community Project onto plan sheet are not required to be revised from AB indication to RD. AB is able to remain on the plan sheets.

Additional Information Sheets – Additional information sheets are drawings that contain additional information pertinent to the project. This may include hand drawn sketches or actual additional drawings provided for or included as part of the project. These additional information sheets must be sealed, signed and dated by a PE.

Agency – Agency refers to the agency being discussed, typically an outside agency.

CADD – Computer Aided Design and Drafting, typically refers to the software and/or the electronic files used to produce engineering drawings.

Change Order –Change orders are a form of supplemental agreement that occurs from an unforeseen situation during design and construction.

CIQM – The Construction Independent Quality Manager

Construction Administrator – The Construction Independent Quality Manager, who is in charge of administering the Quality Acceptance program of the project during construction. This person needs to be a Professional Engineer (PE) and is designated as such on the face sheet of the record drawings in the information block. See Appendix C.

Department – The Department refers to the Arizona Department of Transportation.

Design Manager (DM) – The Design Manager (DM) is the person in charge of or oversees the Design Services During Construction of a project.

Design-Builder – means the successful Proposer Entity with which the Contract is executed.

Electronic Design Files – Electronic design files are created using Computer Aided Design Drafting (CADD) software.

Engineer of Record – The Engineer of Record (EOR) is the DM for the Project for the purposes of signing that portion of the Record Drawing Information Block on the face sheet of the Record Drawings. The EOR can also refer to the person responsible for sealing the design of a particular plan sheet or specification.

Field Red-Lines – The field red-lines are the changes or modifications that occurred during construction of the project but did not require a re-issuance of the sheet. These are typically minor modifications. Field red-lines are addressed as specified in the ADOT-approved CQMP and are denoted with a prefix of "RDAB" (i.e.

Record DrawingAs-Built).

Final Record Drawings – Also see Preliminary Record Drawing Plans. The Final Record Drawing Plans compose the final set of record drawings approved by ADOT.

Information Block – See Record Drawing Information Block. See Appendix C.

Liaison – The liaison is an employee that represents ADOT.

PE – See Registered Professional Engineer (PE).

Preliminary Record Drawings – Also see Final Record Drawings. The Preliminary Record Drawings compose the Record Drawing Plans which have been approved by Design-Builder and submitted to ADOT for review.

Professional Services Quality Manager (PSQM) - means the individual filling the position with the responsibility to cause the methods and procedures contained in the ADOT-approved Professional Services Quality Management Plan (PSQMP) to be implemented and followed by Design-Builder's Professional Services staff in the performance of the Work, as more particularly described in TP Section 110.03(B)(6) (*Professional Services Quality Manager*) of the Technical Provisions. PSQM shall certify the Record Drawings comply with the QMP.

Project Submittal Form – See Record Drawing Project Submittal Form. See Appendix B.

Record Drawing Information Block – This is shown on the Face Sheet of the project plans along the right side of the sheet. This Record Drawing Information Block includes the name of the Design-Builder / Construction Company that constructed the project and the date the project was completed. This block also contains the name of the Construction Administrator and the date the CIQM signed off on the project completion This block also has the name of the EOR and the date the record drawings were completed. See Appendix C.

Red-lines – See Field Red-lines.

References – References shall be shown on the Design Sheet of a plan set. References are the historical record plans that were used to develop / design the current set of plans References are very useful for locating information that may not be available in the current set of plans.

Registered Professional Engineer (PE) – the PE is a person, ADOT or Non-ADOT, who has been granted registration by the Arizona State Board of Technical Registration and is authorized to practice professionally in the State of Arizona. This individual is usually a member of the design team who is in charge of developing the plans for a project and has current license when the project is required to be sealed and signed. This person can be a Civil Engineer, Landscape Architect, Architect, Electrical Engineer or Land Surveyor.

Record Drawing Coordinator / Project Resource Office Liaison – The Record Drawing Coordinator is an ADOT employee who oversees the record drawing procedure and verifies the content of the deliverables to the Department.

Record Drawing Plans – See also Preliminary Record Drawings and Final Record Drawings. Record Drawing Plans are the complete set of Project Plans, along with any required Shop Drawings and Sketches, which

include all of the changes during construction for a project based on a Professional Engineers (PE) or Field Redline changes to the original design. The changes are based on field observations or information obtained during construction, including any plans re-issued via NDC during construction. ADOT is required to maintain the record drawings (formerly known as “As Built Plans”) per the Arizona Revised Statues ARS 32-152. The record drawing red-lines record the changes occurring during construction and are incorporated onto the plans manually and/or electronically.

Record Drawing Project Submittal Form – The ADOT Construction Manager or Designee must submit a Record Drawing Project Submittal Form (see Appendix B) with the final submittal of the Final Record Drawing Plans to the Project Resource Office. This project submittal form lets the project resource office know that the ADOT Construction Manager or Deputy Construction Manager has reviewed the Final Record Drawing Plans and they include all of the field changes and the changes have been recorded accurately based on the marked up version from the field and the requirements of the Record Drawing Guidelines.

ROAD – ROAD is the acronym used for the Repository of Online Archived Documents. This is a cloud based portal to a database that contains all of the final record drawings for state and local governments. Record drawings can be searched by project information or through an interactive GIS map.

ShareFile – ShareFile is available to ADOT employees as a method to transfer large files or files that are too large to send through email. The maximum message size for emails is 20 MB (includes message and any/all attachments). ShareFile has replaced the ADOT FTP site. To access ShareFile you will need to setup a ShareFile account by opening a Service Desk Ticket from Information Technology Group (ITG). This is done either through an email or calling the Help Desk.

Sketches – Hand drawings or CADD drawings which are added to a set of plans to clarify something. Sketches must be clearly legible and the quality of the sketch and information must be reproducible if the sketch is scanned or copied. Additionally, these sketches must be placed within a Project border and must be sealed by a PE.

Supplemental Agreement – Is a signed written agreement between ADOT and the Design-Builder covering changes of work not otherwise provided for in the contract, such as revisions or amendments to the terms of the contract.

Chapter 3

Record Drawing Preparation

3.1 Transferring the field changes to the Record Drawings

1. The RFC drawings within the Design-Builder's EDMS system comprise the single drawing set. This set of drawings shall be used to keep track of or record all of the field changes during construction. Modifications shall be recorded promptly to ensure that a thorough and accurate set of final record drawings are compiled. If a drawing within the set is damaged or impaired, immediately replace the damaged drawing with a clean copy to record any changes. The electronic file being used shall be stored in a directory accessible to the project field staff and designated members of the ADOT/GEC administration team.

2. During the course of construction activities, the CIQM is responsible for recording any changes in the locations, dimensions or summary sheet information of constructed elements from those shown in the original RFC contract documents (i.e., construction plan sheets). The EOR shall record all changes recorded following the approved field design change processes. Red-lines are a continuous process from the start of a project.

   Per the General Provisions in Section 16 of the ADOT Bridge Group Design Guidelines, available on the Bridge Group web page (see References in Section 1.4), the following selected working drawings will become part of the final record drawings for permanent retention:

   a) Post-tensioning details
   b) Expansion Joint details (non-standard only)
   c) Proprietary bearing details
   d) Proprietary retaining wall details
   e) Proprietary sound barrier wall details
   f) Precast and stay-in-place deck panels
   g) Other working drawings for atypical structures as specified in the Technical Provisions

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6. The EOR shall complete the "Record Drawing Information Block" on the face sheet of the project plans. This includes the company name of the Design-Builder and the Substantial Completion date. Also included are the name and date of the CIQM and date the red-lines were completed and ready to be handed off to the EOR.

7. The EOR and CIQM must ensure that the final record drawing set includes all Revisions, field changes and any additional drawings or sketches created as a result of unforeseen circumstances (see checklist in Section 6.1 #11). Any additional drawings must be stamped, sealed and signed by a PE.

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3.2 Methods to prepare Final Record Drawings

The Final Record Drawings shall be legible, clean, not faded and reproducible.

The size of the font used on the PDF should be large enough so as to be as readable as the original note text on the sheet..

The EOR can make the field red-line changes electronically to a PDF copy of the RFC plan set as changes are required (during construction activities). Changes shall be recorded following the approved processes of the CQMP (Reference tags can be left on the Record Drawing plans).

Once the project is complete and all of the field changes have been recorded, the EOR can create a PDF/A document and submit this, along with a completed Record Drawing Project Submittal Form directly to ADOT for review.

Never remove or cover any original values or details.

Chapter 4

Record Drawing Preparation

4.1 Creating the Final Record Drawings (EOR Requirements)

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4. If questions arise during the preparation of the final record drawings regarding the final submittal, the Design-Builder shall submit an Information Request to ADOT.
5. The record drawing plans must be converted to a PDF/A document.
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7. Prior to submission of Final Record Drawing, the Design Manager shall make sure the final record drawings are in conformance with the checklist on the submittal form. Design-Builder shall verify that the Project Submittal Form is ADOT's most up to date version.
8. Once ADOT is satisfied with the Preliminary Record Drawings, ADOT will send the Final Record Drawings to the Project Resource Office with the Project Request Form attached for Final Approval. The Project Resource Office email address for record drawing submittals is: RecordDrawings@azdot.gov.
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Chapter 5

Record Drawing Preparation

5.1 Final Record Drawing Review (Project Resource Office Review Requirements)

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3. If there are changes that need to be made to the Final Record Drawings, the Project Resource Office will notify ADOT of the required changes. ADOT will provide the required changes to the Design-Builder.
4. The Design-Builder will re-submit the revised Preliminary Record Drawings to ADOT for another review. Reviews will continue until the Project Resource Office approves the Final Record Drawings.
5. Once the Project Resource Office accepts the Final Record Drawings, the Project Resource Office will generate an acceptance email and send the acceptance email to ADOT, the Design Manager, Field Reports, MPD, and Final Voucher notifying them that the Final Record Drawings have been accepted. The Field Reports Section will send out an email indicating that the Final Record Drawings have been documented in the FAST Contract Card.
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Chapter 6

Record Drawing General Requirements

6.1 Record Drawing General Requirements

Below are general requirements for the preparation of the Preliminary Record Drawings.

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2. The Record Drawing Information Block on the Face Sheet must be filled in. See Appendix C.

3. Ensure that every sheet has been sealed, signed and dated by the Design Manager or the Engineer of Record. The seals need to be clear and readable. This applies to additional sheets or sketches that have been added.

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5. References shall be included on the Design Sheet. References shall list the plans and or survey number that were used to develop / design the project.

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7. All field revisions to permanent construction shall be documented on the sheet where the change occurs and shown in red unless the sheet is re-issued to reflect changes.

8. Notations to reflect Change Order (CO) and Letter of Agreement (LOA) numbers are not to be identified on the record drawings.

9. Shop drawings that are unique in nature and are original Design-Builder submitted designs shall all be included in the final record drawings.

10. Per the General Provisions in Section 16 of the ADOT Bridge Group Design Guidelines, available on the Bridge Group web page (see References in Section 1.4 and TP Section 600.04(F) (*Structure Shop Drawings and Working Drawings*)), the following selected working drawings will become part of the final record drawings for permanent retention at a minimum:

    a. Post-tensioning details
    b. Expansion Joint details (non-standard only)
    c. Proprietary bearing details
    d. Proprietary retaining wall details
    e. Proprietary sound barrier wall details
    f. Precast and stay-in-place deck panels
    g. Other working drawings for atypical structures as specified in the Technical Provisions

11. Record Drawing Submittal shall include

    a. Screed Elevations (TP Section 600.03(H)(1))

b. Foundation Data (TP Section 600.03(H)(1))
c. As-Built Geotechnical Engineering Report (TP Section 300.03(C))
d. Project Drainage Report (TP Section 500.03(C))
e. Construction Survey Report (TP Section 925.04(D))
f. As-Built Load Rating Report (TP Section 600.04(H))
g. Record Drawing Cable Schedule (TPA 738-1 ITS Spec Section 742-3)
h. GPS Data Table for ITS info (TP Section 738.03(C))

12. Specifically Added to Record Drawing Submittal (Attachments not numbered)

    a. Wrong Way Sign Assembly (TP Section 738.04(B)(8))
    b. Conduit offset documentation (TP Section 738.04(B)(7))

13. If the project includes a SWPPP sheet, Part 2 of the sheet needs to be completed if more than 1 acre was disturbed during construction. This information is provided by ADOT.

14. Record Drawing sheet numbers and the record drawing date shall be shown in the lower right corner.

15. Added plan sheets shall be inserted within the appropriate section. Label the sheet with the sheet number and the next letter in the alpha designation sequence using upper case alpha letters (i.e. 18A, 18B, 18C, etc.). These should be shown in the lower right corner of the sheet.

16. Removal plans (if separate from Roadway Plans), MOT plans and Traffic Control Plans are not to be included in the Record Drawings.

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6.2 Record Drawing Deliverables

1. The Preliminary Record Drawings shall be submitted electronically in PDF/A format with the following settings:

    - The size of the drawings within the PDF document shall all be 17” x 11” (also known as half size). All drawings in the PDF document must be the same size.
    - Any added text using PDF software must be at least as large as the original text size..
    - The PDF document shall have no security on it. The PDF file needs to be unlocked and not password protected.

2. All record drawing submittals must be submitted electronically in PDF/A format.

    PDF/A is a “standard being established to set guidelines for archiving and preserving digital documents in Portable Document Format (PDF) and will ensure the preservation of their contents over an extended period of time and will ensure that those documents can be retrieved and rendered with a consistent and predictable result in the future.”

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6.3 Record Drawing Naming Convention

1. The record drawings and shop drawings must follow the correct file naming convention:

2. File Naming Convention: TRACS Number, Volume Number, Page Range, Record Drawings, - year Substantial Completion was achieved, File Extension. (Note, no spaces allowed in file names, use underscore or dash)

   Example (Regular plans, file size above 100 MB, broken up into separate files <100 MB):
   H835401C_vol1(pgs1to75of150)RecDwgs-2017.pdf
   H835401C_vol1(pgs76to150of150)RecDwgs-2017.pdf *(Try to break by discipline)*

   Example (Shop Dwgs): H835401C_vol1(pgs1to50of50)ShopDwgs-2017.pdf

Note: Try to make the break between files occur where the project files change from one group to another (i.e. break between Roadway and Traffic Group sheets). Please identify each discipline and this will be added to the description in the ROAD portal.

Example (Large Set): H922501C_vol1(pgs1to974of2980)RecDwgs-2016.pdf (Roadway sheets)

H922501C_vol1(pgs975to1026of2980)RecDwgs-2016.pdf (Roadway sheets)

H922501C_vol1(pgs1027to1089of2980)RecDwgs-2016.pdf (Roadway sheets)

H922501C_vol2(pgs1090to1100of2980)RecDwgs-2016.pdf (Traffic sheets)

H922501C_vol2(pgs1101to1275of2980)RecDwgs-2016.pdf (Landscape sheets)

H922501C_vol3(pgs1276to1395of2980)RecDwgs-2016.pdf (Irrigation sheets)

H922501C_vol3(pgs1396to2780of2980)RecDwgs-2016.pdf (Bridge Sheets)

3. The record drawing PDF file size shall be limited to 100 MB (which is 100,000 KB). Larger projects will need to be broken up into smaller file sizes. File naming conventions shall be followed (see Section 6.3). This makes downloading the final record drawings quicker and easier to upload and retrieve from the ROAD portal.

   PDF file size can be dramatically reduced by optimizing or reducing the file size from within PDF editing software. If the file is optimized or reduced, please make sure none of the data such as red-

lines are removed as part of the optimization process. PDF optimization and file reduction needs to occur prior to creating the final PDF/A document. Following optimization, verification shall be reviewed prior to official submittal. A check shall be completed for the following:

- Pixelated plan sheets/seals/markups
- Zoom in functionality
- Missing Record Drawing Markups
- Page Numbering
- Blank sheets
- Other Misc items

Chapter 7

CADD File Archiving Requirements

7.1 CADD File Archiving General Requirements

ADOT requires that CADD files be submitted as part of the record drawing submittal process before the project can be closed. This is to ensure ADOT receives all CADD files associated with the project.

CADD files shall include all OpenRoads design files. All files need to have logical names, by following a reasonable logical naming convention.

- CADD files shall be submitted in a Zip file.
    - ZIP files shall include the words “CADD_Files”. Individual CADD files themselves do not require inclusion of the words “CADD Files”.
- Base files shall be submitted. Sheet files are not required to be submitted
- Working files and temp files shall not be included
- Reference file links need to also have non-associated files removed
- Zip file size shall be less than 100MB. If the file size is larger than the 100MB size requirement, the CADD files need to be separated into smaller Zip files. The files shall be broken into specific disciplines (Bridge, Roadway, Traffic, etc.)
- The CADD file shall be by discipline and include the ADOT project number (F007201C) and the words CADD_Files as shown below in the ZIP File title:

  F007201C_CADD_Files_Bridge

  F007201C_CADD_Files_Traffic

  etc.
- The CADD file submittal must include all CADD base and modeling files by discipline for the project. The CADD file submittal shall be submitted at one time per discipline.
- All CADD files for the project including base design files, other reference files and OpenRoads modeling files must be included as part of the submittal.

Appendix B: Project Submittal

RECORD DRAWING PROJECT SUBMITTAL FORM
ARIZONA DEPARTMENT OF TRANSPORTATION
Project Resource Office

This Record Drawing Project Submittal Form must be completed and submitted with all projects as part of the record drawings submission process to ADOT.

Record Drawings shall be submitted electronically to: RecordDrawings@azdot.gov

SUBMITTAL DATE:_____

PROJECT NUMBER:_____ ADOT PROJECT NUMBER:_____

ROUTE:_____ COUNTY:_____ MILEPOST:_____

PROJECT DESCRIPTION:_____

BELOW IS A LIST OF ITEMS THAT NEED TO BE ***CHECKED*** AS PART OF THE RECORD DRAWING SUBMITTAL PROCESS

- ☐ All As-Bid sheets are included.
- ☐ If required all Bridge Working Drawings are included.
- ☐ Record Drawings are being submitted as a PDF/A.
- ☐ If required Part 2 of the SWPPP sheet has been filled in or "X'd" out (if Part 2 was not used) and if there is one on the project. Were there any Addendums on this project? (See Appendix G in the Record Drawing Guidelines – PDF page 49)
  - ☐ No.
  - ☐ Yes, the addendum numbers _____ are included in the Record Drawings.
- ☐ All of the field red-lines shown on the plans are clouded and shown in red.

Were there any Change Orders or Supplemental Agreements on this project that changed the plans?

- ☐ No.
- ☐ Yes, please list the Change Order(s) number (i.e. CO-4, LOA-1):_____

_____

- ☐ All utility work (gas, water, CAP, electric, communications, irrigation, railroad, etc.) that was moved, added, or abandoned as part of the project are shown on the record drawings.
- ☐ All of the information that the Contractor is required to provide has been shown in red on the record drawings. (i.e. record drawing information for electrical items, pull box locations, etc.)
- ☐ All of the information in the "record drawing block" on the face sheet is completed and shown in red.
  - ☐ The Construction Administrator's name and date, and the Record Drawing Designer's name and date are shown in red.
  - ☐ The Construction Administrator and Record Drawing Designer are designated as a PE.
- ☐ All of the drawings have the PE stamp and signature.
- ☐ All of the Record Drawing sheet numbers and dates are shown on each sheet in red.
- ☐ The file size of each PDF/A file is below < 100 MB.
- ☐ The PDF/A file is unlocked and not password protected.
- ☐ The file name(s) are correct (i.e. H123401C_vol1(pgs1to18of18)RecDwgs-2016.pdf)

The Environmental EPIC_Sheet 1F - Has been completed with the Project Resident Engineer name and signature.
If no EPIC_Sheet 1F is required please provide reason: _____ or
☐ Supplemental documentation with Environmental Planning division was submitted.

RECORD DRAWING CERTIFICATION

I HEREBY CERTIFY THAT THESE RECORD DRAWINGS WERE MADE UNDER MY SUPERVISION OR AS NOTED AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

_____	_____	_____
Construction Administrator (RE, RLS) (Signature Required)	Registration Number	Expiration Date

_____
Printed Name

Rev. 4/2023

Appendix C: Face Sheet Information Block

Constructed by:

Project Manager
Design-Builder

Completion Date

Red-Lines by:

Construction Independent Quality Manager
Construction Administrator

Completion Date

Record Drawings by:

Design Manager
Engineer of Record

Completion Date

TPA 117-1 Environmental Commitments

I-10 Gila River Indian Community Project (Interstate 10 Corridor Study: State Route 202L to State Route 387 EA) Environmental Commitments and Mitigation Measures

The following table includes the Project-specific environmental commitments as written in the NEPA approval and supporting documents, with minor modifications for clarification purposes. Design-Builder is responsible for performing and complying with all obligations of ADOT specified in the column with the heading of "Environmental Commitment Record Requirement" and as specified in the FONSI or supporting documents, except those obligations that are specifically identified below in the column with the heading "Description of ADOT–Retained Obligation" as being the obligations of ADOT, or a third-party, or the Community, Governmental Entity or Utility Company as applicable.

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
General			
1.	GEN-1	The Arizona Department of Transportation design team will continue to review community access impacts, mobility, and impacts on community services, community cohesion, aesthetics, and community values in all areas affected by the project to include the traditionally underserved communities that were identified in the study area, including short-term impacts that could affect minority and low-income residents.	ADOT retains this obligation.
2.	GEN-2	Roadside memorials will be avoided or relocated in consultation with the Gila River Indian Community Tribal Historic Preservation Office.	ADOT retains this obligation.
3.	GEN-3	The contractor shall avoid all flagged and/or otherwise designated sensitive areas.	None retained; all delegated to Design-Builder.
Landscape			
4.	LAND-1	The design team will evaluate mitigation measures for cut-and-fill slopes, which may erode unless stabilized with vegetation or geotextiles. Vegetation will slow surface runoff, help bind soils, reduce rainfall impact, and break up flow patterns. Geotextiles including matting, retaining walls, and rock slope protection will prevent extensive contact between surface runoff and soil, keeping the soil intact. Retaining walls decrease cut-and-fill slopes, reducing runoff velocities and erosion potential. Rock slope protection armors the slope, preventing soil movement.	None retained; all delegated to Design-Builder.

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
5.	LAND-2	The design team will evaluate mitigation measures for slopes along roadside channels and at discharge points from culverts, which may be steep and promote erosion. Therefore, conveyance features may require protection in the form of channel lining, reduced slopes, or energy-dissipating structures designed to break up and reduce discharge velocities.	None retained; all delegated to Design-Builder.
6.	LAND-3	According to the Arizona Department of Transportation's *Standard Specifications for Road and Bridge Construction*, Section 107.11, Protection and Restoration of Property and Landscape (2021), "materials removed during construction operations, such as trees, stumps, building materials, irrigation and drainage structures, broken concrete, and other similar materials, shall not be dumped on either private or public property unless the contractor has obtained written permission from the owner or public agency with jurisdiction over the land. Written permission will not be required, however, when materials are disposed of at an operating, public dumping ground." Excess waste material and construction debris will be disposed of at sites supplied by the contractor, at a municipal landfill approved under Title D of the Resource Conservation and Recovery Act, at a construction debris landfill approved under Article 3 of Arizona Revised Statutes 49-241 (Aquifer Protection Permit) administered by the Arizona Department of Environmental Quality, or at an inert landfill.	None retained; all delegated to Design-Builder.
Material Sources			
7.	MAT-1	The contractor shall use material sources from the Arizona Department of Transportation's Contractor-Furnished Materials Sources List. If the source that the contractor prefers to use is not on the Arizona Department of Transportation list, the contractor shall complete the Arizona Department of Transportation Environmental Planning's Material Source Environmental Analysis Application in accordance with the Arizona Department of Transportation's *Standard Specifications for Road and Bridge Construction*, Section 104 Material Sources (2021 Edition) (Stored Specifications 104 ENVIRO – 07/21 and 1001 MATL – 06/17/21), prior to using material from that source.	None retained; all delegated to Design-Builder.

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
8.	MAT-2	Contractor-furnished material sources must go through a process to obtain environmental clearance for use on Arizona Department of Transportation projects. The material source owner or operator must submit a Material Source Environmental Analysis Application, with cultural survey and reports, to the Arizona Department of Transportation Environmental Planning. After receiving the completed application, the Arizona Department of Transportation Environmental Planning will initiate a cultural consultation process. Upon successful completion of this process, the material source will receive a tracking number and may be included on the Arizona Department of Transportation's Contractor-Furnished Materials Sources List.	None retained; all delegated to Design-Builder.
Biology			
9.	BIO-1	During final design, a qualified biologist will complete surveys for nesting birds protected under the Migratory Bird Treaty Act, as necessary, and develop mitigation measures to avoid impacts on nesting birds during construction.	None retained; all delegated to Design-Builder.
10.	BIO-2	During final design, a qualified biologist will inspect all structures including concrete box culverts, underpass bridges, and large pipes that will be impacted by construction for roosting bats and develop mitigation measures to avoid impacts on bats during construction.	None retained; all delegated to Design-Builder.
11.	BIO-3	During final design of the project, the status of species and critical habitat proposed, listed, or designated under the Endangered Species Act will be reviewed. If new species or critical habitat have been proposed, listed, or designated following completion of the Biological Evaluation, or if the potential effects on species or critical habitat from the project have changed from those described in the Biological Evaluation, an update to the Biological Evaluation will be prepared and any required consultation with the U.S. Fish and Wildlife Service will be completed.	None retained; all delegated to Design-Builder.

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
12.	BIO-4	During final design, the Arizona Department of Transportation shall coordinate with the Gila River Indian Community Department of Environmental Quality on features to encourage wildlife passage based on the results of the Wildlife Connectivity Assessment.	None retained; all delegated to Design-Builder except Design-Builder shall coordinate with ADOT on features to encourage wildlife passage. Design-Builder shall follow requirements in TP Section 117.04(F) (*Biological Resources*).
13.	BIO-5	Plants protected by the Gila River Indian Community's Native Plant Ordinance will be impacted by this project; therefore, the Arizona Department of Transportation Roadside Development Section will coordinate with the Gila River Indian Community Department of Environmental Quality to ensure compliance with the Native Plant Ordinance.	ADOT retains this responsibility except Design-Builder shall follow requirements in TP Section 800.02(A) (*Plant Salvage Operation Plan*).
14.	BIO-6	The Arizona Department of Transportation Roadside Development Section, in coordination with the Gila River Indian Community Department of Environmental Quality, will provide special provisions for the control of noxious and invasive plant species during construction that may require treatment and control within the project limits.	ADOT retains this obligation.
15.	BIO-7	Protected native plants within the project limits will be impacted by this project; therefore, the Arizona Department of Transportation Roadside Development Section will determine whether Arizona Department of Agriculture notification is needed. If notification is needed, the Arizona Department of Transportation Roadside Development Section will send the notification at least 60 (sixty) calendar days prior to the start of construction.	No Design-Builder responsibility.

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
16.	BIO-8	The Arizona Department of Transportation Roadside Development Section will provide special provisions for the control of noxious and invasive plant species during construction that may require treatment and control within the project limits. The Arizona Department of Transportation Roadside Development Section will review and approve or reject the Noxious and Invasive Plant Species Treatment and Control Plan prepared by the contractor and submitted to the Engineer as required in the specifications within 10 (ten) working days of receipt. Once approved, the Arizona Department of Transportation Roadside Development Section will return the plan to the Engineer.	ADOT retains this obligation.
17.	BIO-9	The contractor shall develop a Noxious and Invasive Plant Species Treatment and Control Plan in accordance with the requirements in the contract documents. Plants to be controlled shall include those listed in the state and federal noxious weed list, the state invasive species list, and Gila River Indian Community lists, as applicable, in accordance with state and federal laws and executive orders. The plan and associated treatments shall include all areas within the project right-of-way and easements as shown on the project plans. The treatment and control plan shall be submitted to the Engineer for the Arizona Department of Transportation Construction Professional Landscape Architect for review and approval prior to implementation by the contractor.	None retained; all delegated to Design-Builder, except ADOT retains reviewing and commenting on Design-Builder's Plan as provided in TP Section 800.02(B) (*Noxious and Invasive Species Control Plan*).
18.	BIO-10	Prior to the start of ground-disturbing activities and throughout the duration of construction and any landscape establishment period, the contractor shall arrange for and perform the control of noxious and invasive species in the project area.	None retained; all delegated to Design-Builder. Requirements are identified in TP Section 800.02(B) (*Noxious and Invasive Species Control Plan*).
19.	BIO-11	To prevent the introduction of invasive species seeds, all earthmoving and hauling equipment shall be washed prior to entering the construction site and the contractor shall inspect all construction equipment and remove all attached debris, including plant parts, soil, and mud, prior to the equipment entering the construction site.	None retained; all delegated to Design-Builder. Requirement is identified in TP Section 800.02(B) (*Noxious and Invasive Species Control Plan*).

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
20.	BIO-12	To prevent invasive species seeds from leaving the site, the contractor shall inspect all construction and hauling equipment and remove all debris, including plant parts, soil, and mud, prior to leaving the construction site.	None retained; all delegated to Design-Builder.
21.	BIO-13	All disturbed soils not paved that will not be landscaped or otherwise permanently stabilized by construction shall be seeded using species native to the project vicinity.	None retained; all delegated to Design-Builder. Requirements are identified in TP Section 800.02(B) (*Noxious and Invasive Species Control Plan*).
22.	BIO-14	Prior to construction, all personnel who will be on-site, including, but not limited to, contractors, contractors' employees, supervisors, inspectors, and subcontractors, shall review the Arizona Department of Transportation Environmental Planning "Western Burrowing Owl Awareness" flier included in the RIDs.	None retained; all delegated to Design-Builder.
23.	BIO-15	If any burrowing owls or active burrows are identified, the contractor shall notify the District Engineer immediately. No construction activities will take place within 100 feet of any active burrow.	None retained; all delegated to Design-Builder.
24.	BIO-16	If the District Engineer, in cooperation with the Arizona Department of Transportation Biologist, determines that burrowing owls cannot be avoided, the contractor shall employ a qualified biologist holding a U.S. Fish and Wildlife Service permit to relocate burrowing owls from the project area, as appropriate. Should relocation be necessary, the qualified biologist shall work with the Gila River Indian Community Department of Environmental Quality to identify an appropriate location within the Gila River Indian Community for relocation.	None retained; all delegated to Design-Builder.
25.	BIO-17	Prior to construction activity, the contractor's field personnel including the Project Manager, Assistant Project Manager, General Superintendent, and Project Superintendent shall review the Arizona Department of Transportation Environmental Planning "Sonoran Desert Tortoise Awareness Program Handout" flier, (included in the RIDs) become familiar with the identification and avoidance of the Sonoran desert tortoise, and follow the notification request, as applicable.	None retained; all delegated to Design-Builder.

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
26.	BIO-18	If any Sonoran desert tortoises are encountered during construction, the contractor shall adhere to the Arizona Game and Fish Department "Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects" included in the RIDs. If any tortoise is encountered during construction, the contractor shall notify the Engineer to report the encounter.	None retained; all delegated to Design-Builder.
27.	BIO-19	The contractor shall report encounters with any Sonoran desert tortoises (live, injured, or dead) during construction to the Engineer using the Arizona Department of Transportation Sonoran Desert Tortoise Observation Form included in the RIDs. The final form shall be sent to Arizona Department of Transportation Environmental Planning (email: bioteam@azdot.gov) within 24 hours of the encounter. Photographs shall be taken of tortoises encountered and included in the report if possible. The Gila River Indian Community Department of Environmental Quality shall be notified of any encounters with any Sonoran desert tortoises and, should relocation be necessary, the qualified biologist shall work with the Gila River Indian Community Department of Environmental Quality to identify an appropriate location within the Gila River Indian Community for relocation.	None retained; all delegated to Design-Builder.
Cultural			
28.	CUL-1	The design team will ensure that Traditional Cultural Properties 9 and 15 will be accessible continually during and after construction. Although portions of the current access roads to Traditional Cultural Properties 9 and 15 will require permanent realignment to accommodate construction at the Nelson Road (Rd) Traffic Interchange (TI), the properties will be accessible on existing roads during construction and on the newly aligned roads following construction.	No Design-Builder responsibilities.
29.	CUL-2	The design team, in coordination with the Gila River Indian Community Tribal Historic Preservation Office, will ensure protection measures are employed to avoid Traditional Cultural Properties 13, 15, and 35 during construction.	No Design-Builder responsibilities.

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
30.	CUL-3	No work will occur in areas requiring archaeological testing and data recovery, flagging, fencing, or monitoring until the Arizona Department of Transportation Environmental Planning Historic Preservation Team informs the Engineer that the testing/data recovery, avoidance flagging, or fencing has been completed or an archaeological monitor has been arranged in accordance with the Historic Properties Treatment Plan.	ADOT retains this obligation except Design-Builder shall be responsible for placing avoidance fencing and requesting archaeological monitoring for Design-Builder activities.
31.	CUL-4	The contractor shall contact the Arizona Department of Transportation Environmental Planning Historic Preservation Team (602.712.7767 or 480.341.3029) at least 14 (fourteen) business days prior to the start of ground-disturbing activities to arrange for a qualified archaeologist to delineate avoidance areas.	None retained; all delegated to Design-Builder.
32.	CUL-5	The contractor shall avoid all flagged and/or otherwise designated sensitive cultural areas.	None retained; all delegated to Design-Builder.
33.	CUL-6	During the development of project designs, the Arizona Department of Transportation Environmental Planning Historic Preservation Team will arrange for additional archaeological surveys to identify previously unrecorded cultural resources and evaluate their National Register of Historic Places eligibility, verify archaeological site boundaries, update site records, and evaluate site conditions for those historic properties located in, or intersecting with, the area of potential effects.	ADOT retains this obligation.

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
34.	CUL-7	During the development of project designs, a Historic Properties Treatment Plan will be developed and implemented by the Arizona Department of Transportation Environmental Planning Historic Preservation Team, in consultation with the Gila River Indian Community Tribal Historic Preservation Office and other consulting parties. The Historic Properties Treatment Plan will be developed in accordance with a programmatic agreement satisfying 36 Code of Federal Regulations 800.6 and 800.14(b). Construction activities will not occur in areas requiring archaeological testing and data recovery until the archaeological investigations are complete and the Arizona Department of Transportation has concluded consultation on the preliminary data recovery report, in accordance with the Historic Properties Treatment Plan.	ADOT retains this obligation.
35.	CUL-8	Archaeological monitoring will also be required. The locations of the monitoring will be determined by the Gila River Indian Community Tribal Historic Preservation Office following archaeological testing and when data recovery efforts have been completed, so the precise locations are not known yet.	ADOT retains this obligation except Design-Builder shall be responsible for notifying ADOT 10 Days in advance, as necessary, to arrange for a monitor to be present if work occurs within an area requiring monitoring.
36.	CUL-9	Cultural awareness training will be required of contractors.	None retained; all delegated to Design-Builder except that the Gila River Indian Community representatives will provide the training based on a schedule coordinated through ADOT.
37.	CUL-10	The Arizona Department of Transportation Environmental Planning, in coordination with the Gila River Indian Community Tribal Historic Preservation Office, will ensure protection measures are employed to ensure Traditional Cultural Properties 13, 15, and 35 are avoided during construction.	No Design-Builder responsibilities.
38.	CUL-11	The Arizona Department of Transportation Environmental Planning will determine whether any design changes within the boundaries of Section 4(f) historic properties will require reassessment.	ADOT retains this obligation except Design-Builder shall follow requirements in TP Section 117.04 (*Environmental Requirements*).

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
39.	CUL-12	During the development of project designs, a Historic Properties Treatment Plan will be developed and implemented by the Arizona Department of Transportation Environmental Planning Historic Preservation Team, in consultation with the Gila River Indian Community Tribal Historic Preservation Office and other consulting parties. The Historic Properties Treatment Plan will consider traditional religious ceremonies and/or ethnographic research for traditional cultural properties. Construction activities will not occur in traditional cultural properties until treatment outlined in the Historic Properties Treatment Plan is complete and consultation on any ethnographic studies is complete.	ADOT retains this obligation.
40.	CUL-13	If previously unidentified cultural resources are encountered during activity related to the construction of the project, the contractor shall stop work immediately at that location, notify the Engineer, and take all reasonable steps to secure the preservation of those resources. The Engineer will contact the Arizona Department of Transportation Environmental Planning Historic Preservation Team (602.712.8636 or 602.712.7767), which will immediately make arrangements for proper treatment of those resources in coordination with the Gila River Indian Community Tribal Historic Preservation Office, the Gila River Indian Community Cultural Resources Management Program, and the Bureau of Indian Affairs Regional Archaeologist.	ADOT retains this obligation except Design-Builder shall follow requirements in TP Section 117.04(C) (*Cultural Resources*).
41.	CUL-14	The Engineer will contact the Arizona Department of Transportation Environmental Planning Historic Preservation Team (602.712.7767 and 602.712.8636) 14 days prior to construction to ensure that the terms and stipulations of the Historic Properties Treatment Plan have been fulfilled.	ADOT retains this obligation.
Hazardous Materials			
42.	HZM-1	The design team's project manager will contact the Arizona Department of Transportation's Environmental Planning hazardous materials coordinator at 602.920.3882 or 602.712.7767 to determine the need for additional assessment.	None retained; all delegated to Design-Builder.

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
43.	HZM-2	All load-bearing structures will be assessed during the final design to determine the presence of lead-based paint and/or asbestos.	ADOT has completed a lead-based paint and asbestos survey within the project limits. Refer to TP Section 117.04(D) (*Hazardous Materials*) for Design-Builder responsibilities.
44.	HZM-3	If suspected hazardous materials were encountered during construction, work will cease at that location and the Arizona Department of Transportation Environmental Planning hazardous materials coordinator will be contacted to arrange for the proper assessment, treatment, or disposal of those materials.	None retained; all delegated to Design-Builder.
45.	HZM-4	Asbestos and lead-based paint containing materials identified in structures to be modified or demolished will be properly removed and disposed of prior to demolition.	None retained; all delegated to Design-Builder.
46.	HZM-5	No bridge work will occur at structures #01148 (Riggs Rd) and #01149 (Goodyear Rd) until the Lead-Based Paint Removal and Abatement Plan is approved by the Arizona Department of Transportation Environmental Planning hazardous materials coordinator and implemented.	None retained; all delegated to Design-Builder except for ADOT plan approval. Design-Builder shall follow requirements in TP Section 117.04(D) (*Hazardous Materials*).
47.	HZM-6	The Engineer, in association with the contractor, will complete the National Emission Standards for Hazardous Air Pollutants documentation for work associated with structures #01148 (Riggs Rd) and #01149 (Goodyear Rd) and submit it to the Arizona Department of Transportation Environmental Planning hazardous materials coordinator (602.920.3882 or 602.712.7767) for a 5 (five) working day review and approval. Upon approval by the Arizona Department of Transportation Environmental Planning hazardous materials coordinator, the contractor shall file the notification with the Arizona Department of Environmental Quality at least 10 (ten) working days prior to work associated with structures #01148 and #01149.	None retained; all delegated to Design-Builder except for ADOT documentation approval. Design-Builder shall follow requirements in TP Section 117.04(D) (*Hazardous Materials*). See also HZM-15.
48.	HZM-7	The contractor cannot start work associated with modifications to structures #01148 (Riggs Rd) and #01149 (Goodyear Rd) until 10 (ten) working days have passed since the submittal of the National Emission Standards for Hazardous Air Pollutants notification to the regulatory agency.	None retained; all delegated to Design-Builder. Design-Builder shall follow requirements in TP Section 117.04(D) (*Hazardous Materials*).

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
49.	HZM-8	The contractor shall complete a National Emission Standards for Hazardous Air Pollutants notification for work associated with the Dirk Lay Rd and Gasline Rd bridges and all other load-bearing structures and submit it to the Engineer for review.	Commitment does not apply to Design-Builder except direction for other load-bearing structures. Refer to HZM-6 and HZM-7.
50.	HZM-9	The excavation, removal, and disposal of asbestos cement pipe will be done in accordance with Section 202 of the Arizona Department of Transportation's *Standard Specifications for Road and Bridge Construction* (2021).	No Design-Builder responsibilities.
51.	HZM-10	An approved contractor shall develop and implement a Lead-Based Paint Removal and Abatement Plan for the removal of the lead-based paint, a Toxicity Characteristic Leaching Procedure for testing of the generated waste stream, and proper disposal of the waste stream derived from the removal of paint on the Dirk Lay Rd and Gasline Rd bridges (and any other load-bearing structure) and yellow and white pavement stripes. The contractor shall select a lead abatement contractor that meets the qualification requirements specified in the special provisions and as approved by the Engineer. The contractor shall follow all applicable federal, state, and local codes and regulations, including the Arizona Department of Transportation *Standard Specifications for Road and Bridge Construction* (2021 Edition), related to the treatment and handling of lead-based paint.	None retained; all delegated to Design-Builder except Dirk Lay Rd and Gasline Rd bridges are not part of Design-Builder's project. Refer to HZM-5.
52.	HZM-11	The contractor shall submit a Lead-Based Paint Removal and Abatement Plan for the removal of paint on the Dirk Lay Rd and Gasline Rd bridges (and any other bridges found to have lead-based paint) and yellow and white pavement stripes to the Engineer and the Arizona Department of Transportation Environmental Planning hazardous materials coordinator (602.920.3882 or 602.712.7767) for review and approval at least 10 (ten) working days prior to bridge work.	None retained; all delegated to Design-Builder except Dirk Lay Rd and Gasline Rd bridges are not part of Design-Builders project. Refer to HZM-5.

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
53.	HZM-12	Visible fugitive dust emissions from paint removal will be controlled through wet or dry (for example, vacuum) means during the removal process. If the liquid waste stream generated by a waterblasting obliteration method passes the Toxicity Characteristic Leaching Procedure analysis, it may be used as a dust palliative or for compaction on the project. If the water is not used on the project, it will be properly disposed of in accordance with all applicable federal, state, and local regulations.	None retained; all delegated to Design-Builder.
54.	HZM-13	The Contractor in coordination with the Engineer shall contact the Environmental Planning Hazardous Material Coordinator at 602.920.3883 (General mailbox: 602.712.7767) at least 10 days prior to the commencement of any construction activity to ensure that an asbestos survey has been conducted within the 60 months prior to the start of construction (Maricopa County Rule 370) or if there is a need for additional site assessment.	None retained; all delegated to Design-Builder.
55.	HZM-14	An approved contractor shall develop and implement an Asbestos Removal and Disposal Plan for the removal of the asbestos stanchion pads located on the deck of structures #01148 (Riggs Rd) and #01149 (Goodyear Rd) that are planned for modification (each structure having approximately 40 square feet of regulated asbestos-containing material). The Plan shall be submitted to the ADOT Hazardous Materials Coordinator (602.920.3882 or 602.712.7767) and Engineer for review and approval at least 10 (ten) working days prior to beginning the work. The Contractor shall select an asbestos abatement contractor that meets the qualification requirements specified within the special provisions and as approved by the Engineer. The Contractor shall follow all applicable federal, state, and local codes and regulations, including those provided in the Arizona Department of Transportation *Standard Specifications for Road and Bridge Construction* (2021 Edition), related to the treatment, handling, and disposal of asbestos.	None retained; all delegated to Design-Builder except for ADOT plan approval.

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
56.	HZM-15	The Contractor shall complete National Emission Standard for Hazardous Air Pollutants (NESHAP) notifications for the abatement associated with each of the structures containing the stanchion pads, and for the planned demolition or structural modification of any bridge structures in the Project Area, and submit them to the Engineer who shall submit them to the Arizona Department of Transportation Environmental Planning Hazardous Materials Coordinator (602.920.3882 or 602.712.7767) for a five (5) working day review and approval. Upon approval, the Contractor shall file the notification(s) with the United States Environmental Protection Agency (U.S. EPA) and Gila River Indian Community (GRIC) at least ten (10) working days prior to the commencement of any abatement or demolition work.	None retained; all delegated to Design-Builder except for ADOT documentation approval.
57.	HZM-16	An approved contractor shall develop and implement a Lead-Based Paint Removal and Abatement Plan for the removal of the lead-based paint, Toxicity Characteristic Leaching Procedure (TCLP) testing of the generated waste stream, and proper disposal of the waste stream derived from the removal of the silver paint with orange primer from the metal support beams and other related painted components for structures #01148 (Riggs Rd) and #01149 (Goodyear Rd) that are anticipated to be modified within the project limits. The Contractor shall select a lead abatement contractor that meets the qualification requirements specified within the special provisions and as approval by the Engineer. The Contractor shall follow all applicable federal, state, and local codes and regulations, including those provided in the Arizona Department of Transportation *Standard Specifications for Road and Bridge Construction* (2021 Edition), related to the treatment and handling of lead-based paint. The Contractor shall submit the Lead-Based Paint Removal and Abatement Plan to the Engineer and the ADOT Environmental Planning Hazardous Materials Coordinator (602.920.3882 or 602.712.7767) for review and approval at least 10 (ten) working days prior to beginning the bridge work.	None retained; all delegated to Design-Builder except for ADOT plan approval.

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
58.	HZM-17	For milling activities, the roadway surface preceding the milling machine shall be kept sufficiently wet so as to prevent the generation of any visible fugitive dust particles, but not so wet as to cause excess runoff from the roadway surface onto the roadway shoulder.	None retained; all delegated to Design-Builder.
Noise			
59.	NOI-1	During final design, the Arizona Department of Transportation project manager will contact the Arizona Department of Transportation Environmental Planning noise coordinator (adotairnoise@azdot.gov) to arrange for qualified personnel to review and update the noise analysis in accordance with the Arizona Department of Transportation's Noise Abatement Requirements (dated 2017).	ADOT retains this obligation.
60.	NOI-2	Future noise analyses will include public involvement in accordance with the Arizona Department of Transportation's Noise Abatement Requirements and the Public Involvement Plan for the Interstate 10 project.	ADOT retains this obligation.
61.	NOI-3	The Arizona Department of Transportation design team will consider the effects of noise from project construction activities and will determine any additional measures that are needed in the plans or specifications to minimize or eliminate adverse impacts from construction noise.	None retained; all delegated to Design-Builder.
62.	NOI-4	To minimize noise impacts during construction, stationary or idling equipment will be located as far away from noise-sensitive receivers, such as residences, as possible.	None retained; all delegated to Design-Builder.
Air Quality			
63.	AQ-1	Fugitive dust generated from construction activities must be controlled in accordance with Maricopa County Rule 310, the Gila River Indian Community Air Quality Ordinance (GRIC Code – Title 17, Chapter 9), and the Arizona Department of Transportation's *Standard Specifications for Road and Bridge Construction*, Section 104.08 (2021 edition), special provisions, and other local rules and ordinances.	None retained; all delegated to Design-Builder.

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
64.	AQ-2	The Arizona Department of Transportation's *Standard Specifications for Highway and Bridge Construction* (2021) stipulates that all exhaust systems on equipment would be in good working order and that properly designed engine closures and intake silencers would be used where appropriate.	None retained; all delegated to Design-Builder.
65.	AQ-3	Prior to the opening of the new Seed Farm Rd TI, the Gila River Indian Community will pave Seed Farm Rd from Sacaton to Interstate 10 to reduce fugitive dust concerns from the increased traffic that will use this new traffic interchange.	No Design-Builder responsibilities.
Temporary Impacts			
66.	TMP-1	The contractor shall use the most current Arizona Department of Transportation best management practices to reduce short-term adverse construction impacts related to air quality (from dust and exhaust); noise and vibration; surface and groundwater quality (from runoff); the transport, use, storage, and disposal of hazardous materials and waste; and related pollution control measures and practices during construction.	None retained; all delegated to Design-Builder.
67.	TMP-2	All Interstate 10 project activities, vehicles, and construction equipment in the project area will be limited to the existing pavement, pullouts, side roads, and approved construction staging areas/temporary construction easements.	None retained; all delegated to Design-Builder.
68.	TMP-3	The contractor shall ensure the construction project will be managed in such a manner as to minimize temporary impacts on residents, businesses, churches, schools, community centers, and the traveling public, such as noise, vibration, dust, exhaust, traffic restrictions, and potential road closures during construction.	None retained; all delegated to Design-Builder.
69.	TMP-4	Access to businesses and residences shall be maintained during construction.	None retained; all delegated to Design-Builder.
70.	TMP-5	With the exception of roads where access could be limited during construction and those that will experience temporary, short-term closures, the contractor shall maintain access to all businesses and residences throughout construction.	None retained; all delegated to Design-Builder

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
71.	TMP-6	The contractor shall avoid all flagged and/or otherwise designated actively farmed agricultural land or farm fields with prime irrigated soils in the Gila River Indian Community between mileposts 177and 180—specifically at the Gasline Rd and Seed Farm Rd construction areas.	No Design-Builder responsibilities.
72.	TMP-7	The Arizona Department of Transportation Utility and Railroad Engineering Section and Environmental Planning will coordinate with the Gila River Indian Community; Cities of Phoenix, Chandler, and Casa Grande; and private utility and irrigation providers during the design process to minimize the effects of potential utility relocations and adjustments. Coordination will include developing construction schedules to coincide with scheduled maintenance periods and/or off-peak loads.	ADOT partially retains this obligation; Design-Builder shall follow requirements in TP Section 119 (*Utilities*).
73.	TMP-8	Should a utility relocation be required, the Arizona Department of Transportation Utility and Railroad Engineering Section and Environmental Planning will coordinate with the utility owner to determine the need for new right-of-way or easement of the same size as the previous right-of-way or easement for that utility.	ADOT partially retains this obligation; Design-Builder shall follow requirements in TP Section 119 (*Utilities*).
74.	TMP-9	The Arizona Department of Transportation design team will coordinate with Gila Farms regarding its agricultural fields and ongoing agricultural operations near Interstate 10.	No Design-Builder responsibilities.
75.	TMP-10	The contractor shall coordinate with Gila Farms during construction at its agricultural fields at Gasline Rd and at Seed Farm Rd to avoid disrupting its ongoing operations near Interstate 10.	No Design-Builder responsibilities.
76.	TMP-11	The contractor shall not block access to farm fields, agricultural operations, or equipment in the Gila River Indian Community during construction.	None retained; all delegated to Design-Builder.
77.	TMP-12	The contractor shall contact the Arizona Department of Transportation Environmental Planning (602.712.7767) at least ten (10) working days prior to the commencement of work to ensure compliance with agricultural avoidance areas.	No Design-Builder responsibilities.

No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
Visual Resources			
78.	VIS-1	During final design, the Arizona Department of Transportation will coordinate with the Gila River Indian Community regarding the location and scope of aesthetic treatments.	ADOT partially retains this obligation; Design-Builder shall follow requirements in TP Section 800.02(C) (*Aesthetics and Landscape Master Plan*).
Water Resources			
79.	WRE-1	The Arizona Department of Transportation will coordinate the Gila River Indian Community Flood Control Manager regarding the design of drainage features and will provide an opportunity to review and comment on the design plans.	None retained; all delegated to Design-Builder.
80.	WRE-2	Coordination with the Salt River Project, Pima-Maricopa Irrigation Project, Gila River Indian Irrigation and Drainage District, and San Carlos Irrigation Project will occur during final design to consider potential impacts of the project on irrigation infrastructure.	None retained; all delegated to Design-Builder.
81.	WRE-3	The contractor shall develop a containment plan for debris and construction materials to avoid contamination of the Gila Drain. The containment plan will be approved by the Engineer prior to construction.	None retained; all delegated to Design-Builder.
82.	WRE-4	The contractor shall comply with the terms and conditions of the applicable state and local permits and rules for well abandonment, if applicable.	None retained; all delegated to Design-Builder.
83.	WRE-5	Best management practices set forth in the Erosion and Pollution Control Manual for Highway Design and Construction (Arizona Department of Transportation 2020) will be included in the Stormwater Pollution Prevention Plan.	None retained; all delegated to Design-Builder.
84.	WRE-6	Temporary and permanent erosion controls and stormwater best management practices will be implemented during construction in accordance with the Arizona Department of Transportation Erosion and Pollution Control Manual for Highway Design and Construction and the Arizona Department of Transportation Post-Construction Best Management Practices Manual for Water Quality.	None retained; all delegated to Design-Builder.

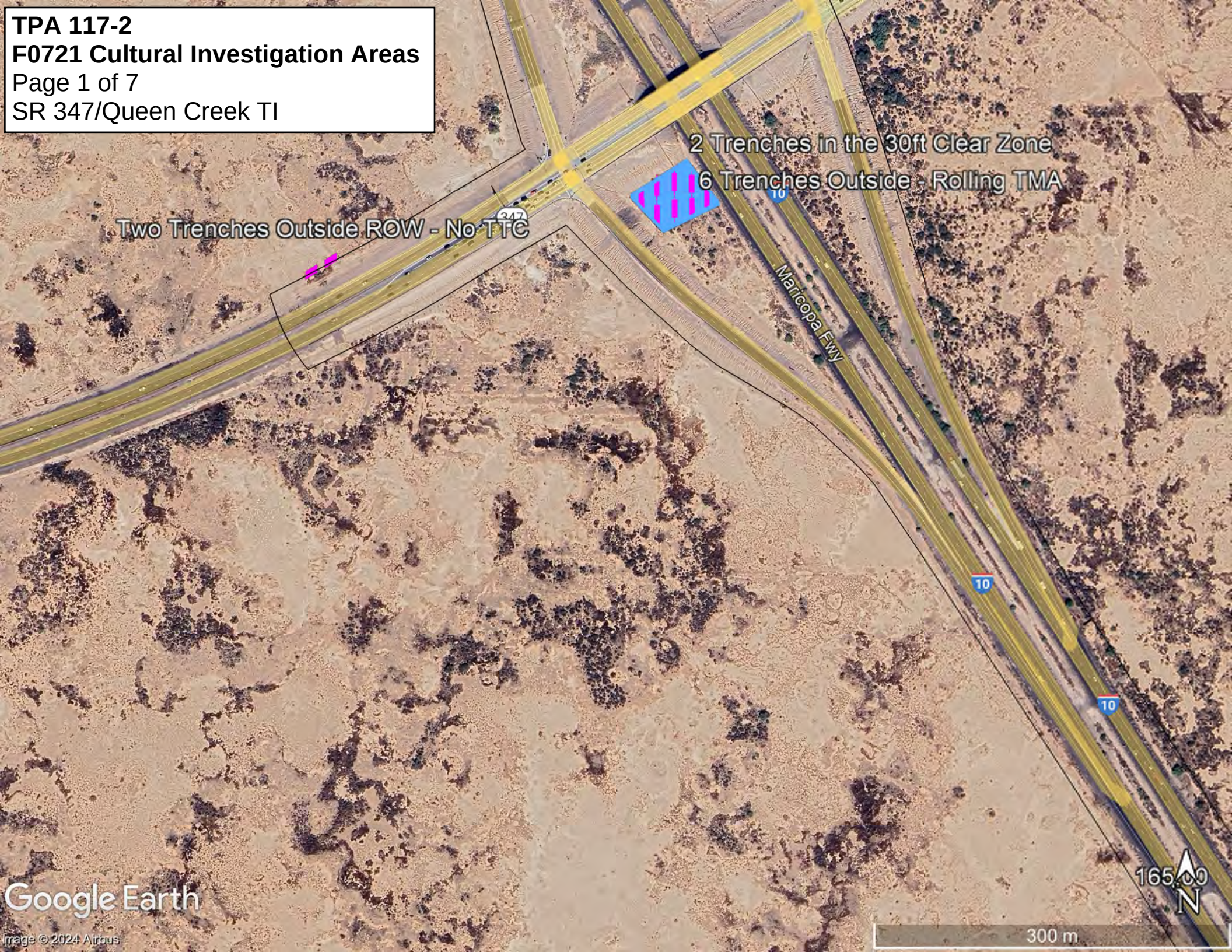
No.	ECR No.	Environmental Commitment Record (ECR) Requirements	Description of ADOT-Retained Obligations
Waters of the U.S.			
85.	WUS-1	The Arizona Department of Transportation Environmental Planning will determine Clean Water Act Section 404, Section 401, and Section 402 permitting needs during final design.	There are no Section 404 or 401 requirements; Design-Builder shall follow requirements in TP Section 104.09 (*Prevention of Landscape Defacement; Protection of Streams, Lakes and Reservoirs*).
Section 4(f)			
86.	S4F-1	The design team will ensure that construction staging will not occur within the boundaries of any Section 4(f) property without prior coordination and approval from the Arizona Department of Transportation Environmental Planning.	None retained; all delegated to Design-Builder.
87.	S4F-2	The design team will coordinate with the Arizona Department of Transportation Environmental Planning on any changes in design within the boundaries of Section 4(f) properties.	None retained; all delegated to Design-Builder.

TPA 117-2 Cultural Investigation Areas

See attached

TPA 117-2
F0721 Cultural Investigation Areas

SR 347/Queen Creek TI

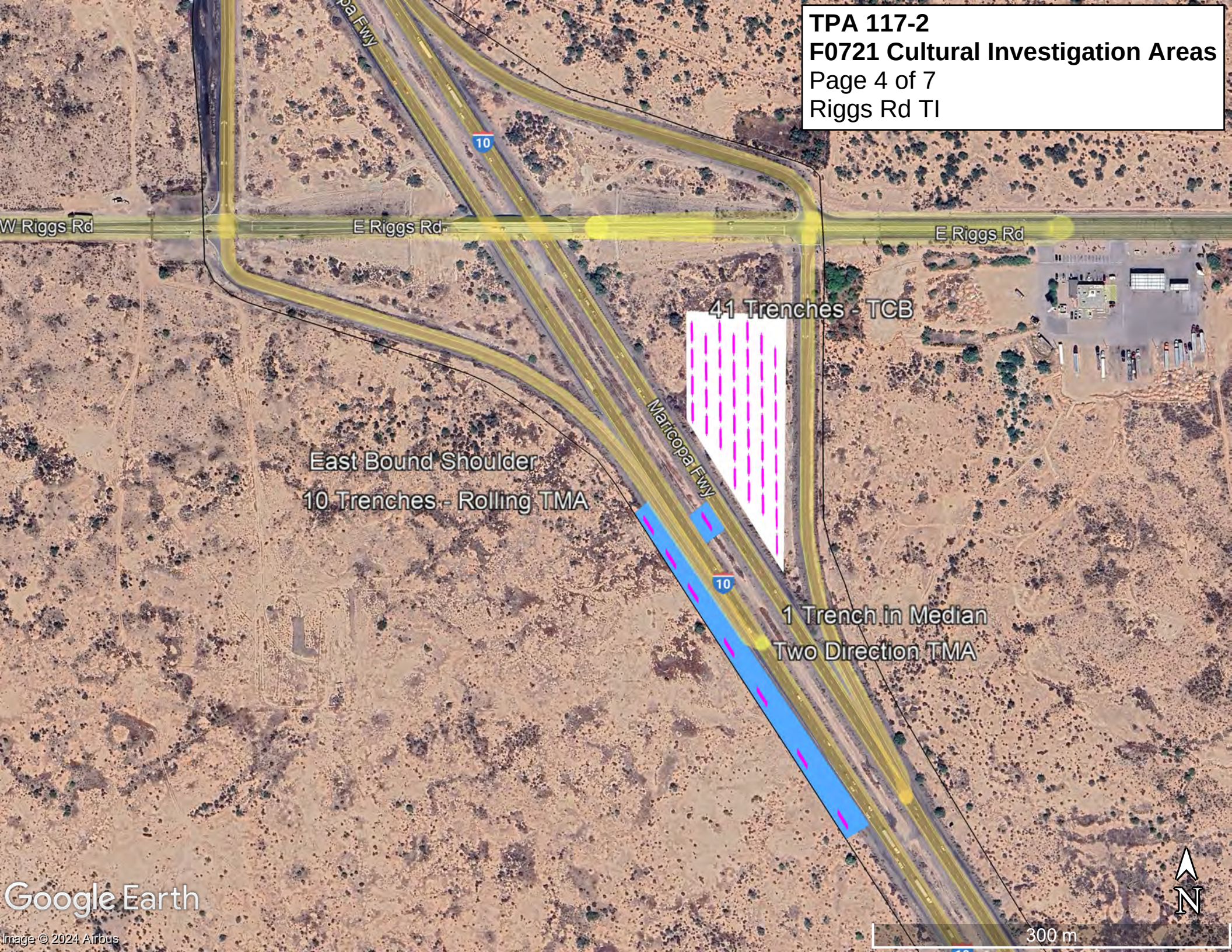


TPA 117-2
F0721 Cultural Investigation Areas
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I-10 near MP 165



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F0721 Cultural Investigation Areas
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I-10 near MP 167

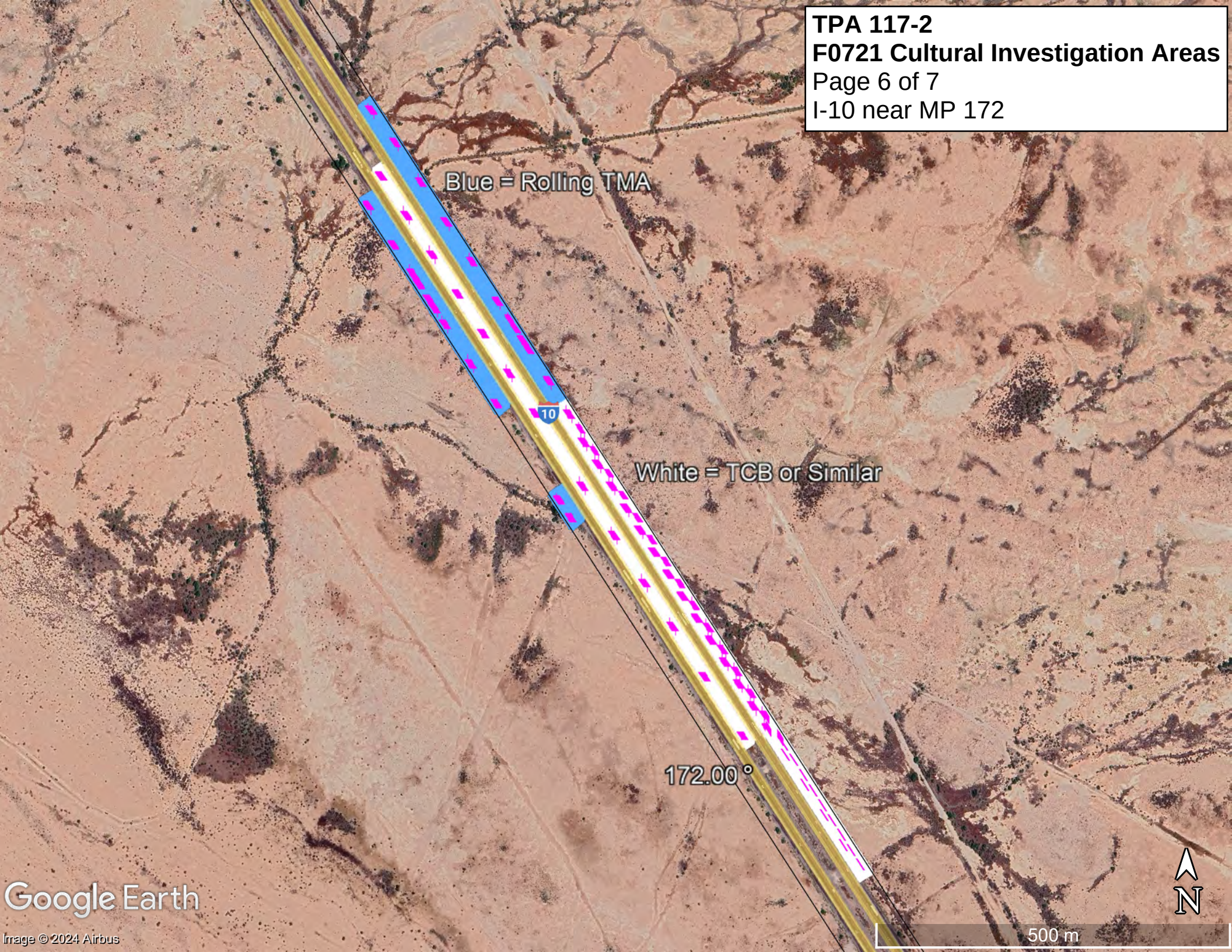



TPA 117-2
F0721 Cultural Investigation Areas
Page 4 of 7
Riggs Rd TI
W Riggs Rd
E Riggs Rd
E Riggs Rd
41 Trenches - TCB
East Bound Shoulder
10 Trenches - Rolling TMA
Maricopa Fwy
1 Trench in Median
Two Direction TMA
10
10
Google Earth
Image © 2024 Airbus
300 m
N

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F0721 Cultural Investigation Areas
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I-10 near MP 171



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I-10 near MP 172




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I-10 near MP 172.75
Incomplete From F0270
White = TCB or Similar
10
10
10
Gila River
172.75
Google Earth
Image © 2024 Airbus
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300 m

TPA 118-1 Acquisition and Relocation Status Report

No.	Parcel No.	APN	Parcel Location	Property Type	Acquisition Type	Activity	Est. Date Parcel Available for Design-Builder Use
1.	7-12792	N/A	Wild Horse Pass Blvd/Sundust Rd TI	Tribal	Permanent Easement	Parcel is currently available.	At issuance of NTP 1
2.	7-13022	313	SE & SW Quadrant Koli Rd TI	Allotted	Permanent Easement	Appraisal is underway.	March 31, 2027
3.	7-13023	314	SE & SW Quadrant Koli Rd TI	Allotted	Permanent Easement	Appraisal is underway.	March 31, 2027
4.	7-13024	315	SE & SW Quadrant Koli Rd TI	Allotted	Permanent Easement	Appraisal is underway.	March 31, 2027
5.	7-13015	860	NW & SW Quadrant Koli Rd TI	Allotted	Permanent Easement	Appraisal is underway.	March 31, 2027
6.	7-13020	2129	NE & SE Quadrant Koli Rd TI	Allotted	Permanent Easement	Appraisal is underway.	March 31, 2027
7.	7-13019	2130	NE & SE Quadrant Koli Rd TI	Allotted	Permanent Easement	Appraisal is underway.	March 31, 2027
8.	7-13014	2135	NW & SW Quadrant Koli Rd TI	Allotted	Permanent Easement	Appraisal is underway.	March 31, 2027
9.	7-13013	2136	NE & NW Quadrant Koli Rd TI	Allotted	Permanent Easement	Appraisal is underway.	March 31, 2027
10.	7-13012	2137	NE & NW Quadrant Koli Rd TI	Allotted	Permanent Easement	Appraisal is underway.	March 31, 2027
11.	7-13011	2138	NE & NW Quadrant Koli Rd TI	Allotted	Permanent Easement	Appraisal is underway.	March 31, 2027
12.	7-13021	3724	SE Quadrant Koli Rd TI	Allotted	Permanent Easement	Appraisal is underway.	March 31, 2027

No.	Parcel No.	APN	Parcel Location	Property Type	Acquisition Type	Activity	Est. Date Parcel Available for Design-Builder Use
13.	7-12798	2064 & 2065	NW Quadrant SR 347/ Queen Creek Rd TI	Allotted	Permanent Easement	Maps and legal descriptions awaiting approval by the Community and BIA.	July 31, 2026
14.	7-12799	2066	SW Quadrant SR 347/ Queen Creek Rd TI	Allotted	Permanent Easement	Maps and legal descriptions awaiting approval by the Community and BIA.	July 31, 2026
15.	7-12800	417	NW & SW Quadrant SR 347/Queen Creek Rd TI	Allotted	Permanent Easement	Maps and legal descriptions awaiting approval by the Community and BIA.	July 31, 2026
16.	7-12801	123	SW Quadrant SR 347/ Queen Creek Rd TI	Allotted	Permanent Easement	Maps and legal descriptions awaiting approval by the Community and BIA.	July 31, 2026
17.	7-12793	181	NE & SE Quadrant SR 347/Queen Creek Rd TI	Allotted	Permanent Easement	Maps and legal descriptions awaiting approval by the Community and BIA.	July 31, 2026
18.	7-12797	179	SE Quadrant SR 347/ Queen Creek Rd TI	Allotted	Permanent Easement	Maps and legal descriptions awaiting approval by the Community and BIA.	July 31, 2026
19.	7-12794	180	SE Quadrant SR 347/ Queen Creek Rd TI	Allotted	Permanent Easement	Maps and legal descriptions awaiting approval by the Community and BIA.	July 31, 2026
20.	7-12796	1869	NW Quadrant SR 347/ Queen Creek Rd TI	Allotted	Permanent Easement	Maps and legal descriptions awaiting approval by the Community and BIA.	July 31, 2026
21.	7-12804	2375	NE Quadrant SR 347/ Queen Creek Rd TI	Allotted	Permanent Easement	Maps and legal descriptions awaiting approval by the Community and BIA.	July 31, 2026
22.	7-12805	350	SE Quadrant Riggs Rd TI	Allotted	Access Control	Maps and legal descriptions awaiting approval by the Community and BIA.	July 31, 2026
23.	7-12802	3745	SE Quadrant Riggs Rd TI	Allotted	Access Control	Maps and legal descriptions awaiting approval by the Community and BIA.	March 31, 2026
24.	7-12803	1105	SW Quadrant Riggs Rd TI	Allotted	Access Control	Maps and legal descriptions awaiting approval by the Community and BIA.	March 31, 2026
25.	7-12806	4475	NW Quadrant Riggs Rd TI	Allotted	Access Control	Maps and legal descriptions awaiting approval by the Community and BIA.	March 31, 2026

No.	Parcel No.	APN	Parcel Location	Property Type	Acquisition Type	Activity	Est. Date Parcel Available for Design-Builder Use
26.	11-1146	1253	NE & NW Quadrant Goodyear Rd	Allotted	Permanent Easement	Avoided	N/A
27.	11-1149	1056	NE Quadrant Goodyear Rd	Allotted	Permanent Easement	Avoided	N/A
28.	11-1147	2591	SE & SW Quadrant Goodyear Rd	Allotted	Permanent Easement	Avoided	N/A
29.	11-1148	1249	SE Quadrant Goodyear Rd	Allotted	Permanent Easement	Avoided	N/A

1

TPA 119-1 Prior Rights Document Index

No.	TPA 119-1 Ref. No.	Company	Description	Relocation Required	ADOT Compensation by Agreement	Prior Rights Document from Utility	Document	Section	Township	Range	1/4 Section	Station	Location	Notes
1		SRP Irrigation	30” Rubber Gasket Reinforced Concrete Pipe (RGRCP) Irrigation Line	No	No	N/A	N/A					869+41 (RT) to 874+60 (RT)		
2		LUMEN LOCAL	Telephone Line	No	No	N/A	N/A					873+87 (LT) to 875+27 (LT)		
3		LUMEN LOCAL	Telephone Line	No	No	N/A	N/A					873+87 (LT) to 876+02 (LT)		
4		LUMEN LOCAL	Fiber Optic Line	No	No	N/A	N/A					874+13 (LT) to 876+78 (LT)		
5		LUMEN LOCAL	(3) Fiber Optic Line	No	No	N/A	N/A					874+39 (LT) to 876+77 (LT)		
6		LUMEN LOCAL	Fiber Optic Line	No	No	N/A	N/A					875+08 (LT) to 876+76 (LT)		
7		APS	230 kV Overhead (OH) Power Line	No	No	N/A	N/A					876+02 (RT) to 877+01 (LT)		
8		SRP	69 kV OH Power Line	No	No	N/A	N/A					876+59 (RT) to 877+63 (LT)		
9		LUMEN LOCAL	Telephone Line	No	No	N/A	N/A					876+72 (RT) to 877+90 (LT)		
10		SRP	Power Line	No	No	N/A	N/A					877+28 (RT) to 877+56 (LT)		
11		Unknown	Fiber Optic Line	No	No	N/A	N/A					877+35 (RT) to 877+50 (LT)		
12		COP	20” Reinforced Concrete Pipe (RCP) Water Line	No	No	N/A	N/A					877+38 (RT) to 877+94 (LT)		
13		SRP Irrigation	36” RGRCP Irrigation Line	No	No	N/A	N/A					877+36 (RT) to 878+06 (LT)		
14		SRP	69 kV OH Power Line	No	No	N/A	N/A					877+55 (RT) to 878+56 (LT)		
15		SRP	Power Line	No	No	N/A	N/A					877+62 (RT) to 877+81 (RT)		
16		SRP	12 kV OH Power Line	No	No	N/A	N/A					877+70 (RT) to 877+81 (RT)		

No.	TPA 119-1 Ref. No.	Company	Description	Relocation Required	ADOT Compensation by Agreement	Prior Rights Document from Utility	Document	Section	Township	Range	1/4 Section	Station	Location	Notes
17	4	KM/EPNG	6” Gas Line (Abandoned According to Utility Records [AATUR])	No	No	None submitted at this time	ADOT 010-3(36)_VOL1 (PGS 1-38 of 87)	32	1S	4E	SESW, SWSE	877+96 (RT) to 878+49 (LT)	Crossing I-10 at Pecos Rd	ADOT AS-BUILT used for initial prior rights disposition
18		SRP	12 kV OH Power Line	No	No	N/A	N/A					878+29 (LT) to 878+50 (LT)		
19	5	KM/EPNG	20” Steel (STL) Gas Line	No	No	None submitted at this time	ADOT 010-3(36)_VOL1 (PGS 1-38 of 87)	32	1S	4E	SESW, SWSE	878+56 (RT) to 879+11 (LT)	Crossing I-10 at Pecos Rd	ADOT AS-BUILT used for initial prior rights disposition
20		Unknown	Gas Line (AATUR) Unk dia.	No	No	N/A	N/A					878+76 (RT) to 879+31 (LT)		
21		P-MIP	54” Reinforced Cylindrical Concrete Pipe (RCCP) Irrigation Line	No	Yes	N/A	N/A					879+93 (LT) to 883+54 (RT)		
22		P-MIP	84” RCCP Irrigation Line	No	Yes	N/A	N/A					880+01 (LT) to 883+74 (RT)		
23		GRTI	Fiber Optic Line	No	Yes	N/A	N/A					890+90 (RT) to 891+00 (LT)		
24		P-MIP	Broadacres Canal (AATUR)	No	Yes	N/A	N/A					893+80 (RT) to 895+19 (LT)		
25		Unknown	Fiber Optic Line (AATUR)	No	No	N/A	N/A					897+68 (RT) to 897+86 (LT)		
26		Land Use Planning and Zoning	36” RCP Storm Drain	No	Yes	N/A	N/A					897+90 (LT) to 897+90 (RT)		
27		Unknown	Telephone Line	No	No	N/A	N/A					899+00 (LT) to 899+00 (RT)		
28		GRICUA	OH Power Line (Sign Feed)	No	Yes	N/A	N/A					908+38 (LT) to 913+54 (LT)		
29		SCIP	12.47kV OH Power Line	No	Yes	N/A	N/A					911+94 (LT) to 913+86 (LT)		
30		P-MIP	(3) 120” X 84” Concrete Box Culvert (CBC) Irrigation Line	No	Yes	N/A	N/A					912+99 (LT) to 913+86 (RT)		
31		LBDC	8” VCP Sewer	No	Yes	N/A	N/A					918+33 (LT) to 927+48 (LT)		
32	22	SCIP	12.47 kV OH Power Line	Yes	Yes	N/A	I10 202 to 387_05012023	5	2S	4E	SWSE	913+17 (LT) to 919+92 (LT)	NW of Sundust Rd	
33		SCIP	Power Line	No	Yes	N/A	N/A					919+47 (LT) to 924+11 (LT)		

No.	TPA 119-1 Ref. No.	Company	Description	Relocation Required	ADOT Compensation by Agreement	Prior Rights Document from Utility	Document	Section	Township	Range	1/4 Section	Station	Location	Notes
34		LBDC	18” VCP Sewer	No	Yes	N/A	N/A					919+95 (LT) to 925+71 (LT)		
35		Private (PVT)	Power Line	No	No	N/A	N/A					920+06 (RT) to 920+26 (RT)		
36		GRTI	Telephone Line	No	Yes	N/A	N/A					920+08 (RT) to 922+67 (RT)		
37		SCIP	Power Line	No	Yes	N/A	N/A					920+15 (LT) to 920+48 (LT)		
38	25	SCIP	7.2 kV OH Power Line	Yes	Yes	N/A	N/A	5	2S	4E	SWSE, SESE	920+44 (LT) to 925+65 (LT)	Sundust Rd	
39		GRIC DPW	12” PVC Water Line	No	Yes	N/A	N/A					920+45 (RT) to 922+37 (RT)		
40		GRTI	Fiber Optic Line	No	Yes	N/A	N/A					921+30 (RT) to 922+67 (RT)		
41		PVT	Power Line	Yes	No	N/A	N/A					921+43 (RT) to 921+44 (RT)		
42		GRICUA	Underground Power Line	No	Yes	N/A	N/A					922+15 (LT) to 923+02 (LT)		
43		Unknown	Power Line	No	No	N/A	N/A					922+24 (RT) to 922+72 (RT)		
44	39	GRICUA	Underground Power Line	Yes	Yes	N/A	N/A	5, 8, 9	2S	4E	SESE, NENE, SENE, SWNW	922+66 (LT) to 972+35 (LT)	SE of Sundust Rd	Line extension that only serves ADOT DMS
45		GRICUA	Cabinets (Service Connections)	Yes	Yes	N/A	N/A					922+70 (LT) to 922+70 (LT)		
46		SCIP	Power Line	No	Yes	N/A	N/A					923+05 (LT) to 924+11 (LT)		
47		SCIP	Cabinets (Service Connections)	Yes	Yes	N/A	N/A					923+09 (LT) to 923+09 (LT)		
48	40	GRICUA	Underground Power Line	Yes	Yes	N/A	N/A	5	2S	4E	SESE	923+32 (LT) to 924+54 (LT)	SE of Sundust Rd	
49		LBDC	(2) Digital Signs	No	Yes	N/A	N/A					923+38 (LT) to 924+54 (LT)		
50		SCIP	Power Line	No	Yes	N/A	N/A					923+74 (LT) to 924+02 (LT)		
51		SCIP	12.47 kV OH Power Line	No	Yes	N/A	N/A					923+95 (LT) to 924+11 (LT)		

No.	TPA 119-1 Ref. No.	Company	Description	Relocation Required	ADOT Compensation by Agreement	Prior Rights Document from Utility	Document	Section	Township	Range	1/4 Section	Station	Location	Notes
52		GRTI	Telephone Line	No	Yes	N/A	N/A					924+19 (RT) to 929+62 (RT)		
53	29	SCIP	12.47 kV OH Power Line	Yes	Yes	N/A	N/A	5, 8	2S	4E	SESE, NENE	924+11 (LT) to 927+93 (LT)	SE of Sundust Rd	
54		Unknown	Unknown Utility	No	No	N/A	N/A					924+87 (LT) to 925+36 (LT)		
55		COC	30" Sewer (AATUR)	No	No	N/A	N/A					925+31 (RT) to 927+55 (LT)		
56		COC	30" RGRCP Sewer	No	No	N/A	N/A					925+36 (RT) to 927+72 (LT)		Sleeve extension required
57		GRTI	(2) Fiber Optic Lines	No	Yes	N/A	N/A					925+59 (LT) to 927+07 (LT)		
58		GRTI	(2) Telephone Lines	No	Yes	N/A	N/A					925+59 (LT) to 927+07 (LT)		
59		SCIP	Electric Meter	Yes	Yes	N/A	N/A					925+65 (LT) to 925+65 (LT)		
60		SWG	4" Polyethylene Pipe (PE) Gas Line	No	No	N/A	N/A					925+65 (LT) to 927+09 (LT)		
61		LBDC	(2) Water Line, (4) Water Valves	No	Yes	N/A	N/A					925+83 (LT) to 927+08 (LT)		
62		GRTI	(2) Telephone Lines	No	Yes	N/A	N/A					925+92 (LT) to 926+84 (LT)		
63		SCIP	OH Power Line	No	Yes	N/A	N/A					927+78 (LT) to 928+58 (LT)		
64		SCIP	OH Power Line	No	Yes	N/A	N/A					927+93 (LT) to 928+58 (LT)		
65		SCIP	69kV & 12 kV OH Power Line	No	Yes	N/A	N/A					927+93 (LT) to 928+58 (RT)		
66		GRTI	Telephone Line	No	Yes	N/A	N/A					928+00 (LT) to 929+62 (RT)		
67		GRTI	Fiber Optic Line	No	Yes	N/A	N/A					928+00 (LT) to 929+62 (RT)		
68		SCIP	(2) OH Power Line Unk. kV	No	Yes	N/A	N/A					928+28 (RT) to 930+18 (RT)		
69		SCIP	Power Line	No	Yes	N/A	N/A					928+30 (LT) to 941+71 (LT)		
70		GRIC DPW	36" STL Sleeved 24" Sewer	No	Yes	N/A	N/A					930+49 (LT) to 930+49 (RT)		

No.	TPA 119-1 Ref. No.	Company	Description	Relocation Required	ADOT Compensation by Agreement	Prior Rights Document from Utility	Document	Section	Township	Range	1/4 Section	Station	Location	Notes
71		SCIP	Power Line	No	Yes	N/A	N/A					934+72 (LT) to 935+20 (LT)		
72		SCIP	Electric Meter	No	Yes	N/A	N/A					940+13 (RT) to 940+13 (RT)		
73		SCIP	Power Line	Yes	Yes	N/A	N/A					940+13 (RT) to 972+62 (RT)		Conflict with Koli Rd TI
74	41	GRICUA	12.47 kV OH Power Line	Yes	Yes	N/A	N/A	16	2S	4E	NWSE	1017+14 (RT) to 1019+74 (RT)	SR 347	Line extension that only serves ADOT TI
75		MCDOT	Fiber Optic Line, Empty Conduit (MTC) w/ Trace Wire	Yes	No	N/A	N/A					1183+61 (LT) to 1184+34 (LT)		
76		GRICUA	Cabinets (Service Connections)	Yes	Yes	N/A	N/A					1183+63 (LT) to 1183+78 (LT)		
77		GRICUA	(2) Underground Power Line	No	Yes	N/A	N/A					1183+66 (LT) to 1184+63 (LT)		
78	43	GRICUA	(2) OH Power Line	Yes	Yes	N/A	N/A	35	2S	4E	NWNE	1184+18 (LT) to 1185+45 (LT)	Riggs Rd	Line extension that only serves ADOT TI
79		P-MIP	108" Concrete (Conc.) Irrigation Siphon	No	Yes	N/A	N/A					1291+27 (RT) to 1293+73 (LT)		
80		Unknown	(2) 72" X 120" CBC	No	No	N/A	N/A					1382+89 (LT) to 1383+11 (RT)		
81		GRICUA	OH Power Line	No	Yes	N/A	N/A					1400+56 (RT) to 1406+58 (LT)		

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TPA 119-2 Project Specific Utility Specific Technical Provisions

City of Phoenix

City of Phoenix (COP) has facilities within the Project Limits which are listed/shown in the Utility Inventory and mapping provided by ADOT. This is not intended to be a complete list of COP facilities. Design-Builder shall verify the location of all Utilities within the Project Limits per TP Section 119 (*Utilities*).

COP water crossings are summarized in the table below for informational purposes. It shall be Design-Builder's responsibility to verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description
1.	877+38	177' RT	877+94	175' LT	I-10	20" RCP Water Line in 42" Conc. Sleeve

COP Water Services Department (WSD) staff will complete conflict reviews for proposed work near water facilities. WSD will complete all conflict reviews within 21 Business Days. WSD will coordinate with Design-Builder to process critical reviews as quickly as possible.

Design and Construction of COP Water Relocations

Design-Builder shall design and construct all Utility Adjustments to COP owned water facilities, as needed, and shall obtain approval of the design from the COP.

Any adjustments to existing COP water facilities or any new COP water facilities shall be per the current version of the COP Engineering Design Criteria. ADOT requires vent pipes for all COP water facilities within the Project Limits if encasements do not extend to the right of way. Design-Builder shall coordinate with COP Water Services Department for the design of vent pipes.

All new COP water facilities shall be designed /constructed per COP Supplements to MAG and MAG *Standard Specifications and Details*.

All COP water relocation plans shall be submitted per COP drawing requirements, format and datum and be signed and sealed by a Professional Engineer.

All COP water plans must be submitted electronically through Jami Erickson (jami.erickson@phoenix.gov).

Available City of Phoenix Documents

Water quarter section maps are included in the RIDs and available for purchase at the Infrastructure Records Counter. A government issued ID is required. COP WSD Infrastructure Records Section 200 West Washington St, 8th Floor.

Water as-builts are available for purchase at the Infrastructure Records Counter. A background screening is required and generally takes two weeks to complete. Send an email to the address listed below requesting a security screening and include in the email that the request is in reference to ADOT Project F0721 I-10, SR 202L (Santan/South Mountain) to Gila River Bridge. A COP staff member will email a link to complete the background screening. Any additional questions should be directed to the staff member that provides the on-line link.

irspubliccounter.wsd@phoenix.gov

Refer to the RIDs for a preliminary list of COP water as-builts within the Project Limits.

City of Phoenix Water Services Policies, Procedures and Manuals are located at https://www.phoenix.gov/waterservices/publications

City of Chandler

City of Chandler (COC) has facilities within the Project Limits which are listed/shown in the Utility Inventory and mapping provided by ADOT. This is not intended to be a complete list of COC facilities. Design-Builder shall verify the location of all Utilities within the Project Limits per TP Section 119.02 (*Administrative Requirements*).

COC sewer crossings are summarized in the table below for informational purposes. It shall be Design-Builder's responsibility to verify the location of all Utilities within the Project Limits per TP Section 119.02 (*Administrative Requirements*).

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description
1.	925+31	191' RT	927+55	152' LT	I-10	30" RGRCP Sewer (AATUR)
2.	925+36	204' RT	927+72	157'	I-10	30" RGRCP (Sewer)

Agreements

The active sewer crossing is located within an easement that is leased by the City from GRIC. Under the current lease agreement GRIC is responsible for any adjustments at their expense while COC maintains and operates. The ownership of sewer line will revert to GRIC when lease agreement expires in 2027. GRIC has not indicated any intention to renew the current agreement at this time. The existing agreement is available in the RIDs.

Design and Construction of COC Sewer Relocations

Design-Builder shall design and construct all Utility Adjustments to COC owned sanitary sewer facilities, as needed, and shall obtain approval of the design from the COC.

Any adjustments to existing COC sewer facilities or any new COC sewer facilities shall be per the current version of the COC Engineering Design Criteria.

All new COC sewer facilities shall be designed /constructed per COC Supplements to MAG and MAG *Standard Specifications and Details*.

All COC sewer relocation plans shall be submitted per COC drawing requirements, format and datum and be signed and sealed by a Professional Engineer.

All COC sewer plans must be submitted electronically per the COC Electronic Plan Review Submittal Guidelines included in the RIDs.

https://www.chandleraz.gov/sites/default/files/City-of-Chandler-Engineering-Design-Standards-Manual.pdf

Available COC Documents

COC sewer quarter section maps and as-builts are provided in the RIDs.

COC Permitting and Fees

Design-Builder shall be responsible for obtaining all necessary permits and paying all fees per COC municipal code.

https://library.municode.com/az/chandler/codes/code_of_ordinances?nodeId=PTVIIPUWO_CH47OTECOIMREPRDE_47-6FEREOTEIMPLCIIMPLSP

COC Utility Record Drawings

Design-Builder shall submit Utility Record Drawings for all COC water and sewer relocations and adjustments per TP Section 119.04C(2) (*Utility Record Drawings*). This includes meters and hydrants relocates and manhole adjustments.

Kinder Morgan/El Paso Natural Gas

Kinder Morgan/El Paso Natural Gas (KM/EPNG) has facilities within the Project Limits which are listed/shown in the Utility Inventory and mapping provided by ADOT. This is not intended to be a complete list of KM/EPNG facilities. Design-Builder shall verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

KM/EPNG crossings are summarized in the table below for informational purposes. It shall be Design-Builder's responsibility to verify the location of all utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description
1.	877+96	164' RT	878+49	162' LT	I-10	6" Gas Line (AATUR)
2.	878+56	160' RT	879+11	164' LT	I-10	20" STL Gas Line

*The abandoned Gas Line crossing at Sta 879 as seen in the designating plans was replaced with the 20" STL Gas Line in table above

Design Plans to be submitted to KMEncroachmentsWest@KinderMorgan.com for review and approval.

Design and Construction of KM/EPNG Facilities

KM/EPNG will design and construct all Utility Adjustment to their facilities.

Design-Builder shall coordinate with KM/EPNG per TP Section 119 (*Utilities*).

KM/EPNG Gas Inspection and Permitting

When working within 25-feet horizontally of these crossing Design-Builder shall contact AZ 811 six Days in advance to schedule an inspector on-site. Coordination of the inspection schedule shall be coordinated by Design-Builder. See RIDs for the encroachment form which must be filled out by Design-Builder. KM/EPNG will procure an encroachment agreement/letter for Design-Builder that must be signed by both parties prior to working within their easement. It is the responsibility of Design-Builder to determine the cost of inspection. **The cost of inspection, as required, shall be included in Design-Builder's bid.**

KM/EPNG Prior Rights

KM/EPNG's prior rights determination pending review for facilities within the Project Limits.

Design-Builder must obtain approval from KM/EPNG for any improvements with KM/EPNG ROW or easement.

Available KM/EPNG Documents

Refer to the RIDs for a preliminary list of KM/EPNG as-builts within the Project Limits.

Maricopa County Department of Transportation (MCDOT)

MCDOT has facilities within the Project Limits which are listed/shown in the Utility Inventory and mapping provided by ADOT. This is not intended to be a complete list of their facilities. Design-Builder shall verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description
1.	1183+61	706' LT	1184+34	825' LT	I-10	Fiber Optic Line, MTC w/ Trace Wire

Design Plans to be submitted to Reed Kempton (Reed.Kepton@Maricopa.Gov) for distribution to the appropriate MCDOT personnel to review.

Design and Construction of MCDOT Facilities

MCDOT will design and construct all Utility Adjustment to their existing facilities.

Design-Builder shall coordinate with these utility owners per TP Section 119 (*Utilities*).

CenturyLink/Level 3/Lumen Local (CLN/LUMEN)

CLN/LUMEN has facilities within the Project Limits which are listed/shown in the Utility Inventory and mapping provided by ADOT. This is not intended to be a complete list of CLN/Lumen facilities. Design-Builder shall verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

CLN/LUMEN facilities are summarized in the table below for informational purposes. It shall be the Design-Builder's responsibility to verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description
1.	873+87	184' LT	875+27	182' LT	I-10	Underground (UG) Copper Telephone Line
2.	873+87	184' LT	876+02	196' LT	I-10	UG Copper Telephone Line
3.	874+13	179' LT	876+78	160' LT	I-10	Fiber Optic Line
4.	874+39	179' LT	876+77	187' LT	I-10	(3) Fiber Optic Lines
5.	875+08	157' LT	876+76	171' LT	I-10	Fiber Optic Line
6.	876+72	190' RT	877+90	157' LT	I-10	UG Copper Telephone Line

CLN/Lumen will design and construct all Utility Adjustments to their facilities.

Design-Builder shall submit design Plans to relocations@lumen.com and CC Lumen representative for review.

Available CLN/LUMEN Documents

Any CLN/LUMEN as-builts are provided in the RIDs.

Salt River Project

Initial Plan Review Process

Salt River Project (SRP) utilizes an Initial Plan Review (IPR) process which helps identify the impact of a proposed project upon the operation and maintenance of SRP facilities. In order to accommodate the project needs in a responsible and effective manner, SRP Land Department's Land Rights Management Division will facilitate and coordinate a Compatibility Review Process for the proposed improvements within existing SRP Facilities and Land Rights through our IPR Process.

Any improvements within SRP's Water easements/ROW shall have written approval which is given by SRP in the form of a License Agreement.

Any improvements within Salt River Project's Transmission (SRP-T) easement/ROW shall have written approval which is given by SRP in the form of the Consent to Use Agreement.

Prior to the start of any construction Design-Builder shall upload their final plans to the SRP Land Portal at: https://srp.net/planportal

SRP will review the plans and determine if any Land Use Licenses or Consent to Use Agreements will be required. If it is determined that a license or consent is required, Design-Builder shall allow 10 Business Days for the execution of the license or consent. The license or consent will be issued to ADOT at no cost.

SRP Power

SRP Power has facilities within the Project Limits which are listed/shown in the Utility Inventory and mapping provided by ADOT. This is not intended to be a complete list of SRP Power facilities. Design-Builder shall verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

SRP Power facilities are summarized in the table below for informational purposes. It shall be Design-Builder's responsibility to verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description
1.	876+59	490' RT	877+63	192' LT	I-10	69 kV Overhead Power Line
2.	877+28	202' RT	877+56	160' LT	I-10	Underground Power Line
3.	877+55	203' RT	878+56	560' LT	I-10	69 kV Overhead Power Line
4.	877+62	209' RT	877+81	164' RT	I-10	Underground Power Line
5.	877+70	215' RT	877+81	164' RT	I-10	12 kV Overhead Power Line
6.	878+29	153' LT	878+50	252' LT	I-10	12 kV Overhead Power Line

When working under or near OH power lines Design-Builder shall contact SRP Safety Services at 602-236-8117. A safety representative will coordinate a meeting with Design-Builder to discuss working safely under OH Power lines.

Design and Construction of SRP Power Facilities

SRP will design and construct all Utility Adjustments to their facilities. Design-Builder shall submit lock down sheets prior to SRP starting relocation construction and will need to coordinate with SRP for lock down sheet requirements.

Design-Builder shall coordinate with SRP per TP Section 119 (*Utilities*).

Outages

Design-Builder shall schedule their work to accommodate SRP restrictions for outages. Outages between May 1st and October 1st will be limited. All other outages shall be requested a minimum of 30 Business Days in advance.

Power Lines

The project has a network of underground and overhead power lines. All work at or in close proximity to said lines shall be performed in accordance with all Federal, State, and local laws and regulations, including but not limited to:

(A) Arizona law regarding "Underground Facilities" (A.R.S. 40-360.21, .22, .24, .26 and .28);

(B) Arizona law regarding "High Voltage Power Lines and Safety Restrictions" (A.R.S. 40-360.41-.45);

(C) The Occupational Safety and Health Administration; and

(D) The National Electric Safety Code.

SRP Irrigation

SRP Irrigation has facilities within the Project Limits which are listed/shown in the Utility Inventory and mapping provided by ADOT. This is not intended to be a complete list of SRP Irrigation facilities. Design-Builder shall verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

SRP Irrigation facilities are summarized in the table below for informational purposes. It shall be Design-Builder's responsibility to verify the location of all Utilities within the Project per TP Section 119 03 (*Design Requirements*).

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description	USA Fee Land
1.	869+41	442' RT	874+60	260' RT	I-10	30" RGRCP Irrigation Line	
2.	877+36	267' RT	878+06	160' LT	I-10	36" RGRCP Irrigation Line	

Design-Builder shall submit lock down sheets prior to SRP starting relocation construction and will need to coordinate with SRP for lock down sheet requirements.

Available SRP Documents

Any SRP quarter section maps and as-builts are provided in RIDs.

Arizona Public Service (APS) Power

APS has facilities within the Project Limits which are listed/shown in the Utility Inventory and mapping provided by ADOT. This is not intended to be a complete list of APS facilities. Design-Builder shall verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

APS crossings are summarized in the table below for informational purposes. It shall be Design-Builder's responsibility to verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description
1.	876+02	482' RT	877+01	201' LT	I-10	230 kV Overhead Power Line

Design and Construction of APS Facilities

APS will design and construct all Utility Adjustments to their facilities.

Design-Builder shall coordinate with APS per TP Section 119 (*Utilities*).

Design-Builder shall schedule their work to accommodate APS restrictions for outages.

Power Lines

The project has a network of underground and overhead power lines. All work at or in close proximity to said lines shall be performed in accordance with all Federal, State, and local laws and regulations, including but not limited to:

(A) Arizona law regarding "Underground Facilities" (A.R.S. 40-360.21, .22, .24, .26 and .28);

(B) Arizona law regarding "High Voltage Power Lines and Safety Restrictions" (A.R.S. 40-360.41-.45);

(C) The Occupational Safety and Health Administration; and

(D) The National Electric Safety Code.

Available APS Documents

As-builts for facilities within the Project Limits have not been found in APS inventory.

San Carlos Irrigation Project

San Carlos Irrigation Project (SCIP) has facilities within the Project which are listed/shown in the Utility Inventory and mapping provided by ADOT. This is not intended to be a complete list of SCIP facilities. Design-Builder shall verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

SCIP facilities are summarized in the table below for informational purposes. It shall be Design-Builder's responsibility to verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description
1.	911+94	390' LT	913+86	218' LT	I-10	12.47 kV Overhead Power Line
2.	913+17	240' LT	919+92	363' LT	I-10	12.47 kV Overhead Power Line
3.	919+47	356' LT	924+11	328' LT	I-10	Underground Power Line
4.	920+15	809' LT	920+48	821' LT	I-10	Underground Power Line
5.	920+44	811' LT	925+65	1568' LT	I-10	7.2 kV Overhead Power Line
6.	923+05	244' LT	924+11	327' LT	I-10	Underground Power Line
7.	923+74	916' LT	924+02	965' LT	I-10	Underground Power Line
8.	923+95	622' LT	924+11	327' LT	I-10	12.47kV Overhead Power Line
9.	924+11	327' LT	927+93	168' LT	I-10	12.47 kV Overhead Power Line
10.	927+78	217' LT	928+58	270' LT	I-10	Overhead Power Line Unknown kV
11.	927+93	168' LT	928+58	270' LT	I-10	Overhead Power Line Unknown kV
12.	927+93	168' LT	928+58	434' RT	I-10	69 kV w/ 12 kV Overhead Power Line
13.	928+28	168' RT	930+18	178' RT	I-10	(2) Overhead Power Lines Unknown kV
14.	928+30	168' LT	941+71	180' LT	I-10	Underground Power Line
15.	934+72	156' LT	935+20	187' LT	I-10	Underground Power Line
16.	940+13	176' RT	972+62	174' RT	I-10	Underground Power Line

Design and Construction of SCIP Facilities

SCIP will design and construct all Utility Adjustments to their facilities.

Design-Builder shall coordinate with SCIP per TP Section 119 (*Utilities*).

Relocation plans for facility 22, 25, and 29 are being developed.

Outages

Design-Builder shall schedule their work to accommodate SCIP restrictions for outages.

Power Lines

The project has a network of underground and overhead power lines. All work at or in close proximity to said lines shall be performed in accordance with all Federal, State, and local laws and regulations, including but not limited to:

(A) Arizona law regarding "Underground Facilities" (A.R.S. 40-360.21, .22, .24, .26 and .28);

(B) Arizona law regarding "High Voltage Power Lines and Safety Restrictions" (A.R.S. 40-360.41-.45);

(C) The Occupational Safety and Health Administration; and

(D) The National Electric Safety Code.

Service Connection

Design-Builder shall make application to San Carlos Irrigation Project and pay the established charges, follow process outlined established charges, https://www.bia.gov/programs-services/power-utilities/scip-power.

Available SCIP Documents

Any SCIP as-builts are provided in RIDs.

Gila River Indian Community Utility Authority Coordination

Review Process

GRICUA requires that an online application be submitted for review per each relocation or removal at the following location: https://gricua.net/new-service-requirements/new-commercial-service/

GRICUA will accept email plan review requests with Dropbox or SharePoint (preferred) for large plan sets.

Gila River Indian Community Utility Authority Power

Gila River Indian Community Utility Authority (GRICUA) Power has facilities within the Project Limits which are listed/shown in the Utility Inventory and mapping provided by ADOT. This is not intended to be a complete list of GRICUA Power facilities. Design-Builder shall verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

GRICUA Power crossings are summarized in the table below for informational purposes. It shall be Design-Builder's responsibility to verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description
1.	908+38	186' LT	913+54	248' LT	I-10	Overhead Power Line Unknown kV
2.	922+15	1078' LT	923+02	1244' LT	I-10	Underground Power Line
3.	922+66	279' LT	972+35	147' LT	I-10	Underground Power Line
4.	923+32	1233' LT	924+54	1160' LT	I-10	Underground Power Line
5.	1017+14	2381' RT	1019+74	572' RT	I-10	12.47kV OH Power Line

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description
6.	1183+66	687’ LT	1184+63	788’ LT	I-10	(2) Underground Power Lines
7.	1184+18	785’ LT	1185+45	983’ LT	I-10	(2) Overhead Power Lines Unknown kV
8.	1400+56	155’ RT	1406+58	155’ LT	I-10	Overhead Power Line Unknown kV

Design and Construction of GRICUA Facilities

GRICUA will design and construct all Utility Adjustments to their facilities.

Design-Builder shall coordinate with GRICUA per TP Section 119 (*Utilities*).

Relocation plans for facility 39, 40, 41 and 43 are being developed.

Outages

Design-Builder shall schedule their work to accommodate GRICUA restrictions for outages.

Power Lines

The project has a network of underground and overhead power lines. All work at or in close proximity to said lines shall be performed in accordance with all Federal, State, and local laws and regulations, including but not limited to:

(A) Arizona law regarding “Underground Facilities” (A.R.S. 40-360.21, .22, .24, .26 and .28);

(B) Arizona law regarding “High Voltage Power Lines and Safety Restrictions” (A.R.S. 40-360.41-.45);

(C) The Occupational Safety and Health Administration; and

(D) The National Electric Safety Code.

Service Connection

Design-Builder shall make application to Gila River Indian Community Utility Authority and pay the established charges.

https://gricua.net/wp-content/uploads/2021/01/01-28-15-REVISED-FILLABLE-commercial-application-for-service-2-min.pdf

https://gricua.net/new-service-requirements/rules-and-regulations/

Available GRICUA Documents

Any GRICUA as-builts are provided in RIDs.

Gila River Indian Community Department of Public Works

Gila River Indian Community Department of Public Works (GRIC DPW) has facilities within the Project Limits which are listed/shown in the Utility Inventory and mapping provided by ADOT. This is not intended to be a complete list of GRIC DPW facilities. Design-Builder shall verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

GRIC DPW facilities are summarized in the table below for informational purposes. It shall be Design-Builder’s responsibility to verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description
1.	920+45	1558’ RT	922+37	768’ RT	I-10	12” PVC Water Line

Design Plans to be submitted to Land Use Planning and Zoning for review.

Design and Construction of GRIC DPW Facilities

GRIC DPW will design and construct all Utility Adjustments to their facilities.

Design-Builder shall coordinate with GRIC DPW per TP Section 119 (*Utilities*).

Pima-Maricopa Irrigation Project

Pima-Maricopa Irrigation Project (P-MIP) has facilities within the Project Limits which are listed/shown in the Utility Inventory and mapping provided by ADOT. This is not intended to be a complete list of P-MIP facilities. Design-Builder shall verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

P-MIP crossings are summarized in the table below for informational purposes. It shall be Design-Builder’s responsibility to verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description
1.	879+93	182’ LT	883+54	248’ RT	I-10	54” RCCP Irrigation Line
2.	880+01	184’ LT	883+74	238’ RT	I-10	84” RCCP Irrigation Line
3.	893+80	445’ RT	895+19	281’ LT	I-10	Broadacres Canal (AATUR)
4.	912+99	195’ LT	918+21	289’ RT	I-10	(3) 120” X 84” CBC Irrigation Line (Gila Drain)
5.	1291+27	190’ RT	1293+73	188’ LT	I-10	108” Conc. Irrigation Siphon

Design and Construction of P-MIP Facilities

P-MIP will design and construct all Utility Adjustments to their facilities.

Design-Builder shall coordinate with GRICUA per TP Section 119 (*Utilities*).

Available P-MIP Documents

Any P-MIP as-builts are provided in the RIDs.

Gila River Telecommunications Inc.

Gila River Telecommunications Inc (GRTI) has facilities within the Project Limits which are listed/shown in the Utility Inventory and mapping provided by ADOT. This is not intended to be a complete list of GRTI facilities. Design-Builder shall verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

GRTI facilities are summarized in the table below for informational purposes. It shall be Design-Builder’s responsibility to verify the location of all Utilities within the Project Limits per TP Section 119.03 (*Design Requirements*).

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description
1. *	890+90	132'RT	891+00	171' LT	I-10	Fiber Optic Line
2.	920+08	896' RT	922+67	1097' RT	Wild Horse Pass Blvd	Telephone Line
3.	921+30	1459' RT	922+67	1097' RT	Wild Horse Pass Blvd	Fiber Optic Line
4.	924+19	216' RT	929+62	162' RT	I-10	Telephone Line
5.	925+59	1654' LT	927+07	1564' LT	Sundust Rd	(2) Fiber Optic Lines
6.	925+59	1654' LT	927+07	1564' LT	Sundust Rd	(2) Telephone Lines
7.	925+92	1641' LT	926+84	1519' LT	Sundust Rd	(2) Telephone Lines
8.	928+00	160' LT	929+62	183' RT	I-10	Telephone Line
9.	928+00	160' LT	929+57	183' RT	I-10	Fiber Optic Line

*Note: Designer-Builder shall coordinate with GRTI to locate and pothole existing facility.

Design and Construction of GRTI Facilities

GRTI will design and construct all Utility Adjustments to their existing facilities that are in conflict with the Project.

Design-Builder shall coordinate with GRTI per TP Section 119 (*Utilities*).

Available GRTI Documents

Any GRTI as-builts are provided in the RIDs.

Lone Butte Development Corporation (LBDC)

Lone Butte Development Corporation (LBDC) has facilities within the Project Limits which are listed/shown in the Utility Inventory and mapping provided by ADOT. This is not intended to be a complete list of LBDC facilities. Design-Builder shall verify the location of all Utilities within the Project Limits per TP Section 119.02 (*Administrative Requirements*).

LBDC sewer and water facilities are summarized in the table below for informational purposes. It shall be Design-Builder's responsibility to verify the location of all Utilities within the Project Limits per TP Section 119.02 (*Administrative Requirements*).

No.	Begin Station	Begin Offset	End Station	End Offset	Location Alignment	Description
1.	918+33	2042' LT	927+48	1553' LT	I-10	8" VCP Sewer
2.	919+95	948' LT	925+71	612' LT	I-10	18" VCP/DIP Sewer
3.	925+83	1685' LT	927+08	1601' LT	I-10	(2) Water Lines, (4) Water Valves

The existing 18" vitrified clay pipe/ductile iron pipe (VCP/DIP) sewer line crossing Sundust Rd east of I-10 shall be analyzed for additional stress placed on the line from additional embankment material and heavy machinery during earthmoving operations. Stress calculations shall be provided to confirm that the sewer line is protected during these construction operations. If the line is found to be impacted by these procedures or by placement of additional embankment, additional protection shall be designed and constructed by Design-Builder and included in the Contract Price. Design-Builder shall propose mitigation strategies with supporting calculations in coordination with ADOT and LBDC.

Design Plans to be submitted to Lone Butte representative for review.

Available LBDC Documents

LBDC sewer and water quarter section maps and as-builts are provided in the RIDs.

TPA 200-1 Roadway Design Criteria

TPA 200-1.1 Mainline and Ramp Design Criteria 82
TPA 200-1.2 Crossroad and Local Street Design Criteria 84

1 **TPA 200-1.1 Mainline and Ramp Design Criteria**

No.	Description	Mainline		Service Interchange Ramp		SR 347/Queen Creek Rd TI Direct-Connect Ramp
		MP 161.00 to 165.22	MP 165.22 to 172.75	MP 161.00 to 165.22	MP 165.22 to 172.75	
1.	Minimum Design Speed (mph)	65	75	50 (Body)	50 (Body)	45 (Body)
2.		Ramp at Mainline Entrance Gore:		55[3]	65	55 (@ I-10)
3.		Ramp at Mainline Exit Gore:		60	70	45 (@ SR347)
4.		DDI Ramp Terminals Turning Roadways:		20	N/A	N/A
5.		At Ramp Terminal with Crossroad:		35	35	N/A
6.	Minimum Lane Width (feet)	12	12	12	12	12
7.	Minimum Left Shoulder Width (feet)[1]	12[2]	12[2]	Per Technical Provisions	Per Technical Provisions	4
8.	Minimum Right Shoulder Width (feet)[1]	12	12	Per Technical Provisions	Per Technical Provisions	8
9.	Minimum Barrier Offset (feet)	0	0	2	2	2
10.	Maximum Superelevation Rate (feet/feet)	0.06	0.06	0.06	0.06	0.06
11.	Normal Cross-Slope (feet/feet)	Per Technical Provisions	Per Technical Provisions	0.02	0.02	0.02
12.	Maximum Grade Up (%)	3	3	4	4	4
13.	Maximum Grade Down (%)	3	3	5	5	5
14.	Curb Type	C-05.10	C-05.10	C-05.10	C-05.10	C-05.10

No.	Description	Mainline		Service Interchange Ramp		SR 347/Queen Creek Rd TI Direct-Connect Ramp
		MP 161.00 to 165.22	MP 165.22 to 172.75	MP 161.00 to 165.22	MP 165.22 to 172.75	
15.	Minimum Vertical Clearance for New or Widened Roadway Structures (feet)	16.5	16.5	N/A	N/A	16.5
16.	Minimum Vertical Clearance for Existing, Non-widened Roadway Structures (feet)	16.0	16.0	N/A	N/A	N/A
17.	Minimum Vertical Clearance for Sign Structures (feet)	18.5		18.5	18.5	18.5
18.	Design Vehicle	WB-67	WB-67	WB-67	WB-67	WB-67

Notes:

1. Shoulder requirement does not apply on portions of I-10 and SR 202L System TI ramps where only milling and diamond grinding are specified. It does apply to roadways where reconstruction and/or widening is specified. Shoulder designations “Left” and “Right” are relative to the direction of travel of the adjacent travel lane(s).
2. Within the urban section of I-10 with a single median barrier, left shoulders shall be 15 feet. Exceptions to the 15-foot requirement are allowed at sign foundations and bridge piers but in no case shall the shoulders be less than 12 feet.
3. The SR 347/Queen Creek Rd TI entrance ramp to I-10 WB shall connect to the SR 347/Queen Creek Rd TI direct-connect ramp and utilize a design speed of 50 mph at the gore.

1

TPA 200-1.2 Crossroad and Local Street Design Criteria

No.	Description	Wild Horse Pass Boulevard (Blvd)/Sundust Rd		Koli Rd		SR 347/Queen Creek Rd		Riggs Rd		Goodyear Rd
		ADOT Jurisdiction	GRIC DOT Jurisdiction	ADOT Jurisdiction	GRIC DOT Jurisdiction	ADOT Jurisdiction	MCDOT Jurisdiction	ADOT Jurisdiction	MCDOT Jurisdiction	ADOT Jurisdiction
1.	Minimum Design Speed (mph)	35	35	30	40	45	45	45	45	55
2.	Minimum Lane Width (feet)	12	12	12	12	12	12	12	12	12
3.	Minimum Left Shoulder Width (feet)[4]	2	2	2	2	2	2	2	2	N/A
4.	Minimum Right Shoulder Width (feet)[4]	5	5	5	5	5[5]	5	5	5	8
5.	Minimum Barrier Offset (feet)	2	2	2	2	2	2	2	2	2
6.	Maximum Superelevation Rate (feet/feet)	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
7.	Normal Cross-Slope (feet/feet)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
8.	Maximum Grade (%)	3.5	3.5	3.5	3.5	2.5	2.5	4	4	Match Existing
9.	Construction Standards	ADOT C-Standards	ADOT C-Standards	ADOT C-Standards	ADOT C-Standards	ADOT C-Standards	MAG Std Details & MCDOT Supplements	ADOT C-Standards	MAG Std Details & MCDOT Supplements	ADOT C-Standards
10.	Vertical Clearance for Sign Structures (feet)	18.5	18.5 Existing to Remain	18.5	18.5	18.5	18.5	18.5	18.5	N/A

No.	Description	Wild Horse Pass Boulevard (Blvd)/Sundust Rd		Koli Rd		SR 347/Queen Creek Rd		Riggs Rd		Goodyear Rd
		ADOT Jurisdiction	GRIC DOT Jurisdiction	ADOT Jurisdiction	GRIC DOT Jurisdiction	ADOT Jurisdiction	MCDOT Jurisdiction	ADOT Jurisdiction	MCDOT Jurisdiction	ADOT Jurisdiction
11.	Design Vehicle	WB-67	WB-67	WB-67	WB-67	WB-67	WB-67	WB-67	WB-67	WB-67

Notes:

1. See TPA 200-3 for Design Exceptions and Design Variances to applicable criteria. See specific Technical Provision sections for standards to be used for other design disciplines.
2. ADOT standards, specifications, and design methodologies govern within GRIC Design Authority.
3. See TPA 200-7 for limits of the Community, Governmental Entity and ADOT Design Authority as applicable.
4. There is no left shoulder requirement for turn lanes on crossroads, but the five-foot buffer between through and right tun lanes must be provided. Shoulder designations “Left” and “Right” are relative to the direction of travel of the adjacent travel lane(s).
5. Right shoulders on SR 347 shall be 10 feet in width west of the direct-connect ramp exit gore.

TPA 200-2 Intentionally Left Blank

TPA 200-3 Design Decision Documentation

TPA 200-3.1 Summary of AASHTO Controlling Design Criteria Variances.....88
TPA 200-3.2 Summary of ADOT Roadway Design Guidelines Variances.....89

There is one AASHTO *Controlling Design Criteria* variance required for the Proposal Design. Certain ADOT *Roadway Design Guidelines* variances have been identified for the Proposal and Schematic Designs.

TPA 200-3.1 Summary of AASHTO Controlling Design Criteria Variances

No.	Design Feature	Location	Discrepancy from Required Design Value
1.	Horizontal Stopping Sight Distance.	EB SR 347 to I-10 WB Direct-Connect Ramp	XXX feet less than the required XXX feet[1]

Notes:

1. Design-Builder to determine the specific values based on their design.

TPA 200-3.2 Summary of ADOT Roadway Design Guidelines Variances

No.	Design Feature	Location	Discrepancy from Required Design Value
1.	Tapered-type ramps New or reconstructed entrance and exit ramps on the urban or "urban fringe" freeways of Metropolitan Phoenix and Tucson shall be designed as parallel type.	Koli Rd TI ramps A and B	Using tapered type entrance and exit ramps on the north side of the interchange due to continuous aux lanes on EB and WB I-10 between Wild Horse Pass/Sundust Rd TI and SR 347/Queen Creek Rd TI.
2.	Access Control	Various, See TPA 200-6	Various, See TPA 200-6

TPA 200-4 Maintenance Access (Exceptions to Continuous Access)

No.	Location No.	Location Description	Roadway	Begin Station	End Station	Length (Feet)
1.	1	West ADOT ROW along mainline I-10	I-10	Begin Project 841+26	Approx 914+00	7274
2.	2	East ADOT ROW along mainline I-10	I-10	Begin Project	Approx 878+50	2451

TPA 200-5 ADA Asset Sample Spreadsheet

No.	Asset ID	Asset Type	Location	Dwg No.	ADA Compliant Design	Constructed Per Design
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						
21.						
22.						
23.						
24.						
25.						

TPA 200-6 ADOT Roadway Design Guidelines Access Control Variances

No.	Location	Quadrant	Exit/Entrance	Distance (ft) Per ADOT RDG[1] (Full/RIRO[2])	Distance (ft) Per Schematic Design[1] (Full/RIRO[2])	Variance Required (Full/RIRO[2])	Features
1.	Wild Horse Pass Blvd / Sundust Rd TI	NW	Exit	990/1320	1100/0	No/Yes	RIRO: Signalized Intersection
2.		SW	Entrance	330/1320	974/1156	No/Yes	Existing Gas Station to remain RIRO. RIRO: Signalized Intersection
3.		NE	Entrance	330/1320	925/1300	No/Yes	RIRO: Signalized Intersection
4.		SE	Exit	660/1320	749/1350	No/No	Full: Existing Commercial Turnout (full access maintained) RIRO: Existing Commercial Turnout (converted to RIRO)
5.	Koli Rd TI	NW	Exit	990/1320	408/0	Yes/Yes	
6.		SW	Entrance	330/1320	424/0	No/Yes	
7.		NE	Entrance	330/1320	600/0	No/Yes	
8.		SE	Exit	990/1320	490/0	Yes/Yes	
9.	SR 347 / Queen Creek Rd TI	NW	Exit	990/1320	Full Access Control on SR 347 to West	No/No	
10.		SW	Entrance	330/1320	Full Access Control on SR 347 to West	No/No	
11.		NE	Entrance	330/1320	900/0	No/Yes	
12.		SE	Exit	990/1320	819/0	No/Yes	

No.	Location	Quadrant	Exit/Entrance	Distance (ft) Per ADOT RDG[1] (Full/RIRO[2])	Distance (ft) Per Schematic Design[1] (Full/RIRO[2])	Variance Required (Full/RIRO[2])	Features
13.	Riggs Rd TI	NW	Exit	990/1320	660/975	No/Yes	
14.		SW	Entrance	330/1320	330/970	No/Yes	
15.		NE	Entrance	330/1320	330/815	No/Yes	
16.		SE	Exit	990/1320	545/749	Yes/Yes	Full: Existing Commercial Driveway (changed to RIRO) RIRO: Existing Commercial Driveway (full access maintained)

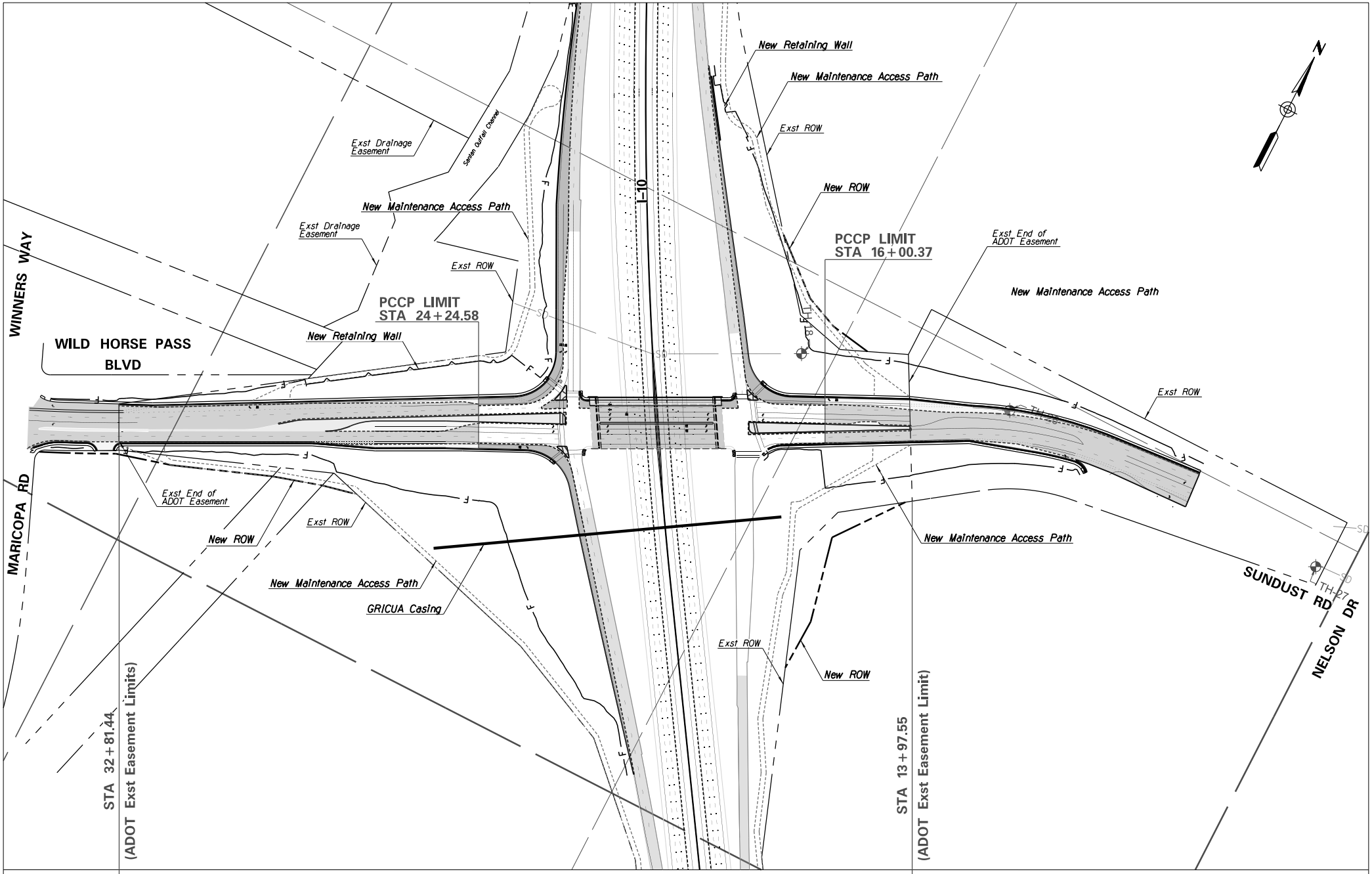
Notes:

1. Distances measured from ramp radius returns at Diamond TI and measured from begin/end of ramp centerline on DDI's. See ADOT *Roadway Design Guidelines* (RDG) Section 506 for more information on required distances.
2. RIRO = right-in/right-out access only; distance noted as the total distance from radius return (Diamond) or begin/end ramp centerline (DDI) to the extent of RIRO Limit.
3. Values presented are per Schematic Design and shall be verified and updated per Design-Builder's Design.

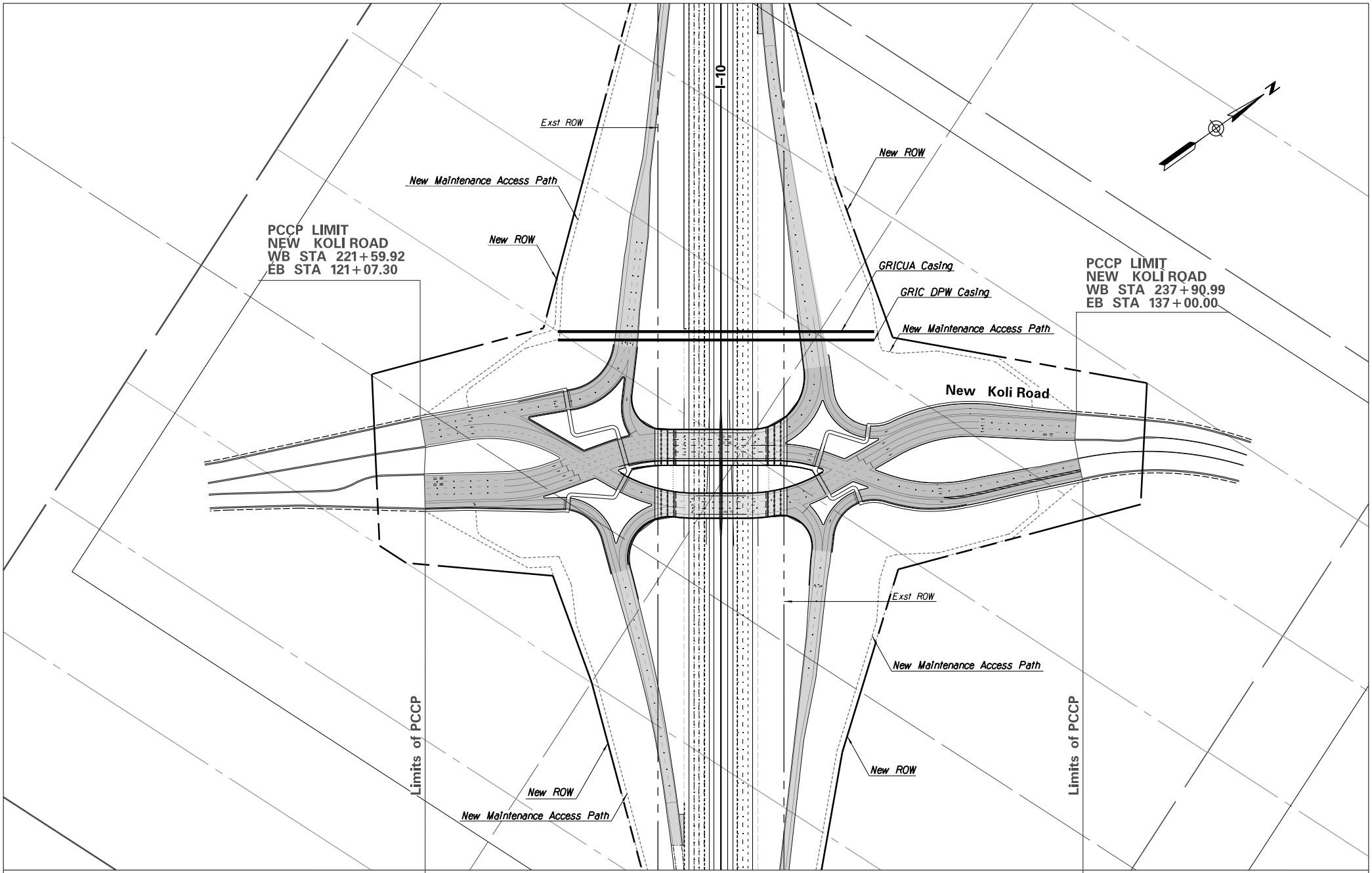
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TPA 200-7 Crossroad Design Authority Limits

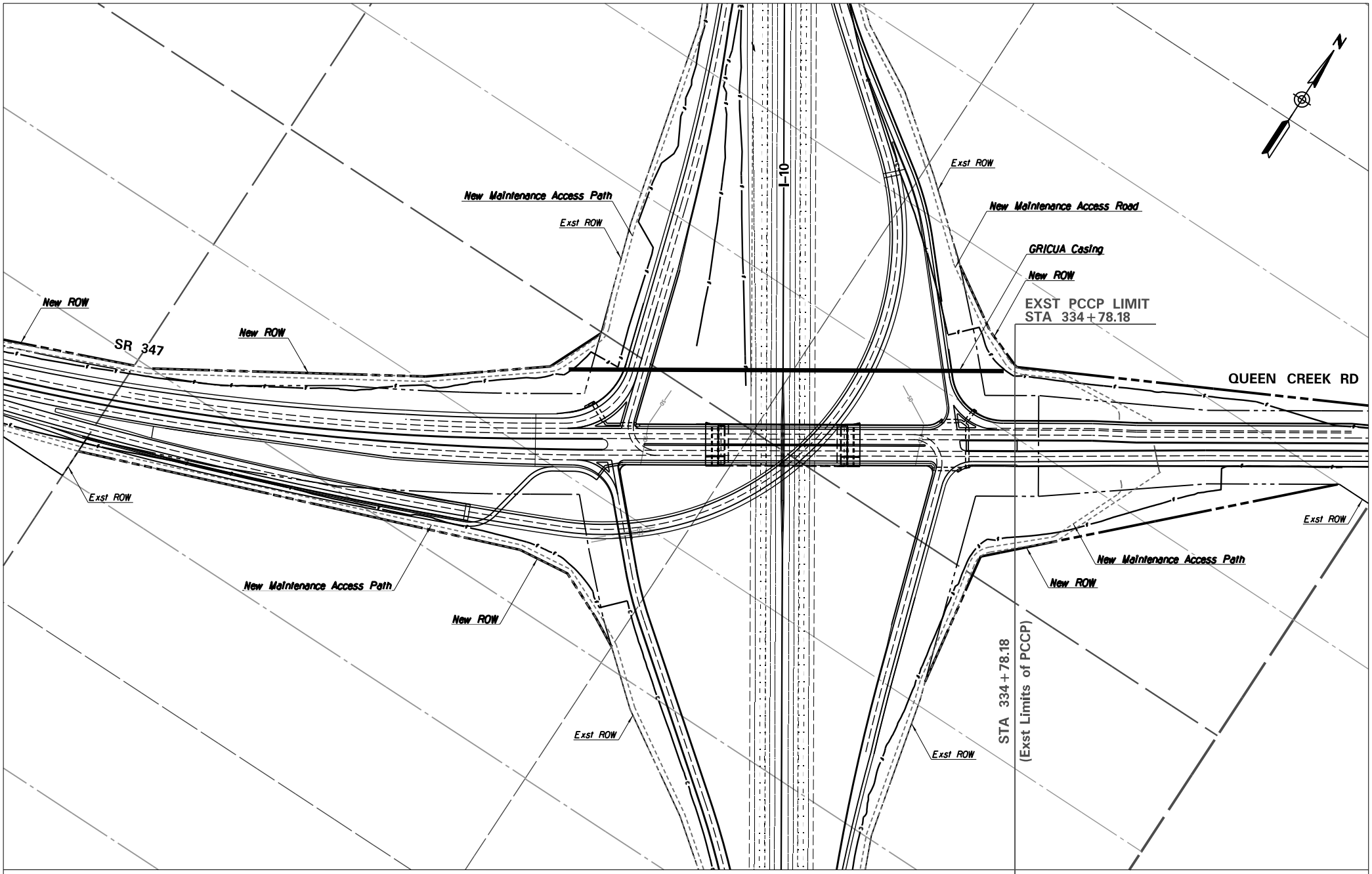
See attached



I-10, GILA RIVER INDIAN COMMUNITY PROJECT
WILD HORSE PASS BLVD DESIGN AUTHORITY LIMITS

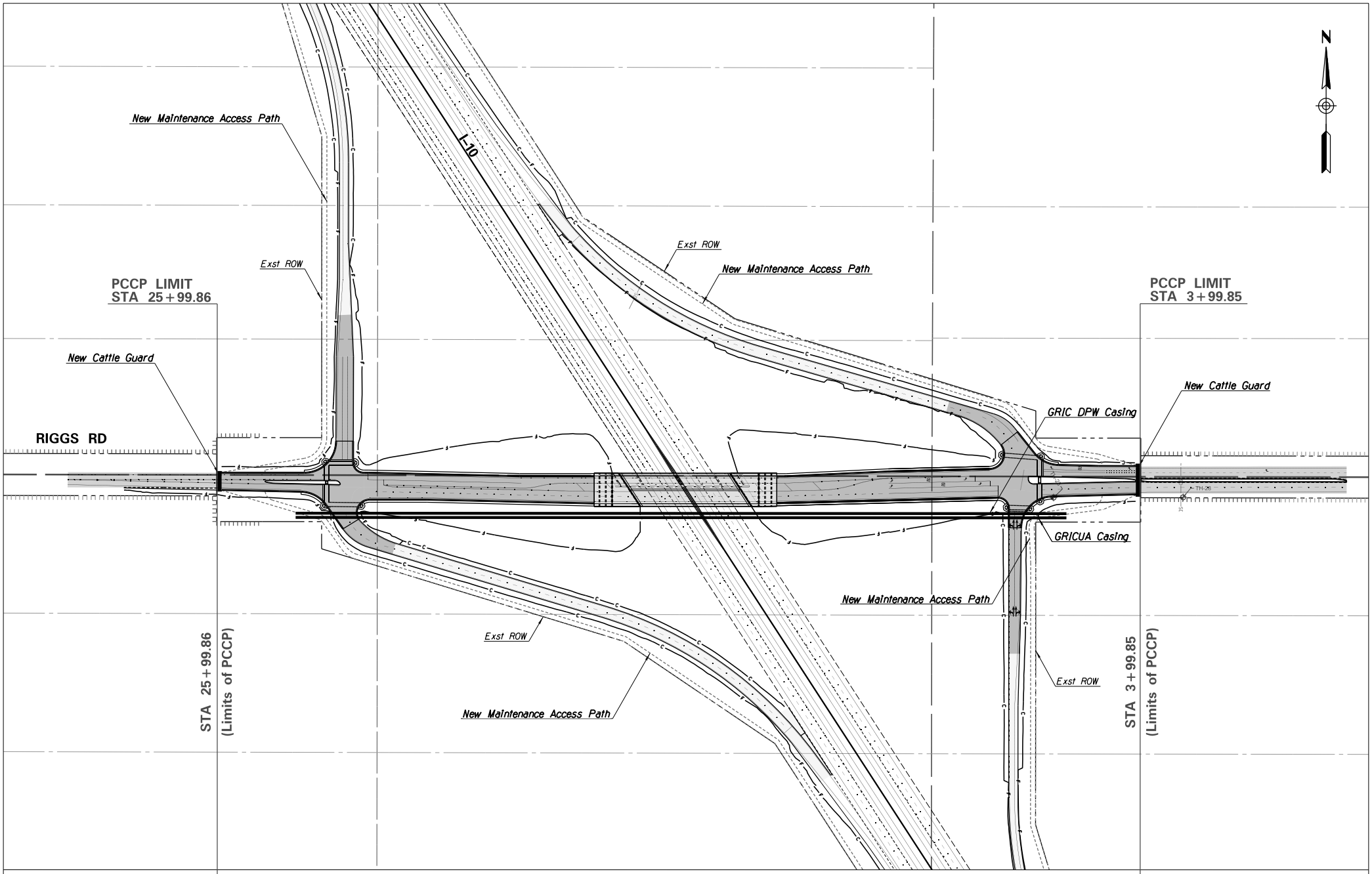


I–10, GILA RIVER INDIAN COMMUNITY PROJECT
KOLI ROAD DESIGN AUTHORITY LIMITS

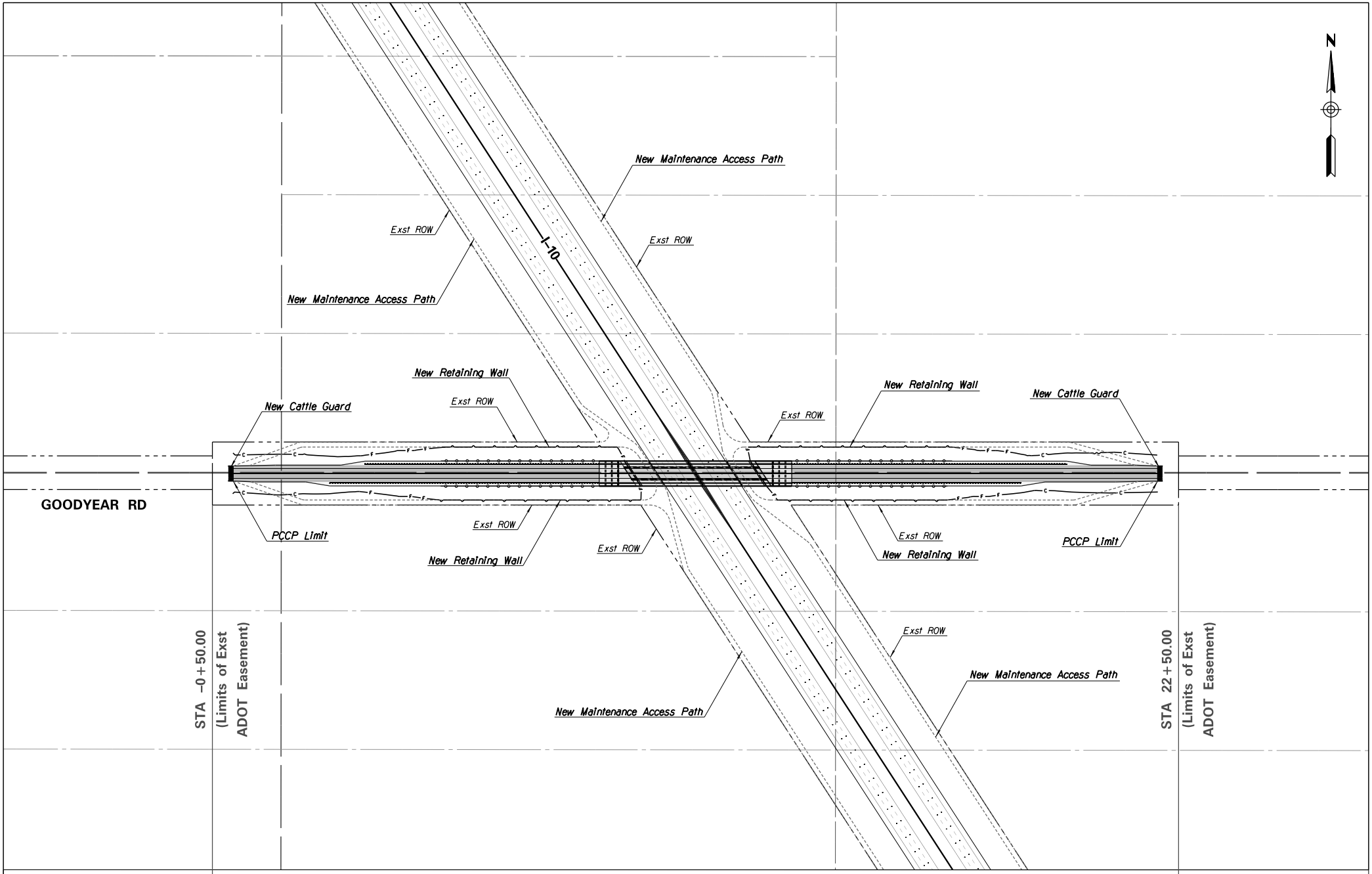


I-10, GILA RIVER INDIAN COMMUNITY PROJECT

SR 347 / QUEEN CREEK ROAD DESIGN AUTHORITY LIMITS



I-10, GILA RIVER INDIAN COMMUNITY PROJECT
RIGGS RD DESIGN AUTHORITY LIMITS



I-10, GILA RIVER COMMUNITY PROJECT
GOODYEAR RD DESIGN AUTHORITY LIMITS

TPA 200-8 Repairs and Modifications to Existing Roadways

The following table identifies the required repairs and modifications to existing roadways as part of this Project.

No.	Item Description	Description of Work
1.	This table intentionally left blank.	This table intentionally left blank.

TPA 400-1 ADOT-Provided PDSs and MDRs

Note: See exceptions to these reports as specified in TP Section 400 (*Pavement*).

TPA 400-1.1 Pavement Design Summary 97
TPA 400-1.2 Materials Design Report 98
TPA 400-1.3 Pavement Design Summary – Koli Road TI 99
TPA 400-1.4 Materials Design Report – Koli Road TI 100

TPA 400-1.1 Pavement Design Summary

See attached

I-10 Gila River Indian Community Design-Build Project
202L to Gila River Bridge
ADOT General Engineering Consultant

Pavement Design Summary

ADOT Report No. 24-28-F; ADOT TRACS No. F025201D

August 1, 2024 | Terracon Project No. 65225282

Prepared for:

HDR Engineering, Inc.
20 E. Thomas Road, Suite 2500
Phoenix, Arizona 85012



Terracon
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August 1, 2024

HDR Engineering, Inc.
20 E. Thomas Road, Suite 2500
Phoenix, Arizona 85012

Attn: Mr. Nick LaFronz, P.E.
Phone: (602) 522-7728
Email: nick.lafronz@hdrinc.com

Report Type: Final

Re: Pavement Design Summary
I-10 Gila River Indian Community Design-Build Project
202L to Gila River Bridge
ADOT General Engineering Consultant
ADOT Report No. 24-28-F; ADOT TRACS No. F025201D
Terracon Project No. 65225282

Dear Mr. LaFronz:

Terracon Consultants, Inc. (Terracon) has completed the Geotechnical Engineering Services for the above referenced project in general accordance with Terracon Proposal No. P65225282 – Revision 5, dated February 14, 2023. This Pavement Design Summary (PDS) report presents the findings of the subsurface exploration and provides recommendations concerning pavement thickness design for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon



Ramon Padilla, P.E.
Geotechnical Department Manager



Donald R. Clark, P.E.
Sr. Consultant/Sr. Principal

Reviewed By: Joseph A. Phillips, P.E., Sr. Consultant / Sr. Principal

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Introduction

This report presents the results of our pavement engineering services performed as part of the General Engineering Consultant (GEC) services for the Arizona Department of Transportation (ADOT) Interstate Highway 10 (I-10) Gila River Indian Community (GRIC) Interstate Widening planned from State Route 202L (SR202L, Santan / South Mountain) to the north end of the Gila River Bridge Replacement Project (in the Phoenix to Casa Grande area in Arizona). The project limits extend from approximately I-10 Milepost (MP) 161 (north limit of the project) towards the south to the north end of the Gila River Bridge Replacement Project (or approx. MP 172.75).

HDR Engineering, Inc. (HDR) prepared a Design Concept Report (DCR) for a broader extent of the I-10 GRIC corridor and the DCR was titled: *Design Concept Report, Interstate 10 Corridor: State Route 202L to State Route 387, Maricopa and Pinal County, Arizona*, ADOT Project Nos. F0252 01L and F0252 02L, Federal Aid No. 010-C(222)S, dated October 2023. As previously mentioned, the project limits for Terracon's scope of work extended from approximately I-10 MP 161 to MP 172.75, and Terracon performed a geotechnical exploration for the project and summarized the results in a report titled: *Geotechnical Engineering Data Report, I-10 Gila River Indian Community Design-Build Project, 202L to the Gila River Bridge, ADOT General Engineering Consultant* (Terracon Project No. 65225282, dated April 2, 2024).

The purpose of these pavement engineering services is to support HDR as the ADOT GEC for the project for the planned improvements. The pavement design recommendations presented in this report are based on the results of the field and laboratory testing, our experience with similar soil conditions, and our understanding of the proposed project. This Pavement Design Summary (PDS) includes limited and generalized pavement condition surveys on selected small pavement area samples across the project and presents an outline on the selected rehabilitation (mill and overlay) for existing pavements; however, this PDS excludes: falling weight deflectometer testing, ADOT SODA rehabilitation evaluations, or any other detailed or comprehensive pavement rehabilitation evaluations; but includes recommendations from the ADOT Pavement Design Section.

Based on the information provided, we understand the majority of the planned pavement improvements for the project will be based on ADOT methodologies and standards. The pavement design presented in this PDS for the project are based on the procedures outlined in the ADOT Pavement Design Manual (2017). As exceptions, we understand the following roadways for the project will be based on Maricopa County Department of Transportation (MCDOT) methodologies and standards:

- Queen Creek Road – eastern approx. 600 feet (ft) of the roadway within the project limits.
- Riggs Road – eastern 300 ft and western 350 ft of the roadway within the project limits.

Project Description

Our initial understanding of the project was provided in our proposal and our final understanding of the project conditions is as follows:

Item	Description
Project Description	Based on the information provided, we understand the project will include widening I-10 with one general purpose lane and 1 High-Occupancy Vehicle (HOV) lane in each direction from SR202L to Riggs Road. The I-10 typical section between Riggs Road and the end of the overall project at Milepost (MP) 172.75 will include a general-purpose lane in each direction. The project limits for this report extend from approximately MP 161 to MP 172.75.
Bridge Structures within Project Limits for this Report	Widening of existing bridge structures along the corridor is anticipated with the proposed I-10 lane widening. Based on the information provided, the bridge structures within the limits of Terracon's scope of work consist of the following: ■ I-10 & Wild Horse Pass Boulevard Traffic Interchange (TI) Underpass (UP) • New 2 span bridge constructed to the south of the existing bridge • Existing bridge structure remains ■ Queen Creek Road TI UP • New 2 span bridge constructed to the south of the existing bridge • Existing bridge structure remains ■ Riggs Road TI UP • New 2 span bridge constructed to the south of the existing bridge • Existing bridge structure remains ■ Goodyear Road TI UP • Existing bridge structure remains • New 4 span bridge structure widening to the north of the existing bridge • New 4 span bridge structure widening to the south of the existing bridge
Pavements	New pavements consisting of both asphaltic concrete and portland cement concrete pavements are anticipated in order to integrate the proposed improvements with the existing roadway. Based on the information provided, the new pavement areas within the project limits consist of the following: ■ General purpose (GP) and HOV lane widening from MP 161 to MP 172.75 ■ Occasional minor shoulder widening ■ Traffic interchange ramps ■ Traffic interchange crossroad improvements within the ADOT, MCDOT and GRIC ROWs
Grading / Slopes	Minor cuts and fills are generally anticipated for the project. As an exception, the traffic interchange improvements are anticipated to include the construction of new embankments (or earthwork modifications to existing embankments) to elevate the new alignments of on- and off-ramps to the crossroad underpass bridge structures and to elevate the widened/improved crossroads where they will cross over the I-10 mainline.

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration:

Item	Description
Location	The project limits for this report extend from approximately I-10 MP 161 (north limit of the project at approximately SR202L) towards the south to the north edge of the Gila River Bridge Replacement Project (or approximately MP 172.75).
Existing Improvements	The I-10 corridor project site generally consists of a rural 4-lane (2 lanes in each direction) freeway mainly as the corridor traverses the GRIC. As the corridor reaches the Phoenix metropolitan area on the north end of the project alignment, I-10 widens into an existing urban freeway (at SR202L); and beyond the project limits further south as the corridor reaches SR387, I-10 widens to match the existing 3-lane typical section in each direction. Other existing improvements include existing traffic interchanges, and multiple elevated crossroad bridges over I-10.
Current Pavements	The majority of the existing pavements across the site consist of asphaltic concrete (AC) pavements. The site includes areas of portland cement concrete pavements (PCCP) at some traffic interchange ramp areas adjacent to bridge crossings and at the northern portion of the project as the interstate travel lanes transition into the urban freeway system.
Existing Topography	The topography along the corridor appears to be fairly flat, and overall the ground surface increases in elevation from north to south. Based on data obtained from Google Earth Pro, the ground surface elevation in the area of I-10 and SR202L (Santan) is roughly 1,165 feet above mean sea level (AMSL); and the ground surface elevation in the area north of the Gila River Bridge is roughly 1,200 feet AMSL. Survey data provided to Terracon of the ground surface at the as-drilled roadway borings along the I-10 mainline indicated the ground surface elevations ranged from approximately 1,149 to 1,198 feet AMSL.

Planned Pavement Improvements Overview

The planned pavement improvements for the project include new pavements for: general purpose and HOV lane widening, minor shoulder widening, traffic interchange ramp improvements, and for traffic interchange crossroads. As a note, approximately 3,300 linear feet (from approximately Sta. 1287 to 1320) of the entire width of I-10 (at Goodyear Road) is planned to be re-constructed with new pavement as part of the widening improvements.

We also understand the existing AC travel lanes are planned to be milled and overlaid with new AC to structurally improve the pavement to extend the design life of the existing pavement structure. In addition, we understand the existing asphalt rubber asphalt

concrete friction course (AR-ACFC) overlying the existing I-10 PCCP in the northern portion of the project (from approximately Mileposts (MP) 161 to 163) is planned to be milled and the exposed portland cement concrete pavement is planned to be diamond-ground as the finished pavement surface. New mainline PCCP is also to be diamond-ground.

I-10 Mainline Lane and Shoulder Improvements

Based on the planned new pavement areas outlined in the DCR and the ADOT Average Annual Daily Traffic Report 2022, the pavement improvements along I-10 mainline were subdivided for purposes of design for the project as summarized in the following table:

Interstate 10 (I-10)

Roadway Description	Approx. Stations	Approx. Mileposts
I-10 Mainline – Segment 1 North end of project to past Wild Horse Pass Boulevard / Sundust Road. The existing PCCP section has three 12-foot lanes in each direction with a 10-foot outside shoulder and a 4- to 8-foot inside shoulder. Auxiliary lanes are present which, in some cases add an additional two 12-foot lanes.	841+25.79 to 943+70.00 (WB) / 967+30.00 (EB)	161.00 to 163.04 (WB) /163.48 (EB)
I-10 Mainline – Segment 2 From past Wild Horse Pass Boulevard / Sundust Road to SR347 / Queen Creek Road. The existing AC section has three 12-foot lanes in each direction with a 10-foot outside shoulder and a 4- to 8-foot inside shoulder. Auxiliary lanes are present which, in some cases add an additional 12-foot lane.	943+70.00 (WB) / 967+30.00(EB) to 1020	163.04 (WB) / 163.48 (EB) to 164.5
I-10 Mainline – Segment 3 From SR347 / Queen Creek Road to Riggs Road TI. The existing AC section has two 12-foot lanes in each direction, a 10-foot outside shoulder and a 4-foot inside shoulder.	1020 to 1208	164.5 to 168
I-10 Mainline – Segment 4 From Riggs Road TI to the north end of the Gila River Bridge Replacement Project. The existing AC section has two 12-foot lanes in each direction, a 10-foot outside shoulder and a 4-foot inside shoulder.	1208 to 1457	168 to 172.75

Legend: Westbound (WB); Eastbound (EB).
Note: Approx. Stations and Mileposts obtained from the project Design Concept Report.

Roadway Description	Summary of Planned Pavement Improvement (EB and WB unless noted otherwise)
I-10 Mainline – Segment 1	Add one lane by removing the inside median 8-foot AC shoulder and placing a new 12-foot lane and a new 12-foot PCCP shoulder. Add a 12-foot PCCP outside shoulder in the EB direction. Mill AR surface course pavement from existing PCCP in remaining 3 12-foot lanes and outside shoulder. Diamond grind all existing and new PCCP.
I-10 Mainline – Segment 2	Add two lanes by removing the 4-foot AC Pavement inside shoulder and placing two new 12-foot AC Pavement lanes and a new 12-foot AC Pavement shoulder. Occasional outside shoulder widening slivers with new AC pavement to accommodate planned TI ramp improvements. Milling and filling pavement rehabilitation of existing AC.
I-10 Mainline – Segment 3	Add one lane by removing the 4-foot AC Pavement inside shoulder and placing two new 12-foot AC Pavement lanes and a new 12-foot AC Pavement shoulder. Occasional outside widening with new AC pavement to accommodate planned TI ramp improvements. Milling and filling pavement rehabilitation of existing AC.
I-10 Mainline – Segment 4	Add one lane by removing the 4-foot AC Pavement inside shoulder and placing one new 12-foot AC Pavement lane and a new 12-foot AC Pavement shoulder. Milling and filling pavement rehabilitation of existing AC. Approx. 3,300 ft. of full I-10 width AC pavement reconstruction at Goodyear Rd.

Thin shoulder AC pavements (e.g., 3-inches of AC over 15-inches of AB) will be removed to accommodate the planned widening and the recommended new pavement sections. In planned PCCP I-10 mainline widening travel lane areas, any existing non-doweled PCCP that is proposed to be a traffic lane as part of this project is recommended to be removed and replaced with doweled PCCP. The longitudinal joints of proposed PCCP should be located at the proposed lane line or at the center of the planned lane (and not at or near wheel paths) with the following minimum dowel requirements:

- ADOT Standard epoxy-coated smooth dowel bars along the longitudinal joint (#5 x 24-inch long at 30-inch centers) when the widening width is 12 feet or more.
- ADOT Standard epoxy-coated deformed dowel bars along the longitudinal joint (#5 x 24-inch long at 30-inch centers) when the widening width is less than 12 feet.

If PCCP longitudinal joints are not located at the lane line or center of the lane, then the minimum longitudinal dowel requirements shall not be less than: 1½-inch diameter x 18-inch long epoxy-coated smooth dowel bars placed at 24-inch on centers; or #8 x 18-inch long epoxy-coated smooth dowel bars placed at 18-inch on centers. Longitudinal dowel bars shall not be placed within 15 inches of a transverse joint.

Crossroads & Traffic Interchange Ramp Improvements

Based on the planned new pavement areas outlined in the DCR, the pavement improvements for the (I-10) crossroads within the project are subdivided as summarized in the following tables:

Wild Horse Pass Boulevard / Sundust Road

Roadway Description	Planned Pavement Improvement
Wild Horse Pass Boulevard - From approximately 800 feet west of the I-10 Centerline (CL) to Winners Way (approx. 700-ft length)	Mill and Overlay, and minor New AC Pavement Widening
Wild Horse Pass Boulevard / Sundust Road From approximately 800 feet west of the I-10 CL to 800 feet east of the I-10 CL (approx. 1,600-ft length)	New Portland Cement Concrete Pavement (PCCP) & Bridge Structure
Sundust Road - From approximately 800 feet east of the I-10 CL to 1,250 feet east of the I-10 CL (approx. 450-ft length)	New Asphaltic Concrete (AC) Pavement
Sundust Road - From approximately 1,250 feet east of the I-10 CL to Nelson Drive (approx. 400-ft length)	Mill and Overlay

State Route 347 (SR 347) / Queen Creek Road

Roadway Description	Planned Pavement Improvement
SR 347 - From approximately 2,100 feet west of the I-10 CL to ½ mile west of the I-10 CL (approx. 700-ft length)	New AC Pavement East- and West-Bound, & Mill and Overlay West-Bound
SR 347 - From approximately 850 feet west of the I-10 CL to 2,100 feet west of the I-10 CL (approx. 1,250-ft length)	New AC Pavement
SR 347 / Queen Creek Road - From approximately 850 feet west of the I-10 CL to 850 feet east of the I-10 CL (approx. 1,700-ft length)	New PCCP & Bridge Structure
Queen Creek Road - From approximately 850 feet east of the I-10 CL to 1,450 feet east of the I-10 CL (approx. 600-ft length)	New AC Pavement (MCDOT Design)

Riggs Road

Roadway Description	Planned Pavement Improvement
Riggs Road - From approximately 1,150 feet west of the I-10 CL to 1,500 feet west of the I-10 CL (approx. 350-ft length)	Mill and Overlay, and Sliver of New AC Widening (MCDOT Design)
Riggs Road - From approximately 1,150 feet west of the I-10 CL to 1,050 feet east of the I-10 CL (approx. 2,200-ft length)	New PCCP & Bridge Structure
Riggs Road - From approximately 1,050 feet east of the I-10 CL to 1,350 feet east of the I-10 CL (approx. 300-ft length)	Mill and Overlay, and Sliver of New AC Widening (MCDOT Design)

Goodyear Road

Roadway Description	Planned Pavement Improvement
Goodyear Road - From approximately 1,100 feet west of I-10 CL to 1,100 feet east of I-10 CL (approx. 2,200-ft length)	New PCCP; and AC under guardrail and for sidewalks (not a designed pavement structural section)

The I-10 traffic interchange ramps at Wildhorse Pass Boulevard / Sundust Road are planned as new PCCP, and the ramps at the I-10 traffic interchanges for State Route 347 (SR 347) / Queen Creek Road and Riggs Road are planned as new AC pavements. Based on the information provided, these ramps are planned to be re-constructed and some ramp alignments are planned to have slight to some variations. The following tables outline the planned improvements for the ramps:

Ramps – I-10 Traffic Interchange at Wild Horse Pass Blvd / Sundust Road

Ramp	Summary of Existing Condition	Summary of Planned Improvements
WB Off-Ramp	1 lane and widens to 2 lanes	1 lane and widens to 3 lanes
WB On-Ramp	2 lanes tapers to 1 nearing I-10	3 lanes tapers to 2 nearing I-10
EB Off-Ramp	2 lanes and widens to 3 lanes	2 lanes and widens to 3 lanes
EB On-Ramp	2 lanes tapers to 1 nearing I-10	2 lanes tapers to 1 nearing I-10

Ramps – I-10 Traffic Interchange at SR 347 / Queen Creek Road

Ramp	Summary of Existing Condition	Summary of Planned Improvements
WB Off-Ramp	1 lane and widens to 2 lanes	1 lane and widens to 2 lanes
WB On-Ramp	2 lanes tapers to 1 nearing I-10	3 lanes tapers to 2 nearing I-10
EB Off-Ramp	2 lanes and widens to 3 lanes	2 lanes and widens to 4 lanes
EB On-Ramp	2 lanes tapers to 1 nearing I-10	2 lanes (no tapering until reaching I-10)

Ramps – I-10 Traffic Interchange at Riggs Road

Ramp	Summary of Existing Condition	Summary of Planned Improvements
WB Off-Ramp	1 lane and widens to 2 lanes	1 lane and widens to 2 lanes
WB On-Ramp	2 lanes tapers to 1 nearing I-10	2 lanes tapers to 1 nearing I-10
EB Off-Ramp	1 lane and widens to 2 lanes	1 lane and widens to 3 lanes
EB On-Ramp	2 lanes tapers to 1 nearing I-10	2 lanes (no tapering until reaching I-10)

Pavement History

Existing Site Conditions



The overall project consists of the I-10 corridor extending from approximately SR202L (Santan) to SR387 between Phoenix and Casa Grande, Arizona (and the overall study area limits will extend from approximately Interstate 10 Milepost 161 to Milepost 187). The project limits for this report extend from the north limit of the project to the north edge of the Gila River Bridge Replacement Project (or approximately MP 161 to MP 172.75).



The I-10 corridor project site generally consists of a rural 4-lane freeway (with 2 lanes in each direction) as the corridor traverses the GRIC. The travel lanes are approximately 12 feet wide. The outside paved shoulder generally measures approximately 10 feet wide, and the inside (median) shoulder generally measures approximately 2 to 4 feet wide.



As the corridor reaches the Phoenix metropolitan area on the north, I-10 widens into an existing urban freeway (at SR202L), I-10 widens to match the existing 3-lane typical section in each direction on I-10. The travel lanes are approximately 12 feet wide. The outside paved shoulder generally measures approximately 10 to 12 feet wide, and the inside (median) paved shoulder generally measures approximately 8 to 10 feet wide.

The southern end of the geotechnical exploration presented in this report extends to approximately I-10 MP 172.75, which is approximately the northern end of the Gila River Bridge Replacement Project.

Wild Horse Pass Boulevard / Sundust Road generally consist of 2 lanes in each direction with a (variable width) raised center median dividing east- and west-bound traffic. The center median on the eastern portion of Wild Horse Pass Boulevard (at approximately 535 feet east of the I-10 centerline) transitions to a paved center median

turn lane. The travel lanes are approximately 12 feet wide. The outside paved shoulder has variable widths ranging from approximately 2 to 10 feet. Wild Horse Pass Boulevard / Sundust Road also includes various turn lanes.

Ramps at the I-10 and Wild Horse Pass Boulevard / Sundust Road Traffic Interchange. The East- and West-Bound On-Ramps consist of 2 lanes that taper into 1 lane upon approaching the I-10 travel lanes. The East-Bound Off-Ramp consists of 2 lanes, and widens to 3 lanes to accommodate the turn lanes upon approaching Wild Horse Pass Boulevard / Sundust Road. The West-Bound Off-Ramp consists of 1 lane, and widens to 2 lanes upon approaching Wild Horse Pass Boulevard / Sundust Road. The travel ramp lanes are approximately 12 feet wide, and the paved shoulders range from approximately 2 to 6 feet wide.

State Route 347 (SR 347) / Queen Creek Road generally consist of a divided roadway with 2 lanes in each direction. The travel lanes are approximately 11 to 12 feet wide. The outside paved shoulder has variable widths ranging from approximately 10 to 15 feet wide, and the inside (median) paved shoulder has variable widths ranging from approximately 1 to 8 feet wide. SR 347 / Queen Creek Road also includes various turn lanes.

Ramps at the I-10 and SR 347 / Queen Creek Road Traffic Interchange. The East- and West-Bound On-Ramps consist of 2 lanes that taper into 1 lane upon approaching the I-10 travel lanes. The East-Bound Off-Ramp consists of 2 lanes, and widens to 3 lanes to accommodate the turn lanes upon approaching SR 347 / Queen Creek Road. The West-Bound Off-Ramp consists of 1 lane, and widens to 2 lanes upon approaching SR 347 / Queen Creek Road. The travel ramp lanes are approximately 12 feet wide, and the paved shoulders range from approximately 2 to 8 feet wide.

Riggs Road generally consist of 2 lanes in each direction (east of I-10) and 1 lane in each direction (west of I-10). The travel lanes are approximately 12 feet wide within the I-10 traffic interchange and approximately 11 feet wide beyond the I-10 traffic interchange. The outside paved shoulder west of I-10 has variable widths ranging from approximately 2 to 6 feet wide. The outside paved shoulder east of I-10 has variable widths ranging from approximately 2 to 4 feet wide and portions of the roadway include concrete curb and gutter. Riggs Road also includes intermittent paved center median with variable widths and various turn lanes.

Ramps at the I-10 and Riggs Road Traffic Interchange. The East- and West-Bound On-Ramps consist of 2 lanes that taper into 1 lane upon approaching the I-10 travel lanes. The East- and West-Bound Off-Ramp consist of 1 lane, and widen to 2 lanes to accommodate the turn lanes upon approaching Riggs Road. The travel ramp lanes are approximately 12 feet wide, and the paved shoulders range from approximately 2 to 10 feet wide.

Goodyear Road generally consist of 1 lane in each direction. The travel lanes are approximately 12 feet in width. The outside paved shoulders are approximately 2 to 4 feet wide. Goodyear Road is a low volume road and is only a crossroad over I-10 and excludes ramps.

Project Alignment Overview

The project limits of this report extend from approximately I-10 MP 161 to MP 172.75. The following provides a general overview of the site by showing photographs of selected structures along the project alignment. The following photographs shown in this section are extracted images compiled from Google Earth Pro Street View.

Wild Horse Pass Boulevard (2-span) bridge structure crossing over I-10:



Queen Creek Road (2-span) bridge structure crossing over I-10:



Riggs Road (4-span) bridge structure crossing over I-10:



Drainage channel crossing beneath I-10 located between Riggs Road and Goodyear Road:



Goodyear Road (4-span) bridge structure crossing over I-10:



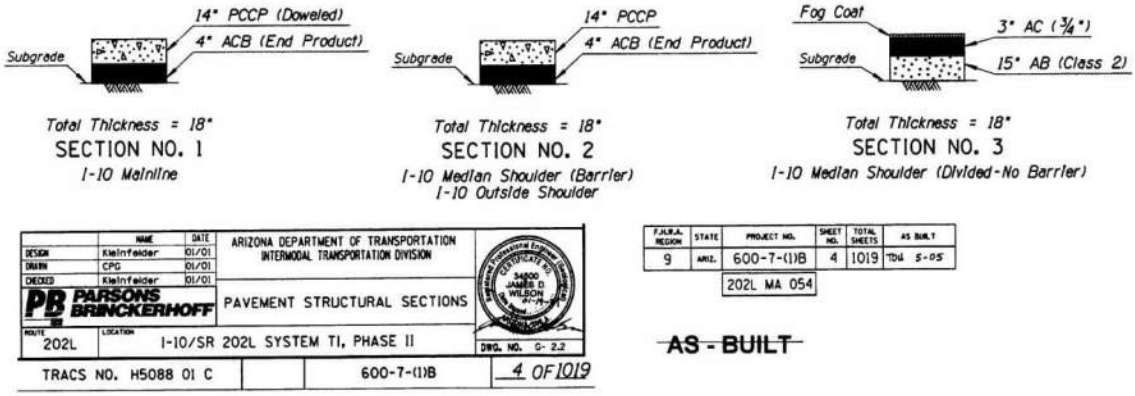
The Gila River Bridge is located south of Goodyear Road at approximately I-10 MP 172.75.

Previous ADOT Projects

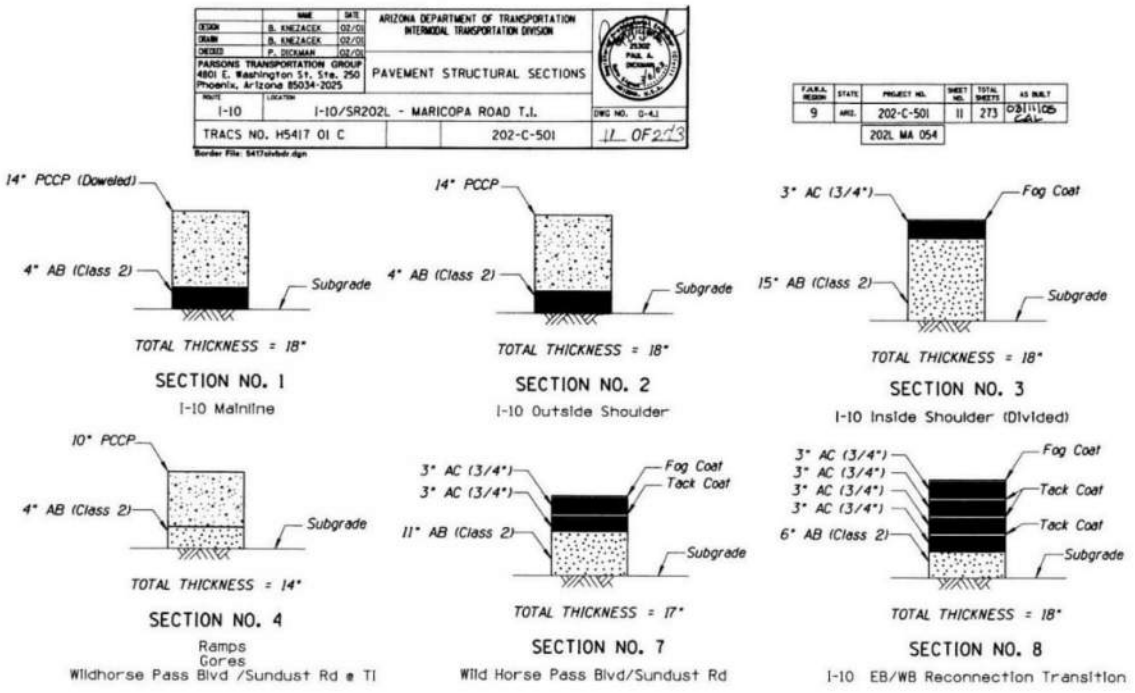
ADOT has performed various roadway improvement projects along the project corridor. An ADOT Pavement History Report of I-10 from MP 161 to MP 173 for both the West- and East-Bound directions is included in Appendix G of this report. In addition, Appendix G also includes an ADOT Pavement Condition Report of I-10 from MP 161 to MP 173 for both the West- and East-Bound directions.

Terracon also performed a cursory review of available plans of the previous roadway improvement projects. The cursory review of the available plan sheets was performed in an effort to identify elements that could provide some geotechnical and pavement structure information related to the project. Some of the plan sheets included in the review are slightly outside of the project limits and were included as they may have some relevance. The previous project information presented in this report is limited and other previous project information may also exist. The following summarizes selected information obtained from these plan sheets, including pertinent extracted images from the plan sheets. The extracted images from the plans shown below are incomplete and are only intended to provide a brief preview of the referenced plans sheets; for additional information, please refer to the corresponding entire plans sheets.

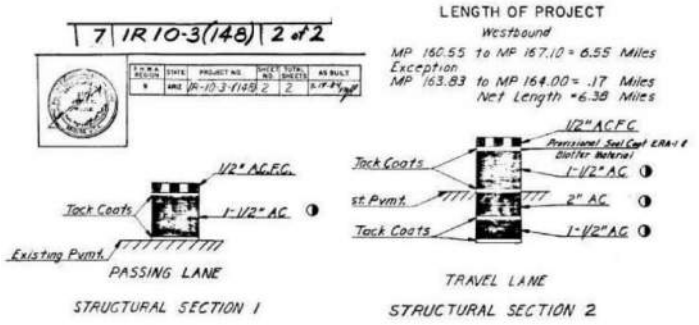
- I-10, SR 202L System Traffic Interchange, Ph II; Pavement sections included: I-10 Mainline 14-inch PCCP (Doweled) over 4-inch Asphaltic Concrete Base (ACB); I-10 Median (Barrier) and Outside Shoulders 14-inch PCCP (no dowels) over 4-inch ACB; and 3-inch AC over 15-inch AB Median Shoulder (Divided No Barrier); ADOT Project No. 600-7-(1)B; Tracs No. H5088 01C, dated 2005.



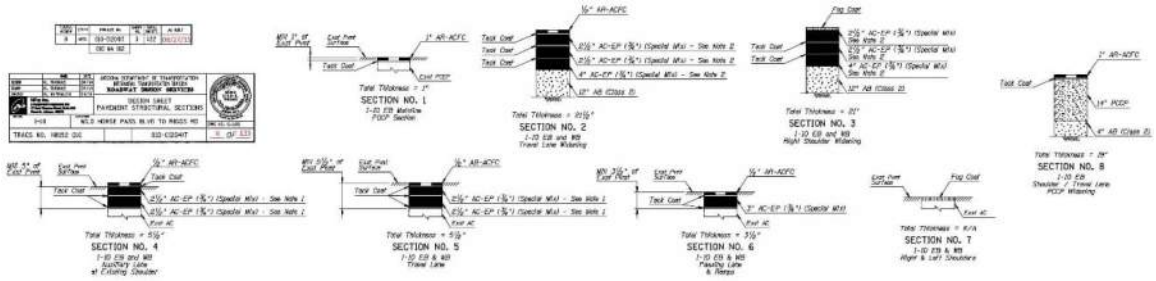
- I-10, Maricopa Road T.I. Santan Freeway (202L); Pavement sections included: I-10 Mainline 14-inch PCCP (Doweled) over 4-inch AB; I-10 Outside Shoulder 14-inch PCCP (no dowels) over 4-inch AB; Ramps/Gores Wildhorse Pass Blvd / Sundust Rd TI 10-inch PCCP (no dowels) over 4-inch AB; Wild Horse Pass Blvd / Sundust Rd 6-inch AC over 11-inch AB; and I-10 EB/WB Reconnection Transition 12-inch AC over 6-inch AB; ADOT Project No. 202-C-501; Tracs No. H5417 01C, dated 2003.



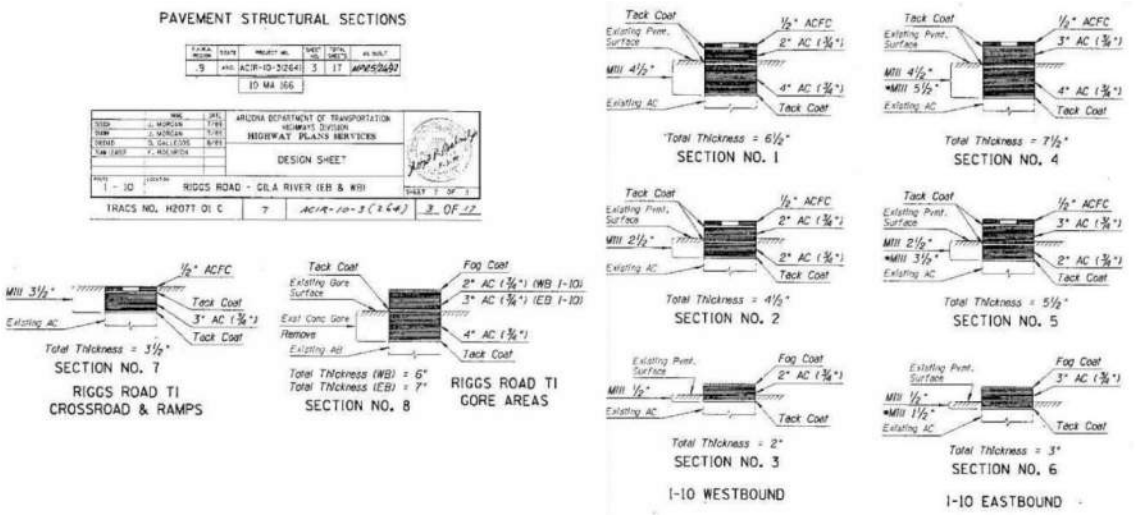
- I-10 Roadway Improvements – Between Mileposts 160.55 to 167.10; asphaltic concrete overlay including milling and replacing 3.5 inches of AC with an additional ½-inch of asphaltic concrete friction course (ACFC) and 1½-inches of AC; or placement of ½-inch of ACFC and 1½-inches of AC over the existing pavement; ADOT Project No. IR 10-3(148), dated 1984.



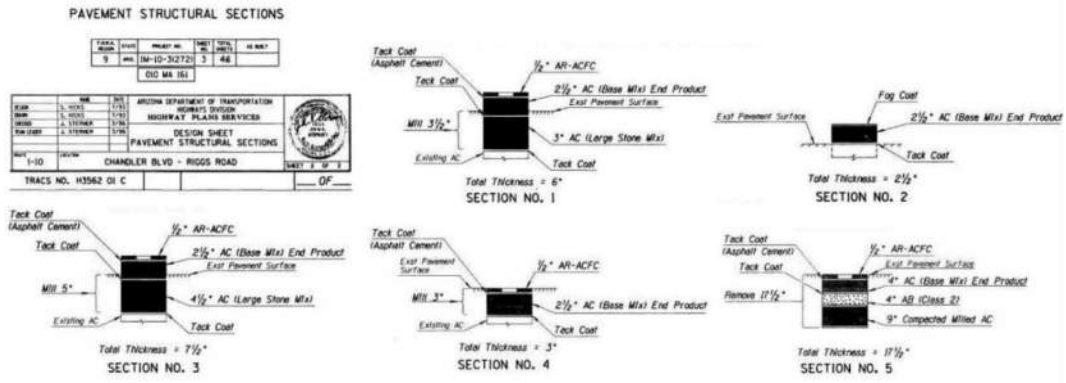
- I-10 Roadway Improvements - Wild Horse Pass Boulevard to Riggs Road; various pavement structure improvements including milling and overlaying existing AC pavements, and new AC and PCCP pavements; ADOT Tracs No. 010 MA 162 H8192 01C, 010-C(204)T, Sheet No. 3 of 122, dated 2014 – 2015.



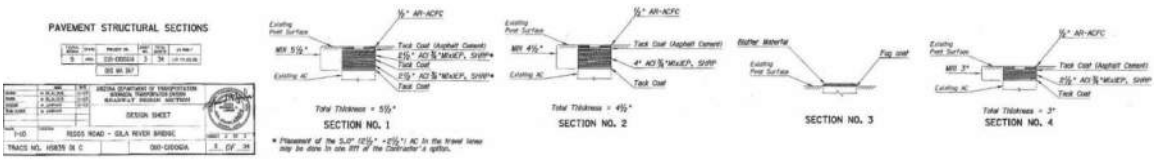
- I-10 Roadway Improvements – Riggs Road – Gila River (EB & WB); various pavement structure improvements including milling and overlaying existing AC pavements, and new AC and PCCP pavements; ADOT Tracs No. 010 MA 166 H2077 01C, ACIR-10-3(264), Sheet No. 3 of 17, dated 1989 – 1992.



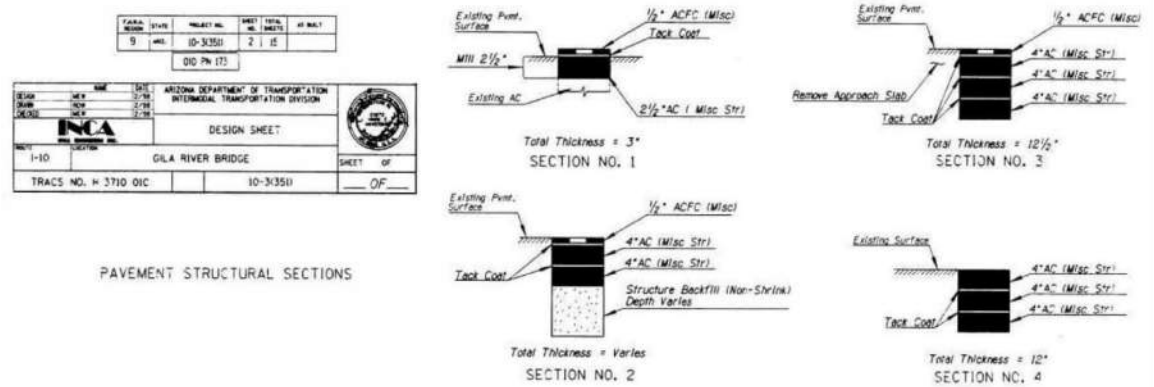
- I-10 Roadway Improvements – Chandler Boulevard – Riggs Road; various pavement structure improvements including milling and overlaying existing AC pavements; ADOT Tracs No. 010 MA 161 H3562 01C, IM-10-3(272), Sheet No. 3 of 46, dated 1993.



- I-10 Roadway Improvements – Riggs Road – Gila River Bridge; various pavement structure improvements including milling and overlaying existing AC pavements; ADOT Tracs No. 010 MA 167 H5839 01C, 010-C(006)A, Sheet No. 3 of 34, dated 2003 – 2008.



- I-10 Roadway Improvements – Gila River Bridge; various pavement structure improvements including milling/overlaying and new AC pavements; ADOT Tracs No. 010 PN 173 H3710 01C, 10-3(351), Sheet No. 2 of 15, dated 1998.



Subsurface Conditions

Existing Pavement Core Exploration Results

The existing pavements within the project were cored at 29 locations across the project site with an electric core rig and a 4-inch diameter core barrel. The cores were performed from January 22 to 25, 2024. The approximate core locations at the project site are shown on Site Plan and Exploration Locations figures in the previously referenced Geotechnical Engineering Data Report for the project. The following table summarizes the pavement thicknesses measured at the core locations:

Core No.	Existing Pavement Thicknesses (inches)				Roadway (and Approx. I-10 Station)	Approx. Latitude	Approx. Longitude
	AC	PCCP	AC	ABC			
1	1¼	14.5	--	4	I-10, EB, Far Left Lane (Sta 890)	33.28709°	-111.9708°
2	1	15	--	4	I-10,EB,Far Right Lane (Sta 940)	33.27381°	-111.96262°
3	--	--	12	±6	I-10, EB, Far Left Lane (Sta 990)	33.26250°	-111.95379°
4	--	--	11	>9 [A]	I-10, EB, Right Lane (Sta 1050)	33.24908°	-111.94342°
5	--	--	11	>12 [A]	I-10, EB, Left Lane (Sta 1100)	33.23719°	-111.93423°
6	--	--	11.5	>12 [A]	I-10, EB, Left Lane (Sta 1153)	33.22512°	-111.92490°
7	--	--	7	>9 [A]	I-10, EB, Right Lane (Sta 1205)	33.21304°	-111.91560°
8	--	--	9	>14 [A]	I-10, EB, Left Lane (Sta 1258)	33.20110°	-111.90634°
9	--	--	8 [B]	>9 [A]	I-10, EB, Right Lane (Sta 1310)	33.18927°	-111.89725°
10	--	--	8.5	>15 [A]	I-10, EB, Left Lane (Sta 1363)	33.17693°	-111.88769°
11	--	--	8	>7 [A]	I-10, EB, Right Lane (MP 1415)	33.16492°	-111.87847°
12	--	--	8.5	>7 [A]	I-10, WB, Left Lane (MP 1445)	33.15778°	-111.87252°
13	--	--	8	>10 [A]	I-10, WB, Right Lane (Sta 1393)	33.17036°	-111.88223°
14	--	--	8.5	>7 [A]	I-10, WB, Left Lane (Sta 1340)	33.18229°	-111.89148°
15	--	--	8	>7 [A]	I-10, WB, Right Lane (Sta 1287)	33.19462°	-111.90092°
16	--	--	8.5	>7 [A]	I-10, WB, Left Lane (Sta 1233)	33.20966°	-111.91261°
17	--	--	7	>8 [A]	I-10, WB, Right Lane (Sta 1180)	33.21916°	-111.91987°
18	--	--	9 [B]	>5 [A]	I-10, WB, Left Lane (Sta 1127)	33.23122°	-111.92924°
19	--	--	10	>7 [A]	I-10, WB, Right Lane (Sta 1075)	33.24366°	-111.93882°
20	--	--	11	>6 [A]	I-10, WB, Left Lane (Sta 1020)	33.25579°	-111.94823°
21	--	--	9	>9 [A]	I-10,WB,Far Right Lane (Sta 970)	33.26784°	-111.95746°
22	1	14	--	4	I-10, WB, Far Left Lane (Sta 920)	33.28002°	-111.96698°
23	--	--	6	±8	WHPB, EB, Right Lane	33.27845°	-111.96912°
24	--	--	8 [B]	>8 [A]	WHPB, EB, Right Lane	33.28042°	-111.96461°

Core No.	Existing Pavement Thicknesses (inches)				Roadway (and Approx. I-10 Station)	Approx. Latitude	Approx. Longitude
	AC	PCCP	AC	ABC			
25	1	10.5	--	4	I-10-WHPB, WB On Ramp, R-Ln	33.28119°	-111.96724°
26	1	10	--	4	I-10-WHPB, EB On Ramp, R-Ln	33.27832°	-111.96648°
27	--	--	4	±4	I-10-QCR, EB Off Ramp, R-Ln	33.25755°	-111.95044°
28	--	--	3.5	±5	I-10-QCR, WB on Ramp, R-Ln	33.25743°	-111.94863°
29	--	--	7	>10 [A]	I-10-Riggs, WB On Ramp	33.22139°	-111.92131°

Legend: Portland Cement Concrete Pavement (PCCP); Asphaltic Concrete (AC); Aggregate Base Course (ABC); Interstate 10 (I-10); Wild Horse Pass Boulevard (WHP); Queen Creek Road (QCR); Riggs Road (Riggs); Eastbound (EB); Westbound (WB); Right Lane (R-Ln); Left Lane (L-Ln); Shoulder (Shldr).

Note [A]: Manual excavation refusal and/or difficulties prevented entire ABC thicknesses measurement.

Note [B]: Initial core thickness measurement. The bottom portion of the AC core crumbled and the photograph of core indicates a thickness of 1 to 2 inches less than is recorded in the table above.

The majority of the geotechnical boring explorations for the project were drilled off of the existing pavements. At some locations, the borings were drilled through the existing pavements. The following table summarizes the pavement thicknesses measured at the borings drilled within the limits of the existing pavements:

Boring No.	Existing Pavement Thicknesses (inches)			Roadway	Approx. Latitude	Approx. Longitude
	PCCP	AC	ABC			
R&C-18	--	4	8	QCR, WB, Right Shoulder	33.2546°	-111.9503°
R&C-19	--	3	9	QCR, WB, Right Shoulder	33.2571°	-111.9456°
R&C-23	--	5	8	I-10-QCR, EB On Ramp, L-Ln	33.2542°	-111.9485°
R&C-24	--	3	9	I-10-QCR, WB Off Ramp, L-Ln	33.2551°	-111.9468°
R&C-30	--	3	±21 [C]	Riggs, EB, Right Lane	33.2192°	-111.9215°
R&C-31	--	3	±21 [C]	Riggs, EB, Right Lane	33.2192°	-111.9188°
R&C-34	--	3	6	I-10-Riggs, EB On Ramp, Shldr	33.2177°	-111.9193°
B-10	--	3	>12 [C]	Goodyear Road, WB	33.1903°	-111.8983°
B-19	--	3	>12 [C]	Goodyear Road, EB	33.1902°	-111.8972°

Note [C]: Non-plastic gravelly silty sand fill materials encountered which appears to have been used as aggregate base for the asphaltic concrete.

Subsurface Soil Conditions

Specific conditions encountered at each boring location are indicated on the individual boring logs included in Appendix A of the previously referenced Geotechnical Engineering Data Report for the project. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. The results of the field and laboratory testing indicated variations in subsurface conditions and engineering characteristics throughout the site. The subsurface conditions for the project can be generalized as listed in the following tables:

Generalized Subsurface Soil Conditions Summary			
I-10 Mainline Roadway Borings			
Description	Approx. Depth to Bottom of Stratum (feet)	Material Encountered	Relative Density / Consistency
Stratum 1	3	Existing Roadway Embankment Fill: Coarse-Grained Soils with variable amounts of Gravel, Silt and Clay; mixed with asphalt millings	Variable Loose to Dense
Stratum 2	3 to 10½ (maximum depth explored) [1]	Coarse-Grained Soils with variable amounts of Gravel, Silt and Clay; and some occurrences of Fine-Grained soils.	Variable Very Loose to Very Dense / Variable Medium Stiff to Hard

1. The depths of Borings R-2, R-7, R-8, R-10, R-11, R-73, R-74, & R-75 were deepened to approximately 15½ to 20½ feet due to low penetration resistance at the 9-foot depth sample.

Generalized Subsurface Soil Conditions Summary			
I-10 TI Underpass Bridge at Wild Horse Pass Boulevard & Ramps & Crossroad			
Description	Approx. Depth to Bottom of Stratum (feet)	Material Encountered	Relative Density / Consistency
Stratum 1 [A]	1 to 18	Existing Roadway Embankment Fill: Coarse-Grained Soils with variable amounts of Gravel, Silt, and Clay; with Fine-Grained Soils	Variable Medium Dense to Very Dense / Variable Stiff to Hard
Stratum 2	10 to 71½	Stratified deposits of Sandy Lean Clay, Fat Clay, and Coarse-Grained Soils with variable amounts of Gravel	Variable Loose to Very Dense / Variable Soft to Hard
Groundwater at approx. 64 to 74 feet deep (approx. Elev. 1,076 to 1,086 ft. amsl)			
Stratum 3 [B]	120½ (maximum depth explored)	Coarse-Grained Soils with variable amounts of Gravel, Cobbles, Silt and Clay	Variable Medium Dense to Very Dense

Generalized Subsurface Soil Conditions Summary			
I-10 TI Underpass Bridge at Wild Horse Pass Boulevard & Ramps & Crossroad			
Description	Approx. Depth to Bottom of Stratum (feet)	Material Encountered	Relative Density / Consistency

A. Existing roadway embankment fill encountered at the locations of Borings R&C–1, R&C–2, R&C–3, R&C–4, R&C–5, R&C–6, R&C–9, R&C–10, & R&C–12.
B. Auger refusal encountered in Stratum 3 due to gravels, cobbles and possible boulders at an approximate depth of 104.5 feet at the location of Boring B-1.

Generalized Subsurface Soil Conditions Summary			
I-10 TI Underpass Bridge at Queen Creek Road & Ramps & Crossroad			
Description	Approx. Depth to Bottom of Stratum (feet)	Material Encountered	Relative Density / Consistency
Stratum 1 [A]	3 to 20	Existing Roadway Embankment Fill: Coarse-Grained Soils with variable amounts of Gravel, Silt and Clay; with Sandy Lean Clay	Medium Dense to Dense / Very Stiff
Stratum 2	90 to 96	Stratified deposits of Sandy Lean Clay, Fat Clay, and Coarse-Grained Soils with variable amounts of Gravel	Variable Medium Dense to Very Dense / Variable Medium Stiff to Hard
Groundwater at approx. 63 to 89 feet deep (approx. Elev. 1,070 to 1,096 ft. amsl)			
Stratum 3 [B]	120½ (maximum depth explored)	Coarse-Grained Soils with variable amounts of Gravel, Silt and Clay	Variable Loose to Very Dense

A. Existing roadway embankment fill encountered at the locations of Borings R&C–13, R&C–14, R&C–15, R&C–16, R&C–17, R&C–18, R&C–19, R&C–20, & R&C–24.
B. Auger refusal encountered in Stratum 3 soils due to heaving sands at an approximate depth of 99 feet at the location of Boring B-6.

Generalized Subsurface Soil Conditions Summary			
I-10 TI Underpass Bridge at Riggs Road & Ramps & Crossroad			
Description	Approx. Depth to Bottom of Stratum (feet)	Material Encountered	Relative Density / Consistency
Stratum 1 [A]	1 to 22	Existing Roadway Embankment Fill: Coarse-Grained Soils with variable amounts of Gravel, Silt and Clay; and stratified with Fine Grained Soils	Medium Dense to Dense / Stiff to Very Stiff
Stratum 2	48 to 80	Coarse- and Fine-Grained Soils with variable amounts of Gravel, Silt and Clay	Variable Loose to Very Dense / Variable Stiff to Hard
Groundwater at approx. 67 to 77 feet deep (approx. Elev. 1,090 to 1,106 ft. amsl)			
Stratum 3	120 (maximum depth explored)	Coarse-Grained Soils with variable amounts of Gravel, Silt and Clay	Variable Medium Dense to Very Dense

A. Existing roadway embankment fill encountered at the locations of Borings R&C–25, R&C–26, R&C–27, R&C–28, R&C–30, R&C–31, R&C–32, & R&C–33.

Generalized Subsurface Soil Conditions Summary			
I-10 TI Underpass Bridge at Goodyear Road & Crossroad			
Description	Approx. Depth to Bottom of Stratum (feet)	Material Encountered	Relative Density / Consistency
Stratum 1 [A]	1 to 26	Existing Roadway Embankment Fill: Coarse-Grained Soils with variable amounts of Gravel, Silt and Clay; and Sandy Lean Clay	Loose to Medium Dense / Variable Medium Stiff to Very Stiff
Stratum 2	17 to 87	Stratified deposits of Coarse-Grained Soils with variable amounts of Gravel, Silt and Clay; and Sandy Lean Clay	Variable Loose to Very Dense / Variable Stiff to Hard
Groundwater at approx. 83 to 109 feet deep (approx. Elev. 1,099 to 1,108 ft. amsl)			
Stratum 3 [B]	114½ to 140½ (maximum depth explored)	Coarse-Grained Soils with variable amounts of Gravel, Silt and Clay	Variable Loose to Very Dense

A. Existing roadway embankment fill generally ranged between 1 to 2 feet. Borings B-10, B-14, B-15, and B-19 were drilled on Goodyear Road adjacent to the bridge abutment and the existing roadway embankment fill thickness ranged between approximately 19 and 26 feet.

B. Auger refusal was encountered in Stratum 3 soils due to gravels, cobbles and possible boulders at an approximate depth of 114.5 feet at the location of Boring B-16.

Pavement Subgrade Parameters

Based on the results of the pavement subgrade soil conditions encountered during our field exploration and laboratory testing for the project, the following sections provide a summary of the R-Values and Correlated R-Values for the project. Pavement subgrade evaluation was performed based on the results of the laboratory testing, including correlated and tested R-values, and in accordance with the 2017 ADOT Pavement Design Manual (PDM). The correlated R-Values presented in the following tables are in general accordance with Section 2.1.5.1 (Correlated R-value) and Table 2-3 (Correlated R-value at 300 psi) of the ADOT PDM (2017). Based on the Seasonal Variation Factors outlined on Table 2-4 of the ADOT PDM (2017) for Phoenix, Chandler and Casa Grande, a SVF of 1.0 was used for the project. All soils placed within 3 feet of finished pavement subgrade should meet the R-value requirements for the project.

I-10 Mainline Lanes and Shoulders Pavement Subgrade Parameters

The I-10 mainline roadway alignment for the project was divided into the following segments based on the annual average daily traffic volumes and existing pavement types:

- Segment 1 - I-10 Mainline - From Approximately northern end of project to south of Wild Horse Pass Boulevard / Sundust Road (or approx. Milepost (MP) 161.00 to 163.04 (WB) / 163.48 (EB); or approx. Station (Sta.) 841+25.79 to Stations 943+70.00 (WB) / 967+30.00 (EB)).

- Segment 2 - I-10 Mainline - From Approximately Wild Horse Pass Boulevard / Sundust Road to SR347 / Queen Creek Road (or approx. MP 163.04 (WB) / 163.48 (EB) to 164.5; or approx. Stations 943+70.00 (WB) / 967+30.00 (EB) to Sta. 1020).

- Segment 3 - I-10 Mainline - From SR347 / Queen Creek Road to Riggs Road (or approx. MP 164.5 to 168; or approx. Sta. 1020 to Sta. 1208).

- Segment 4 - I-10 Mainline - From Riggs Road to the Gila River Bridge (or approx. MP 168 to 172.75; or approx. Sta. 1208 to Sta. 1457).

The R-Values and Correlated R-Values for these I-10 segments are summarized in the following tables:

Legend: Liquid Limit (LL); Plasticity Index (PI); Percent Passing the No. 200 Sieve (-#200).

Notes: The Correlated R-values, R_{MEAN} and Construction Control R-values outlined in the following tables were correlated in general accordance with the 2017 ADOT PDM (Sections 2.1.5.1, 2.1.5.2 and 2.1.5.2), including determining R-value Adjusted Averages for standard deviations greater than 10.

Summary of Tested and Correlated R-Values								
I-10 Mainline Roadway Borings – Segment 1 From Approx. 202L to Wild Horse Pass Blvd / Sundust Rd								
Boring No.	Approx. Elevation (ft) [A]	Approx. Station and CL Offset	Depth (ft)	LL	PI	-#200	Tested R-Value	Correlated R-Value
R-1	1167.84	885+00; 25R±	1 - 3	24	7	47	--	40
R-2	1159.80	893+00; 25L±	0 - 5	35	15	43	--	31
R-3	1153.30	901+00; 25R±	2 - 5	29	14	46	15	31
R-4	1153.04	909+00; 25L±	0.5 - 4	25	5	36	--	50
R-5	1151.11	917+00; 25R±	1.5 - 5	20	4	47	57	45
R-6	1150.11	925+00; 25L±	0.5 - 5	21	3	34	--	56
R-7	1151.06	933+00; 25R±	0.5 - 5	20	1	29	--	64
R-8	1151.49	941+00; 25L±	0.5 - 4	0	0	43	--	55
R-9	1153.32	949+00; 25R±	0.5 - 4	21	2	38	72	55
R-10	1152.66	957+00; 25L±	1 - 5	22	6	43	--	44
R-11	1154.83	965+00; 25R±	1 - 5	20	3	39	--	52
R-73	1,150.73	937+00; 75R±	1 - 4	18	2	31	--	60
R-74	1,150.74	945+00; 75R±	1 - 5	20	5	42	39	46
R-75	1,151.62	953+00; 75R±	3 - 5	21	7	41	--	43
R-76	1,148.76	961+00; 75R±	1 - 3	23	9	42	--	39
						Count:	4	15
						Average:	45.8	47.3
						Adjusted Average:	31.2	47.3
						Standard Deviation:	24.5	10.0
						R_{mean}:	46.7	
						Design R_{mean}:	40	
						Construction Control R-Value (R_C):	30	

Summary of Tested and Correlated R-Values								
I-10 Mainline Roadway Borings – Segment 2 From Approx. Wild Horse Pass Blvd / Sundust Rd to SR347 / Queen Creek Rd								
Boring No.	Approx. Elevation (ft) [A]	Approx. Station and CL Offset	Depth (ft)	LL	PI	-#200	Tested R-Value	Correlated R-Value
R-8	1151.49	941+00; 25L±	0.5 - 4	0	0	43	--	55
R-9	1153.32	949+00; 25R±	0.5 - 4	21	2	38	72	55
R-10	1152.66	957+00; 25L±	1 - 5	22	6	43	--	44
R-11	1154.83	965+00; 25R±	1 - 5	20	3	39	--	52
R-12	1154.93	973+00; 25L±	1 - 5	22	8	41	46	41
R-13	1155.82	981+00; 25R±	0.5 - 4	19	4	45	--	46
R-14	1155.63	989+00; 25L±	1 - 5	25	11	51	21	32
R-15	1157.15	997+00; 25R±	1 - 4.5	38	20	64	--	19
R-16	1156.78	1005+00;25L±	0 - 4	39	18	77	17	17
R-17	1158.27	1013+00;25R±	1 - 4	38	19	75	--	17
R-18	1157.86	1021+00;25L±	0 - 4	39	19	67	--	19
R-74	1,150.74	945+00; 75R±	1 - 5	20	5	42	39	46
R-75	1,151.62	953+00; 75R±	3 - 5	21	7	41	--	43
R-76	1,148.76	961+00; 75R±	1 - 3	23	9	42	--	39
R-77	1,157.41	1001+00;75R±	1 - 5	27	13	51	--	30
R-78	1,156.95	1006+00;75L±	1.5 - 4	34	20	59	7	20
						Count:	6	16
						Average:	33.7	35.9
						Adjusted Average:	20.0	32.0
						Standard Deviation:	23.7	14.0
						R_{mean}:	30.6	
						Design R_{mean}:	30	
						Construction Control R-Value (R_C):	20	

Summary of Tested and Correlated R-Values								
I-10 Mainline Roadway Borings – Segment 3 From SR347 / Queen Creek Road to Riggs Road								
Boring No.	Approx. Elevation (ft) [A]	Approx. Station and CL Offset	Depth (ft)	LL	PI	-#200	Tested R-Value	Correlated R-Value
R-19	1159.55	1029+00; 25R±	3 - 5	30	15	55	--	26
R-20	1158.94	1037+00; 25L±	0 - 5	32	16	65	19	22
R-21	1160.87	1045+00; 25R±	1.5 - 4	29	13	49	--	31
R-22	1160.94	1053+00; 25L±	0 - 5	29	12	45	--	34
R-23	1162.09	1061+00; 25R±	1 - 5	27	9	49	--	36
R-24	1162.14	1069+00; 25L±	1 - 5	30	14	50	19	29
R-25	1162.88	1077+00; 25R±	1 - 5	29	12	47	--	33
R-26	1163.50	1085+00; 25L±	0 - 5	37	20	63	11	19
R-27	1164.52	1093+00; 25R±	1 - 5	33	17	54	--	24
R-28	1164.73	1101+00; 25L±	1 - 4	32	16	55	--	25
R-29	1167.22	1109+00; 25R±	2 - 5	36	19	51	--	23
R-30	1167.33	1117+00; 25L±	1 - 5	25	8	38	42	43
R-31	1168.66	1125+00; 25R±	0 - 5	26	9	40	--	40
R-32	1167.86	1133+00; 25L±	1 - 5	32	18	51	9	24
R-33	1168.85	1141+00; 25R±	2 - 5	31	17	67	--	20
R-34	1167.95	1149+00; 25L±	0 - 5	32	15	60	--	24
R-35	1169.74	1157+00; 25R±	2 - 5	27	12	48	--	32
R-36	1169.97	1165+00; 25L±	0.3 - 5	33	19	49	13	24
R-37	1170.12	1173+00; 25R±	0 - 5	34	18	57	--	22
R-79	1,158.36	1035+00; 75R±	0.5 - 3	22	6	34	--	49
			3 - 5	23	5	62	--	35
R-80	1,159.87	1042+00; 75L±	1 - 5	24	8	48	--	38
R-81	1,160.38	1048+00; 75L±	1 - 5	25	9	45	27	38
R-82	1,159.62	1051+00; 75R±	1 - 4	30	13	49	23	31
R-83	1,169.07	1153+00; 75L±	2.5 - 5	25	10	48	--	35
R-84	1,168.39	1161+00; 75R±	1 - 5	22	6	42	--	44
R-85	1,169.35	1169+00; 75L±	0 - 2.5	0	0	5	--	93
			2.5 - 5	32	11	45	--	35
						Count:	8	28
						Average:	20.4	33.2
						Adjusted Average:	19.7	29.1
						Standard Deviation:	10.7	14.1
						R_{mean}:	26.0	
						Design R_{mean}:	26	
						Construction Control R-Value (R_C):	20	

Summary of Tested and Correlated R-Values I-10 Mainline Roadway Borings – Segment 4 From Riggs Road to the Gila River Bridge								
Boring No.	Approx. Elevation (ft) [A]	Approx. Station and CL Offset	Depth (ft)	LL	PI	-#200	Tested R-Value	Correlated R-Value
R-38	1,169.95	1181+00; 25L±	0.3-4.5	29	11	56	--	30
R-39	1,172.54	1189+00; 25R±	0.3 - 5	36	23	66	9	16
R-40	1,172.87	1197+00; 25L±	0 - 5	32	16	50	--	27
R-41	1,174.69	1205+00; 25R±	1.5 - 5	32	17	51	--	25
R-42	1,175.52	1213+00; 25L±	0.3 - 5	39	20	60	10	20
R-43	1,176.73	1221+00; 25R±	0 - 3	24	8	25	--	52
R-44	1,177.39	1229+00; 25L±	0.3 - 2	24	9	37	--	42
			2 - 5	44	26	72	--	13
R-45	1,179.31	1237+00; 25R±	1 - 5	31	15	51	--	27
R-46	1,179.43	1245+00; 25L±	0.3 - 5	37	21	72	9	16
R-47	1,181.58	1253+00; 25R±	1.5 - 5	29	14	31	--	38
R-48	1,180.98	1261+00; 25L±	0.3 - 5	30	14	52	--	28
R-49	1,184.64	1269+00; 25R±	0 - 5	32	16	58	12	24
R-50	1,185.51	1277+00; 25L±	0.5 - 5	30	13	40	--	35
R-51	1,187.86	1285+00; 25R±	1 - 5	36	19	56	10	22
R-52	1,187.56	1293+00; 25L±	0.5 - 5	23	6	39	--	46
R-53	1,189.94	1301+00; 25R±	1 - 5	25	7	36	--	46
R-54	1,189.95	1309+00; 25L±	0.5 - 5	28	11	40	--	37
R-55	1,192.10	1317+00; 25R±	1 - 5	0	0	50	16	50
R-56	1,192.62	1325+00; 25L±	1 - 5	30	12	55	13	29
R-57	1,194.44	1333+00; 25R±	1 - 3	30	13	28	--	41
R-58	1,194.62	1341+00; 25L±	1 - 4	26	12	51	--	31
R-59	1,195.58	1349+00; 25R±	1 - 5	29	12	48	29	32
R-60	1,196.00	1357+00; 25L±	0.5 - 3	0	0	16	--	80
R-61	1,196.37	1365+00; 25R±	2 - 4	21	6	32	48	51
R-62	1,194.60	1373+00; 25L±	1.5 - 4	16	1	32	--	62
R-63	1,193.97	1381+00; 25R±	0 - 4	0	0	17	--	79
R-64	1,192.62	1389+00; 25L±	2 - 5	22	3	39	60	52
R-65	1,194.37	1397+00; 25R±	0.5 - 4	0	0	37	--	60
R-66	1,195.23	1405+00; 25L±	1 - 3	0	0	32	--	64
R-67	1,196.03	1413+00; 25R±	1 - 4	0	0	17	80	79
			4 - 5	21	4	56	--	39
R-68	1,196.33	1421+00; 25L±	2 - 5	20	3	41	70	50
R-69	1,198.20	1429+00; 25R±	1 - 5	0	0	21	--	75
R-70	1,198.45	1437+00; 25L±	2 - 5	0	0	31	--	65

Summary of Tested and Correlated R-Values I-10 Mainline Roadway Borings – Segment 4 From Riggs Road to the Gila River Bridge								
Boring No.	Approx. Elevation (ft) [A]	Approx. Station and CL Offset	Depth (ft)	LL	PI	-#200	Tested R-Value	Correlated R-Value
R-71	1,198.20	1445+00; 25R±	1 - 5	0	0	24	80	72
R-72	1,198.46	1453+00; 25L±	1 - 5	0	0	29	--	67
R-86	1,169.62	1187+00; 75R±	1 - 3	0	0	54	--	47
			3 - 6	32	17	49	--	26
R-87	1,172.92	1195+00; 75L±	1.5 - 5	0	0	60	10	44
R-88	1,173.13	1200+00; 75R±	1.5 - 5	39	23	37	8	24
R-89	1,173.42	1203+00; 75L±	2 - 5	29	13	51	11	30
R-90	1,188.06	1289+00; 60R±	2 - 5	22	5	35	44	51
R-91	1,190.06	1298+00; 60L±	2 - 5	23	6	36	52	48
R-92	1,191.94	1312+00; 60R±	2 - 5	30	12	50	22	31
R-93	1,190.16	1320+00; 60L±	0.5 - 5	35	17	55	16	24
						Count:	20	46
						Average:	30.5	42.4
						Adjusted Average:	14.8	34.0
						Standard Deviation:	25.7	18.4
						R_{mean}:	30.5	
						Design R_{mean}:	30	
						Construction Control R-Value (R_C):	20	

Note [A]: Approximate existing ground surface elevation at the surveyed boring location at the time of the geotechnical field exploration.

The following table summarizes the Design and Construction Control R-values for each I-10 Mainline Segments:

Design and Construction Control R-Values for I-10 Mainline		
I-10 Mainline Segment	Design R-Value	Construction Control R-Value
Segment 1 – North end of Project to Wild Horse Pass Blvd/Sundust Rd	40[A]	30[A]
Segment 2 - Wild Horse Pass Blvd/Sundust Rd to SR347/Queen Creek Rd	30	20
Segment 3 - From SR347 / Queen Creek Road to Riggs Road	26	20
Segment 4 - From Riggs Road to the Gila River Bridge	30	20
Note [A]: A design R-value of 46 and construction control R-value of 36 were calculated, but the lower values presented are recommended to reduce areas of unsuitable subgrade during construction. The impact to pavement thickness in this part of the project is minimal.		

Crossroads & Traffic Interchange Ramps – Pavement Subgrade Parameters

The project includes crossroad and traffic interchange ramps at the following roadway crossings over I-10:

- Wild Horse Pass Boulevard / Sundust Road
- State Route 347 (SR 347) / Queen Creek Road
- Riggs Road

The project includes a crossroad only (and no traffic interchange ramps) at the following roadway crossings over I-10:

- Goodyear Road

The R-Values and Correlated R-Values for each of the crossroads are summarized in the following tables:

Summary of Tested and Correlated R-Values

Wild Horse Pass Boulevard / Sundust Road Crossroad & Ramps at I-10

Boring No.	Approx. Elevation (ft) [A]	Approx. Latitude / Longitude; and Approx. Station and CL Offset	Depth (ft)	LL	PI	-#200	Tested R-Value	Correlated R-Value
R&C-1	1,147.35	33.278°/-111.970°; WHP Sta. 30 & 60L±	1-4.5	26	15	62	--	23
R&C-2	1,159.48	33.279°/-111.969°; WHP Sta. 27 & 0±	1 - 5	28	15	52	31	27
R&C-3	1,172.45	33.280°/-111.968°; EB Off Rmp Sta. 19 & 0±	1 - 4	28	15	62	--	24
R&C-4	1,157.59	33.281°/-111.968°; EB Off Rmp Sta. 14 & 0±	2 - 5	30	17	70	30	20
R&C-5	1,155.79	33.282°/-111.968°; WB On Rmp Sta. 12 & 0±	2 - 5	22	11	39	--	38
R&C-6	1,170.04	33.280°/-111.966°; SnDst Sta. 15 & 70R±	0 - 5	32	18	43	44	27
R&C-7	1,154.82	33.280°/-111.964°; SnDst Sta. 11 & 60L±	0 - 5	21	10	36	--	41
R&C-8	1,153.89	33.281°/-111.963°; SnDst Sta. 6 & 40R±	0.5-5	22	7	31	--	49
R&C-9	1,164.62	33.279°/-111.966°; WB Off Rmp Sta. 2 & 0±	0 - 5	35	19	30	--	32
R&C-10	1,153.35	33.278°/-111.965°; WB Off Rmp Sta. 8 & 0±	1 - 5	23	10	28	--	46
R&C-11	1,148.37	33.278°/-111.967°; EB On Rmp Sta. 4 & 0±	0 - 4	26	11	26	56	45
			4 - 5	0	0	17	--	79
R&C-12	1,169.97	33.279°/-111.968°; WHP Sta. 20 & 60L±	4 - 5	27	11	3	--	63
						Count:	4	13
						Average:	40.3	39.6
						Adjusted Average:	38.0	32.3
						Standard Deviation:	12.3	17.3
						R_{mean}:	34.5	
						Design R_{mean}:	30	
						Construction Control R-Value (R_C):	20	

Summary of Tested and Correlated R-Values								
State Route 347 (SR 347) / Queen Creek Road Crossroad & Ramps at I-10								
Boring No.	Approx. Elevation (ft) [A]	Latitude / Longitude	Depth (ft)	LL	PI	-#200	Tested R-Value	Correlated R-Value
R&C-13	1,159.59	33.258°/-111.950°; EB Off Rmp Sta. 24 & 0±	1.5 - 5	21	5	38	--	48
R&C-14	1,167.21	33.257°/-111.949°; WB On Rmp Sta. 25 & 0±	2 - 4	28	13	47	--	31
			4 - 6	19	3	28	--	61
R&C-15	1,175.30	33.256°/-111.950°; EB Off Rmp Sta. 32 & 0±	1 - 5	23	7	38	16	45
R&C-16	1,159.77	33.256°/-111.948°; WB On Rmp Sta. 30 & 0±	1 - 3	0	0	20	--	76
			3 - 5	22	7	45	--	41
R&C-17	1,155.73	33.253°/-111.955°; SR347 Sta. 2819 & 50L±	0.5 - 4	23	5	25	--	58
R&C-18	1,173.53	33.255°/-111.950°; SR347 Sta. 2834 & 50L±	1 - 5	33	16	47	7	28
R&C-19	1,170.32	33.257°/-111.946°; QCR Sta. 2850 & 30L±	1 - 4	23	7	31	40	49
R&C-20	1,160.52	33.254°/-111.952°; SR347 Sta. 2827 & 50R±	0.3 - 5	27	8	37	9	44
R&C-21	1,157.45	33.255°/-111.949°; SR347 Sta. 2836 & 100R±	0 - 2	0	0	26	--	70
			2 - 5	39	22	59	--	19
R&C-22	1,160.97	33.256°/-111.947°; QCR Sta. 2846 & 80R±	1 - 7	31	15	65	--	23
R&C-23	1,171.36	33.254°/-111.948°; EB On Rmp Sta. 5 & 0±	1.1 - 5	19	3	36	--	54
R&C-24	1,171.19	33.255°/-111.947°; WB Off Rmp Sta. 5 & 0±	1 - 5	23	5	30	60	54
						Count:	5	15
						Average:	26.4	46.8
						Adjusted Average:	13.5	40.2
						Standard Deviation:	22.9	16.5
						R_{mean}:	36.3	
						Design R_{mean}:	33	
						Construction Control R-Value (R_C):	23	

Summary of Tested and Correlated R-Values								
Riggs Road Ramps & Crossroad at I-10								
Boring No.	Approx. Elevation (ft) [A]	Latitude / Longitude	Depth (ft)	LL	PI	-#200	Tested R-Value	Correlated R-Value
R&C-25	1,170.20	33.222°/-111.923°; EB Off Rmp Sta. 26 & 0±	0 - 1.5	0	0	9	--	88
			1.5 - 4	27	13	36	19	37
			4 - 5	42	22	74	--	15
R&C-26	1,170.20	33.221°/-111.921°; WB On Rmp Sta. 15 & 0±	0 - 4	0	0	9	--	88
R&C-27	1,171.44	33.220°/-111.923°; EB Off Rmp Sta. 33 & 0±	0.5 - 5	31	14	43	26	32
R&C-28	1,170.23	33.220°/-111.918°; WB On Rmp Sta. 26 & 0±	0 - 5	31	15	28	--	38
R&C-29	1,168.01	33.219°/-111.924°; Riggs Sta. 25 & 30L±	1 - 4	33	14	38	40	34
R&C-30	1,185.32	33.219°/-111.922°; Riggs Sta. 19 & 10L±	0.3 - 2	0	0	9	--	88
			2 - 4	38	21	40	--	25
R&C-31	1,184.84	33.219°/-111.919°; Riggs Sta. 10 & 10L±	2 - 5	43	27	57	8	16
R&C-32	1,170.39	33.219°/-111.917°; Riggs Sta. 6 & 30L±	0.5 - 5	36	19	51	8	24
R&C-33	1,170.69	33.219°/-111.923°; EB On Rmp Sta. 12 & 0±	0 - 4	22	4	19	--	66
			4 - 5	0	0	43	--	55
R&C-34	1,171.85	33.218°/-111.919°; EB On Rmp Sta. 23 & 0±	0.8 - 4	0	0	7	--	91
						Count:	5	14
						Average:	20.2	49.8
						Adjusted Average:	16.7	30.8
						Standard Deviation:	13.5	29.0
						R_{mean}:	22.0	
						Design R_{mean}:	22	
						Construction Control R-Value (R_C):	20	

Summary of Tested and Correlated R-Values								
Goodyear Road Crossroad at I-10								
Boring No.	Approx. Elevation (ft) [A]	Latitude / Longitude	Depth (ft)	LL	PI	-#200	Tested R-Value	Correlated R-Value
R&C-35	1,185.72	33.190°/-111.901°; Gdyr Sta. 2 & 20R±	0 – 5	35	18	35	26	31
R&C-36	1,197.50	33.190°/-111.899°; Gdyr Sta. 7 & 30L±	0 – 2	23	5	46	--	44
			2 – 5	26	9	40	61	41
R&C-37	1,199.11	33.190°/-111.897°; Gdyr Sta. 14 & 30R±	0 – 5	25	9	40	--	40
R&C-38	1,190.03	33.190°/-111.895°; Gdyr Sta. 20 & 20L±	0.5 - 4	20	7	35	--	47
						Count:	2	5
						Average:	43.5	40.5
						Adjusted Average:	28.8	40.5
						Standard Deviation:	24.8	6.1
						R_{mean}:	40.2	
						Design R_{mean}:	36	
						Construction Control R-Value (R_C):	26	

Note [A]: Approximate existing ground surface elevation at the surveyed boring location at the time of the geotechnical field exploration.

The following table summarizes the Design and Construction Control R-values for the Crossroads and Traffic Interchange Ramps for the project:

Recommended Design and Construction Control R-Values for Crossroads & TI Ramps		
Crossroad	Design R-Value	Construction Control R-Value
Wild Horse Pass Boulevard / Sundust Road	30	20
State Route 347 / Queen Creek Road	33	23
Riggs Road	22	20
Goodyear Road	36	26

Legend: Liquid Limit (LL); Plastic Index (PI); Percent Passing the No. 200 Sieve (-#200).

Notes: The Correlated R-values, R_{MEAN} and Construction Control R-values outlined in the following tables were correlated in general accordance with the 2017 ADOT PDM (Sections 2.1.5.1, 2.1.5.2 and 2.1.5.2), including determining R-value Adjusted Averages for standard deviations greater than 10. Design and Construction Control R-values were reduced slightly where appropriate to reduce over-excavation limits.

Unsuitable Subgrade and Over-Excavation Limits

Areas of the proposed roadway alignment that include subgrade soils with an R-value of less than the requirement (unsuitable subgrade materials) will require over-excavation of these areas to a minimum depth of 3 feet below finished subgrade elevation. The over-excavated areas should be replaced with suitable soils meeting the project R-value requirements for that Segment. The over-excavation of unsuitable subgrade should extend across the entire proposed pavement width plus a minimum lateral extent of 2 feet or up to the edge of the adjacent existing pavement. The recommended R-value requirements were compared to the tested and correlated R-values previously tabulated, and the following tables provide an outline of the required areas for removal of unsuitable subgrade soils to a depth of 3 feet below finished subgrade (or mitigation based on the placement of approved geogrid, if applicable). These removal limits are subject to change based on subgrade acceptance testing during construction.

I-10 Mainline Lanes and Shoulders

Segment 1 - I-10 Mainline Unsuitable Subgrade Materials						
Boring No.	Boring Approx. Station and CL Offset	R-Value [1]	Construction Control R-Value	[2] Unsuitable Subgrade Removal Area	Unsuitable Subgrade Removal Station Limits	Geogrid Alternative to Subgrade Removal [3]
R-3	901+00; 25R±	15(T) 31(C)	30	Center Median Widening (WB & EB)	897+00 to 905+00	No

Segment 2 - I-10 Mainline Unsuitable Subgrade Materials						
Boring No.	Boring Approx. Station and CL Offset	R-Value [1]	Construction Control R-Value	[2] Unsuitable Subgrade Removal Area	Unsuitable Subgrade Removal Station Limits	Geogrid Alternative to Subgrade Removal [3]
R-15	997+00; 25R±	19 (C)	20	Center Median Widening (WB & EB)	985+00 to 1025+00	Yes
R-16	1005+00;25L±	17 (T&C)				
R-17	1013+00;25R±	17 (C)				
R-18	1021+00;25L±	19 (C)				
R-78	1006+00;75L±	7(T) 20(C)	20	WB Outside Shoulder Widening	1002+00 to 1010+00	No

Segment 3 - I-10 Mainline Unsuitable Subgrade Materials						
Boring No.	Boring Approx. Station and CL Offset	R-Value [1]	Construction Control R-Value	[2] Unsuitable Subgrade Removal Area	Unsuitable Subgrade Removal Station Limits	Geogrid Alternative to Subgrade Removal [3]
R-20	1037+00; 25L±	19(T) 22(C)	20	Center Median Widening (WB & EB)	1033+00 to 1041+00	Yes
R-24	1069+00; 25L±	19 (T)	20	Center Median Widening (WB & EB)	1065+00 to 1073+00	Yes
R-26	1085+00; 25L±	11 (T) 19(C)	20	Center Median Widening (WB & EB)	1081+00 to 1089+00	Yes
R-32	1133+00; 25L±	9 (T)	20	Center Median Widening (WB & EB)	1129+00 to 1137+00	No
R-36	1165+00; 25L±	13 (T)	20	Center Median Widening (WB & EB)	1161+00 to 1169+00	Yes

Segment 4 - I-10 Mainline Unsuitable Subgrade Materials						
Boring No.	Boring Approx. Station and CL Offset	R-Value [1]	Construction Control R-Value	[2] Unsuitable Subgrade Removal Area	Unsuitable Subgrade Removal Station Limits	Geogrid Alternative to Subgrade Removal [3]
R-39	1189+00; 25R±	9(T) 16(C)	20	Center Median Widening (WB & EB)	1185+00 to 1193+00	No
R-42	1213+00; 25L±	10(T) 20(C)	20	Center Median Widening (WB & EB)	1209+00 to 1217+00	Yes

Segment 4 - I-10 Mainline Unsuitable Subgrade Materials						
Boring No.	Boring Approx. Station and CL Offset	R-Value [1]	Construction Control R-Value	[2] Unsuitable Subgrade Removal Area	Unsuitable Subgrade Removal Station Limits	Geogrid Alternative to Subgrade Removal [3]
R-44	1229+00; 25L±	13(C)	20	Center Median Widening (WB & EB)	1225+00 to 1233+00	Yes
R-46	1245+00; 25L±	9(T) 16(C)	20	Center Median Widening (WB & EB)	1241+00 to 1249+00	No
R-49	1269+00; 25R±	12 (T)	20	Center Median Widening (WB & EB)	1265+00 to 1273+00	Yes
R-51	1285+00; 25R±	10(T) 22(C)	20	Center Median Widening (WB & EB)	1281+00 to 1289+00	Yes
R-55	1317+00; 25R±	16 (T)	20	Center Median Widening (WB & EB)	1313+00 to 1329+00	Yes
R-56	1325+00; 25L±	13 (T)				
R-87	1195+00; 75L±	10 (T)	20	WB Outside Shoulder Widening	1191+00 to 1207+00	Yes
R-89	1203+00; 75L±	11 (T)				
R-88	1200+00; 75R±	8 (T)	20	EB Outside Shoulder Widening	1196+00 to 1204+00	No
R-93	1320+00; 60L±	16 (T)	20	WB & EB Outside Shldr. Widening	1316+00 to 1324+00	Yes

Note [1]: Tested R-value (T); Correlated R-value (C). Note [2]: Eastbound (EB); Westbound (WB). Note [3]: The placement of geogrid as part of the pavement structure can be considered as an alternative to removal of unsuitable subgrade provided the geogrid meets the project requirements including the requirements and specifications outlined in the 2017 ADOT PDM and in the ADOT Standard Specifications. The placement of Geogrid is to include a Geotextile under the Geogrid meeting the ADOT and Project requirements and specifications. Geogrid alternative only applicable under new AC pavements. Geogrid alternative is not applicable under new PCCP. If the Geogrid (with Geotextile) alternative is used, a minimum aggregate base (AB) of 8 inches is required; therefore, if the pavement section AB is less than 8 inches, the AB should be increased to a minimum thickness of 8 inches.

Crossroads & Traffic Interchange Ramps

State Route 347 (SR 347) / Queen Creek Road Crossroad & Ramps at I-10						
Boring No.	Boring Approx. Latitude / Longitude	R-Value [1]	Construction Control R-Value	Unsuitable Subgrade Removal Area	Unsuitable Subgrade Removal Limits [3]	Geogrid Alternative to Subgrade Removal [4]
R&C-15	33.256°/-111.950°	16 (T)	23	EB Off-Ramp	From Approx. Ramp Station 30+00 to 35+00	No
R&C-18	33.255°/-111.950°	7 (T)		New AC and PCCP	From approx. 200 feet west of the I-10 CL to 2,100 feet west of the I-10 CL (approx. 1,900-ft length)	No
R&C-20	33.254°/-111.952°	9 (T)				
R&C-21	33.255°/-111.949°	19 (C)				

Riggs Road Crossroad & Ramps at I-10						
Boring No.	Boring Approx. Latitude / Longitude	R-Value [1]	Construction Control R-Value	[2] Unsuitable Subgrade Removal Area	Unsuitable Subgrade Removal Limits [3]	Geogrid Alternative to Subgrade Removal [4]
R&C-25	33.222°/-111.923°	19 (T)	20	EB Off-Ramp	From Approx. Ramp Station 24+00 to 30+00	Yes
R&C-31	33.219°/-111.919°	8(T) 16(C)		New PCCP	From approx. I-10 CL to 1,050 feet east of the I-10 CL (approx. 1,050-ft length)	No
R&C-32	33.219°/-111.917°	8 (T)				

Note [1]: Tested R-value (T); Correlated R-value (C). Note [2]: Eastbound (EB); Westbound (WB). Note [3]: Unsuitable Subgrade Removal Limits only applicable for existing subgrade soils within the upper 3 feet of finished subgrade under planned new pavements. Unsuitable Subgrade Removal Limits not applicable in planned new (ramp) pavement areas that will be realigned and constructed in new engineered roadway embankment fills with the upper 3 feet beneath finished subgrade meeting the project requirements including suitable R-value requirements.
Note [4]: The placement of geogrid as part of the pavement structure can be considered as an alternative to removal of unsuitable subgrade provided the geogrid meets the project requirements including the requirements and specifications outlined in the 2017 ADOT PDM and in the ADOT Standard Specifications. The placement of Geogrid is to include a Geotextile under the Geogrid meeting the ADOT and Project requirements and specifications. Geogrid alternative only applicable under new AC pavements. Geogrid alternative is not applicable under new PCCP. If the Geogrid (with Geotextile) alternative is used, a minimum aggregate base (AB) of 8 inches is required; therefore, if the pavement section AB is less than 8 inches, the AB should be increased to a minimum thickness of 8 inches.

Pavement Thickness Design

The Average Annual Daily Traffic (AADT) and truck percentages for this report were obtained from a combination of the project DCR with 2019 traffic data and the subsequently published ADOT 2022 AADT Report. The design Equivalent Single Axle Loads (ESALs) for the various pavements planned for the project were determined using the following parameters:

- Two-way traffic outlined in the 2023 DCR (unless otherwise noted)
- Annual growth rates derived from the DCR and/or ADOT AADT projections
- Truck Load Factor Clusters and associated cluster distribution
- Truck Traffic Classification (TTC) with associated Vehicle Class Distribution (VCD)
- A Directional Distribution (D_D) Factor and a Lane Distribution (D_L) Factor
- An initial design year of 2027 (anticipated build year)

The I-10 Mainline pavement improvements include the following:

- Portland cement concrete pavement (PCCP) widening from the north end of the project to slightly south of Wild Horse Pass Boulevard / Sundust Road (approx. MP 161 to 163.04/163.48).
- Asphaltic concrete (AC) pavement widening from slightly south of Wild Horse Pass Boulevard / Sundust Road to the Gila River Bridge (approx. MP 163.04/163.48 to 172.75).
- Mill and fill existing asphaltic concrete pavements (approx. MP 161 to 169.5 and 170.2 to 172.75).
- Full width and widening reconstruction of AC pavements on I-10 at Goodyear Road (approx. MP 169.5 to 170.2).

The roadway bridge approaches for the I-10 crossings are planned to consist of PCCP for the following crossroads:

- Wild Horse Pass Boulevard / Sundust Road
- State Route 347 (SR347) / Queen Creek Road
- Riggs Road
- Goodyear Road

New asphaltic concrete (AC) pavement and/or AC milling and filling is planned beyond the PCCP crossroad limits for the following crossroads:

- Wild Horse Pass Boulevard / Sundust Road
- State Route 347 (SR347) / Queen Creek Road
- Riggs Road

Note: The Goodyear Road bridge approach and crossroad improvements planned for the project are planned to consist entirely of PCCP.

The Design Traffic, Traffic Design Parameters, and the Design ESALs are outlined in the following sections based on the I-10 Mainline, Ramps, and Crossroads outlines above. The Design ESALs were evaluated for each Ramp based on the AADT provided in the DCR and on the design parameters outlined in this report, as well as a comparison to 10 percent of the I-10 Mainline ESALs as outlined in the ADOT PDM (2017). The DCR provided 2-way AADT for the east and west sides of the Crossroads. The east and west Design ESALs for each Crossroad were compared, and the Crossroad PCCP roadway bridge approach for both sides of I-10 was evaluated based on the greater (east or west) crossroad Design ESALs.

Design Traffic

The AADT information presented in the DCR and ADOT 2022 AADT Report was used to determine the growth rates between projected traffic volumes for the I-10 Mainline segments. The AADT information for each of the Traffic Interchange Ramps and Crossroads was obtained from information presented in the project DCR, the ADOT 2022 AADT Report, the ADOT Multimodal Planning Transportation Data Management System, and the Maricopa County Traffic Counts database. The DCR included ADT information for the years of 2025, 2035, 2040 and 2050. A growth rate for the design period (of 2025 to 2045) was not provided. Therefore, the growth rate was estimated based on the 2025 AADT and the interpolated 2045 AADT.

I-10 Mainline Lanes and Shoulders

The following tables summarize the AADT and estimated growth rates for the I-10 Mainline segments for the project:

I-10 Mainline Segment	2019 AADT (DCR)	2040 AADT (DCR)	2050 AADT (DCR)	2022 AADT (ADOT)	2042 AADT (ADOT)
Segment 1 (MP161 to WHP)	124,000	197,000	224,000	108,055	182,343
Estimated Growth Rate:	2.23%			2.651%	
	1.93%				
Design Values:	2027 AADT:	147,916	2022 ADOT Truck %:	Singles:	3.50%
	Growth Rate:	2.23%		Combos:	7.09%
Note:	AADT and Growth Rate selected for project based on DCR.				

I-10 Mainline Segment	2019 AADT (DCR)	2040 AADT (DCR)	2050 AADT (DCR)	2022 AADT (ADOT)	2042 AADT (ADOT)
Segment 2 (WHP to SR347)	107,000	171,000	198,000	112,237	189,400
Estimated Growth Rate:	2.26%			2.65%	
	2.01%				
Design Value:	2027 AADT:	127,924	2022 ADOT Truck %:	Singles:	4.14%
	Growth Rate:	2.65%		Combos:	9.57%
Note:	AADT and Growth Rate selected for project based on ADOT 2022 Report.				

I-10 Mainline Segment	2019 AADT (DCR)	2040 AADT (DCR)	2050 AADT (DCR)	2022 AADT (ADOT)	2042 AADT (ADOT)
Segment 3 (SR347-Riggs Rd)	82,800	152,000	180,000	55,081	92,949
Estimated Growth Rate:	2.94%			2.65%	
	2.54%				
Design Value:	2027 AADT:	104,360	2022 ADOT Truck %:	Singles:	8.45%
	Growth Rate:	2.94%		Combos:	19.49%
Note:	AADT and Growth Rate selected for project based on DCR.				

I-10 Mainline Segment	2019 AADT (DCR)	2040 AADT (DCR)	2050 AADT (DCR)	2022 AADT (ADOT)	2042 AADT (ADOT)
Segment 4 (Riggs Rd to GRB)	65,200	134,000	163,000	65,404	133,050
Estimated Growth Rate:	3.49%			3.61%	
	3.00%				
Design Value:	2027 AADT:	78,108	2022 ADOT Truck %:	Singles:	2.77%
	Growth Rate:	3.61%		Combos:	7.34%
Note:	AADT and Growth Rate selected for project based on ADOT 2022 Report.				

Legend: Wild Horse Pass Boulevard (WHP); State Route 347 (SR347); Gila River Bridge (GRB).

Traffic Interchange Ramps

The following tables present the projected traffic data and growth rates for each of the project Traffic Interchange Ramps:

Ramps – I-10 Traffic Interchange at Wild Horse Pass Blvd / Sundust Road						
Ramp	2025 AADT (DCR)	2035 AADT (DCR)	2040 AADT (DCR)	2045 AADT (interpolated)	2050 AADT (DCR)	2025 to 2045 Growth Rate [A]
WB Off-Ramp	5,000	7,000	8,000	8,850	9,700	2.90%
WB On-Ramp	18,600	36,000	44,700	46,900	49,100	4.74%
EB Off-Ramp	15,900	25,200	29,900	32,250	34,600	3.60%
EB On-Ramp	7,100	12,800	15,600	16,500	17,400	4.32%

Ramps – I-10 Traffic Interchange at SR347 / Queen Creek Road						
Ramp	2025 AADT (DCR)	2035 AADT (DCR)	2040 AADT (DCR)	2045 AADT (interpolated)	2050 AADT (DCR)	2025 to 2045 Growth Rate [A]
WB Off-Ramp	1,300	2,900	3,600	4,150	4,700	6.00%
WB On-Ramp	21,100	27,200	30,300	30,900	31,500	1.94%
EB Off-Ramp	20,200	25,100	27,600	28,150	28,700	1.68%
EB On-Ramp	2,500	6,200	8,000	8,550	9,100	6.35%

Ramps – I-10 Traffic Interchange at Riggs Road						
Ramp	2025 AADT (DCR)	2035 AADT (DCR)	2040 AADT (DCR)	2045 AADT (interpolated)	2050 AADT (DCR)	2025 to 2045 Growth Rate [A]
WB Off-Ramp	2,600	3,300	3,700	3,900	4,100	2.10%
WB On-Ramp	6,300	6,000	5,900	6,200	6,500	1% [B]
EB Off-Ramp	8,900	12,400	14,200	14,900	15,600	2.64%
EB On-Ramp	1,800	2,000	2,100	2,200	2,300	1.10%

I-10 at Goodyear Road
Goodyear Road crossing at I-10 excludes ramps.

Note [A]: Estimated Growth Rates for the 20-year Design Period of 2025 to 2045.
Note [B]: Estimated Growth Rates resulted in approx. 0%, therefore, defaulted to the minimum of 1% in general accordance with the 2017 ADOT PDM.

Crossroads

The following tables present the projected traffic data and growth rates for each of the project Crossroads:

Wild Horse Pass Blvd / Sundust Road Crossroad at the I-10 Traffic Interchange						
Roadway	2025 AADT (DCR)	2035 AADT (DCR)	2040 AADT (DCR)	2045 AADT (interpolated)	2050 AADT (DCR)	2025 to 2045 Growth Rate [A]
West of I-10	36,200	71,100	88,500	93,150	97,800	3.86%
East of I-10	17,100	28,700	34,500	34,800	35,100	2.90%

SR347 / Queen Creek Road Crossroad at the I-10 Traffic Interchange						
Roadway	2025 AADT (DCR)	2035 AADT (DCR)	2040 AADT (DCR)	2045 AADT (interpolated)	2050 AADT (DCR)	2025 to 2045 Growth Rate [A]
West of I-10	40,600	63,600	75,200	80,400	85,600	2.78%
East of I-10	25,300	37,600	43,800	46,450	49,100	2.46%

Riggs Road Crossroad at the I-10 Traffic Interchange						
Roadway	2025 AADT (DCR)	2035 AADT (DCR)	2040 AADT (DCR)	2045 AADT (interpolated)	2050 AADT (DCR)	2025 to 2045 Growth Rate [A]
West of I-10	8,000	10,300	11,500	12,100	12,700	1.70%
East of I-10	14,600	18,300	20,200	21,200	22,200	1.51%

Goodyear Road Crossroad at I-10		
Roadway	2025 AADT	2025 to 2045 Growth Rate
Goodyear Road	3,000 [B]	8.72% [B]

Notes [B]: No traffic data available. Roadway is a low volume road with an AADT estimated at less than 500. The 2025 AADT and assumed growth rate are based on back-calculations of the ESALs matching the ADOT minimum PCCP thickness of 9-inches.

Note [A]: Estimated Growth Rates for the 20-year Design Period of 2025 to 2045.

Traffic Design Parameters and ESALs

The Truck Traffic Classification (TTC), Lane Distribution Factor (D_L), and the Truck Load Factor Cluster were selected based on Tables A-1, A-2 and A-4 in the ADOT PDM (2017), respectively. The Directional Distribution Factor (D_D) are based on ADOT 2022 AADT Report and/or the ADOT Multimodal Planning Transportation Data Management System. The Truck Volumes (of Singles and Combos) were obtained from the ADOT 2022 AADT Report for the I-10 Mainline segments. Specific Truck Volumes (of Singles and Combos) for the Traffic Interchange Ramps were not available; therefore, the Truck Volumes for the Traffic Interchange Ramps were estimated based on the Singles and Combos percentages of the I-10 Mainline. Truck Volumes for the Crossroads were only available on the ADOT 2022 AADT Report for SR347 / Queen Creek Road; therefore, the Truck Volumes for the remaining Crossroads (Wild Horse Pass Boulevard / Sundust Road, Riggs Road, and Goodyear Road) were estimated based on the Singles and Combos percentages of SR347 / Queen Creek Road.

I-10 Mainline Lanes and Shoulders

The traffic design parameters used for I-10 Mainline pavement thickness design for the project are presented in the following tables:

I-10 Mainline Segment	Cluster No.	Truck Traffic Classification	Lane Distribution Factor (D_L)	Directional Distribution Factor (D_D)
Segment 1 (MP161 to WHP)	1	AZ-3	0.8	0.57
Segment 2 (WHP to SR347)	1	AZ-2	0.8	0.54
Segment 3 (SR347 to Riggs Rd)	1	AZ-2	0.8	0.53
Segment 4 (Riggs Rd to GRB)	1	AZ-2	0.8	0.67

Note: The Directional Distribution Factor used in the analyses was the greatest value between the directional ratio between the ratio of Positive and Negative Direction AADT and the D Factor presented in the ADOT 2022 AADT Report. The Lane Distribution Factor is based on the planned widening improvements of 3 lanes in each direction. Segment 1 contains both 3-lane and 4-lane configurations. Pavement thicknesses were essentially the same with both configurations and a 3-lane distribution factor was used in the design.

Based on the traffic design parameters outlined in this report, the total estimated design Equivalent Single Axle Loads (ESALs) are outlined in the following tables:

I-10 Mainline Segment	2027 AADT	Truck Volumes Singles (Combos) [1]	Growth Rate (%)	Design Period (years)	Design ESALs (flexible)	Pavement Type
Segment 1 (MP161 to WHP)	147,916	4,341 (8,797)	2.23	20	94,765,684	Rigid
Segment 2 (WHP to SR347)	127,924	4,652 (10,737)	2.65	20	93,638,364	Flexible
Segment 3 (SR347-Riggs Rd)	104,360	6,997 (16,138)	2.94	20	156,863,749	Flexible
Segment 4 (Riggs Rd to GRB)	78,108	1,811 (4,802)	3.61	20	57,792,883	Flexible

Note [1]: The Truck Volumes (Singles and Combos) are based on the percentage of these trucks based on the ADOT 2022 AADT Report.

Traffic Interchange Ramps

The traffic design parameters used for Traffic Interchange Ramps pavement thickness design and their estimated design Equivalent Single Axle Loads (ESALs) are outlined in the following tables:

Ramps – I-10 Traffic Interchange at Wild Horse Pass Blvd / Sundust Road				
Ramp	Cluster No.	Truck Traffic Classification	Lane Distribution Factor (D_L)	Directional Distribution Factor (D_D)
WB Off-Ramp	1	AZ-2	1.0	1.0
WB On-Ramp	1	AZ-2	1.0	1.0
EB Off-Ramp	1	AZ-2	0.9	1.0
EB On-Ramp	1	AZ-2	1.0	1.0

Ramps – I-10 Traffic Interchange at Wild Horse Pass Blvd / Sundust Road					
Ramp	2027 AADT	Truck Volumes Singles (Combos)	Growth Rate (%)	Design Period (years)	Design ESALs (Rigid)
WB Off-Ramp	5,294	207 (479)	2.90	20	12,768,252
WB On-Ramp	20,405	770 (1,780)	4.74	20	59,326,430
EB Off-Ramp	17,065	658 (1,522)	3.60	20	39,702,223
EB On-Ramp	7,727	294 (679)	4.32	20	21,491,599

Ramps – I-10 Traffic Interchange at SR347 / Queen Creek Road				
Ramp	Cluster No.	Truck Traffic Classification	Lane Distribution Factor (D_L)	Directional Distribution Factor (D_D)
WB Off-Ramp	1	AZ-2	1.0	1.0
WB On-Ramp	1	AZ-2	1.0	1.0
EB Off-Ramp	1	AZ-2	0.9	1.0
EB On-Ramp	1	AZ-2	1.0	1.0

Ramps – I-10 Traffic Interchange at SR347 / Queen Creek Road					
Ramp	2027 AADT	Truck Volumes Singles (Combos)	Growth Rate (%)	Design Period (years)	Design ESALs (Flexible)
WB Off-Ramp	1,461	110 (253)	6.00	20	15,686,375 [A]
WB On-Ramp	21,927	1,783 (4,112)	1.94	20	70,348,760
EB Off-Ramp	20,884	1,707 (3,937)	1.68	20	58,792,076
EB On-Ramp	2,828	211 (487)	6.35	20	15,686,375 [A]
Note [A]: Calculated Ramp ESALs less than 10% of Mainline ESALS. Therefore, Design ESALs based on 10% of I-10 Mainline.					

Ramps – I-10 Traffic Interchange at Riggs Road				
Ramp	Cluster No.	Truck Traffic Classification	Lane Distribution Factor (D_L)	Directional Distribution Factor (D_D)
WB Off-Ramp	1	AZ-2	1.0	1.0
WB On-Ramp	1	AZ-2	1.0	1.0
EB Off-Ramp	1	AZ-2	1.0	1.0
EB On-Ramp	1	AZ-2	1.0	1.0

Ramps – I-10 Traffic Interchange at Riggs Road					
Ramp	2027 AADT	Truck Volumes Singles (Combos)	Growth Rate (%)	Design Period (years)	Design ESALs (Flexible)
WB Off-Ramp	2,710	220 (507)	2.10	20	15,686,375 [A]
WB On-Ramp	6,427	532 (1,228)	1	20	18,780,564
EB Off-Ramp	9,376	752 (1,735)	2.64	20	32,269,732
EB On-Ramp	1,840	152 (351)	1.10	20	15,686,375 [A]
Note [A]: Calculated Ramp ESALs less than 10% of Mainline ESALS. Therefore, Design ESALs based on 10% of I-10 Mainline.					

I-10 at Goodyear Road
Goodyear Road crossing at I-10 excludes ramps.

Crossroads

The traffic design parameters used for Traffic Interchange Ramps pavement thickness design and their estimated design Equivalent Single Axle Loads (ESALs) are outlined in the following tables:

Wild Horse Pass Blvd / Sundust Road Crossroad at the I-10 Traffic Interchange				
Roadway	Cluster No.	Truck Traffic Classification	Lane Distribution Factor (D_L)	Directional Distribution Factor (D_D)
West of I-10	3	AZ-3	0.8	0.51
I-10 Crossing	3	AZ-3	0.8	0.51
East of I-10	3	AZ-3	0.8	0.51

Wild Horse Pass Blvd / Sundust Road Crossroad at the I-10 Traffic Interchange						
Roadway	2027 AADT	Truck Volumes Singles (Combos)	Growth Rate (%)	Design Period (years)	Design ESALs	Pavement Type
West of I-10	39,049	1,727 (2,291)	3.86	20	22,533,283	Flexible (AC)
I-10 Crossing	39,049	1,727 (2,291)	3.86	20	31,054,074	Rigid (PCCP)
East of I-10	18,106	816 (1,082)	2.90	20	9,470,398	Flexible (AC)

SR347 / Queen Creek Road Crossroad at the I-10 Traffic Interchange				
Roadway	Cluster No.	Truck Traffic Classification	Lane Distribution Factor (D_L)	Directional Distribution Factor (D_D)
West of I-10	2	AZ-3	0.8	0.65
I-10 Crossing	2	AZ-3	0.8	0.65
East of I-10	2	AZ-3	0.8	0.65

SR347 / Queen Creek Road Crossroad at the I-10 Traffic Interchange						
Roadway	2027 AADT	Truck Volumes Singles (Combos)	Growth Rate (%)	Design Period (years)	Design ESALs	Pavement Type
West of I-10	42,889	1,937 (2,570)	2.78	20	24,892,047	Flexible (AC)
I-10 Crossing	42,889	1,937 (2,570)	2.78	20	33,075,617	Rigid (PCCP)
East of I-10	26,560	1,207 (1,601)	2.46	20	14,925,797	Flexible (AC)

Riggs Road Crossroad at the I-10 Traffic Interchange				
Roadway	Cluster No.	Truck Traffic Classification	Lane Distribution Factor (D_L)	Directional Distribution Factor (D_D)
Crossing West of I-10	3	AZ-3	0.9	0.51
I-10 Crossing	3	AZ-3	0.9	0.51
Crossing East of I-10	3	AZ-3	0.9	0.51

Riggs Road Crossroad at the I-10 Traffic Interchange						
Roadway	2027 AADT	Truck Volumes Singles (Combos)	Growth Rate (%)	Design Period (years)	Design ESALs	Pavement Type
Crossing W of I-10	8,274	382 (506)	1.70	20	5,958,873	Rigid (PCCP)
Crossing E of I-10	15,044	696 (924)	1.51	20	10,623,381	Rigid (PCCP)

Goodyear Road is generally comprised of a low (traffic) volume graded roadway with no ramp connection to I-10, and with no immediate interconnection to arterial or collector roadways in the vicinity. We understand the AADT for the Goodyear Road Crossroad is equal or less than 500. No traffic data was available for the Goodyear Road Crossroad. Based on the information provided, we understand the entire length of the Goodyear Road Crossroad improvements for the project will consist of PCCP. The Design ESALs estimated for Goodyear Road were back-calculated based on the minimum (9-inch thickness) PCCP requirements in the ADOT PDM (2017), on the encountered subgrade soil conditions, and on the traffic design parameters outlined in the following tables:

Goodyear Road Crossroad at I-10				
Roadway	Cluster No.	Truck Traffic Classification	Lane Distribution Factor (D_L)	Directional Distribution Factor (D_D)
I-10 Crossing	2	AZ-3	1.0	0.5

Goodyear Road Crossroad at I-10						
Roadway	2027 AADT	Truck Volumes Singles (Combos)	Growth Rate (%)	Design Period (years)	Design ESALs	Pavement Type
I-10 Crossing	3,546	143 (190)	8.72	20	5,009,632	Rigid (PCCP)

Pavement Design Parameters

Pavement design parameters were utilized based on the 2017 ADOT Pavement Design Manual. The following tables summarize the design parameters that were utilized for the rigid and flexible pavement thickness designs.

I-10 Mainline Lanes and Shoulders

Design Parameter		I-10 Mainline			
		I-10 Mainline Segment 1	I-10 Mainline Segment 2	I-10 Mainline Segment 3	I-10 Mainline Segment 4
Design ESALs		94,765,684	93,638,364	156,863,749	57,792,883
Design R-value		40	30	26	30
Subgrade Resilient Modulus (psi)		24,425	17,875	15,479	17,875
Level of Reliability		99%	99%	99%	99%
Standard Normal Deviate		-2.327	-2.327	-2.327	-2.327
Standard Deviation		0.25	0.45	0.45	0.45
Initial PSI		4.2	4.2	4.2	4.2
Terminal PSI		3.0	3.0	3.0	3.0
Layer Coefficient	Asphaltic Concrete (AC)	--	0.44	0.44	0.44
	Aggregate Base (Class 2)	--	0.14	0.14	0.14
Seasonal Variation Factor		1.0	1.0	1.0	1.0
Drainage Coefficient for Class 2 layer (fair)		1.0	1.0	1.0	1.0
Base Material		AB Class 2	--	--	--
Base Material Modulus (psi)		36,000	--	--	--
Base Material Thickness (in)		4	--	--	--
Composite Modulus k_m (pci)		1,000	--	--	--
Loss of Subgrade Support		0	--	--	--
Modulus of Subgrade Reaction (pci)		1,000	--	--	--
Modulus of Rupture for Concrete (psi)		670	--	--	--
Compressive Strength of Concrete f'c (psi)		5,000	--	--	--
Modulus of Elasticity (ksi)		4,000	--	--	--

Design Parameter	I-10 Mainline			
	I-10 Mainline Segment 1	I-10 Mainline Segment 2	I-10 Mainline Segment 3	I-10 Mainline Segment 4
Rigid Pavement Type (Plain Jointed)	With Dowels	--	--	--
Load Transfer (J)	2.8	--	--	--
Flexible Pavement Structural Number (SN)	--	6.61	7.38	6.20

Traffic Interchange Ramps

Design Parameter		Ramps – I-10 Traffic Interchange at Wild Horse Pass Boulevard / Sundust Road			
		WB I-10 Off-Ramp	WB I-10 On-Ramp	EB I-10 Off-Ramp	EB I-10 On-Ramp
Design ESALs		12,768,252	59,326,430	39,702,223	21,491,599
Design R-value		30	30	30	30
Subgrade Resilient Modulus (psi)		17,875	17,875	17,875	17,875
Level of Reliability		99%	99%	99%	99%
Standard Normal Deviate		-2.327	-2.327	-2.327	-2.327
Standard Deviation		0.25	0.25	0.25	0.25
Initial PSI		4.2	4.2	4.2	4.2
Terminal PSI		3.0	3.0	3.0	3.0
Layer Coefficient	Asphaltic Concrete (AC)	--	--	--	--
	Aggregate Base (Class 2)	--	--	--	--
Seasonal Variation Factor		1.0	1.0	1.0	1.0
Drainage Coefficient for Class 2 layer (fair)		1.0	1.0	1.0	1.0
Base Material		AB Class 2	AB Class 2	AB Class 2	AB Class 2
Base Material Modulus (psi)		36,000	36,000	36,000	36,000
Base Material Thickness (in)		4	4	4	4
Composite Modulus k_m (pci)		1,000	1,000	1,000	1,000
Loss of Subgrade Support		0	0	0	0
Modulus of Subgrade Reaction (pci)		1,000	1,000	1,000	1,000

Design Parameter	Ramps – I-10 Traffic Interchange at Wild Horse Pass Boulevard / Sundust Road			
	WB I-10 Off-Ramp	WB I-10 On-Ramp	EB I-10 Off-Ramp	EB I-10 On-Ramp
Modulus of Rupture for Concrete (psi)	670	670	670	670
Compressive Strength of Concrete f'c (psi)	5,000	5,000	5,000	5,000
Modulus of Elasticity (ksi)	4,000	4,000	4,000	4,000
Rigid Pavement Type	With Dowels	With Dowels	With Dowels	With Dowels
Load Transfer (J)	2.8	2.8	2.8	2.8
Flexible Pavement Structural Number (SN)	--	--	--	--

Design Parameter		Ramps – I-10 Traffic Interchange at State Route 347 (SR347) / Queen Creek Road			
		WB I-10 Off-Ramp	WB I-10 On-Ramp	EB I-10 Off-Ramp	EB I-10 On-Ramp
Design ESALs		15,686,375	70,348,760	58,792,076	15,686,375
Design R-value		33	33	33	33
Subgrade Resilient Modulus (psi)		19,756	19,756	19,756	19,756
Level of Reliability		99%	99%	99%	99%
Standard Normal Deviate		-2.327	-2.327	-2.327	-2.327
Standard Deviation		0.45	0.45	0.45	0.45
Initial PSI		4.2	4.2	4.2	4.2
Terminal PSI		3.0	3.0	3.0	3.0
Layer Coefficient	Asphaltic Concrete (AC)	0.44	0.44	0.44	0.44
	Aggregate Base (Class 2)	0.14	0.14	0.14	0.14
Seasonal Variation Factor		1.0	1.0	1.0	1.0
Drainage Coefficient for Class 2 layer (fair)		1.0	1.0	1.0	1.0
Flexible Pavement Structural Number (SN)		4.96	6.17	6.02	4.96

Design Parameter		Ramps – I-10 Traffic Interchange at Riggs Road			
		WB I-10 Off-Ramp	WB I-10 On-Ramp	EB I-10 Off-Ramp	EB I-10 On-Ramp
Design ESALs		15,686,375	18,780,564	32,269,732	15,686,375
Design R-value		22	22	22	22
Subgrade Resilient Modulus (psi)		13,211	13,211	13,211	13,211
Level of Reliability		99%	99%	99%	99%
Standard Normal Deviate		-2.327	-2.327	-2.327	-2.327
Standard Deviation		0.45	0.45	0.45	0.45
Initial PSI		4.2	4.2	4.2	4.2
Terminal PSI		3.0	3.0	3.0	3.0
Layer Coefficient	Asphaltic Concrete (AC)	0.44	0.44	0.44	0.44
	Aggregate Base (Class 2)	0.14	0.14	0.14	0.14
Seasonal Variation Factor		1.0	1.0	1.0	1.0
Drainage Coefficient for Class 2 layer (fair)		1.0	1.0	1.0	1.0
Flexible Pavement Structural Number (SN)		5.70	5.85	6.30	5.70

I-10 and Goodyear Road
Note: Goodyear Road excludes traffic interchange ramps at I-10.

Crossroads

Design Parameter		Crossroad – Wild Horse Pass Boulevard / Sundust Road at I-10		
		AC Crossroad West of I-10	PCCP Limits of Crossroad at I-10	AC Crossroad East of I-10
Design ESALs		22,533,283	31,054,074	9,470,398
Design R-value		30	30	30
Subgrade Resilient Modulus (psi)		17,875	17,875	17,875
Level of Reliability		95%	95%	95%
Standard Normal Deviate		-1.645	-1.645	-1.645
Standard Deviation		0.45	0.25	0.45
Initial PSI		4.2	4.2	4.2
Terminal PSI		2.8	2.8	2.8
Layer Coefficient	Asphaltic Concrete (AC)	0.44	--	0.44
	Aggregate Base (Class 2)	0.14	--	0.14
Seasonal Variation Factor		1.0	1.0	1.0
Drainage Coefficient for Class 2 layer (fair)		1.0	1.0	1.0
Base Material		--	AB Class 2	--
Base Material Modulus (psi)		--	36,000	--
Base Material Thickness (in)		--	4	--
Composite Modulus k_m (pci)		--	1,000	--
Loss of Subgrade Support		--	0	--
Modulus of Subgrade Reaction (pci)		--	1,000	--
Modulus of Rupture for Concrete (psi)		--	670	--
Compressive Strength of Concrete f'c (psi)		--	5,000	--
Modulus of Elasticity (ksi)		--	4,000	--
Rigid Pavement Type		--	Plain Jointed	--
Load Transfer (J)		--	3.9	--
Flexible Pavement Structural Number (SN)		4.65	--	4.03

Design Parameter		Crossroad – State Route 347 (SR347) / Queen Creek Road at I-10		
		AC Crossroad West of I-10	PCCP Limits of Crossroad at I-10	AC Crossroad East of I-10
Design ESALs		24,892,047	33,075,617	14,925,797
Design R-value		33	33	33
Subgrade Resilient Modulus (psi)		19,756	19,756	19,756
Level of Reliability		99%	99%	99%
Standard Normal Deviate		-2.327	-2.327	-2.327
Standard Deviation		0.45	0.25	0.45
Initial PSI		4.2	4.2	4.2
Terminal PSI		3.0	3.0	3.0
Layer Coefficient	Asphaltic Concrete (AC)	0.44	--	0.44
	Aggregate Base (Class 2)	0.14	--	0.14
Seasonal Variation Factor		1.0	1.0	1.0
Drainage Coefficient for Class 2 layer (fair)		1.0	1.0	1.0
Base Material		--	AB Class 2	--
Base Material Modulus (psi)		--	36,000	--
Base Material Thickness (in)		--	4	--
Composite Modulus k_m (pci)		--	1,000	--
Loss of Subgrade Support		--	0	--
Modulus of Subgrade Reaction (pci)		--	1,000	--
Modulus of Rupture for Concrete (psi)		--	670	--
Compressive Strength of Concrete f'c (psi)		--	5,000	--
Modulus of Elasticity (ksi)		--	4,000	--
Rigid Pavement Type		--	Plain Jointed	--
Load Transfer (J)		--	3.9	--
Flexible Pavement Structural Number (SN)		5.32	--	4.92

Design Parameter		Crossroad – Riggs Road at I-10		Crossroad – Goodyear Road at I-10
		PCCP Limits of Crossroad at I-10		PCCP Limits of Crossroad at I-10
Design ESALs		10,623,381		5,009,632
Design R-value		22		36
Subgrade Resilient Modulus (psi)		13,211		21,709
Level of Reliability		95%		95%
Standard Normal Deviate		-1.645		-1.645
Standard Deviation		0.25		0.25
Initial PSI		4.2		4.2
Terminal PSI		2.8		2.8
Layer Coefficient	AC	--		--
	AB Class 2	--		--
Seasonal Variation Factor		1.0		1.0
Drainage Coefficient for Class 2 layer (fair)		1.0		1.0
Base Material		AB Class 2		AB Class 2
Base Material Modulus (psi)		36,000		36,000
Base Material Thickness (in)		4		4
Composite Modulus k_m (pci)		1,000		1,000
Loss of Subgrade Support		0		0
Modulus of Subgrade Reaction (pci)		1,000		1,000
Modulus of Rupture for Concrete (psi)		670		670
Compressive Strength of Concrete f'c (psi)		5,000		5,000
Modulus of Elasticity (ksi)		4,000		4,000
Rigid Pavement Type		Plain Jointed		Plain Jointed
Load Transfer (J)		3.9		3.9
Flexible Pavement Structural Number (SN)		--		--

Design Thickness Recommendations

Based on the information provided as outlined in this report and in accordance with the ADOT pavement design procedures, the pavement improvements presented in the following tables are recommended for the project.

I-10 Mainline Lanes and Shoulders

I-10 Mainline	Thicknesses shown are in inches			
	PCCP (Plain w/ Dowels)	AC	AB	Total
Segment 1 - MP161 to WHP (approx. MP 161 to 163.1WB/163.5EB)	14 [A, B, C]	--	4	18
Segment 2 - WHP to SR347 (approx. MP 163.1WB/163.5EB to 164.5)	--	13	7	20
Segment 3 - SR347 to Riggs Rd (approx. MP 164.5 to 167.5)	--	13	12	25
Segment 4 - Riggs Rd to GRB (approx. MP 167.5 to 172.8)	--	13	4	17

Legend: Wild Horse Pass Boulevard (WHP); State Route 347 (SR347); Gila River Bridge (GRB).
Note [A]: The analyses indicated a PCCP thickness of 13.5 inches and the recommended thickness was increased to match the existing PCCP.
Note [B]: In planned PCCP I-10 mainline widening travel lane areas, any existing non-doweled PCCP is recommended to be removed and replaced with doweled PCCP.
Note [C]: If wheel paths are planned near longitudinal joints, then the placement of dowels along the joint will be required to provide load transfer between existing and proposed PCCP.

Traffic Interchange Ramps

Ramps I-10 Traffic Interchange at Wild Horse Pass Boulevard / Sundust Road	Thicknesses shown are in inches			
	PCCP (Plain w/ Dowels)	AC	AB	Total
West-Bound Off-Ramp	9.5	--	4	13.5
West-Bound On-Ramp	12.5	--	4	16.5
East-Bound Off-Ramp	12	--	4	16
East-Bound On-Ramp	10.5	--	4	14.5

Ramps I-10 Traffic Interchange at State Route 347 (SR347) / Queen Creek Road	Thicknesses shown are in inches			
	PCCP (Plain)	AC	AB	Total
West-Bound Off-Ramp	--	11.5	4	15.5
West-Bound On-Ramp	--	11.5	8	19.5
East-Bound Off-Ramp	--	11.5	7	18.5
East-Bound On-Ramp	--	11.5	4	15.5

Ramps I-10 Traffic Interchange at Riggs Road	Thicknesses shown are in inches			
	PCCP (Plain)	AC	AB	Total
West-Bound Off-Ramp	--	10.5	8	18.5
West-Bound On-Ramp	--	10.5	9	19.5
East-Bound Off-Ramp	--	10.5	12	22.5
East-Bound On-Ramp	--	10.5	8	18.5

I-10 and Goodyear Road
Note: Goodyear Road excludes traffic interchange ramps at I-10.

Crossroads

Crossroad Wild Horse Pass Boulevard / Sundust Road at I-10	Thicknesses shown are in inches			
	PCCP (Plain)	AC	AB	Total
AC Crossroad – West & East of I-10 [A]	--	8	8	16
PCCP Limits of Crossroad at I-10	12.5	--	4	16.5
Note [A]: The AC Pavement Structure for the Crossroad East of I-10 was calculated to be 7 inches of AC over 6 inches of AB based on the anticipated traffic. However, the AC Pavement Structure for the Crossroad East of I-10 was increased slightly to match the AC Pavement Structure for the Crossroad West of I-10 to accommodate a possible slight increase in truck traffic.				

Crossroad State Route 347 (SR347) / Queen Creek Road at I-10	Thicknesses shown are in inches			
	PCCP (Plain)	AC	AB	Total
AC Crossroad - West of I-10	--	10	7	17
PCCP Limits of Crossroad at I-10	13.5	--	4	17.5
AC Crossroad - East of I-10	See MCDOT section of this report.			

Crossroad Riggs Road at I-10	Thicknesses shown are in inches			
	PCCP (Plain)	AC	AB	Total
PCCP Limits of Crossroad at I-10	10.5	--	4	14.5
AC Crossroad East and West of TI	See MCDOT section of this report.			

Crossroad Goodyear Road at I-10	Thicknesses shown are in inches			
	PCCP (Plain)	AC	AB	Total
PCCP Limits of Crossroad at I-10	9	--	4	13

Planned Pavement Rehabilitation (Mill/Fill)

The project will include pavement rehabilitation improvements of the existing AC along the I-10 Mainline. Based on the information provided, we understand ADOT is planning for these pavement rehabilitation improvements to consist of milling the existing I-10 Mainline AC pavements to a depth of 5½ inches and subsequently filling/placing a 5-inch thick AC overlay (with the upper 2.5-inches consisting of Stone Matrix Asphalt (SMA)). The 5½ inch depth of milling includes the existing AR-ACFC if present, otherwise depth of milling shall be limited to 5 inches. As a note, ADOT was planning a pavement rehabilitation project from Riggs Road to the Gila River Bridge that included mill and fill recommendations on the order of those outlined above. Due to this planned Design-Build Project, that previous rehabilitation project was modified to perform interim mill and fill improvements of milling 2.5 inches and replace with 2 inches of AC. This Design-Build Project was then directed to implement the 5.5-inch mill and 5-inch fill. The Design-Build Project has decided to also use this recommendation for the entire AC mainline.

Crossroads rehabilitation improvements of existing AC pavements are anticipated to include a mill depth of 3 inches followed by a 3-inch AC overlay. As with any pavement rehabilitation, periodic locations with significant structural distress requiring removal and replacement of the isolated location should be anticipated. As an exception, the cores performed on Riggs Road indicated an existing AC thickness on the order of 3 inches; therefore, a 2-inch mill/fill depth is recommended for Riggs Road as further detailed in the MCDOT sections of this report.

Terracon performed a limited pavement condition survey of asphaltic concrete pavements at selected locations across the project as summarized in Appendix E of this report. This limited pavement condition survey is only for informational purposes and limited to the cursory overview of pavement conditions observed at the selected locations outlined in this report. Given the very small evaluation areas with respect to the overall pavement area for the project, other pavement conditions than those outlined in this report are anticipated to be possible on the existing pavements across the project. Terracon's scope of work excluded evaluating the pavement subgrade modulus with falling weight deflectometer testing and excluded performing an ADOT SODA Method rehabilitation evaluation.

As outlined in the Pavement Core Exploration Results, Terracon performed coring of the project pavements at 29 locations. In addition, 9 borings were drilled through the existing asphaltic concrete and a measurement of the approximate pavement thickness was obtained.

I-10 Mainline Lanes and Shoulders

The limited pavement condition survey indicates the I-10 Mainline pavements at the locations observed are generally in the Fair to Satisfactory range (PCI range of 41 to 96) based on the procedures outlined in Appendix E of this report. Based on this range and the generally low severity of structural distress observed, these pavements appear to be good candidates for pavement rehabilitation measures such as those described in the DCR. The following table provides a cursory overview (based on generalized averages) of the effective structural number of the existing I-10 Mainline pavements and proposed new I-10 Mainline pavement sections.

Generalized Average Values for the I-10 Mainline Existing Pavements				
I-10 Mainline (Existing)	Average Thickness (inches)	Estimated Effective Structural Layer Coefficient [1]	Effective Structural Number (SN) of Existing Layer	Effective Structural Number (SN) of Existing Pavements
Existing AC	9	0.35	3.15	4.35
Existing ABC	12	0.10	1.2	

Generalized Average Values for the I-10 Mainline Rehabilitated Pavements				
I-10 Mainline (Mill / Fill)	Average Thickness (inches)	Estimated Effective Structural Layer Coefficient [1]	Effective Structural Number (SN) of Existing Layer	Effective Structural Number (SN) of Rehabilitated Pavements
New SMA & AC	5	0.44	2.2	4.63
Milled Existing AC	3.5	0.35	1.23	
Existing ABC	12	0.10	1.2	

Note [1]: Estimated effective structural coefficient values based on the limited pavement condition survey and on the American Association of State Highway and Transportation Officials (AASHTO) Design of Pavement Structures guidelines.

Generalized Average Values for the I-10 Mainline Planned New Pavements				
I-10 Mainline (Planned New Pavements)	Average Thickness (inches)	Structural Layer Coefficient	Structural Number (SN) Layer	Structural Number (SN) of New Pavements [1]
New AC	13	0.44	5.72	6.8
New ABC	7.7	0.14	1.08	

Note [1]: A comparison between the average Effective Structural Number of the Rehabilitated Pavement (of 4.63) with the average Structural Number of New Pavements (of 6.8) indicates a Structural Number difference of approx. 2.17. For informational purposes only, in order to match or approximate the average structural numbers of rehabilitated pavements to new pavements, the rehabilitated pavements would require an additional thickness of AC of approx. 5 inches.

Based on the information outlined above and based on a broad comparison of the estimated effective structural number for the milling and filling of existing I-10 Mainline pavements with the structural number of planned new I-10 Mainline pavements, an estimated design life for the planned milling and filling along the I-10 Mainline pavements with no to low severity distress is anticipated to be on the order of approximately 10 to 14 years. Periodic maintenance of any pavement is required during their service life.

Traffic Interchange Ramps

Based on the information provided, we understand the Design-Build Project will include all traffic interchange ramps to be re-constructed with new pavement sections. The Goodyear Road bridge over I-10 excludes traffic interchange ramps.

Crossroads

The limited pavement condition survey indicates the Wild Horse Pass Boulevard / Sundust Road asphaltic pavements at the locations observed are generally in the Fair range with some areas in the Poor to Satisfactory range (PCI range of 54 to 84) based on the procedures outlined in Appendix E of this report. Based on the Fair range pavement areas with generally low to medium severity distress observed, these pavements appear to be good candidates for pavement rehabilitation measures such as those described in the DCR. The following table provides a cursory overview (based on generalized averages) of the effective structural number of the existing Wild Horse Pass Blvd. / Sundust Rd. pavements and proposed new Wild Horse Pass Blvd. / Sundust Rd. pavement sections.

Generalized Average Values for the Wild Horse Pass Boulevard / Sundust Road Existing Pavements				
Crossroad (Existing)	Average Thickness (inches)	Estimated Effective Structural Layer Coefficient [1]	Effective Structural Number (SN) of Existing Layer	Effective Structural Number (SN) of Existing Pavements
Existing AC	7	0.35	2.45	3.25
Existing ABC	8	0.10	0.8	

Generalized Average Values for the Wild Horse Pass Boulevard / Sundust Road Rehabilitated Pavements				
Crossroad (Mill / Fill)	Average Thickness (inches)	Estimated Effective Structural Layer Coefficient [1]	Effective Structural Number (SN) of Existing Layer	Effective Structural Number (SN) of Rehabilitated Pavements
New AC	3	0.44	1.32	3.52
Milled Existing AC	4	0.35	1.4	
Existing ABC	8	0.10	0.8	

Note [1]: Estimated effective structural coefficient values based on the limited pavement condition survey and on the American Association of State Highway and Transportation Officials (AASHTO) Design of Pavement Structures guidelines.

Generalized Average Values for the Wild Horse Pass Boulevard / Sundust Road Planned New Pavements				
Crossroad (Planned New Pavements)	Average Thickness (inches)	Structural Layer Coefficient	Structural Number (SN) Layer	Structural Number (SN) of New Pavements
New AC	7.5	0.44	3.3	4.21
New ABC	6.5	0.14	0.91	

Based on the information outlined above and based on a broad comparison of the estimated effective structural number for the milling and filling of existing Wild Horse Pass Boulevard / Sundust Road pavements with the structural number of planned new Wild Horse Pass Boulevard / Sundust Road pavements, an estimated design life for the planned milling and filling along the Wild Horse Pass Boulevard / Sundust Road pavements with no to low severity distress is anticipated to be on the order of approximately 12 to possibly 16 years. Any other areas with greater severity distress are anticipated to have a reduced estimated design life for the planned milling and filling. Consideration should be given to the reconstruction of all medium to high severity distress areas. Periodic maintenance of any pavements is required during their service life.

No milling and filling pavement rehabilitation is planned for the Queen Creek Road or Goodyear Road. The portions of Riggs Road within the project limits and beyond the planned traffic interchange PCCP are within MCDOT jurisdiction, and the pavement rehabilitation for these portions of Riggs Road are outlined in the following sections of this report.

Summary of Design Thickness Recommendations

The Design Thickness Recommendations presented in the previous tables for the ADOT I-10 Mainline, Traffic Interchange Ramps and Crossroads are summarized into the following single table:

Summary of Structural Thicknesses (in inches)

Roadway Description [1]	Roadway Location [1]	Mill/ Remove [2]	PCCP (Plain w/ Dowels)	PCCP (Plain)	AC	AB	Total
I-10 Seg1 - (MP 161 to 163.04WB/163.48EB)	New Widening	--	14	--	--	4	18
I-10 Seg2 - (MP 163.04WB/163.48EB to 164.5)	New Widening	--	--	--	13	7	20
I-10 Seg3 - (MP 164.5 to 168)	New Widening	--	--	--	13	12	25
I-10 Seg4 - (MP 168 to 172.75)	New Widening	--	--	--	13	4	17
I-10 Seg. 1 to 4 (MP 163.04WB/163.48EB to 172.75)	Existing Travel Lanes	5.5	--	--	5	--	5
I-10 Seg. 1 to 4 (MP 163.04WB/163.48EB to 172.75)	Existing Shoulders	5	--	--	5	--	5
I-10 TI UP at Wild Horse Pass Bvld	WB Off Ramp	--	9.5	--	--	4	13.5
	WB On Ramp	--	12.5	--	--	4	16.5
	EB Off Ramp	--	12	--	--	4	16
	EB On Ramp	--	10.5	--	--	4	14.5
I-10 TI UP at SR 347	WB Off Ramp & EB On Ramp	--	--	--	11.5	4	15.5
	WB On Ramp	--	--	--	11.5	8	19.5
	EB Off Ramp	--	--	--	11.5	7	18.5
I-10 TI UP at Riggs Rd	WB Off Ramp & EB On Ramp	--	--	--	10.5	8	18.5
	WB On Ramp	--	--	--	10.5	9	19.5
	EB Off Ramp	--	--	--	10.5	12	22.5
I-10 Crossroad – Wild Horse Pass Blvd / Sundust Rd	W & E of I-10	--	--	--	8	8	16
	PCCP Limits	--	--	12.5	--	4	16.5
	AC Mill/Fill Limits	3	--	--	3	--	3
I-10 Crossroad – SR 347 / Queen Creek Rd	West of I-10	--	--	--	10	7	17
	PCCP Limits	--	--	13.5	--	4	17.5
	AC Mill/Fill Limits	3	--	--	3	--	3
	East of I-10	See MCDOT section of PDS					
I-10 Crossrd-Riggs Rd	PCCP Limits	--	--	10.5	--	4	14.5
	AC E&W of TI	See MCDOT section of PDS					
I-10 Crossrd-Goodyear	PCCP Limits	--	--	9	--	4	13

Note [1]: Refer to the project plans for exact project limits and locations and stationing of each proposed improvement. Note [2]: Rehabilitation shall be across the full width of the existing roadway.

MCDOT Crossroads

As previously mentioned, we understand the majority of the planned pavement improvements for the project will be based on ADOT methodologies and standards. The pavement design presented in this PDS for the project was based on the procedures outlined in the ADOT Pavement Design Manual (2017). As exceptions, we understand the eastern portion of Queen Creek Road and the eastern and western portions of Riggs Road for the project will be based on Maricopa County Department of Transportation (MCDOT) methodologies and standards. Based on the information outlined in the DCR, the pavement improvements for the MCDOT (I-10) crossroads within the project are summarized in the following tables:

Queen Creek Road

Roadway Description	Planned Pavement Improvement
Queen Creek Road - From the east edge of the I-10 TI PCCP limits to approximately 600 feet further east along Queen Creek Road (or from approximately 850 feet east of the I-10 CL to 1,450 feet east of the I-10 CL (approx. 600-ft length)).	New AC Pavement

Riggs Road

Roadway Description	Planned Pavement Improvement
Riggs Road – From approximately 350 feet west along Riggs Rd beyond the I-10 TI PCCP (or from approximately 1,150 feet west of the I-10 CL to 1,500 feet west of the I-10 CL (approx. 350-ft length)).	Mill and Overlay and slivers of new AC pavement
Riggs Road - From approximately 300 feet east along Riggs Rd beyond the I-10 TI PCCP (or from approximately 1,050 feet east of the I-10 CL to 1,350 feet east of the I-10 CL (approx. 300-ft length)).	Mill and Overlay and slivers of new AC pavement

MCDOT Queen Creek Road Improvements

State Route 347 (SR347) is a divided highway and as it extends east of I-10 it transitions into Queen Creek Road. The eastern approximately 600 feet of Queen Creek Road within the project limits is within MCDOT jurisdiction. This portion of Queen Creek Road within the MCDOT jurisdiction was evaluated based on roadway classification of Highways and Parkways as outlined in the MCDOT Roadway Design Manual (2023). The following provides an outline summarizing the MCDOT methodologies and standards performed to evaluate the recommended pavement structure for the proposed portion of Queen Creek Road within the project limits and within MCDOT jurisdiction; and a MCDOT Queen Creek Calculation Package detailing this evaluation is included in Appendix D of this PDS report. The design and construction of this portion of Queen Creek Road should be in accordance with the current versions of the MCDOT Roadway Design Manual and the Maricopa Association of Governments (MAG) Uniform Standard Specifications and Details for Public Works Construction (2021).

The results of the field and laboratory tests indicate the eastern portion of I-10 and Queen Creek Road include subgrade soils with expansive potentials in the moderate range. Therefore, lime stabilization of the subgrade soils is recommended to a minimum depth of 6 inches as outlined in the MCDOT Roadway Manual (Table 10.2.9) and MAG Section 309. The Design Resilient Modulus Analysis performed on these subgrade soils based on the MCDOT Roadway Design Manual indicate an R_{mean} of 40 and a Design Resilient Modulus (M_r) of 24,425 pounds per square inch (psi).

As presented in the MCDOT Queen Creek Package, the traffic analyses and ESAL estimate was performed using the traffic data outlined in this report and using an average truck equivalent factor of 1.2 as outlined in the MCDOT Roadway Design Manual. However, given the specific AADT and truck traffic from the 2022 ADOT ADT Report, the Design ESALs previously estimated for this portion of the roadway (based on the ADOT methodology) were greater and were used to calculate the AC pavement structure of Queen Creek Road based on the MCDOT Roadway Design Manual.

Analyses for the pavement design of the project were based on the procedures of AASHTO as modified by the MCDOT Roadway Design Manual. Based on the data outlined in this report, the following design parameters were determined by the procedures outlined in the MCDOT Roadway Design Manual and were utilized for pavement engineering analyses for the portion of Queen Creek Road within the project and within the MCDOT jurisdiction:

MCDOT Queen Creek Road (approx. 600-ft length)		
Design Parameter		East of I-10
Design ESALs		14,925,797
Design R-value		40
Subgrade Resilient Modulus (psi)		25,124
Level of Reliability		95%
Standard Normal Deviate		-1.645
Standard Deviation		0.45
Initial PSI		4.6
Terminal PSI		2.7
Layer Coefficient	PMTR [1]	0.61
	Asphaltic Concrete (AC)	0.42
	Aggregate Base (ABC)	0.12
	Lime Stabilized Subgrade (LSS)	0.16
Seasonal Variation Factor		1.0
Flexible Pavement Structural Number (SN)		3.57

Note [1]: Applicable to PMTR used in the top 1.5 inches of the pavement surface.

Based on the information provided as outlined in this report and in general accordance with the MCDOT Roadway Design Manual, the following pavement structure alternatives were developed for consideration of the eastern portion of Queen Creek Road for this project:

AC Recommended Pavement Section Alternatives for Queen Creek Road (MCDOT) [1]

Pavement Construction Item (MCDOT / MAG)	Thicknesses (inches)
PMTR (½-inch mix) (Superpave Mix for High Traffic) (MAG 326)	1.5
AC Pavement (¾-inch mix) (Superpave Mix for High Traffic) (MAG 325)	3
AC Pavement (¾-inch mix) (Superpave Mix for High Traffic) (MAG 325)	3
Aggregate Base Course (MAG 310)	4
[2] Lime Stabilized Subgrade (MAG 309)	6
Total Pavement Thickness:	17.5
Required Structural Number (SN):	3.57
[3] Actual Structural Number (SN):	4.88

Note 1: The asphaltic concrete for this project should be based on a gyratory mix. Polymer Modified plus Tire Rubber (PMTR) Asphaltic Concrete; Asphaltic Concrete (AC); Aggregate Base Course (ABC); Lime Stabilized Subgrade (LSS). Pavements are required to be in accordance with MAG Standard Specifications, the MCDOT Roadway Design Manual, and the project requirements. Specifications are to include the MCDOT Supplement to the MAG Standard Specifications.

Note 2: The Lime Stabilized Subgrade is required to be in accordance with the MCDOT Roadway Design Manual (including Chapter 10 and MAG Section 309).

Note 3: A layered analysis indicated the minimum layer thicknesses shown in the table above; and the layered analysis considered the LSS thickness as part of the minimum base thickness. A minimum thickness of 4 inches of ABC was included to separate the AC from the LSS.

Site grading within the new pavement areas should be performed under the supervision of a qualified and experienced geotechnical engineer. A compacted subgrade of on-site soils or imported soils with equal or greater supporting properties is assumed. In an effort to reduce water infiltration and retard premature oxidation of the surfacing, the pavement surface should be sealed after the first summer of use, and routinely thereafter.

Site grades should provide effective drainage away from the planned pavement improvements during and after construction. Water permitted to pond next to the pavements can result in moisture content increases in subgrade soils and consequently in premature deterioration of the pavement structure and increased maintenance. Positive drainage should be provided during construction and maintained throughout the life of the proposed improvements at the site. We recommend that protective slopes be provided with a minimum grade of approximately 5 percent for at least 10 feet from the structures. Backfill placed at the site should be well compacted and free of all construction debris to reduce the moisture infiltration.

As previously mentioned, the design and construction of the portion of Queen Creek Road within the project and within the MCDOT jurisdiction should be completed in accordance with the current versions of the MCDOT Roadway Design Manual and the Maricopa Association of Governments (MAG) Uniform Standard Specifications and Details for Public Works Construction (2021) and the MCDOT Supplement to the MAG Standard Specifications.

MCDOT Riggs Road Improvements

Approximately 300 ft east and 350 ft west along Riggs Rd beyond the I-10 TI PCCP are within the project limits and within MCDOT jurisdiction. We understand these portions of Riggs Road are planned to be improved as part of the project, and these roadway improvements are planned to consist of: milling the existing asphaltic concrete (AC) and filling the milled thickness with new AC; and slivers of new AC pavement widening. Terracon's scope of work excluded performing a pavement condition survey along these portions of Riggs Road. Terracon performed 2 cores along Riggs Road to measure the approximate pavement thickness, and the AC was approximately 3 inches thick at both core locations. Therefore, only based on the existing pavement thickness, the thicknesses of the milling and new AC filling for the possible pavement rehabilitation of Riggs Road are 2 inches. No pavement structure design was performed for new AC pavement sliver widenings planned along Riggs Road. Therefore, new AC pavement sliver widenings planned along Riggs Road are to match the existing Riggs Road pavement section. Based on the 2 cores performed along Riggs Road, the existing pavement section along Riggs Road is anticipated to be comprised of 3 inches of AC over 21 inches of ABC.

General Comments

This report was prepared as part of the General Engineering Consultant (GEC) services for the project. Any other geotechnical and/or pavement structure recommendations for the design and construction of the project that are required to complement the information and considerations presented in this report will be the responsibility of the awarded design-build team for the project. The information and considerations presented in this report are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. We understand it will be the responsibility of the awarded design-build team to retain a qualified and experienced geotechnical engineer to provide any supplemental design recommendations that may be required for the project and to provide observation and testing services during pertinent construction phases. If variations appear, further evaluation by the retained qualified and experienced geotechnical engineer will be required to develop any necessary supplemental recommendations for the project.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration and/or modification of groundwater/surface water flow during construction. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

APPENDIX A

I-10 Mainline Calculation Package

I-10 GRIC Design-Build Project, 202L to Gila River Bridge
Terracon Project No. 65225282

I-10 Segment 1 - North End of Project to Wild Horse Pass Boulevard

	AADT	
	DCR	**ADOT ADT Report 2022**
2019	124,000	
2022		108,055
2040	197,000	
2042		182,343
2050	224,000	

Notes:
DCR Growth Rate from 2019 to 2040 = 2.229%
DCR Growth Rate from 2019 to 2050 = 1.926%
DCR 2019 to ADOT 2022 = -4.48%
ADOT Growth Rate from 2022 to 2042 = 2.651%
Selecting DCR ADT & DCR Growth Rate of 2.229%
ADOT 2022 Trucks % Singles: 3.50%
Combos: 7.09%

I-10 Segment 2 - from Wild Horse Pass Boulevard to SR347 / Queen Creek Road

	AADT	
	DCR	**ADOT ADT Report 2022**
2019	107,000	
2022		112,237
2040	171,000	
2042		189,400
2050	198,000	

Notes:
DCR Growth Rate from 2019 to 2040 = 2.258%
DCR Growth Rate from 2019 to 2050 = 2.005%
DCR 2019 to ADOT 2022 = 1.606%
ADOT Growth Rate from 2022 to 2042 = 2.651%
Selecting ADOT ADT & ADOT Growth Rate of 2.651%
ADOT 2022 Trucks % Singles: 4.14%
Combos: 9.57%

I-10 Segment 3 - from SR347 / Queen Creek Road to Riggs Road

	AADT	
	DCR	**ADOT ADT Report 2022**
2019	82,800	
2022		55,081
2040	152,000	
2042		92,949
2050	180,000	

Notes:
DCR Growth Rate from 2019 to 2040 = 2.935%
DCR Growth Rate from 2019 to 2050 = 2.537%
DCR 2019 to ADOT 2022 = negative
ADOT Growth Rate from 2022 to 2042 = 2.651%
Selecting DCR ADT & DCR Growth Rate of 2.935%
ADOT 2022 Trucks % Singles: 8.45%
Combos: 19.49%

I-10 Segment 4 - from Riggs Road to the Gila River Bridge

	AADT	
	DCR	**ADOT ADT Report 2022**
2019	65,200	
2022		65,404
2040	134,000	
2042		133,050
2050	163,000	

Notes:
DCR Growth Rate from 2019 to 2040 = 3.490%
DCR Growth Rate from 2019 to 2050 = 3.000%
DCR 2019 to ADOT 2022 = 0.104%
ADOT Growth Rate from 2022 to 2042 = 3.614%
Selecting ADOT ADT & ADOT Growth Rate of 3.614%
ADOT 2022 Trucks % Singles: 2.77%
Combos: 7.34%

SEGMENT 1

I-10 Mainline - From Approximately northern end of project to south of Wild Horse Pass Boulevard / Sundust Road
Approx. MP 161 to 163.04/163.48
Approx. Sta. 841 to Stations 944/968

Design Resilient Modulus Analysis

Project Data

PROJECT NAME, LOCATION and SEASONAL VARIATION FACTOR

Project Name:	I-10 GRIC - PDS Segment 1
Location:	
Seasonal Variation Factor:	1.0

Laboratory Test Data

Boring No. Point ID	Boring Location	Depth (ft)	LL	PI	-#200	Laboratory R-Value	Correlated R-Value
R-1	885+00; 25R±	1--3		7	47		40
R-2	893+00; 25L±	0--5		15	43		31
R-3	901+00; 25R±	2--5		14	46	15	31
R-4	909+00; 25L±	0.5--4		5	36		50
R-5	917+00; 25R±	1.5--5		4	47	57	45
R-6	925+00; 25L±	0.5--5		3	34		56
R-7	933+00; 25R±	0.5--5		1	29		64
R-8	941+00; 25L±	0.5--4		0	43		55
R-9	949+00; 25R±	0.5--4		2	38	72	55
R-10	957+00; 25L±	1--5		6	43		44
R-11	965+00; 25R±	1--5		3	39		52
R-73	937+00; 75R±	1--4		2	31		60
R-74	945+00; 75R±	1--5		5	42	39	46
R-75	953+00; 75R±	3--5		7	41		43
R-76	961+00; 75R±	1--3		9	42		39

Mean R-Value and Modulus Calculations

Number of Laboratory Tested R-Values:	4	(Nt)	
Average of Laboratory Tested R-Value Results:	45.75	(Rt)	
Standard Deviation of Laboratory Tested R-Values:	24.54	(SDt)	
Number of Correlated R-Value:	15	(Nc)	Construction
Average of Correlated R-Value Results:	47.33	(Rc)	Control R-Value (Rc): 33.9
Standard Deviation of Correlated R-Values:	9.96	(SDc)	90% t Value: 1.345
Adjusted Average of Tested R-Values:	31.21	(Rt)	
Adjusted Average of Correlated R-Values:	47.33	(Rc)	

Calculation for Mean R-Value:

$$R_{mean} = \frac{N_t \times R_t \times SD_c^2 + N_c \times R_c \times SD_t^2}{N_t \times SD_c^2 + N_c \times SD_t^2}$$

R_{mean} = **46.7**

Seasonal Variation Factor for Project Location= **1.0**

Design Resilient Modulus M_r (adjusted for SVF)= **26,000** psi

Terracon Consultants, Inc.

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project		
Route:	I-10-Seg1	BMP:	161.00	Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate)		
		EMP:	163.50	Growth Rate (%):	2.2	Pavement Type:	Rigid	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2019	124,000	Data Year	4341.2336	8797.2236	3.50%	7.09%	33%	67%	AZ-3
AADT	2027	147,916	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.7	21.3	5.7	0.4	19.0	45.6	1.7	1.5	0.7	0.4	100
Class Volume (daily)	132,252	580	3336	893	63	2976	7143	266	235	110	63	147917
Growth Factor (G)	24.86	24.86	24.86	24.86	24.86	24.86	24.86	24.86	24.86	24.86	24.86	
Class Volume (total)	1200041423	5262862	30270530	8102993	571656	27003926	64814868	2413657	2132367	998129	571656	
Truck Load Factor (T_{LF})	0.0008	1.29	0.30	0.82	0.80	0.62	2.35	2.32	1.61	1.19	5.53	
Class ESAL's	960033	6789092	9081159	6644454	457325	16742434	152314940	5599684	3433111	1187774	3161258	206,371,264

Total Number of Trucks	142,142,644
Directional Distribution Factor (D_D)	0.57
Lane Distribution Factor (D_L)	0.80
Design ESAL's	94,765,684

Notes:

1) Shaded cells in the Worksheet are user input values. All other cells are calculated values and are locked.
2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Rigid Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Classification	I-10 Seg1
Design Life (years)	20
Equivalent Axle Loads/Day	12981.6005
Total EAL's	94,765,684
Seasonal Variation Factor	1
Reliability	99%
Overall Standard Deviation	0.25
Drainage Coefficient	1.00

SUBGRADE SOIL DATA

Mean R-Value, R_{Mean}	40	
Resilient Modulus MR (psi)	24,425	
Design Subgrade Modulus (psi)	24,425	
Modulus of Subgrade Reaction k (pci)	1,259	This is the k value w/o modification for loss of subgrade support or base material.

DESIGN SUBGRADE FOR PAVEMENT

Design Subgrade or Base Material	Aggregate Base	
Base Material Modulus (psi)	36,000	
Base Material Thickness (inches)	4.0	
Composite Modulus k_m (pci)	1,000	Enter the composite modulus or subgrade
Loss of Subgrade Support	0.0	modulus if there is no base material
Modulus of Subgrade Reaction k (pci)	1000	

SERVICEABILITY

Present (2.5 to 5.0)	4.2
Terminal (1.5 to 4.1)	3.0

CONCRETE PROPERTIES

Modulus of Rupture (psi), approximate	670
Compressive Strength f'c (psi)	5,000
Modulus of Elasticity (psi)	4,030,509
Pavement Type	Jointed Reinforced, (w/dowels)
Load Transfer J	2.8

Design Calculations

Design Slab Thickness	**13.5**	**Inches**	**Jointed Reinforced, (w/dowels)**
Design Base Thickness	**4.0**	**Inches**	**Aggregate Base**
Total Section Thickness	**17.5**	**Inches**	

SEGMENT 2

I-10 Mainline - From Approximately Wild Horse Pass Boulevard / Sundust Road to SR347 / Queen Creek Road
Approx. MP 163.04/163.48 to 164.5
Approx. Stations 944/968 to Sta. 1020

Design Resilient Modulus Analysis

Project Data

PROJECT NAME, LOCATION and SEASONAL VARIATION FACTOR

Project Name:	I-10 GRIC - PDS Segment 2
Location:	
Seasonal Variation Factor:	1.0

Laboratory Test Data

Boring No. Point ID	Boring Location	Depth (ft)	LL	PI	-#200	Laboratory R-Value	Correlated R-Value
R-8	941+00; 25L±	0.5--4		0	43		55
R-9	949+00; 25R±	0.5--4		2	38	72	55
R-10	957+00; 25L±	1--5		6	43		44
R-11	965+00; 25R±	1--5		3	39		52
R-12	973+00; 25L±	1--5		8	41	46	41
R-13	981+00; 25R±	0.5--4		4	45		46
R-14	989+00; 25L±	1--5		11	51	21	32
R-15	997+00; 25R±	1--4.5		20	64		19
R-16	1005+00; 25L±	0--4		18	77	17	17
R-17	1013+00; 25R±	1--4		19	75		17
R-18	1021+00; 25L±	0--4		19	67		19
R-74	945+00; 75R±	1--5		5	42	39	46
R-75	953+00; 75R±	3--5		7	41		43
R-76	961+00; 75R±	1--3		9	42		39
R-77	1001+00; 75R±	1--5		13	51		30
R-78	1006+00; 75L±	1.5--4		20	59	7	20

Mean R-Value and Modulus Calculations

Number of Laboratory Tested R-Values:	6	(Nt)	
Average of Laboratory Tested R-Value Results:	33.67	(Rt)	
Standard Deviation of Laboratory Tested R-Values:	23.66	(SDt)	
Number of Correlated R-Value:	16	(Nc)	Construction
Average of Correlated R-Value Results:	35.94	(Rc)	Control R-Value (Rc): 20.0
Standard Deviation of Correlated R-Values:	13.99	(SDc)	90% t Value: 1.341
Adjusted Average of Tested R-Values:	20.01	(Rt)	
Adjusted Average of Correlated R-Values:	31.95	(Rc)	

Calculation for Mean R-Value:

$$R_{mean} = \frac{N_t \times R_t \times SD_c^2 + N_c \times R_c \times SD_t^2}{N_t \times SD_c^2 + N_c \times SD_t^2}$$

R_{mean} = **30.6**

Seasonal Variation Factor for Project Location= **1.0**

Design Resilient Modulus M_r (adjusted for SVF)= **18,226** psi

Terracon Consultants, Inc.

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project		
Route:	I-10-Seg2	BMP:	163.10	Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate)		
		EMP:	164.50	Growth Rate (%):	2.7	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2022	112,237	Data Year	4652	10737	4.14%	9.57%	30%	70%	AZ-2
AADT	2027	127,924	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	110,386	544	2578	509	18	1631	11294	228	333	263	140	127924
Growth Factor (G)	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	
Class Volume (total)	1045145687	5150646	24408762	4819263	170426	15442471	106932721	2158727	3152877	2490110	1325534	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	836117	5511191	8054891	3084328	98847	9419907	173231008	3086980	5517535	3262044	4652624	216,755,472

Total Number of Trucks	166,051,537
Directional Distribution Factor (D_D)	0.54
Lane Distribution Factor (D_L)	0.80
Design ESAL's	93,638,364

Notes:

1) Shaded cells in the Worksheet are user input values. All other cells are calculated values and are locked.
2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	I-10 Seg2
Design Life (years)	20
Equivalent Axle Loads/Day	12827
Total ESALs	93,638,364
Seasonal Variation Factor	1.0
Reliability	99%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	30.0
Resilient Modulus MR (psi)	17,875
Design Modulus (psi)	17,875

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	3.0

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: **6.61**

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		13.0	7	20.0	6.70	0.09
B		15		15	6.60	-0.01

SEGMENT 3

I-10 Mainline - From SR347 / Queen Creek Road to Riggs Road
Approx. MP 164.5 to 168
Approx. Sta. 1020 to Sta. 1208

Design Resilient Modulus Analysis

Project Data

PROJECT NAME, LOCATION and SEASONAL VARIATION FACTOR

Project Name:	I-10 GRIC - Segment 3
Location:	
Seasonal Variation Factor:	1.0

Laboratory Test Data

Boring No. Point ID	Boring Location	Depth (ft)	LL	PI	-#200	Laboratory R-Value	Correlated R-Value
R-19	1029+00; 25R±	3--5		15	55		26
R-20	1037+00; 25L±	0--5		16	65	19	22
R-21	1045+00; 25R±	1.5--4		13	49		31
R-22	1053+00; 25L±	0--5		12	45		34
R-23	1061+00; 25R±	1--5		9	49		36
R-24	1069+00; 25L±	1--5		14	50	19	29
R-25	1077+00; 25R±	1--5		12	47		33
R-26	1085+00; 25L±	0--5		20	63	11	19
R-27	1093+00; 25R±	1--5		17	54		24
R-28	1101+00; 25L±	1--4		16	55		25
R-29	1109+00; 25R±	2--5		19	51		23
R-30	1117+00; 25L±	1--5		8	38	42	43
R-31	1125+00; 25R±	0--5		9	40		40
R-32	1133+00; 25L±	1--5		18	51	9	24
R-33	1141+00; 25R±	2--5		17	67		20
R-34	1149+00; 25L±	0--5		15	60		24
R-35	1157+00; 25R±	2--5		12	48		32
R-36	1165+00; 25L±	0.3--5		19	49	13	24
R-37	1173+00; 25R±	0--5		18	57		22
R-79	1035+00; 75R±	0.5--3		6	34		49
R-79	1035+00; 75R±	3--5		5	62		35
R-80	1042+00; 75L±	1--5		8	48		38
R-81	1048+00; 75L±	1--5		9	45	27	38
R-82	1051+00; 75R±	1--4		13	49	23	31
R-83	1153+00; 75L±	2.5--5		10	48		35
R-84	1161+00; 75R±	1--5		6	42		44
R-85	1169+00; 75L±	0--2.5		0	5		93
R-85	1169+00; 75L±	2.5--5		11	45		35

Mean R-Value and Modulus Calculations

Number of Laboratory Tested R-Values:	8	(Nt)	
Average of Laboratory Tested R-Value Results:	20.38	(Rt)	
Standard Deviation of Laboratory Tested R-Values:	10.65	(SDt)	
Number of Correlated R-Value:	28	(Nc)	Construction
Average of Correlated R-Value Results:	33.23	(Rc)	Control R-Value (Rc): 20.0
Standard Deviation of Correlated R-Values:	14.12	(SDc)	90% t Value: 1.314
Adjusted Average of Tested R-Values:	19.73	(Rt)	
Adjusted Average of Correlated R-Values:	29.12	(Rc)	

Calculation for Mean R-Value:

$$R_{mean} = \frac{N_t \times R_t \times SD_c^2 + N_c \times R_c \times SD_t^2}{N_t \times SD_c^2 + N_c \times SD_t^2}$$

R_{mean} = **26.0**

Seasonal Variation Factor for Project Location= **1.0**

Design Resilient Modulus M_r (adjusted for SVF)= **15,467** psi

Terracon Consultants, Inc.

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project		
Route:	I-10-Seg3	BMP:	164.50	Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate)		
		EMP:	167.50	Growth Rate (%):	2.9	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2019	82,800	Data Year	6996.6	16137.72	8.45%	19.49%	30%	70%	AZ-2
AADT	2027	104,360	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	75,202	904	4286	846	29	2712	18778	379	554	437	233	104360
Growth Factor (G)	26.69	26.69	26.69	26.69	26.69	26.69	26.69	26.69	26.69	26.69	26.69	
Class Volume (total)	732606604	8806632	41753569	8241605	282514	26419897	182932459	3692161	5396985	4257188	2269851	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	586085	9423096	13778678	5274627	163858	16116137	296350584	5279790	9444724	5576916	7967177	369,961,672

Total Number of Trucks	284,052,861
Directional Distribution Factor (D_D)	0.53
Lane Distribution Factor (D_L)	0.80
Design ESAL's	156,863,749

Notes:

1) Shaded cells in the Worksheet are user input values. All other cells are calculated values and are locked.
2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	I-10 Seg3
Design Life (years)	20
Equivalent Axle Loads/Day	21488
Total ESALs	156,863,749
Seasonal Variation Factor	1.0
Reliability	99%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	26.0
Resilient Modulus MR (psi)	15,479
Design Modulus (psi)	15,479

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	3.0

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: 7.38

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		13.0	12	25.0	7.40	0.02
B		17		17	7.48	0.10

SEGMENT 4

I-10 Mainline - From Riggs Road to the Gila River Bridge
Approx. MP 168 to 172.75
Approx. Sta. 1208 to Sta. 1457

Design Resilient Modulus Analysis

Project Data

PROJECT NAME, LOCATION and SEASONAL VARIATION FACTOR

Project Name:	I-10 GRIC - Segment 4
Location:	
Seasonal Variation Factor:	1.0

Laboratory Test Data

Boring No. Point ID	Boring Location	Depth (ft)	LL	PI	-#200	Laboratory R-Value	Correlated R-Value
R-38	1181+00; 25L±	0.3--4.5		11	56		30
R-39	1189+00; 25R±	0.3--5		23	66	9	16
R-40	1197+00; 25L±	0--5		16	50		27
R-41	1205+00; 25R±	1.5--5		17	51		25
R-42	1213+00; 25L±	0.3--5		20	60	10	20
R-43	1221+00; 25R±	0--3		8	25		52
R-44	1229+00; 25L±	0.3--2		9	37		42
R-44	1229+00; 25L±	2--5		26	72		13
R-45	1237+00; 25R±	1--5		15	51		27
R-46	1245+00; 25L±	0.3--5		21	72	9	16
R-47	1253+00; 25R±	1.5--5		14	31		38
R-48	1261+00; 25L±	0.3--5		14	52		28
R-49	1269+00; 25R±	0--5		16	58	12	24
R-50	1277+00; 25L±	0.5--5		13	40		35
R-51	1285+00; 25R±	1--5		19	56	10	22
R-52	1293+00; 25L±	0.5--5		6	39		46
R-53	1301+00; 25R±	1--5		7	36		46
R-54	1309+00; 25L±	0.5--5		11	40		37
R-55	1317+00; 25R±	1--5		0	50	16	50
R-56	1325+00; 25L±	1--5		12	55	13	29
R-57	1333+00; 25R±	1--3		13	28		41
R-58	1341+00; 25L±	1--4		12	51		31
R-59	1349+00; 25R±	1--5		12	48	29	32
R-60	1357+00; 25L±	0.5--3		0	16		80
R-61	1365+00; 25R±	2--4		6	32	48	51
R-62	1373+00; 25L±	1.5--4		1	32		62
R-63	1381+00; 25R±	0--4		0	17		79
R-64	1389+00; 25L±	2--5		3	39	60	52
R-65	1397+00; 25R±	0.5--4		0	37		60
R-66	1405+00; 25L±	1--3		0	32		64
R-67	1413+00; 25R±	1--4		0	17	80	79
R-67	1413+00; 25R±	4--5		4	56		39
R-68	1421+00; 25L±	2--5		3	41	70	50

R-69	1429+00; 25R±	1--5		0	21		75
R-70	1437+00; 25L±	2--5		0	31		65
R-71	1445+00; 25R±	1--5		0	24	80	72
R-72	1453+00; 25L±	1--5		0	29		67
R-86	1187+00; 75R±	1--3		0	54		47
R-86	1187+00; 75R±	3--6		17	49		26
R-87	1195+00; 75L±	1.5--5		0	60	10	44
R-88	1200+00; 75R±	1.5--5		23	37	8	24
R-89	1203+00; 75L±	2--5		13	51	11	30
R-90	1289+00; 60R±	2--5		5	35	44	51
R-91	1298+00; 60L±	2--5		6	36	52	48
R-92	1312+00; 60R±	2--5		12	50	22	31
R-93	1320+00; 60L±	0.5--5		17	55	16	24

Mean R-Value and Modulus Calculations

Number of Laboratory Tested R-Values:	20	(Nt)	
Average of Laboratory Tested R-Value Results:	30.45	(Rt)	
Standard Deviation of Laboratory Tested R-Values:	25.65	(SDt)	
Number of Correlated R-Value:	46	(Nc)	Construction
Average of Correlated R-Value Results:	42.39	(Rc)	Control R-Value (Rc): 20.0
Standard Deviation of Correlated R-Values:	18.36	(SDc)	90% t Value: 1.303
Adjusted Average of Tested R-Values:	14.80	(Rt)	
Adjusted Average of Correlated R-Values:	34.04	(Rc)	

Calculation for Mean R-Value:

$$R_{mean} = \frac{N_t \times R_t \times SD_c^2 + N_c \times R_c \times SD_t^2}{N_t \times SD_c^2 + N_c \times SD_t^2}$$

R_{mean} = **30.5**

Seasonal Variation Factor for Project Location= **1.0**

Design Resilient Modulus M_r (adjusted for SVF)= **18,204** psi

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project		
Route:	I-10-Seg4	BMP:	167.50	Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate)		
		EMP:	172.80	Growth Rate (%):	3.6	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2022	65,404	Data Year	1811	4802	2.77%	7.34%	27%	73%	AZ-2
AADT	2027	78,108	Build Year					Select appropriate TTC from Table A-1 using % Combos above		

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	70,211	245	1161	229	8	734	5086	103	150	118	63	78108
Growth Factor (G)	28.61	28.61	28.61	28.61	28.61	28.61	28.61	28.61	28.61	28.61	28.61	
Class Volume (total)	733188899	2558449	12123917	2391367	83541	7664905	53111318	1075593	1566398	1232233	657887	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	586551	2737540	4000893	1530475	48454	4675592	86040335	1538098	2741197	1614225	2309183	107,822,543

Total Number of Trucks	82,465,608
Directional Distribution Factor (D_D)	0.67
Lane Distribution Factor (D_L)	0.80
Design ESAL's	57,792,883

Notes:

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2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	I-10 Seg4
Design Life (years)	20
Equivalent Axle Loads/Day	7917
Total ESALs	57,792,883
Seasonal Variation Factor	1.0
Reliability	99%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	30.0
Resilient Modulus MR (psi)	17,875
Design Modulus (psi)	17,875

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	3.0

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: 6.20

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		13.0	4	17.0	6.28	0.08
B		14.5		15	6.38	0.18

APPENDIX B

Traffic Interchange Ramps Calculation Package

TRAFFIC INTERCHANGE RAMPS AT WILD HORSE PASS BOULEVARD / SUNDUST ROAD

Project: I-10 GRIC DB Project, 202L to Gila River Bridge
Terracon Project No.: 65225282

Note: Growth Rates based on ADOT ESAL Calculation Worksheet.

RAMPS AT TRAFFIC INTERCHANGE - WILD HORSE PASS BLVD / SUNDUST RD

	WB I-10 Off-Ramp at WHP			
Year:	**2025**	**2035**	**2040**	**2050**
ADT:	**5,000**	7,000	8,000	9,700
Growth Rate (%)	3.50			
		2.70		
		2.20		
			1.95	
	3.20			
	2.70			

2045
8,850

Growth Rate 2025 - 2045
2.90%

2025 AADT Truck Volumes	
Singles	Combos
207	**479**

	WB I-10 On-Ramp at WHP			
Year:	**2025**	**2035**	**2040**	**2050**
ADT:	**18,600**	36,000	44,700	49,100
Growth Rate (%)	6.85			
		4.45		
		2.10		
			0.95	
	6.02			
	4.00			

2045
46,900

Growth Rate 2025 - 2045
4.74%

2025 AADT Truck Volumes	
Singles	Combos
770	**1,780**

	EB I-10 Off-Ramp at WHP			
Year:	**2025**	**2035**	**2040**	**2050**
ADT:	**15,900**	25,200	29,900	34,600
Growth Rate (%)	4.75			
		3.50		
		2.15		
			1.50	
	4.07			
	3.17			

2045
32,250

Growth Rate 2025 - 2045
3.60%

2025 AADT Truck Volumes	
Singles	Combos
658	**1,522**

	EB I-10 On-Ramp at WHP			
Year:	**2025**	**2035**	**2040**	**2050**
ADT:	**7,100**	12,800	15,600	17,400
Growth Rate (%)	6.10			
		4.10		
		2.10		
			1.10	
	5.40			
	3.65			

2045
16,500

Growth Rate 2025 - 2045
4.32%

2025 AADT Truck Volumes	
Singles	Combos
294	**679**

Truck Info from I-10 Mainline Traffic Data			
Percent Trucks			
(% of total AADT)		(% of total AADTT)	
Singles	Combos	Singles	Combos
4.14%	9.57%	30.00%	70.00%

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - WHP - WB - OFF-RAMP		
Route:	RAMP	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate) - Ramp		
		EMP:		Growth Rate (%):	2.9	Pavement Type:	Rigid	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	5,000	Data Year	207	479	4.14%	9.58%	30%	70%	AZ-2
AADT	2027	5,294	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	4,568	23	107	21	1	68	468	9	14	11	6	5296
Growth Factor (G)	26.60	26.60	26.60	26.60	26.60	26.60	26.60	26.60	26.60	26.60	26.60	
Class Volume (total)	44350712	223307	1038863	203889	9709	660212	4543812	87381	135926	106799	58254	
Truck Load Factor (T_{LF})	0.0008	1.29	0.30	0.82	0.80	0.62	2.35	2.32	1.61	1.19	5.53	
Class ESAL's	35481	288066	311659	167189	7767	409331	10677958	202724	218841	127091	322145	12,768,252

Total Number of Trucks	7,068,152
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	1.00
Design ESAL's	12,768,252

Notes:

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2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - WHP - WB - ON-RAMP		
Route:	RAMP	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate) - Ramp		
		EMP:		Growth Rate (%):	4.7	Pavement Type:	Rigid	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	18,600	Data Year	770	1780	4.14%	9.57%	30%	70%	AZ-2
AADT	2027	20,405	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	17,608	87	411	81	3	260	1801	36	53	42	22	20404
Growth Factor (G)	32.17	32.17	32.17	32.17	32.17	32.17	32.17	32.17	32.17	32.17	32.17	
Class Volume (total)	206754016	1021558	4825983	951106	35226	3052933	21147432	422714	622329	493166	258325	
Truck Load Factor (T_{LF})	0.0008	1.29	0.30	0.82	0.80	0.62	2.35	2.32	1.61	1.19	5.53	
Class ESAL's	165403	1317810	1447795	779907	28181	1892818	49696465	980696	1001950	586868	1428537	59,326,430

Total Number of Trucks	32,830,772
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	1.00
Design ESAL's	59,326,430

Notes:

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3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - WHP - EB - OFF-RAMP		
Route:	RAMP	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate) - Ramp		
		EMP:		Growth Rate (%):	3.6	Pavement Type:	Rigid	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	15,900	Data Year	658	1522	4.14%	9.57%	30%	70%	AZ-2
AADT	2027	17,065	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	14,726	73	344	68	2	218	1507	30	44	35	19	17066
Growth Factor (G)	28.57	28.57	28.57	28.57	28.57	28.57	28.57	28.57	28.57	28.57	28.57	
Class Volume (total)	153563464	761248	3587249	709107	20856	2273315	15715071	312842	458834	364982	198133	
Truck Load Factor (T_{LF})	0.0008	1.29	0.30	0.82	0.80	0.62	2.35	2.32	1.61	1.19	5.53	
Class ESAL's	122851	982010	1076175	581468	16685	1409455	36930417	725793	738723	434329	1095675	44,113,581

Total Number of Trucks	24,401,637
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	0.90
Design ESAL's	39,702,223

Notes:

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3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - WHP - EB - ON-RAMP		
Route:	RAMP	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate) - Ramp		
		EMP:		Growth Rate (%):	4.3	Pavement Type:	Rigid	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	7,100	Data Year	294	679	4.14%	9.56%	30%	70%	AZ-2
AADT	2027	7,727	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	6,668	33	156	31	1	98	682	14	20	16	8	7727
Growth Factor (G)	30.79	30.79	30.79	30.79	30.79	30.79	30.79	30.79	30.79	30.79	30.79	
Class Volume (total)	74937318	370866	1753183	348389	11238	1101358	7664555	157337	224767	179814	89907	
Truck Load Factor (T_{LF})	0.0008	1.29	0.30	0.82	0.80	0.62	2.35	2.32	1.61	1.19	5.53	
Class ESAL's	59950	478417	525955	285679	8990	682842	18011704	365022	361875	213979	497186	21,491,599

Total Number of Trucks	11,901,414
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	1.00
Design ESAL's	21,491,599

Notes:

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2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design Resilient Modulus Analysis

Project Data

PROJECT NAME, LOCATION and SEASONAL VARIATION FACTOR

Project Name:	I-10 GRIC - WHP Blvd TI
Location:	
Seasonal Variation Factor:	1.0

Laboratory Test Data

Boring No. Point ID	Boring Location	Depth (ft)	LL	PI	-#200	Laboratory R-Value	Correlated R-Value
R&C-1	33.278°/-111.970°	1--4.5		15	62		23
R&C-2	33.279°/-111.969°	1--5		15	52	31	27
R&C-3	33.280°/-111.968°	1--4		15	62		24
R&C-4	33.281°/-111.968°	2--5		17	70	30	20
R&C-5	33.282°/-111.968°	2--5		11	39		38
R&C-6	33.280°/-111.966°	0--5		18	43	44	27
R&C-7	33.280°/-111.964°	0--5		10	36		41
R&C-8	33.281°/-111.963°	0.5--5		7	31		49
R&C-9	33.279°/-111.966°	0--5		19	30		32
R&C-10	33.278°/-111.965°	1--5		10	28		46
R&C-11	33.278°/-111.967°	0--4		11	26	56	45
R&C-11	33.278°/-111.967°	4--5		0	17		79
R&C-12	33.279°/-111.968°	4--5		11	3		63

Mean R-Value and Modulus Calculations

Number of Laboratory Tested R-Values:	4 (Nt)	
Average of Laboratory Tested R-Value Results:	40.25 (Rt)	
Standard Deviation of Laboratory Tested R-Values:	12.28 (SDt)	
Number of Correlated R-Value:	13 (Nc)	Construction
Average of Correlated R-Value Results:	39.59 (Rc)	Control R-Value (Rc): 20.0
Standard Deviation of Correlated R-Values:	17.26 (SDc)	90% t Value: 1.356
Adjusted Average of Tested R-Values:	37.97 (Rt)	
Adjusted Average of Correlated R-Values:	32.33 (Rc)	

Calculation for Mean R-Value:

$$R_{mean} = \frac{N_t \times R_t \times SD_c^2 + N_c \times R_c \times SD_t^2}{N_t \times SD_c^2 + N_c \times SD_t^2}$$

R_{mean} = **34.5**

Seasonal Variation Factor for Project Location= **1.0**

Design Resilient Modulus M_r (adjusted for SVF)= **20,697** psi

Rigid Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Classification	WHP-W-Off
Design Life (years)	20
Equivalent Axle Loads/Day	1749.07562
Total EAL's	12,768,252
Seasonal Variation Factor	1
Reliability	99%
Overall Standard Deviation	0.25
Drainage Coefficient	1.00

SUBGRADE SOIL DATA

Mean R-Value, R_{Mean}	30	
Resilient Modulus MR (psi)	17,875	
Design Subgrade Modulus (psi)	17,875	
Modulus of Subgrade Reaction k (pci)	921	This is the k value w/o modification for loss of subgrade support or base material.

DESIGN SUBGRADE FOR PAVEMENT

Design Subgrade or Base Material	Aggregate Base	
Base Material Modulus (psi)	36,000	
Base Material Thickness (inches)	4.0	
Composite Modulus k_m (pci)	1,000	Enter the composite modulus or subgrade
Loss of Subgrade Support	0.0	modulus if there is no base material
Modulus of Subgrade Reaction k (pci)	1000	

SERVICEABILITY

Present (2.5 to 5.0)	4.2
Terminal (1.5 to 4.1)	3.0

CONCRETE PROPERTIES

Modulus of Rupture (psi), approximate	670
Compressive Strength f'c (psi)	5,000
Modulus of Elasticity (psi)	4,030,509
Pavement Type	Jointed Reinforced, (w/dowels)
Load Transfer J	2.8

Design Calculations

Design Slab Thickness	**9.5**	**Inches**	**Jointed Reinforced, (w/dowels)**
Design Base Thickness	**4.0**	**Inches**	**Aggregate Base**
Total Section Thickness	**13.5**	**Inches**	

Rigid Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Classification	WHP-W-On
Design Life (years)	20
Equivalent Axle Loads/Day	8126.90822
Total EAL's	59,326,430
Seasonal Variation Factor	1
Reliability	99%
Overall Standard Deviation	0.25
Drainage Coefficient	1.00

SUBGRADE SOIL DATA

Mean R-Value, R_{Mean}	30	
Resilient Modulus MR (psi)	17,875	
Design Subgrade Modulus (psi)	17,875	
Modulus of Subgrade Reaction k (pci)	921	This is the k value w/o modification for loss of subgrade support or base material.

DESIGN SUBGRADE FOR PAVEMENT

Design Subgrade or Base Material	Aggregate Base	
Base Material Modulus (psi)	36,000	
Base Material Thickness (inches)	4.0	
Composite Modulus k_m (pci)	1,000	Enter the composite modulus or subgrade
Loss of Subgrade Support	0.0	modulus if there is no base material
Modulus of Subgrade Reaction k (pci)	1000	

SERVICEABILITY

Present (2.5 to 5.0)	4.2
Terminal (1.5 to 4.1)	3.0

CONCRETE PROPERTIES

Modulus of Rupture (psi), approximate	670
Compressive Strength f'c (psi)	5,000
Modulus of Elasticity (psi)	4,030,509
Pavement Type	Jointed Reinforced, (w/dowels)
Load Transfer J	2.8

Design Calculations

Design Slab Thickness	**12.5**	**Inches**	**Jointed Reinforced, (w/dowels)**
Design Base Thickness	**4.0**	**Inches**	**Aggregate Base**
Total Section Thickness	**16.5**	**Inches**	

Rigid Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Classification	WHP-E-Off
Design Life (years)	20
Equivalent Axle Loads/Day	5438.66068
Total EAL's	39,702,223
Seasonal Variation Factor	1
Reliability	99%
Overall Standard Deviation	0.25
Drainage Coefficient	1.00

SUBGRADE SOIL DATA

Mean R-Value, R_{Mean}	30	
Resilient Modulus MR (psi)	17,875	
Design Subgrade Modulus (psi)	17,875	
Modulus of Subgrade Reaction k (pci)	921	This is the k value w/o modification for loss of subgrade support or base material.

DESIGN SUBGRADE FOR PAVEMENT

Design Subgrade or Base Material	Aggregate Base	
Base Material Modulus (psi)	36,000	
Base Material Thickness (inches)	4.0	
Composite Modulus k_m (pci)	1,000	Enter the composite modulus or subgrade
Loss of Subgrade Support	0.0	modulus if there is no base material
Modulus of Subgrade Reaction k (pci)	1000	

SERVICEABILITY

Present (2.5 to 5.0)	4.2
Terminal (1.5 to 4.1)	3.0

CONCRETE PROPERTIES

Modulus of Rupture (psi), approximate	670
Compressive Strength f'c (psi)	5,000
Modulus of Elasticity (psi)	4,030,509
Pavement Type	Jointed Reinforced, (w/dowels)
Load Transfer J	2.8

Design Calculations

Design Slab Thickness	**12.0**	**Inches**	**Jointed Reinforced, (w/dowels)**
Design Base Thickness	**4.0**	**Inches**	**Aggregate Base**
Total Section Thickness	**16.0**	**Inches**	

Rigid Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Classification	WHP-E-On
Design Life (years)	20
Equivalent Axle Loads/Day	2944.05466
Total EAL's	21,491,599
Seasonal Variation Factor	1
Reliability	99%
Overall Standard Deviation	0.25
Drainage Coefficient	1.00

SUBGRADE SOIL DATA

Mean R-Value, R_{Mean}	30	
Resilient Modulus MR (psi)	17,875	
Design Subgrade Modulus (psi)	17,875	
Modulus of Subgrade Reaction k (pci)	921	This is the k value w/o modification for loss of subgrade support or base material.

DESIGN SUBGRADE FOR PAVEMENT

Design Subgrade or Base Material	Aggregate Base	
Base Material Modulus (psi)	36,000	
Base Material Thickness (inches)	4.0	
Composite Modulus k_m (pci)	1,000	Enter the composite modulus or subgrade
Loss of Subgrade Support	0.0	modulus if there is no base material
Modulus of Subgrade Reaction k (pci)	1000	

SERVICEABILITY

Present (2.5 to 5.0)	4.2
Terminal (1.5 to 4.1)	3.0

CONCRETE PROPERTIES

Modulus of Rupture (psi), approximate	670
Compressive Strength f'c (psi)	5,000
Modulus of Elasticity (psi)	4,030,509
Pavement Type	Jointed Reinforced, (w/dowels)
Load Transfer J	2.8

Design Calculations

Design Slab Thickness	**10.5**	**Inches**	**Jointed Reinforced, (w/dowels)**
Design Base Thickness	**4.0**	**Inches**	**Aggregate Base**
Total Section Thickness	**14.5**	**Inches**	

TRAFFIC INTERCHANGE RAMPS AT SR 347 / QUEEN CREEK ROAD

Project: I-10 GRIC DB Project, 202L to Gila River Bridge
Terracon Project No.: 65225282

Note: Growth Rates based on ADOT ESAL Calculation Worksheet.

RAMPS AT TRAFFIC INTERCHANGE - SR347 / QUEEN CREEK ROAD

	WB I-10 Off-Ramp at SR347/QCR			
Year:	**2025**	**2035**	**2040**	**2050**
ADT:	**1,300**	2,900	3,600	4,700
Growth Rate (%)	8.50			
		4.60		
		3.30		
			2.70	
	7.10			
	5.30			

2045
4,150

Growth Rate 2025 - 2045
6.00%

2025 AADT Truck Volumes	
Singles	Combos
110	**253**

	WB I-10 On-Ramp at SR347/QCR			
Year:	**2025**	**2035**	**2040**	**2050**
ADT:	**21,100**	27,200	30,300	31,500
Growth Rate (%)	2.58			
		2.40		
		1.00		
			0.40	
	2.45			
	1.65			

2045
30,900

Growth Rate 2025 - 2045
1.94%

2025 AADT Truck Volumes	
Singles	Combos
1,783	**4,112**

	EB I-10 Off-Ramp at SR347/QCR			
Year:	**2025**	**2035**	**2040**	**2050**
ADT:	**20,200**	25,100	27,600	28,700
Growth Rate (%)	2.20			
		1.95		
		0.90		
			0.40	
	2.15			
	1.45			

2045
28,150

Growth Rate 2025 - 2045
1.68%

2025 AADT Truck Volumes	
Singles	Combos
1,707	**3,937**

	EB I-10 On-Ramp at SR347/QCR			
Year:	**2025**	**2035**	**2040**	**2050**
ADT:	**2,500**	6,200	8,000	9,100
Growth Rate (%)	9.55			
		5.25		
		2.55		
			1.30	
	8.10			
	5.35			

2045
8,550

Growth Rate 2025 - 2045
6.35%

2025 AADT Truck Volumes	
Singles	Combos
211	**487**

Truck Info from I-10 Mainline Traffic Data			
Percent Trucks			
(% of total AADT)		(% of total AADTT)	
Singles	Combos	Singles	Combos
8.45%	19.49%	30.00%	70.00%

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - SR347 - WB - OFF-RAMP		
Route:	RAMP	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate) - Ramp		
		EMP:		Growth Rate (%):	6.0	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	1,300	Data Year	110	253	8.46%	19.46%	30%	70%	AZ-2
AADT	2027	1,461	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	1,053	13	60	12	0	38	263	5	8	6	3	1461
Growth Factor (G)	36.79	36.79	36.79	36.79	36.79	36.79	36.79	36.79	36.79	36.79	36.79	
Class Volume (total)	14140053	174569	805701	161140	0	510277	3531656	67142	107427	80570	40285	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	11312	186789	265881	103130	0	311269	5721283	96013	187997	105547	141400	7,130,621

Total Number of Trucks	5,478,767
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	1.00
Design ESAL's	7,130,621

Notes:

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2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - SR347 - WB - ON-RAMP		
Route:	RAMP	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate) - Ramp		
		EMP:		Growth Rate (%):	1.9	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	21,100	Data Year	1783	4112	8.45%	19.49%	30%	70%	AZ-2
AADT	2027	21,927	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	15,800	190	901	178	6	570	3946	80	116	92	49	21928
Growth Factor (G)	24.15	24.15	24.15	24.15	24.15	24.15	24.15	24.15	24.15	24.15	24.15	
Class Volume (total)	139273050	1674803	7942090	1569026	52889	5024408	34783004	705180	1022511	810957	431923	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	111418	1792039	2620890	1004177	30676	3064889	56348466	1008407	1789394	1062354	1516050	70,348,760

Total Number of Trucks	54,016,791
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	1.00
Design ESAL's	70,348,760

Notes:

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4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - SR347 - EB - OFF-RAMP		
Route:	RAMP	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate) - Ramp		
		EMP:		Growth Rate (%):	1.7	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	20,200	Data Year	1707	3937	8.45%	19.49%	30%	70%	AZ-2
AADT	2027	20,884	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	15,049	181	858	169	6	543	3758	76	111	88	47	20886
Growth Factor (G)	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	
Class Volume (total)	129302513	1555170	7372022	1452065	51553	4665510	32289112	653000	953723	756105	403829	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	103442	1664032	2432767	929322	29901	2845961	52308361	933790	1669015	990498	1417440	65,324,529

Total Number of Trucks	50,152,089
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	0.90
Design ESAL's	58,792,076

Notes:

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3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - SR347 - EB - ON-RAMP		
Route:	RAMP	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate) - Ramp		
		EMP:		Growth Rate (%):	6.4	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	2,500	Data Year	211	487	8.44%	19.48%	30%	70%	AZ-2
AADT	2027	2,828	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	2,038	24	116	23	1	73	508	10	15	12	6	2826
Growth Factor (G)	38.20	38.20	38.20	38.20	38.20	38.20	38.20	38.20	38.20	38.20	38.20	
Class Volume (total)	28415834	334632	1617388	320689	13943	1017839	7083044	139430	209145	167316	83658	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	22733	358056	533738	205241	8087	620882	11474531	199385	366004	219184	293640	14,301,481

Total Number of Trucks	10,987,084
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	1.00
Design ESAL's	14,301,481

Notes:

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3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design Resilient Modulus Analysis

Project Data

PROJECT NAME, LOCATION and SEASONAL VARIATION FACTOR

Project Name:	I-10 GRIC - SR347 QCR TI
Location:	
Seasonal Variation Factor:	1.0

Laboratory Test Data

Boring No. Point ID	Boring Location	Depth (ft)	LL	PI	-#200	Laboratory R-Value	Correlated R-Value
R&C-13	33.258°/-111.950°	1.5--5		5	38		48
R&C-14	33.257°/-111.949°	2--4		13	47		31
R&C-14	33.257°/-111.949°	4--6		3	28		61
R&C-15	33.256°/-111.950°	1--5		7	38	16	45
R&C-16	33.256°/-111.948°	1 --3		0	20		76
R&C-16	33.256°/-111.948°	3 --5		7	45		41
R&C-17	33.253°/-111.955°	0.5 --4		5	25		58
R&C-18	33.255°/-111.950°	1 --5		16	47	7	28
R&C-19	33.257°/-111.946°	1 --4		7	31	40	49
R&C-20	33.254°/-111.952°	0.3 --5		8	37	9	44
R&C-21	33.255°/-111.949°	0 --2		0	26		70
R&C-21	33.255°/-111.949°	2 --5		22	59		19
R&C-22	33.256°/-111.947°	1 --7		15	65		23
R&C-23	33.254°/-111.948°	1.1 --5		3	36		54
R&C-24	33.255°/-111.947°	1 --5		5	30	60	54

Mean R-Value and Modulus Calculations

Number of Laboratory Tested R-Values:	5 (Nt)	
Average of Laboratory Tested R-Value Results:	26.40 (Rt)	
Standard Deviation of Laboratory Tested R-Values:	22.92 (SDt)	
Number of Correlated R-Value:	15 (Nc)	Construction
Average of Correlated R-Value Results:	46.77 (Rc)	Control R-Value (Rc): 24.5
Standard Deviation of Correlated R-Values:	16.54 (SDc)	90% t Value: 1.345
Adjusted Average of Tested R-Values:	13.48 (Rt)	
Adjusted Average of Correlated R-Values:	40.23 (Rc)	

Calculation for Mean R-Value:

$$R_{mean} = \frac{N_t \times R_t \times SD_c^2 + N_c \times R_c \times SD_t^2}{N_t \times SD_c^2 + N_c \times SD_t^2}$$

R_{mean} = **36.3**

Seasonal Variation Factor for Project Location= **1.0**

Design Resilient Modulus M_r (adjusted for SVF)= **21,892** psi

Terracon Consultants, Inc.

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	QCR-W-Off
Design Life (years)	20
Equivalent Axle Loads/Day	2149
Total ESALs	15,686,375
Seasonal Variation Factor	1.0
Reliability	99%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	33.0
Resilient Modulus MR (psi)	19,756
Design Modulus (psi)	19,756

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	3.0

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: **4.96**

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		11.5	4	15.5	5.62	0.66
B		11.5		12	5.06	0.10

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	QCR-W-On
Design Life (years)	20
Equivalent Axle Loads/Day	9637
Total ESALs	70,348,760
Seasonal Variation Factor	1.0
Reliability	99%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	33.0
Resilient Modulus MR (psi)	19,756
Design Modulus (psi)	19,756

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	3.0

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: **6.17**

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		11.5	8	19.5	6.18	0.01
B		14		14	6.16	-0.01

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	QCR-E-Off
Design Life (years)	20
Equivalent Axle Loads/Day	8054
Total ESALs	58,792,076
Seasonal Variation Factor	1.0
Reliability	99%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	33.0
Resilient Modulus MR (psi)	19,756
Design Modulus (psi)	19,756

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	3.0

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: 6.02

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		11.5	7	18.5	6.04	0.02
B		14		14	6.16	0.14

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	QCR-E-On
Design Life (years)	20
Equivalent Axle Loads/Day	2149
Total ESALs	15,686,375
Seasonal Variation Factor	1.0
Reliability	99%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	33.0
Resilient Modulus MR (psi)	19,756
Design Modulus (psi)	19,756

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	3.0

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: **4.96**

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		11.5	4	15.5	5.62	0.66
B		11.5		12	5.06	0.10

TRAFFIC INTERCHANGE RAMPS AT RIGGS ROAD

Project: I-10 GRIC DB Project, 202L to Gila River Bridge
Terracon Project No.: 65225282

Note: Growth Rates based on ADOT ESAL Calculation Worksheet.

RAMPS AT TRAFFIC INTERCHANGE - RIGGS ROAD

	WB I-10 Off-Ramp at Riggs Rd			
Year:	**2025**	**2035**	**2040**	**2050**
ADT:	**2,600**	3,300	3,700	4,100
Growth Rate (%)	2.45			
		2.50		
		1.50		
			1.05	
	2.40			
	1.85			

2045
3,900

Growth Rate 2025 - 2045
2.10%

2025 AADT Truck Volumes	
Singles	Combos
220	**507**

	WB I-10 On-Ramp at Riggs Rd			
Year:	**2025**	**2035**	**2040**	**2050**
ADT:	**6,300**	6,000	5,900	6,500
Growth Rate (%)	-0.40			
		-0.30		
		0.55		
			1.00	
	-0.40			
	0.15			

2045
6,200

Growth Rate 2025 - 2045
0.01%

2025 AADT Truck Volumes	
Singles	Combos
532	**1,228**

	EB I-10 Off-Ramp at Riggs Rd			
Year:	**2025**	**2035**	**2040**	**2050**
ADT:	**8,900**	12,400	14,200	15,600
Growth Rate (%)	3.40			
		2.80		
		1.55		
			0.95	
	3.20			
	2.30			

2045
14,900

Growth Rate 2025 - 2045
2.64%

2025 AADT Truck Volumes	
Singles	Combos
752	**1,735**

	EB I-10 On-Ramp at Riggs Rd			
Year:	**2025**	**2035**	**2040**	**2050**
ADT:	**1,800**	2,000	2,100	2,300
Growth Rate (%)	1.10			
		1.00		
		0.95		
			0.95	
	1.05			
	1.00			

2045
2,200

Growth Rate 2025 - 2045
1.10%

2025 AADT Truck Volumes	
Singles	Combos
152	**351**

Truck Info from I-10 Mainline Traffic Data			
Percent Trucks			
(% of total AADT)		(% of total AADTT)	
Singles	Combos	Singles	Combos
8.45%	19.49%	30.00%	70.00%

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - RIGGS RD - WB - OFF-RAMP		
Route:	RAMP	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate) - Ramp		
		EMP:		Growth Rate (%):	2.1	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	2,600	Data Year	220	507	8.46%	19.50%	30%	70%	AZ-2
AADT	2027	2,710	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	1,953	23	111	22	1	70	488	10	14	11	6	2709
Growth Factor (G)	24.54	24.54	24.54	24.54	24.54	24.54	24.54	24.54	24.54	24.54	24.54	
Class Volume (total)	17493216	206013	994238	197056	8957	626997	4371065	89571	125399	98528	53743	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	13995	220434	328099	126116	5195	382468	7081125	128087	219448	129072	188638	8,822,677

Total Number of Trucks	6,771,567
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	1.00
Design ESAL's	8,822,677

Notes:

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3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - RIGGS RD - WB - ON-RAMP		
Route:	RAMP	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate)		
		EMP:		Growth Rate (%):	1.0	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	6,300	Data Year	532	1228	8.44%	19.49%	30%	70%	AZ-2
AADT	2027	6,427	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	4,632	56	264	52	2	167	1156	23	34	27	14	6427
Growth Factor (G)	22.02	22.02	22.02	22.02	22.02	22.02	22.02	22.02	22.02	22.02	22.02	
Class Volume (total)	37228774	450089	2121847	417940	16075	1342229	9291119	184858	273268	217007	112522	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	29783	481595	700210	267482	9324	818760	15051613	264347	478219	284279	394952	18,780,564

Total Number of Trucks	14,426,954
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	1.00
Design ESAL's	18,780,564

Notes:

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2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - RIGGS RD - EB - OFF-RAMP		
Route:	RAMP	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate) - Ramp		
		EMP:		Growth Rate (%):	2.6	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	8,900	Data Year	752	1735	8.45%	19.49%	30%	70%	AZ-2
AADT	2027	9,376	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	6,756	81	385	76	3	244	1687	34	50	39	21	9376
Growth Factor (G)	25.91	25.91	25.91	25.91	25.91	25.91	25.91	25.91	25.91	25.91	25.91	
Class Volume (total)	63892505	766029	3641003	718743	28371	2307545	15954212	321543	472858	368829	198600	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	51114	819651	1201531	459996	16455	1407602	25845823	459806	827502	483166	697086	32,269,732

Total Number of Trucks	24,777,733
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	1.00
Design ESAL's	32,269,732

Notes:

1) Shaded cells in the Worksheet are user input values. All other cells are calculated values and are locked.
2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - RIGGS RD - EB - ON-RAMP		
Route:	RAMP	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate) - Ramp		
		EMP:		Growth Rate (%):	1.1	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	1,800	Data Year	152	351	8.44%	19.50%	30%	70%	AZ-2
AADT	2027	1,840	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	1,326	16	76	15	1	48	331	7	10	8	4	1842
Growth Factor (G)	22.23	22.23	22.23	22.23	22.23	22.23	22.23	22.23	22.23	22.23	22.23	
Class Volume (total)	10759098	129823	616660	121709	8114	389470	2685717	56798	81140	64912	32456	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	8607	138911	203498	77894	4706	237577	4350862	81221	141995	85035	113921	5,444,227

Total Number of Trucks	4,186,799
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	1.00
Design ESAL's	5,444,227

Notes:

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3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design Resilient Modulus Analysis

Project Data

PROJECT NAME, LOCATION and SEASONAL VARIATION FACTOR

Project Name:	I-10 GRIC - Riggs Rd TI
Location:	
Seasonal Variation Factor:	1.0

Laboratory Test Data

Boring No. Point ID	Boring Location	Depth (ft)	LL	PI	-#200	Laboratory R-Value	Correlated R-Value
R&C-25	33.222°/-111.923°	0 --1.5		0	9		88
R&C-25	33.222°/-111.923°	1.5 --4		13	36	19	37
R&C-25	33.222°/-111.923°	4 --5		22	74		15
R&C-26	33.221°/-111.921°	0 --4		0	9		88
R&C-27	33.220°/-111.923°	0.5 --5		14	43	26	32
R&C-28	33.220°/-111.918°	0 --5		15	28		38
R&C-29	33.219°/-111.924°	1 --4		14	38	40	34
R&C-30	33.219°/-111.922°	0.3 --2		0	9		88
R&C-30	33.219°/-111.922°	2 --4		21	40		25
R&C-31	33.219°/-111.919°	2 --5		27	57	8	16
R&C-32	33.219°/-111.917°	0.5 --5		19	51	8	24
R&C-33	33.219°/-111.923°	0 --4		4	19		66
R&C-33	33.219°/-111.923°	4 --5		0	43		55
R&C-34	33.218°/-111.919°	0.8 --4		0	7		91

Mean R-Value and Modulus Calculations

Number of Laboratory Tested R-Values:	5 (Nt)	
Average of Laboratory Tested R-Value Results:	20.20 (Rt)	
Standard Deviation of Laboratory Tested R-Values:	13.46 (SDt)	
Number of Correlated R-Value:	14 (Nc)	Construction
Average of Correlated R-Value Results:	49.76 (Rc)	Control R-Value (Rc): 20.0
Standard Deviation of Correlated R-Values:	28.99 (SDc)	90% t Value: 1.350
Adjusted Average of Tested R-Values:	16.74 (Rt)	
Adjusted Average of Correlated R-Values:	30.77 (Rc)	

Calculation for Mean R-Value:

$$R_{mean} = \frac{N_t \times R_t \times SD_c^2 + N_c \times R_c \times SD_t^2}{N_t \times SD_c^2 + N_c \times SD_t^2}$$

R_{mean} = **22.0**

Seasonal Variation Factor for Project Location= **1.0**

Design Resilient Modulus M_r (adjusted for SVF)= **13,222** psi

Terracon Consultants, Inc.

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	Riggs2Rmps	WB-Off & EB-On
Design Life (years)	20	
Equivalent Axle Loads/Day	2149	
Total ESALs	15,686,375	
Seasonal Variation Factor	1.0	
Reliability	99%	
Overall Standard Deviation	0.45	

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	22.0
Resilient Modulus MR (psi)	13,211
Design Modulus (psi)	13,211

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	3.0

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: **5.70**

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		10.5	8	18.5	5.74	0.04
B		13		13	5.72	0.02

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	Riggs-W-On
Design Life (years)	20
Equivalent Axle Loads/Day	2573
Total ESALs	18,780,564
Seasonal Variation Factor	1.0
Reliability	99%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	22.0
Resilient Modulus MR (psi)	13,211
Design Modulus (psi)	13,211

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	3.0

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: 5.85

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		10.5	9	19.5	5.88	0.03
B		13.5		14	5.94	0.09

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	Riggs-E-Off
Design Life (years)	20
Equivalent Axle Loads/Day	4421
Total ESALs	32,269,732
Seasonal Variation Factor	1.0
Reliability	99%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	22.0
Resilient Modulus MR (psi)	13,211
Design Modulus (psi)	13,211

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	3.0

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: **6.30**

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		10.5	12	22.5	6.30	0.00
B		14.5		15	6.38	0.08

NOTE:
GOODYEAR ROAD EXCLUDES TRAFFIC INTERCHANGE RAMPS

APPENDIX C

Crossroads Calculation Package

WILD HORSE PASS BOULEVARD / SUNDUST ROAD

Project: I-10 GRIC DB Project, 202L to Gila River Bridge
Terracon Project No.: 65225282

Note: Growth Rates based on ADOT ESAL Calculation Worksheet.

CROSSROAD - WILD HORSE PASS BLVD / SUNDUST RD

	Wild Horse Pass Blvd - WEST of I-10				
Year:	**2025 (DCR)**	**2035 (DCR)**	**2040 (DCR)**	**2045 (interpolated)**	**2050 (DCR)**
ADT:	**36,200**	71,100	88,500	93,150	97,800
Growth Rate (%):	**3.86%**				
Directional Factor DL:	**51%**				

2025 AADT	
Truck Volumes	
Singles	Combos
1,727	**2,291**

	Sundust Road - EAST of I-10				
Year:	**2025 (DCR)**	**2035 (DCR)**	**2040 (DCR)**	**2045 (interpolated)**	**2050 (DCR)**
ADT:	**17,100**	28,700	34,500	34,800	35,100
Growth Rate (%):	**2.90%**				
Directional Factor DL:	**51%**				

2025 AADT	
Truck Volumes	
Singles	Combos
816	**1,082**

Truck Info from SR347 ADOT Traffic Data			
Percent Trucks			
(% of total AADT)		(% of total AADTT)	
Singles	Combos	Singles	Combos
4.77%	6.33%	43%	57%

Design Resilient Modulus Analysis

Project Data

PROJECT NAME, LOCATION and SEASONAL VARIATION FACTOR

Project Name:	I-10 GRIC - WHP Blvd TI
Location:	
Seasonal Variation Factor:	1.0

Laboratory Test Data

Boring No. Point ID	Boring Location	Depth (ft)	LL	PI	-#200	Laboratory R-Value	Correlated R-Value
R&C-1	33.278°/-111.970°	1--4.5		15	62		23
R&C-2	33.279°/-111.969°	1--5		15	52	31	27
R&C-3	33.280°/-111.968°	1--4		15	62		24
R&C-4	33.281°/-111.968°	2--5		17	70	30	20
R&C-5	33.282°/-111.968°	2--5		11	39		38
R&C-6	33.280°/-111.966°	0--5		18	43	44	27
R&C-7	33.280°/-111.964°	0--5		10	36		41
R&C-8	33.281°/-111.963°	0.5--5		7	31		49
R&C-9	33.279°/-111.966°	0--5		19	30		32
R&C-10	33.278°/-111.965°	1--5		10	28		46
R&C-11	33.278°/-111.967°	0--4		11	26	56	45
R&C-11	33.278°/-111.967°	4--5		0	17		79
R&C-12	33.279°/-111.968°	4--5		11	3		63

Mean R-Value and Modulus Calculations

Number of Laboratory Tested R-Values:	4	(Nt)
Average of Laboratory Tested R-Value Results:	40.25	(Rt)
Standard Deviation of Laboratory Tested R-Values:	12.28	(SDt)
Number of Correlated R-Value:	13	(Nc)
Average of Correlated R-Value Results:	39.59	(Rc)
Standard Deviation of Correlated R-Values:	17.26	(SDc)
Adjusted Average of Tested R-Values:	37.97	(Rt)
Adjusted Average of Correlated R-Values:	32.33	(Rc)

Construction Control R-Value (Rc): 20.0

90% t Value: 1.356

Calculation for Mean R-Value:

$$R_{mean} = \frac{N_t \times R_t \times SD_c^2 + N_c \times R_c \times SD_t^2}{N_t \times SD_c^2 + N_c \times SD_t^2}$$

R_{mean} = **34.5**

Seasonal Variation Factor for Project Location= **1.0**

Design Resilient Modulus M_r (adjusted for SVF)= **20,697** psi

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project-Wild Horse Pass Blvd - West of I-10 - AC		
Route:	WHP W	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial - Crossroad		
		EMP:		Growth Rate (%):	3.9	Pavement Type:	Flexible	Cluster Number:	3

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	36,200	Data Year	1727	2291	4.77%	6.33%	43%	57%	AZ-3
AADT	2027	39,049	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.7	21.3	5.7	0.4	19.0	45.6	1.7	1.5	0.7	0.4	100
Class Volume (daily)	34,714	160	923	247	17	824	1977	74	65	30	17	39048
Growth Factor (G)	29.35	29.35	29.35	29.35	29.35	29.35	29.35	29.35	29.35	29.35	29.35	
Class Volume (total)	371882404	1714040	9887868	2646049	182117	8827306	21179107	792744	696329	321383	182117	
Truck Load Factor (T_{LF})	0.0008	1.20	0.13	0.86	0.64	0.52	1.93	1.78	2.25	1.17	2.07	
Class ESAL's	297506	2056848	1285423	2275602	116555	4590199	40875677	1411084	1566740	376018	376982	55,228,634

Total Number of Trucks	46,429,060
Directional Distribution Factor (D_D)	0.51
Lane Distribution Factor (D_L)	0.80
Design ESAL's	22,533,283

Notes:

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2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	WHP-W
Design Life (years)	20
Equivalent Axle Loads/Day	3087
Total ESALs	22,533,283
Seasonal Variation Factor	1.0
Reliability	95%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	30.0
Resilient Modulus MR (psi)	17,875
Design Modulus (psi)	17,875

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	2.8

LAYER COEFFICIENTS	**Structural**	**Drainage**
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: **4.65**

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		8.0	8	16.0	4.64	-0.01
B		11		11	4.84	0.19

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB - Wild Horse Pass Blvd - Crossing of I-10- PCCP		
Route:	WHP Xing	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial - Crossroad		
		EMP:		Growth Rate (%):	3.9	Pavement Type:	Rigid	Cluster Number:	3

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	36,200	Data Year	1727	2291	4.77%	6.33%	43%	57%	AZ-3
AADT	2027	39,049	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.7	21.3	5.7	0.4	19.0	45.6	1.7	1.5	0.7	0.4	100
Class Volume (daily)	34,714	160	923	247	17	824	1977	74	65	30	17	39048
Growth Factor (G)	29.35	29.35	29.35	29.35	29.35	29.35	29.35	29.35	29.35	29.35	29.35	
Class Volume (total)	371882404	1714040	9887868	2646049	182117	8827306	21179107	792744	696329	321383	182117	
Truck Load Factor (T_{LF})	0.0008	1.48	0.12	1.15	0.90	0.55	2.80	2.94	2.09	1.12	3.20	
Class ESAL's	297506	2536779	1186544	3042956	163905	4855018	59301500	2330667	1455328	359949	582774	76,112,926
											Total Number of Trucks	46,429,060
											Directional Distribution Factor (D_D)	0.51
											Lane Distribution Factor (D_L)	0.80
											Design ESAL's	31,054,074

Notes:

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2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Rigid Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Classification	WHP-PCCP
Design Life (years)	20
Equivalent Axle Loads/Day	4253.98274
Total EAL's	31,054,074
Seasonal Variation Factor	1
Reliability	95%
Overall Standard Deviation	0.25
Drainage Coefficient	1.00

SUBGRADE SOIL DATA

Mean R-Value, R_{Mean}	30	
Resilient Modulus MR (psi)	17,875	
Design Subgrade Modulus (psi)	17,875	
Modulus of Subgrade Reaction k (pci)	921	This is the k value w/o modification for loss of subgrade support or base material.

DESIGN SUBGRADE FOR PAVEMENT

Design Subgrade or Base Material	Aggregate Base	
Base Material Modulus (psi)	36,000	
Base Material Thickness (inches)	4.0	
Composite Modulus k_m (pci)	1,000	Enter the composite modulus or subgrade
Loss of Subgrade Support	0.0	modulus if there is no base material
Modulus of Subgrade Reaction k (pci)	1000	

SERVICEABILITY

Present (2.5 to 5.0)	4.2
Terminal (1.5 to 4.1)	2.8

CONCRETE PROPERTIES

Modulus of Rupture (psi), approximate	670
Compressive Strength f'c (psi)	5,000
Modulus of Elasticity (psi)	4,030,509
Pavement Type	Plain Jointed (no dowels)
Load Transfer J	3.9

Design Calculations

Design Slab Thickness	**12.5**	**Inches**	**Plain Jointed (no dowels)**
Design Base Thickness	**4.0**	**Inches**	**Aggregate Base**
Total Section Thickness	**16.5**	**Inches**	

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project-Wild Horse Pass Blvd - East of I-10 - AC		
Route:	WHP E	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial - Crossroad		
		EMP:		Growth Rate (%):	2.9	Pavement Type:	Flexible	Cluster Number:	3

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	17,100	Data Year	816	1082	4.77%	6.33%	43%	57%	AZ-3
AADT	2027	18,106	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.7	21.3	5.7	0.4	19.0	45.6	1.7	1.5	0.7	0.4	100
Class Volume (daily)	16,096	74	428	115	8	382	917	34	30	14	8	18106
Growth Factor (G)	26.60	26.60	26.60	26.60	26.60	26.60	26.60	26.60	26.60	26.60	26.60	
Class Volume (total)	156276064	718466	4155452	1116535	77672	3708838	8903153	330106	291270	135926	77672	
Truck Load Factor (T_{LF})	0.0008	1.20	0.13	0.86	0.64	0.52	1.93	1.78	2.25	1.17	2.07	
Class ESAL's	125021	862159	540209	960220	49710	1928596	17183085	587589	655358	159033	160781	23,211,761

Total Number of Trucks	19,515,090
Directional Distribution Factor (D_D)	0.51
Lane Distribution Factor (D_L)	0.80
Design ESAL's	9,470,398

Notes:

1) Shaded cells in the Worksheet are user input values. All other cells are calculated values and are locked.
2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	WHP-E
Design Life (years)	20
Equivalent Axle Loads/Day	1297
Total ESALs	9,470,398
Seasonal Variation Factor	1.0
Reliability	95%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	30.0
Resilient Modulus MR (psi)	17,875
Design Modulus (psi)	17,875

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	2.8

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: 4.03

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		7.0	7	14.0	4.06	0.03
B		9.5		10	4.18	0.15

SR 347 / QUEEN CREEK ROAD

Project: I-10 GRIC DB Project, 202L to Gila River Bridge
Terracon Project No.: 65225282

Note: Growth Rates based on ADOT ESAL Calculation Worksheet.

CROSSROAD - STATE ROUTE 347 / QUEEN CREEK RD

	SR347 - WEST of I-10				
Year:	**2025 (DCR)**	**2035 (DCR)**	**2040 (DCR)**	**2045 (interpolated)**	**2050 (DCR)**
ADT:	**40,600**	63,600	75,200	80,400	85,600
Growth Rate (%):	**2.78%**				
Directional Factor DL:	**65%**				

2025 AADT	
Truck Volumes	
Singles	Combos
1,937	**2,570**

	Queen Creek Road - EAST of I-10				
Year:	**2025 (DCR)**	**2035 (DCR)**	**2040 (DCR)**	**2045 (interpolated)**	**2050 (DCR)**
ADT:	**25,300**	37,600	43,800	46,450	49,100
Growth Rate (%):	**2.46%**				
Directional Factor DL:	**65%**				

2025 AADT	
Truck Volumes	
Singles	Combos
1,207	**1,601**

Truck Info from SR347 ADOT Traffic Data			
Percent Trucks			
(% of total AADT)		(% of total AADTT)	
Singles	Combos	Singles	Combos
4.77%	6.33%	43%	57%

Design Resilient Modulus Analysis

Project Data

PROJECT NAME, LOCATION and SEASONAL VARIATION FACTOR

Project Name:	I-10 GRIC - SR347 QCR TI
Location:	
Seasonal Variation Factor:	1.0

Laboratory Test Data

Boring No. Point ID	Boring Location	Depth (ft)	LL	PI	-#200	Laboratory R-Value	Correlated R-Value
R&C-13	33.258°/-111.950°	1.5--5		5	38		48
R&C-14	33.257°/-111.949°	2--4		13	47		31
R&C-14	33.257°/-111.949°	4--6		3	28		61
R&C-15	33.256°/-111.950°	1--5		7	38	16	45
R&C-16	33.256°/-111.948°	1 --3		0	20		76
R&C-16	33.256°/-111.948°	3 --5		7	45		41
R&C-17	33.253°/-111.955°	0.5 --4		5	25		58
R&C-18	33.255°/-111.950°	1 --5		16	47	7	28
R&C-19	33.257°/-111.946°	1 --4		7	31	40	49
R&C-20	33.254°/-111.952°	0.3 --5		8	37	9	44
R&C-21	33.255°/-111.949°	0 --2		0	26		70
R&C-21	33.255°/-111.949°	2 --5		22	59		19
R&C-22	33.256°/-111.947°	1 --7		15	65		23
R&C-23	33.254°/-111.948°	1.1 --5		3	36		54
R&C-24	33.255°/-111.947°	1 --5		5	30	60	54

Mean R-Value and Modulus Calculations

Number of Laboratory Tested R-Values:	5 (Nt)	
Average of Laboratory Tested R-Value Results:	26.40 (Rt)	
Standard Deviation of Laboratory Tested R-Values:	22.92 (SDt)	
Number of Correlated R-Value:	15 (Nc)	Construction
Average of Correlated R-Value Results:	46.77 (Rc)	Control R-Value (Rc): 24.5
Standard Deviation of Correlated R-Values:	16.54 (SDc)	90% t Value: 1.345
Adjusted Average of Tested R-Values:	13.48 (Rt)	
Adjusted Average of Correlated R-Values:	40.23 (Rc)	

Calculation for Mean R-Value:

$$R_{mean} = \frac{N_t \times R_t \times SD_c^2 + N_c \times R_c \times SD_t^2}{N_t \times SD_c^2 + N_c \times SD_t^2}$$

R_{mean} = **36.3**

Seasonal Variation Factor for Project Location= **1.0**

Design Resilient Modulus M_r (adjusted for SVF)= **21,892** psi

Terracon Consultants, Inc.

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - SR347 - West of I-10 - AC		
Route:	SR347-W	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Freeway)		
		EMP:		Growth Rate (%):	2.8	Pavement Type:	Flexible	Cluster Number:	2

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	40,600	Data Year	1937	2570	4.77%	6.33%	43%	57%	AZ-3
AADT	2027	42,889	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.7	21.3	5.7	0.4	19.0	45.6	1.7	1.5	0.7	0.4	100
Class Volume (daily)	38,128	176	1014	271	19	905	2171	81	71	33	19	42888
Growth Factor (G)	26.28	26.28	26.28	26.28	26.28	26.28	26.28	26.28	26.28	26.28	26.28	
Class Volume (total)	365731402	1688227	9726491	2599486	182252	8680941	20824666	776968	681046	316543	182252	
Truck Load Factor (T_{LF})	0.0008	1.06	0.39	0.96	0.61	0.91	1.34	1.53	1.96	1.33	3.50	
Class ESAL's	292585	1789521	3793331	2495507	111174	7899656	27905052	1188761	1334850	421002	637882	47,869,321

Total Number of Trucks	45,658,872
Directional Distribution Factor (D_D)	0.65
Lane Distribution Factor (D_L)	0.80
Design ESAL's	24,892,047

Notes:

1) Shaded cells in the Worksheet are user input values. All other cells are calculated values and are locked.
2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	SR347-W
Design Life (years)	20
Equivalent Axle Loads/Day	3410
Total ESALs	24,892,047
Seasonal Variation Factor	1.0
Reliability	99%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	33.0
Resilient Modulus MR (psi)	19,756
Design Modulus (psi)	19,756

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	3.0

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: 5.32

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		10.0	7	17.0	5.38	0.06
B		12.5		13	5.50	0.18

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - SR347 - Crossing of I-10 - PCCP		
Route:	SR347-Xing	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Freeway)		
		EMP:		Growth Rate (%):	2.8	Pavement Type:	Rigid	Cluster Number:	2

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	40,600	Data Year	1937	2570	4.77%	6.33%	43%	57%	AZ-3
AADT	2027	42,889	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.7	21.3	5.7	0.4	19.0	45.6	1.7	1.5	0.7	0.4	100
Class Volume (daily)	38,128	176	1014	271	19	905	2171	81	71	33	19	42888
Growth Factor (G)	26.28	26.28	26.28	26.28	26.28	26.28	26.28	26.28	26.28	26.28	26.28	
Class Volume (total)	365731402	1688227	9726491	2599486	182252	8680941	20824666	776968	681046	316543	182252	
Truck Load Factor (T_{LF})	0.0008	1.26	0.36	1.31	0.85	1.00	1.96	2.46	1.90	1.19	5.74	
Class ESAL's	292585	2127166	3501537	3405327	154914	8680941	40816345	1911341	1293987	376686	1046126	63,606,955

Total Number of Trucks	45,658,872
Directional Distribution Factor (D_D)	0.65
Lane Distribution Factor (D_L)	0.80
Design ESAL's	33,075,617

Notes:

1) Shaded cells in the Worksheet are user input values. All other cells are calculated values and are locked.
2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Rigid Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Classification	SR347-PCCP
Design Life (years)	20
Equivalent Axle Loads/Day	4530.90644
Total EAL's	33,075,617
Seasonal Variation Factor	1
Reliability	99%
Overall Standard Deviation	0.25
Drainage Coefficient	1.00

SUBGRADE SOIL DATA

Mean R-Value, R_{Mean}	33	
Resilient Modulus MR (psi)	19,756	
Design Subgrade Modulus (psi)	19,756	
Modulus of Subgrade Reaction k (pci)	1,018	This is the k value w/o modification for loss of subgrade support or base material.

DESIGN SUBGRADE FOR PAVEMENT

Design Subgrade or Base Material	Aggregate Base	
Base Material Modulus (psi)	36,000	
Base Material Thickness (inches)	4.0	
Composite Modulus k_m (pci)	1,000	Enter the composite modulus or subgrade
Loss of Subgrade Support	0.0	modulus if there is no base material
Modulus of Subgrade Reaction k (pci)	1000	

SERVICEABILITY

Present (2.5 to 5.0)	4.2
Terminal (1.5 to 4.1)	3.0

CONCRETE PROPERTIES

Modulus of Rupture (psi), approximate	670
Compressive Strength f'c (psi)	5,000
Modulus of Elasticity (psi)	4,030,509
Pavement Type	Plain Jointed (no dowels)
Load Transfer J	3.9

Design Calculations

Design Slab Thickness	**13.5**	**Inches**	**Plain Jointed (no dowels)**
Design Base Thickness	**4.0**	**Inches**	**Aggregate Base**
Total Section Thickness	**17.5**	**Inches**	

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - SR347 - East of I-10 - AC		
Route:	SR347-E	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Freeway)		
		EMP:		Growth Rate (%):	2.5	Pavement Type:	Flexible	Cluster Number:	2

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	25,300	Data Year	1207	1601	4.77%	6.33%	43%	57%	AZ-3
AADT	2027	26,560	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.7	21.3	5.7	0.4	19.0	45.6	1.7	1.5	0.7	0.4	100
Class Volume (daily)	23,612	109	628	168	12	560	1344	50	44	21	12	26560
Growth Factor (G)	25.44	25.44	25.44	25.44	25.44	25.44	25.44	25.44	25.44	25.44	25.44	
Class Volume (total)	219251587	1012130	5831357	1559981	111427	5199936	12479846	464280	408566	194998	111427	
Truck Load Factor (T_{LF})	0.0008	1.06	0.39	0.96	0.61	0.91	1.34	1.53	1.96	1.33	3.50	
Class ESAL's	175401	1072858	2274229	1497582	67970	4731942	16722994	710348	800789	259347	389995	28,703,455

Total Number of Trucks	27,373,948
Directional Distribution Factor (D_D)	0.65
Lane Distribution Factor (D_L)	0.80
Design ESAL's	14,925,797

Notes:

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3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	SR347-E
Design Life (years)	20
Equivalent Axle Loads/Day	2045
Total ESALs	14,925,797
Seasonal Variation Factor	1.0
Reliability	99%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	33.0
Resilient Modulus MR (psi)	19,756
Design Modulus (psi)	19,756

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	3.0

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: 4.92

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		9.0	7	16.0	4.94	0.02
B		11.5		12	5.06	0.14

RIGGS ROAD

Project: I-10 GRIC DB Project, 202L to Gila River Bridge
Terracon Project No.: 65225282

Note: Growth Rates based on ADOT ESAL Calculation Worksheet.

CROSSROAD - RIGGS RD

	Riggs Road - WEST of I-10				
Year:	**2025 (DCR)**	**2035 (DCR)**	**2040 (DCR)**	**2045 (interpolated)**	**2050 (DCR)**
ADT:	**8,000**	10,300	11,500	12,100	12,700
Growth Rate (%):	**1.70%**				
Directional Factor DL:	**51%**				

2025 AADT	
Truck Volumes	
Singles	Combos
382	**506**

	Riggs Road - EAST of I-10				
Year:	**2025 (DCR)**	**2035 (DCR)**	**2040 (DCR)**	**2045 (interpolated)**	**2050 (DCR)**
ADT:	**14,600**	18,300	20,200	21,200	22,200
Growth Rate (%):	**1.51%**				
Directional Factor DL:	**51%**				

2025 AADT	
Truck Volumes	
Singles	Combos
696	**924**

Truck Info from SR347 ADOT Traffic Data			
Percent Trucks			
(% of total AADT)		(% of total AADTT)	
Singles	Combos	Singles	Combos
4.77%	6.33%	43%	57%

Design Resilient Modulus Analysis

Project Data

PROJECT NAME, LOCATION and SEASONAL VARIATION FACTOR

Project Name:	I-10 GRIC - Riggs Rd TI
Location:	
Seasonal Variation Factor:	1.0

Laboratory Test Data

Boring No. Point ID	Boring Location	Depth (ft)	LL	PI	-#200	Laboratory R-Value	Correlated R-Value
R&C-25	33.222°/-111.923°	0 --1.5		0	9		88
R&C-25	33.222°/-111.923°	1.5 --4		13	36	19	37
R&C-25	33.222°/-111.923°	4 --5		22	74		15
R&C-26	33.221°/-111.921°	0 --4		0	9		88
R&C-27	33.220°/-111.923°	0.5 --5		14	43	26	32
R&C-28	33.220°/-111.918°	0 --5		15	28		38
R&C-29	33.219°/-111.924°	1 --4		14	38	40	34
R&C-30	33.219°/-111.922°	0.3 --2		0	9		88
R&C-30	33.219°/-111.922°	2 --4		21	40		25
R&C-31	33.219°/-111.919°	2 --5		27	57	8	16
R&C-32	33.219°/-111.917°	0.5 --5		19	51	8	24
R&C-33	33.219°/-111.923°	0 --4		4	19		66
R&C-33	33.219°/-111.923°	4 --5		0	43		55
R&C-34	33.218°/-111.919°	0.8 --4		0	7		91

Mean R-Value and Modulus Calculations

Number of Laboratory Tested R-Values:	5 (Nt)	
Average of Laboratory Tested R-Value Results:	20.20 (Rt)	
Standard Deviation of Laboratory Tested R-Values:	13.46 (SDt)	
Number of Correlated R-Value:	14 (Nc)	Construction
Average of Correlated R-Value Results:	49.76 (Rc)	Control R-Value (Rc): 20.0
Standard Deviation of Correlated R-Values:	28.99 (SDc)	90% t Value: 1.350
Adjusted Average of Tested R-Values:	16.74 (Rt)	
Adjusted Average of Correlated R-Values:	30.77 (Rc)	

Calculation for Mean R-Value:

$$R_{mean} = \frac{N_t \times R_t \times SD_c^2 + N_c \times R_c \times SD_t^2}{N_t \times SD_c^2 + N_c \times SD_t^2}$$

R_{mean} = **22.0**

Seasonal Variation Factor for Project Location= **1.0**

Design Resilient Modulus M_r (adjusted for SVF)= **13,222** psi

Terracon Consultants, Inc.

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - RIGGS - West of I-10 - PCCP		
Route:	RIGGS-W	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial - Crossroad		
		EMP:		Growth Rate (%):	1.7	Pavement Type:	Rigid	Cluster Number:	3

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	8,000	Data Year	382	506	4.78%	6.33%	43%	57%	AZ-3
AADT	2027	8,274	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.7	21.3	5.7	0.4	19.0	45.6	1.7	1.5	0.7	0.4	100
Class Volume (daily)	7,355	34	196	52	4	175	419	16	14	6	4	8275
Growth Factor (G)	23.58	23.58	23.58	23.58	23.58	23.58	23.58	23.58	23.58	23.58	23.58	
Class Volume (total)	63302279	292628	1686913	447548	34427	1506173	3606207	137707	120494	51640	34427	
Truck Load Factor (T_{LF})	0.0008	1.48	0.12	1.15	0.90	0.55	2.80	2.94	2.09	1.12	3.20	
Class ESAL's	50642	433089	202430	514680	30984	828395	10097380	404859	251832	57837	110166	12,982,294

Total Number of Trucks	7,918,164
Directional Distribution Factor (D_D)	0.51
Lane Distribution Factor (D_L)	0.90
Design ESAL's	5,958,873

Notes:

1) Shaded cells in the Worksheet are user input values. All other cells are calculated values and are locked.
2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Rigid Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Classification	RIGGS-W
Design Life (years)	20
Equivalent Axle Loads/Day	816.283973
Total EAL's	5,958,873
Seasonal Variation Factor	1
Reliability	95%
Overall Standard Deviation	0.25
Drainage Coefficient	1.00

SUBGRADE SOIL DATA

Mean R-Value, R_{Mean}	22	
Resilient Modulus MR (psi)	13,211	
Design Subgrade Modulus (psi)	13,211	
Modulus of Subgrade Reaction k (pci)	681	This is the k value w/o modification for loss of subgrade support or base material.

DESIGN SUBGRADE FOR PAVEMENT

Design Subgrade or Base Material	Aggregate Base	
Base Material Modulus (psi)	36,000	
Base Material Thickness (inches)	4.0	
Composite Modulus k_m (pci)	1,000	Enter the composite modulus or subgrade
Loss of Subgrade Support	0.0	modulus if there is no base material
Modulus of Subgrade Reaction k (pci)	1000	

SERVICEABILITY

Present (2.5 to 5.0)	4.2
Terminal (1.5 to 4.1)	2.8

CONCRETE PROPERTIES

Modulus of Rupture (psi), approximate	670
Compressive Strength f'c (psi)	5,000
Modulus of Elasticity (psi)	4,030,509
Pavement Type	Plain Jointed (no dowels)
Load Transfer J	3.9

Design Calculations

Design Slab Thickness	**9.0**	**Inches**	**Plain Jointed (no dowels)**
Design Base Thickness	**4.0**	**Inches**	**Aggregate Base**
Total Section Thickness	**13.0**	**Inches**	

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - RIGGS - East of I-10 - PCCP		
Route:	RIGGS-E	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial - Crossroad		
		EMP:		Growth Rate (%):	1.5	Pavement Type:	Rigid	Cluster Number:	3

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	14,600	Data Year	696	924	4.77%	6.33%	43%	57%	AZ-3
AADT	2027	15,044	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.7	21.3	5.7	0.4	19.0	45.6	1.7	1.5	0.7	0.4	100
Class Volume (daily)	13,374	62	356	95	7	317	762	28	25	12	7	15045
Growth Factor (G)	23.15	23.15	23.15	23.15	23.15	23.15	23.15	23.15	23.15	23.15	23.15	
Class Volume (total)	113006957	523885	3008111	802726	59148	2678571	6438710	236593	211244	101397	59148	
Truck Load Factor (T_{LF})	0.0008	1.48	0.12	1.15	0.90	0.55	2.80	2.94	2.09	1.12	3.20	
Class ESAL's	90406	775350	360973	923135	53233	1473214	18028388	695583	441500	113565	189274	23,144,621
											Total Number of Trucks	14,119,533
											Directional Distribution Factor (D_D)	0.51
											Lane Distribution Factor (D_L)	0.90
											Design ESAL's	10,623,381

Notes:

1) Shaded cells in the Worksheet are user input values. All other cells are calculated values and are locked.
2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Rigid Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Classification	RIGGS-E
Design Life (years)	20
Equivalent Axle Loads/Day	1455.25767
Total EAL's	10,623,381
Seasonal Variation Factor	1
Reliability	95%
Overall Standard Deviation	0.25
Drainage Coefficient	1.00

SUBGRADE SOIL DATA

Mean R-Value, R_{Mean}	22	
Resilient Modulus MR (psi)	13,211	
Design Subgrade Modulus (psi)	13,211	
Modulus of Subgrade Reaction k (pci)	681	This is the k value w/o modification for loss of subgrade support or base material.

DESIGN SUBGRADE FOR PAVEMENT

Design Subgrade or Base Material	Aggregate Base	
Base Material Modulus (psi)	36,000	
Base Material Thickness (inches)	4.0	
Composite Modulus k_m (pci)	1,000	Enter the composite modulus or subgrade
Loss of Subgrade Support	0.0	modulus if there is no base material
Modulus of Subgrade Reaction k (pci)	1000	

SERVICEABILITY

Present (2.5 to 5.0)	4.2
Terminal (1.5 to 4.1)	2.8

CONCRETE PROPERTIES

Modulus of Rupture (psi), approximate	670
Compressive Strength f'c (psi)	5,000
Modulus of Elasticity (psi)	4,030,509
Pavement Type	Plain Jointed (no dowels)
Load Transfer J	3.9

Design Calculations

Design Slab Thickness	**10.5**	**Inches**	**Plain Jointed (no dowels)**
Design Base Thickness	**4.0**	**Inches**	**Aggregate Base**
Total Section Thickness	**14.5**	**Inches**	

GOODYEAR ROAD

Project: I-10 GRIC DB Project, 202L to Gila River Bridge
Terracon Project No.: 65225282

Note: Growth Rates based on ADOT ESAL Calculation Worksheet.

CROSSROAD - GOODYEAR RD

	Goodyear Road	
Year:	**2025 (backcalculated to match min 9-in of PCCP)**	**2027**
ADT:	**3,000**	3,546
Growth Rate (%):	**8.7% (estimated based on other crossroads; estimated high)**	
Directional Factor DL:	**50%**	

2025 AADT	
Truck Volumes	
Singles	Combos
143	**190**

Truck Info from SR347 ADOT Traffic Data			
Percent Trucks			
(% of total AADT)		(% of total AADTT)	
Singles	Combos	Singles	Combos
4.77%	6.33%	43%	57%

Design Resilient Modulus Analysis

Project Data

PROJECT NAME, LOCATION and SEASONAL VARIATION FACTOR

Project Name:	I-10 GRIC - Goodyear Rd TI
Location:	
Seasonal Variation Factor:	1.0

Laboratory Test Data

Boring No. Point ID	Boring Location	Depth (ft)	LL	PI	-#200	Laboratory R-Value	Correlated R-Value
R&C-35	33.190°/-111.901°	0 --5		18	35	26	31
R&C-36	33.190°/-111.899°	0 --2		5	46		44
R&C-36	33.190°/-111.899°	2 --5		9	40	61	41
R&C-37	33.190°/-111.897°	0 --5		9	40		40
R&C-38	33.190°/-111.895°	0.5 --4		7	35		47

Mean R-Value and Modulus Calculations

Number of Laboratory Tested R-Values:	2	(Nt)	
Average of Laboratory Tested R-Value Results:	43.50	(Rt)	
Standard Deviation of Laboratory Tested R-Values:	24.75	(SDt)	
Number of Correlated R-Value:	5	(Nc)	Construction
Average of Correlated R-Value Results:	40.49	(Rc)	Control R-Value (Rc): 31.1
Standard Deviation of Correlated R-Values:	6.12	(SDc)	90% t Value: 1.533
Adjusted Average of Tested R-Values:	28.75	(Rt)	
Adjusted Average of Correlated R-Values:	40.49	(Rc)	

Calculation for Mean R-Value:

$$R_{mean} = \frac{N_t \times R_t \times SD_c^2 + N_c \times R_c \times SD_t^2}{N_t \times SD_c^2 + N_c \times SD_t^2}$$

R_{mean} = **40.2**

Seasonal Variation Factor for Project Location= **1.0**

Design Resilient Modulus M_r (adjusted for SVF)= **24,574** psi

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - GOODYEAR RD - PCCP		
Route:	Goodyear	BMP:		Design Life (years):	20.0	Functional Class:	Minor Arterial to Minor Collector		
		EMP:		Growth Rate (%):	8.7	Pavement Type:	Rigid	Cluster Number:	2

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	3,000	Data Year	143.1	189.9	4.77%	6.33%	43%	57%	AZ-3
AADT	2027	3,546	Build Year					Select appropriate TTC from Table A-1 using % Combos above		

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.7	21.3	5.7	0.4	19.0	45.6	1.7	1.5	0.7	0.4	100
Class Volume (daily)	3,152	15	84	22	2	75	180	7	6	3	2	3548
Growth Factor (G)	49.58	49.58	49.58	49.58	49.58	49.58	49.58	49.58	49.58	49.58	49.58	
Class Volume (total)	57040798	271451	1520123	398127	36193	1357253	3257406	126677	108580	54290	36193	
Truck Load Factor (T_{LF})	0.0008	1.26	0.36	1.31	0.85	1.00	1.96	2.46	1.90	1.19	5.74	
Class ESAL's	45633	342028	547244	521546	30764	1357253	6384516	311625	206302	64605	207748	10,019,264

Total Number of Trucks	7,166,293
Directional Distribution Factor (D_D)	0.50
Lane Distribution Factor (D_L)	1.00
Design ESAL's	5,009,632

Notes:

1) Shaded cells in the Worksheet are user input values. All other cells are calculated values and are locked.
2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Rigid Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Classification	GoodyearRd
Design Life (years)	20
Equivalent Axle Loads/Day	684.931507
Total EAL's	5,000,000
Seasonal Variation Factor	1
Reliability	95%
Overall Standard Deviation	0.25
Drainage Coefficient	1.00

SUBGRADE SOIL DATA

Mean R-Value, R_{Mean}	36	
Resilient Modulus MR (psi)	21,709	
Design Subgrade Modulus (psi)	21,709	
Modulus of Subgrade Reaction k (pci)	1,119	This is the k value w/o modification for loss of subgrade support or base material.

DESIGN SUBGRADE FOR PAVEMENT

Design Subgrade or Base Material	Aggregate Base	
Base Material Modulus (psi)	36,000	
Base Material Thickness (inches)	4.0	
Composite Modulus k_m (pci)	1,000	Enter the composite modulus or subgrade
Loss of Subgrade Support	0.0	modulus if there is no base material
Modulus of Subgrade Reaction k (pci)	1000	

SERVICEABILITY

Present (2.5 to 5.0)	4.2
Terminal (1.5 to 4.1)	2.8

CONCRETE PROPERTIES

Modulus of Rupture (psi), approximate	670
Compressive Strength f'c (psi)	5,000
Modulus of Elasticity (psi)	4,030,509
Pavement Type	Plain Jointed (no dowels)
Load Transfer J	3.9

Design Calculations

Design Slab Thickness	**9.0**	**Inches**	**Plain Jointed (no dowels)**
Design Base Thickness	**4.0**	**Inches**	**Aggregate Base**
Total Section Thickness	**13.0**	**Inches**	

APPENDIX D

MCDOT Crossroads Calculation Package
Queen Creek Road
(Within Project Limits and Beyond ADOT TI PCCP Limits)

Design Resilient Modulus Analysis

Project Data

PROJECT NAME, LOCATION and SEASONAL VARIATION FACTOR

Project Name:	Queen Creek Rd (I-10 GRIC DB Project)
Location:	Maricopa County
Seasonal Variation Factor:	1.0

Laboratory Test Data

Boring No. Point ID	Boring Location	Depth (ft)	LL	PI	-#200	Laboratory R-Value	Correlated R-Value
R&C-14	33.257°/-111.949°	2--4		13	47		28
R&C-16	33.256°/-111.948°	1 --3		0	20		70
R&C-16	33.256°/-111.948°	3 --5		7	45		42
R&C-19	33.257°/-111.946°	1 --4		7	31	40	49
R&C-22	33.256°/-111.947°	1 --7		15	65		21
R&C-24	33.255°/-111.947°	1 --5		5	30	40	57

Mean R-Value and Modulus Calculations

Number of Laboratory Tested R-Values:	13	(Nt)
Average of Laboratory Tested R-Value Results:	40.00	(Rt)
Standard Deviation of Laboratory Tested R-Values:	0.00	(SDt)
Number of Correlated R-Value:	17	(Nc)
Average of Correlated R-Value Results:	60.97	(Rc)
Standard Deviation of Correlated R-Values:	16.16	(SDc)
Adjusted Average of Tested R-Values:	40.0	
Adjusted Average of Correlated R-Values:	54.8	(Rc)
Calculation for Mean R-Value:		

$$R_{mean} = \frac{2xN_t \times R_t \times SD_c^2 + N_c \times R_c \times SD_t^2}{2xN_t \times SD_c^2 + N_c \times SD_t^2}$$

R_{mean} = **40.0**

Seasonal Variation Factor for Project Location= **1.0**

Design Resilient Modulus M_r (adjusted for SVF)= **24,425** psi

Design Traffic Analysis

Spreadsheet To Calculate Traffic for Pavement Design

- Traffic Analysis is based upon procedures by the Asphalt Institute, MS-1 (2008)
- Average Daily Traffic (ADT) is required along with annual growth rate
- Lane factor adjusts design lane traffic for 2, 4 or 6 lanes
- Truck quantities are based on Rural, Urban or Interstate statistics
- All Truck Factors are 18-kip equivalents per vehicle

Initial Data

PROJECT DATA

Project name:	I-10 GRIC DB Project
Location:	Queen Creek Road - East of I-10
Terracon Project No.	65225282

STREET DATA

Street Name	QC Rd - E
Current Average Daily Traffic (ADT)	25,300
Design Period (years)	20
Annual Growth Rate (%)	2.46%
Number of Traffic Lanes (2, 4 or 6)	4
Percentage of Trucks (%)	11.1%

STREET CLASSIFICATIONS

Rural Systems	Urban Systems
◆ Interstate	◆ Interstate
◆ Principal	◆ Freeway
◆ Minor Arterial	◆ Principal
◆ Major Collector	◆ Minor Arterial
◆ Minor Collector	◆ Collector

Equivalent 18-kip Axle Load Analysis

Vehicle Type	% Traffic	No. of Vehicles	Truck Factor	Growth Factor	Equivalent Axle Loads
Passenger Cars	88.9%	8,209,471	0.0008	25.44	167,093
Trucks	11.1%	1,025,030	1.2000	25.44	31,294,628
All Single Units and Automobiles	100%	9,234,500			31,461,720
All Vehicles	100%	9,234,500			31,461,720

Traffic Summary

TOTALS

Equivalent Axle Loads (EAL's)	**31,461,720**
Lane Factor	**0.45**
Design Equivalent Axle Loads	**14,157,774**
Design Traffic Number (DTN)	**1939.4**

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project - SR347 - East of I-10 - AC		
Route:	SR347-E	BMP:		Design Life (years):	20.0	Functional Class:	Principal Arterial (Freeway)		
		EMP:		Growth Rate (%):	2.5	Pavement Type:	Flexible	Cluster Number:	2

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2025	25,300	Data Year	1207	1601	4.77%	6.33%	43%	57%	AZ-3
AADT	2027	26,560	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.7	21.3	5.7	0.4	19.0	45.6	1.7	1.5	0.7	0.4	100
Class Volume (daily)	23,612	109	628	168	12	560	1344	50	44	21	12	26560
Growth Factor (G)	25.44	25.44	25.44	25.44	25.44	25.44	25.44	25.44	25.44	25.44	25.44	
Class Volume (total)	219251587	1012130	5831357	1559981	111427	5199936	12479846	464280	408566	194998	111427	
Truck Load Factor (T_{LF})	0.0008	1.06	0.39	0.96	0.61	0.91	1.34	1.53	1.96	1.33	3.50	
Class ESAL's	175401	1072858	2274229	1497582	67970	4731942	16722994	710348	800789	259347	389995	28,703,455

Total Number of Trucks	27,373,948
Directional Distribution Factor (D_D)	0.65
Lane Distribution Factor (D_L)	0.80
Design ESAL's	14,925,797

Notes:

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2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	QC Rd - E	
Design Life (years)	20	
Equivalent Axle Loads/Day	2045	
Total ESALs	14,925,797	Based on ADOT ADT Data
Seasonal Variation Factor	1.0	
Reliability	95%	
Overall Standard Deviation	0.45	

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	41.0
Resilient Modulus MR (psi)	25,124
Design Modulus (psi)	25,124

SERVICEABILITY

Initial Design Serviceability Index	4.6
Terminal Design Serviceability Index	2.7

LAYER COEFFICIENTS	Structural	Drainage
PMTR	0.61	N/A
Asphalt Concrete	0.42	N/A
Aggregate Base Course	0.12	1.00
Lime Stabilized Subgrade	0.16	1.00

Design Calculations

Required Structural Number SN: **3.57**

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	PMTR	Asphalt Concrete Surface	Aggregate Base Course	Lime Stabilized Subgrade		
A	1.5	6.0	4	6	4.88	1.31
B		8.0	4	6	4.80	1.23
C	Full depth AC not recommended					

APPENDIX E

Limited Pavement Condition Survey

Limited Existing Pavement Condition Evaluation

Terracon performed a limited pavement condition survey of asphaltic concrete pavements at selected locations across the project as outlined in this report. This limited pavement condition survey is only for informational purposes and limited to the cursory overview of pavement conditions observed at the selected locations outlined in this report. Given the very small evaluation areas with respect to the overall pavement area for the project, other pavement conditions than those outlined in this report are anticipated to be possible on the existing pavements across the project. Terracon's scope of work excluded evaluating the pavement subgrade modulus with falling weight deflectometer testing and excluded performing an ADOT SODA Method rehabilitation evaluation. These methods and any other pavement rehabilitation evaluation (that may be required for the project) beyond what is outlined in this report is to be performed by others.

Limited Pavement Condition Survey

The condition of the existing asphalt pavement was evaluated at 29 sample unit locations across the project site, representing a very limited and minimal coverage of the total pavement area for the project. These locations were typically in the vicinity of each asphalt pavement core location. A sample unit area of approximately 2,500 square feet of existing roadway area was evaluated at each selected location. The approximate locations and size of these pavement sample units performed for the limited pavement condition survey are summarized as follows:

I-10 Mainline Roadway				
Sample Unit No.	Roadway	Approx. Station and/or Latitude/Longitude	Nearest Core Location	Sample Unit Area (sq.ft.)
1	I-10, EB, Far Left Lane	890+00; 33.2871° / -111.9708°	C-1	2,562
2	I-10, EB, Far Right Lane	941+00; 33.2738° / -111.9626°	C-2	2,688
3	I-10, EB, Far Left Lane	991+00; 33.2625° / -111.9538°	C-3	2,556
4	I-10, EB, Right Lane	1050+00; 33.2491° / -111.9434°	C-4	2,544
5	I-10, EB, Left Lane	1100+00; 33.2372° / -111.9342°	C-5	2,520
6	I-10, EB, Left Lane	1153+00; 33.2251° / -111.9249°	C-6	2,616
7	I-10, EB, Right Lane	1206+00; 33.2130° / -111.9156°	C-7	2,544

I-10 Mainline Roadway				
Sample Unit No.	Roadway	Approx. Station and/or Latitude/Longitude	Nearest Core Location	Sample Unit Area (sq.ft.)
8	I-10, EB, Left Lane	1258+00; 33.2011° / -111.9063°	C-8	2,640
9	I-10, EB, Right Lane	1309+00; 33.1893° / -111.8973°	C-9	2,592
10	I-10, EB, Left Lane	1362+00; 33.1769° / -111.8877°	C-10	2,616
11	I-10, EB, Right Lane	1414+00; 33.1649° / -111.8785°	C-11	2,640
12	I-10, WB, Left Lane	1445+00; 33.1578° / -111.8725°	C-12	2,640
13	I-10, WB, Right Lane	1392+00; 33.1704° / -111.8822°	C-13	2,640
14	I-10, WB, Left Lane	1339+00; 33.1823° / -111.8915°	C-14	2,592
15	I-10, WB, Right Lane	1287+00; 33.1946° / -111.9009°	C-15	2,640
16	I-10, WB, Left Lane	1233+00; 33.2097° / -111.9126°	C-16	2,616
17	I-10, WB, Right Lane	1181+00; 33.2192° / -111.9199°	C-17	2,640
18	I-10, WB, Left Lane	1127+00; 33.2312° / -111.9292°	C-18	2,640
19	I-10, WB, Right Lane	1074+00; 33.2437° / -111.9388°	C-19	2,640
20	I-10, WB, Left Lane	1020+00; 33.2558° / -111.9482°	C-20	2,592
21	I-10, WB, Far Right Lane	969+00; 33.2678° / -111.9575°	C-21	2,664
22	I-10, WB, Far Left Lane	920+00; 33.2800° / -111.9670°	C-22	2,664

Legend: Interstate 10 (I-10); Eastbound (EB); Westbound (WB); Right Lane (R-Ln); Left Lane (L-Ln).

I-10 Wild Horse Pass Boulevard TI & Ramps & Crossroad				
Sample Unit No.	Ramps & Crossroads	Approx. Latitude/Longitude	Nearest Core Location	Sample Unit Area (sq.ft.)
23	WHPB, EB, Right Lane	33.2785° / -111.9691°	C-23	2,544
24	WHPB, EB, Right Lane	33.2804° / -111.9646°	C-24	2,520
25	I-10-WHPB, WB On Ramp, R-Ln	33.2812° / -111.9672°	C-25	2,544
26	I-10-WHPB, EB On Ramp, R-Ln	33.2783° / -111.9665°	C-26	2,568

Legend: Interstate 10 (I-10); Wild Horse Pass Boulevard (WHP); Eastbound (EB); Westbound (WB); Right Lane (R-Ln).

I-10 Queen Creek Road TI & Ramps & Crossroad				
Sample Unit No.	Ramps & Crossroads	Approx. Latitude/Longitude	Nearest Core Location	Sample Unit Area (sq.ft.)
27	I-10-QCR, EB Off Ramp, R-Ln	33.2576° / -111.9504°	C-27	2,568
28	I-10-QCR, WB on Ramp, R-Ln	33.2574° / -111.9486°	C-28	2,592

Legend: Interstate 10 (I-10); Queen Creek Road (QCR); Eastbound (EB); Westbound (WB); Right Lane (R-Ln).

I-10 Riggs Road TI & Ramps & Crossroad				
Sample Unit No.	Ramps & Crossroads	Approx. Latitude/Longitude	Nearest Core Location	Sample Unit Area (sq.ft.)
29	I-10-Riggs, WB On Ramp	33.2213° / -111.9214°	C-29	2,580

Legend: Interstate 10 (I-10); Riggs Road (Riggs); Westbound (WB).

This pavement condition evaluation was completed in general accordance with the procedures outlined in ASTM D6433-23, *Standard Practice for Roads and Parking Lots Pavement Condition Index Surv*eys. The engineering observations were made to determine the types, amounts and severity of existing pavement distress in the sample units selected along the alignment for this limited pavement condition survey.

Pavement Distress

The distress observed in the asphalt pavements at the sample units selected for this limited pavement condition survey can generally be grouped into two broad categories which include the following:

Distress Summary		
Pavement Type	Category I	Category II
	Structural Distress	Climate/Durability Distress
Asphaltic Concrete	Alligator Cracking	Block Cracking
		Longitudinal & Transverse Cracking
	Rutting	Joint Reflection Cracking
		Weathering
	Shoving	Raveling
		Lane/Shoulder Drop-Off

Structural distress is considered the most detrimental to pavement condition and when present, will shorten pavement life when preventative maintenance or rehabilitation measures are not undertaken on a timely basis. Climate/durability related distress usually contributes to deterioration in pavement serviceability. While less detrimental than structural distress, maintenance measures are usually employed for climate/durability distress to maintain safe pavement conditions. The distresses observed in the asphalt pavements at the selected sample units for this limited pavement condition survey occur in varying severities and locations. A summary of the descriptions of the distresses observed in the pavement at the selected sample units and at the time of our limited pavement condition survey are as follows:

Asphaltic Concrete Distress Types

- Alligator Cracking: Alligator cracking, a structural distress, is usually the result of loss of support for the pavement through a reduction in the strength of the subgrade soils. However, alligator cracking can also be caused as a result of load related failure from traffic due to inadequate pavement thickness. Without proper maintenance or rehabilitation, alligator cracking usually increases in severity and propagates over larger areas of the pavement with infiltration of water to subgrade soils beneath the surface. Alligator cracking observed was generally of low severity. Some medium severity alligator cracking was observed in the pavement sample units near the location of Cores C-27 and C-28.

- Rutting: A rut is a surface depression in the wheel path. Rutting stems from a permanent deformation in any of the pavement layers or subgrades, usually caused by consolidated or lateral movement of the materials due to traffic load. The rutting observed was of low severity.

- Shoving: Shoving is a permanent displacement of a localized area of the pavement surfaced caused by traffic loading. When traffic pushes against the pavement, it produces a short, abrupt wave in the pavement surface. This distress normally occurs only in unstable liquid asphalt mix (cutback or emulsion) pavements. Low severity shoving was observed in the pavement sample unit near the location of Core C-13.

- Block Cracking: Block cracks are interconnected cracks that divide the pavement into approximately rectangular pieces of 1 by 1 foot to 10 by 10 feet. Block cracking is caused mainly by shrinkage of the asphaltic concrete and daily stress/strain cycling from temperature fluctuations and is not load related. Block cracking usually indicates that the asphalt has hardened significantly. Block cracking normally occurs over a large portion of the pavement area, but sometimes will occur only in non-traffic areas. This type of distress differs from alligator cracking in that alligator cracks form smaller, many-sided pieces with sharp angles. Without proper maintenance or rehabilitation, block cracking can progress to more severe alligator cracking (a structural distress). Block cracking observed was generally of low severity. Some medium severity block cracking was observed in the pavement sample units near the location of Cores C-28 and C-29.

- Longitudinal and Transverse (L&T) Cracking: Longitudinal cracks are parallel to the pavement's centerline or laydown direction. They may be caused by a poorly constructed paving lane joint, shrinkage of the AC surface due to low temperatures or hardening of the asphalt and/or daily temperature cycling. Transverse cracks extend across the pavement at approximately right angles to the pavement centerline or direction of laydown. These types of cracks are not usually load-associated. Without proper maintenance or rehabilitation, this type of cracking can progress to more severe forms of pavement distress including block or alligator cracking, as can be seen along several areas of the alignment. Low to medium severity longitudinal and transverse cracking was generally observed.

- Joint Reflection Cracking: This distress occurs only on asphalt-surfaced pavements that have been laid over a PCC slab. These cracks are mainly caused by thermal-or moisture-induced movement of the PCC slab beneath the AC surface. This distress is not load related; however, traffic loading may cause a breakdown of the AC surface near the crack. Low to medium severity joint reflection cracking was generally observed.

- Weathering & Raveling: Weathering and raveling are the wearing away of the pavement surface due to a loss of asphalt or tar binder and dislodged aggregate particles. Surface wear is normally caused by oxidation, insufficient asphalt content, excessive natural sand, surface water erosion, and traffic. Asphalt surface beginning to show signs of aging which may be accelerated by climatic conditions. These distresses indicate that either the asphalt binder has hardened appreciably or that a poor-quality mixture is present. In addition, raveling may be caused by certain types of traffic, e.g., tracked vehicles. Softening of the surface and dislodging of the aggregates due to oil spillage are also included under raveling. The weathering observed was generally of low severity. The raveling observed was generally of medium severity.

- Lane/Shoulder Drop-Off: Lane/shoulder drop-off is a difference in elevation between the pavement edge and shoulder. This distress is caused by shoulder erosion, shoulder settlement, or by building up the roadway without adjusting the shoulder level. Low severity shoulder drop-off was observed in the pavement sample unit near the location of Core C-11.

Pavement Condition Rating

The Pavement Condition Index (PCI) as referenced by the ASTM D6433-23 standard is calculated on the basis of deducting certain values based on the type, amount and severity of distress within a pavement sample. Theoretically, a newly constructed pavement, or one which has been recently rehabilitated to restore structural integrity, has a Pavement Condition Index of 100. Pavements with some level of distress have a PCI less than 100. The numerical index of PCI provides for an indication of overall pavement condition.

Based on our limited pavement condition evaluation of pavement distress and the numerical procedures for determination of the PCI as outlined in the ASTM D6433-23 standard, the Pavement Condition Index (PCI) for pavement section evaluated is summarized as follows:

I-10 Mainline Roadway					
Sample Unit No.	Approx. Station and/or Latitude/Longitude	Nearest Core Location	Sample Unit Area (sq.ft.)	PCI for Sample	PCI Rating per ASTM D6433
1	890+00; 33.2871° / -111.9708° I-10, EB, Far Left Lane	C-1	2,562	80	Satisfactory
2	941+00; 33.2738° / -111.9626° I-10, EB, Far Right Lane	C-2	2,688	62	Fair

I-10 Mainline Roadway					
Sample Unit No.	Approx. Station and/or Latitude/Longitude	Nearest Core Location	Sample Unit Area (sq.ft.)	PCI for Sample	PCI Rating per ASTM D6433
3	991+00; 33.2625° / -111.9538° I-10, EB, Far Left Lane	C-3	2,556	67	Fair
4	1050+00; 33.2491° / -111.9434° I-10, EB, Right Lane	C-4	2,544	80	Satisfactory
5	1100+00; 33.2372° / -111.9342° I-10, EB, Left Lane	C-5	2,520	58	Fair
6	1153+00; 33.2251° / -111.9249° I-10, EB, Left Lane	C-6	2,616	68	Fair
7	1206+00; 33.2130° / -111.9156° I-10, EB, Right Lane	C-7	2,544	96	Good
8	1258+00; 33.2011° / -111.9063° I-10, EB, Left Lane	C-8	2,640	75	Satisfactory
9	1309+00; 33.1893° / -111.8973° I-10, EB, Right Lane	C-9	2,592	88	Good
10	1362+00; 33.1769° / -111.8877° I-10, EB, Left Lane	C-10	2,616	88	Good
11	1414+00; 33.1649° / -111.8785° I-10, EB, Right Lane	C-11	2,640	82	Satisfactory
12	1445+00; 33.1578° / -111.8725° I-10, WB, Left Lane	C-12	2,640	84	Satisfactory
13	1392+00; 33.1704° / -111.8822° I-10, WB, Right Lane	C-13	2,640	86	Good
14	1339+00; 33.1823° / -111.8915° I-10, WB, Left Lane	C-14	2,592	88	Good
15	1287+00; 33.1946° / -111.9009° I-10, WB, Right Lane	C-15	2,640	86	Good

I-10 Mainline Roadway					
Sample Unit No.	Approx. Station and/or Latitude/Longitude	Nearest Core Location	Sample Unit Area (sq.ft.)	PCI for Sample	PCI Rating per ASTM D6433
16	1233+00; 33.2097° / -111.9126° I-10, WB, Left Lane	C-16	2,616	47	Poor
17	1181+00; 33.2192° / -111.9199° I-10, WB, Right Lane	C-17	2,640	81	Satisfactory
18	1127+00; 33.2312° / -111.9292° I-10, WB, Left Lane	C-18	2,640	66	Fair
19	1074+00; 33.2437° / -111.9388° I-10, WB, Right Lane	C-19	2,640	41	Poor
20	1020+00; 33.2558° / -111.9482° I-10, WB, Left Lane	C-20	2,592	68	Fair
21	969+00; 33.2678° / -111.9575° I-10, WB, Far Right Lane	C-21	2,664	73	Satisfactory
22	920+00; 33.2800° / -111.9670° I-10, WB, Far Left Lane	C-22	2,664	76	Satisfactory

PCI Range	0-10	11-25	26-40	41-55	56-70	71-85	86-100
PCI Rating	Failed	Serious	Very Poor	Poor	Fair	Satisfactory	Good

I-10 Wild Horse Pass Boulevard TI & Ramps & Crossroad

Sample Unit No.	Approx. Latitude/Longitude	Nearest Core Location	Sample Unit Area (sq.ft.)	PCI for Sample	PCI Rating per ASTM D6433
23	33.2785° / -111.9691° WHPB, EB, Right Lane	C-23	2,544	65	Fair
24	33.2804° / -111.9646° WHPB, EB, Right Lane	C-24	2,520	54	Poor
25	33.2812° / -111.9672° I-10-WHPB, WB On Ramp, R-Ln	C-25	2,544	84	Satisfactory
26	33.2783° / -111.9665° I-10-WHPB, EB On Ramp, R-Ln	C-26	2,568	63	Fair

PCI Range	0-10	11-25	26-40	41-55	56-70	71-85	86-100
PCI Rating	Failed	Serious	Very Poor	Poor	Fair	Satisfactory	Good

I-10 Queen Creek Road TI & Ramps & Crossroad

Sample Unit No.	Approx. Latitude/Longitude	Nearest Core Location	Sample Unit Area (sq.ft.)	PCI for Sample	PCI Rating per ASTM D6433
27	33.2576° / -111.9504° I-10-QCR, EB Off Ramp, R-Ln	C-27	2,568	28	Very Poor
28	33.2574° / -111.9486° I-10-QCR, WB on Ramp, R-Ln	C-28	2,592	25	Serious

PCI Range	0-10	11-25	26-40	41-55	56-70	71-85	86-100
PCI Rating	Failed	Serious	Very Poor	Poor	Fair	Satisfactory	Good

I-10 Riggs Road TI & Ramps & Crossroad

Sample Unit No.	Approx. Latitude/Longitude	Nearest Core Location	Sample Unit Area (sq.ft.)	PCI for Sample	PCI Rating per ASTM D6433
29	33.2213° / -111.9214° I-10-Riggs, WB On Ramp	C-29	2,580	56	Fair

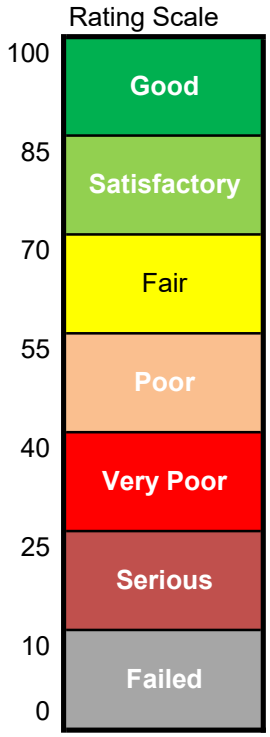
PCI Range	0-10	11-25	26-40	41-55	56-70	71-85	86-100
PCI Rating	Failed	Serious	Very Poor	Poor	Fair	Satisfactory	Good

Limited Pavement Evaluation Summary

For most pavements, there is an approximate decrease of 40% in pavement condition over the first 75% of the life of the pavement, the point at which quality reaches a critical level. At that approximate age and at the critical PCI, predictions usually indicate a rapid increase in rate of deterioration and a significant decrease in the remaining life expectancy of the pavement unless planned maintenance and rehabilitation strategies are implemented. The current PCI for the pavement ranges from 25 to 96 (with an average of 70) with ratings ranging from Serious to Good. The overall rating from the 29 sample units is generally Fair to Satisfactory. The PCI ratings of the pavement are attributable to a combination of age (primarily evidenced by the climate/durability related distress observed in the pavement, block cracking, etc.) and structural distress (i.e., alligator cracking, rutting etc.).

Asphalt Pavement Condition Summary

Distress Type	Sum of Low, Medium, and High Deduct Values Core-1	Core-2	Core-3
Alligator Cracking			
Bleeding			19.9
Block Cracking			
Joint Reflective Cracking	25.9	37.9	
Depression			
Long & Tran Cracking			11.8
Patching			
Potholes			
Rutting			
Weathering/Raveling			22.1
Total Deduction =	26	38	54
Weighted Deduction =	20	38	33
PCI =	80	62	67
Rating	**Satisfactory**	**Fair**	**Fair**



Causes of Distress

A. Age
B. Subgrade Issues
C. Pavement Thickness
D. Drainage
E. Excessive Loads

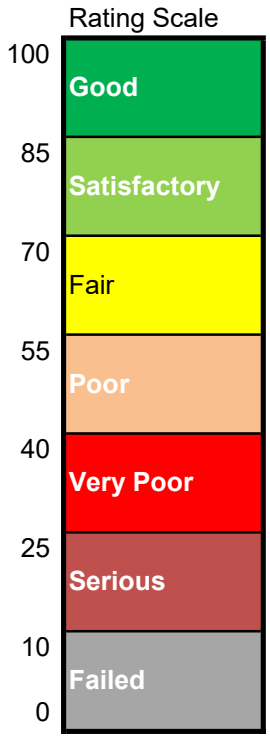
Remedial Option Alternatives

1. Clean and Seal Cracks
2. Fog Seal
3. Shallow AC patch
4. Full depth AC patch
5. Mill and overlay
6. Pulverize and overlay
7. Overlay
8. Remove and replace AC

Project Mngr. RP	Project No. 65225282	Terracon 4685 South Ash Avenue, Suite H4, Tempe, AZ 85282 (480) 897-8200	PCI Survey Summary I-10 GRIC Design-Build Project 202L to Gila River Bridge ADOT General Engineering Consultant	EXHIBIT 1
Drawn By: MB	Scale As Shown			
Checked By: RP	File No.			
Approved By: RP	Date: 3/28/2024			

Asphalt Pavement Condition Summary

Distress Type	Sum of Low, Medium, and High Deduct Values Core-4	Core-5	Core-6
Alligator Cracking			
Bleeding			
Block Cracking	9.7		
Joint Reflective Cracking			
Depression			
Long & Tran Cracking	15.7	9.9	9.9
Patching			
Potholes			
Rutting		37.7	
Weathering/Raveling	5.0	5.0	32.2
Total Deduction =	30	53	42
Weighted Deduction =	20	42	32
PCI =	80	58	68
Rating	**Satisfactory**	**Fair**	**Fair**



Causes of Distress

A. Age
B. Subgrade Issues
C. Pavement Thickness
D. Drainage
E. Excessive Loads

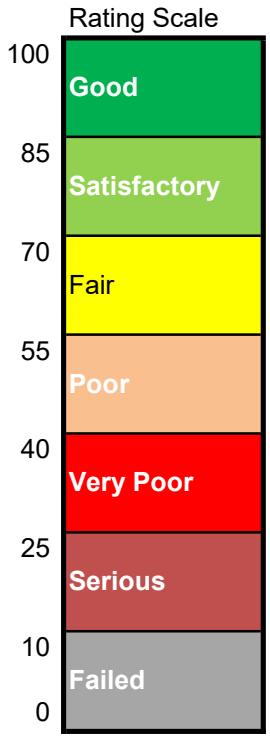
Remedial Option Alternatives

1. Clean and Seal Cracks
2. Fog Seal
3. Shallow AC patch
4. Full depth AC patch
5. Mill and overlay
6. Pulverize and overlay
7. Overlay
8. Remove and replace AC

Project Mngr. RP	Project No. 65225282	Terracon 4685 South Ash Avenue, Suite H4, Tempe, AZ 85282 (480) 897-8200	PCI Survey Summary I-10 GRIC Design-Build Project 202L to Gila River Bridge ADOT General Engineering Consultant	EXHIBIT 2
Drawn By: MB	Scale As Shown			
Checked By: RP	File No.			
Approved By: RP	Date: 3/28/2024			

Asphalt Pavement Condition Summary

Distress Type	Sum of Low, Medium, and High Deduct Values Core-7	Core-8	Core-9
Alligator Cracking			
Bleeding			
Block Cracking			
Joint Reflective Cracking			
Depression			
Long & Tran Cracking		21.0	9.9
Patching			
Potholes			
Rutting			
Weathering/Raveling	3.5	11.4	3.5
Total Deduction =	4	32	13
Weighted Deduction =	4	25	12
PCI =	96	75	88
Rating	Good	Satisfactory	Good



Causes of Distress

A. Age
B. Subgrade Issues
C. Pavement Thickness
D. Drainage
E. Excessive Loads

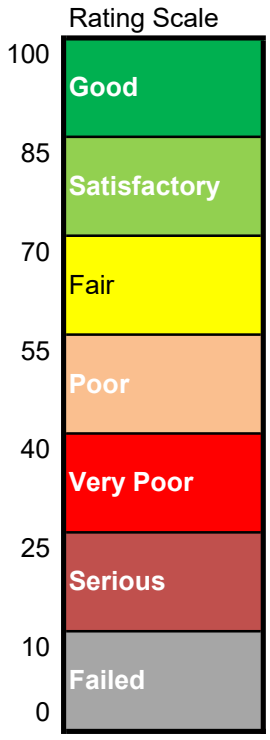
Remedial Option Alternatives

1. Clean and Seal Cracks
2. Fog Seal
3. Shallow AC patch
4. Full depth AC patch
5. Mill and overlay
6. Pulverize and overlay
7. Overlay
8. Remove and replace AC

Project Mngr. RP	Project No. 65225282	Terracon 4685 South Ash Avenue, Suite H4, Tempe, AZ 85282 (480) 897-8200	PCI Survey Summary I-10 GRIC Design-Build Project 202L to Gila River Bridge ADOT General Engineering Consultant	EXHIBIT 3
Drawn By: MB	Scale As Shown			
Checked By: RP	File No.			
Approved By: RP	Date: 3/28/2024			

Asphalt Pavement Condition Summary

Distress Type	Sum of Low, Medium, and High Deduct Values Core-10	Core-11	Core-12
Alligator Cracking			
Bleeding			
Block Cracking			
Joint Reflective Cracking			
Depression			
Long & Tran Cracking	9.9	13.6	15.7
Patching			
Potholes			
Rutting			
Weathering/Raveling	3.5	3.5	
Total Deduction =	13	17	16
Weighted Deduction =	12	18	16
PCI =	88	82	84
Rating	Good	Satisfactory	Satisfactory



Causes of Distress

A. Age
B. Subgrade Issues
C. Pavement Thickness
D. Drainage
E. Excessive Loads

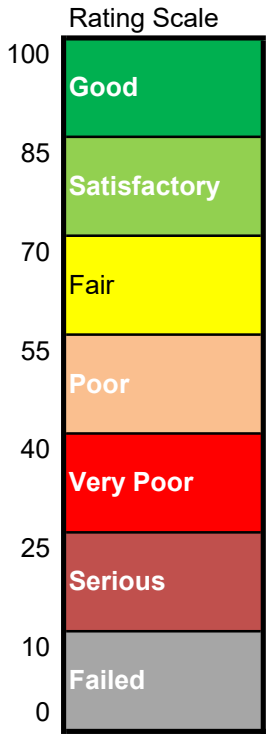
Remedial Option Alternatives

1. Clean and Seal Cracks
2. Fog Seal
3. Shallow AC patch
4. Full depth AC patch
5. Mill and overlay
6. Pulverize and overlay
7. Overlay
8. Remove and replace AC

Project Mngr. RP	Project No. 65225282	Terracon 4685 South Ash Avenue, Suite H4, Tempe, AZ 85282 (480) 897-8200	PCI Survey Summary I-10 GRIC Design-Build Project 202L to Gila River Bridge ADOT General Engineering Consultant	EXHIBIT 4
Drawn By: MB	Scale As Shown			
Checked By: RP	File No.			
Approved By: RP	Date: 3/28/2024			

Asphalt Pavement Condition Summary

Distress Type	Sum of Low, Medium, and High Deduct Values Core-13	Core-14	Core-15
Alligator Cracking			
Bleeding			
Block Cracking			
Joint Reflective Cracking			
Depression			
Long & Tran Cracking	9.9	9.9	
Patching			
Potholes			
Rutting			
Weathering/Raveling	3.5	3.5	3.5
Total Deduction =	13	13	4
Weighted Deduction =	14	12	4
PCI =	86	88	96
Rating	Good	Good	Good



Causes of Distress

A. Age
B. Subgrade Issues
C. Pavement Thickness
D. Drainage
E. Excessive Loads

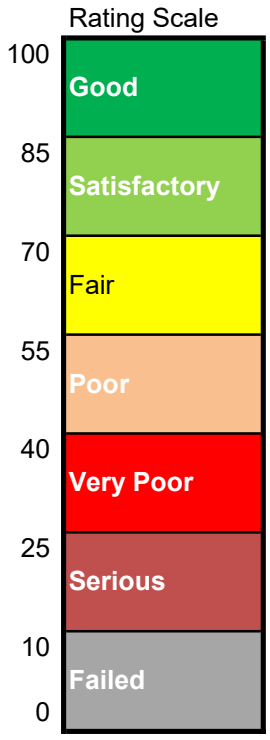
Remedial Option Alternatives

1. Clean and Seal Cracks
2. Fog Seal
3. Shallow AC patch
4. Full depth AC patch
5. Mill and overlay
6. Pulverize and overlay
7. Overlay
8. Remove and replace AC

Project Mngr. RP	Project No. 65225282	Terracon 4685 South Ash Avenue, Suite H4, Tempe, AZ 85282 (480) 897-8200	PCI Survey Summary I-10 GRIC Design-Build Project 202L to Gila River Bridge ADOT General Engineering Consultant	EXHIBIT 5
Drawn By: MB	Scale As Shown			
Checked By: RP	File No.			
Approved By: RP	Date: 3/28/2024			

Asphalt Pavement Condition Summary

	Sum of Low, Medium, and High Deduct Values		
Distress Type	**Core-16**	**Core-17**	**Core-18**
Alligator Cracking	43.7		
Bleeding			
Block Cracking	24.4	17.3	
Joint Reflective Cracking			
Depression			
Long & Tran Cracking			18.3
Patching			
Potholes			
Rutting			
Weathering/Raveling	5.0	3.5	28.3
Total Deduction =	117	21	47
Weighted Deduction =	53	19	34
PCI =	47	81	66
Rating	**Poor**	**Satisfactory**	**Fair**



Causes of Distress

A. Age
B. Subgrade Issues
C. Pavement Thickness
D. Drainage
E. Excessive Loads

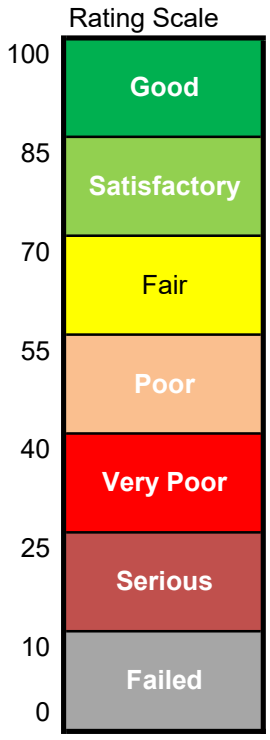
Remedial Option Alternatives

1. Clean and Seal Cracks
2. Fog Seal
3. Shallow AC patch
4. Full depth AC patch
5. Mill and overlay
6. Pulverize and overlay
7. Overlay
8. Remove and replace AC

Project Mngr. RP	Project No. 65225282	Terracon	PCI Survey Summary	EXHIBIT
Drawn By: MB	Scale As Shown	4685 South Ash Avenue, Suite H4, Tempe, AZ 85282 (480) 897-8200	I-10 GRIC Design-Build Project 202L to Gila River Bridge ADOT General Engineering Consultant	6
Checked By: RP	File No.			
Approved By: RP	Date: 3/28/2024			

Asphalt Pavement Condition Summary

Distress Type	Sum of Low, Medium, and High Deduct Values Core-19	Core-20	Core-21
Alligator Cracking	43.0		
Bleeding			
Block Cracking			
Joint Reflective Cracking			
Depression			
Long & Tran Cracking	26.0	9.9	28.5
Patching			
Potholes			
Rutting			
Weathering/Raveling	26.1	32.2	17.0
Total Deduction =	95	42	45
Weighted Deduction =	59	32	27
PCI =	41	68	73
Rating	**Poor**	**Fair**	**Satisfactory**



Causes of Distress

A. Age
B. Subgrade Issues
C. Pavement Thickness
D. Drainage
E. Excessive Loads

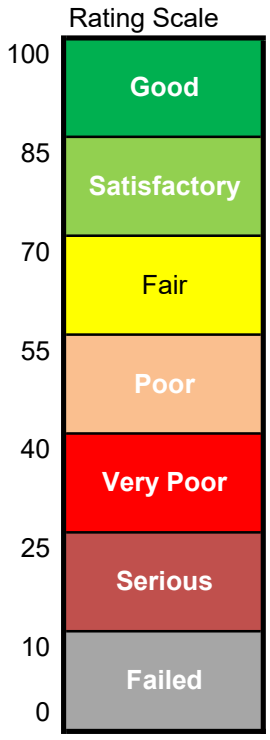
Remedial Option Alternatives

1. Clean and Seal Cracks
2. Fog Seal
3. Shallow AC patch
4. Full depth AC patch
5. Mill and overlay
6. Pulverize and overlay
7. Overlay
8. Remove and replace AC

Project Mngr. RP	Project No. 65225282	Terracon 4685 South Ash Avenue, Suite H4, Tempe, AZ 85282 (480) 897-8200	PCI Survey Summary I-10 GRIC Design-Build Project 202L to Gila River Bridge ADOT General Engineering Consultant	EXHIBIT 7
Drawn By: MB	Scale As Shown			
Checked By: RP	File No.			
Approved By: RP	Date: 3/28/2024			

Asphalt Pavement Condition Summary

Distress Type	Sum of Low, Medium, and High Deduct Values Core-22	Core-23	Core-24
Alligator Cracking			
Bleeding			
Block Cracking			
Joint Reflective Cracking	29.3		
Depression			
Long & Tran Cracking		17.4	17.0
Patching			
Potholes			
Rutting			41.4
Weathering/Raveling	5.0	32.2	3.5
Total Deduction =	34	50	62
Weighted Deduction =	24	34	46
PCI =	76	66	54
Rating	**Satisfactory**	**Fair**	**Poor**



Causes of Distress

A. Age
B. Subgrade Issues
C. Pavement Thickness
D. Drainage
E. Excessive Loads

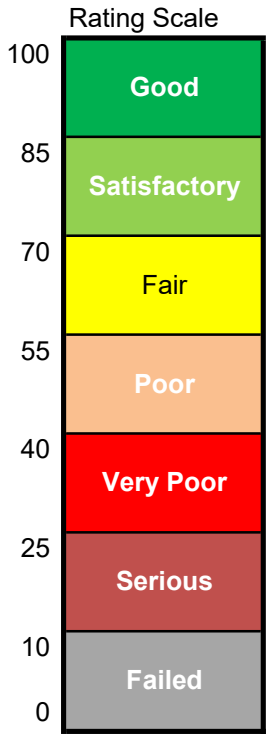
Remedial Option Alternatives

1. Clean and Seal Cracks
2. Fog Seal
3. Shallow AC patch
4. Full depth AC patch
5. Mill and overlay
6. Pulverize and overlay
7. Overlay
8. Remove and replace AC

Project Mngr. RP	Project No. 65225282	Terracon 4685 South Ash Avenue, Suite H4, Tempe, AZ 85282 (480) 897-8200	PCI Survey Summary I-10 GRIC Design-Build Project 202L to Gila River Bridge ADOT General Engineering Consultant	EXHIBIT 8
Drawn By: MB	Scale As Shown			
Checked By: RP	File No.			
Approved By: RP	Date: 3/28/2024			

Asphalt Pavement Condition Summary

Distress Type	Sum of Low, Medium, and High Deduct Values		
	Core-25	Core-26	Core-27
Alligator Cracking			66.1
Bleeding			
Block Cracking			
Joint Reflective Cracking	13.8	35.0	
Depression			
Long & Tran Cracking			28.2
Patching			
Potholes			
Rutting			
Weathering/Raveling	5.0	5.0	15.0
Total Deduction =	19	40	109
Weighted Deduction =	16	37	72
PCI =	84	63	28
Rating	Satisfactory	Fair	Very Poor



Causes of Distress

A. Age
B. Subgrade Issues
C. Pavement Thickness
D. Drainage
E. Excessive Loads

Remedial Option Alternatives

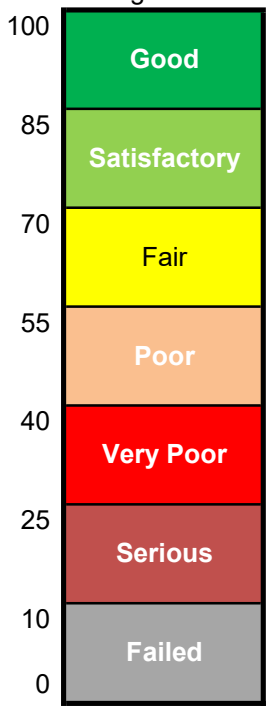
1. Clean and Seal Cracks
2. Fog Seal
3. Shallow AC patch
4. Full depth AC patch
5. Mill and overlay
6. Pulverize and overlay
7. Overlay
8. Remove and replace AC

Project Mngr. RP	Project No. 65225282	Terracon	PCI Survey Summary	EXHIBIT
Drawn By: MB	Scale As Shown	4685 South Ash Avenue, Suite H4, Tempe, AZ 85282 (480) 897-8200	I-10 GRIC Design-Build Project 202L to Gila River Bridge ADOT General Engineering Consultant	9
Checked By: RP	File No.			
Approved By: RP	Date: 3/28/2024			

Asphalt Pavement Condition Summary

Distress Type	Sum of Low, Medium, and High Deduct Values Core-28	Core-29
Alligator Cracking	71.0	
Bleeding		
Block Cracking	30.0	42.0
Joint Reflective Cracking		
Depression		
Long & Tran Cracking		
Patching		
Potholes		
Rutting		
Weathering/Raveling	5.0	5.0
Total Deduction =	106	47
Weighted Deduction =	75	44
PCI =	25	56
Rating	**Serious**	**Fair**

Rating Scale



Causes of Distress

A. Age
B. Subgrade Issues
C. Pavement Thickness
D. Drainage
E. Excessive Loads

Remedial Option Alternatives

1. Clean and Seal Cracks
2. Fog Seal
3. Shallow AC patch
4. Full depth AC patch
5. Mill and overlay
6. Pulverize and overlay
7. Overlay
8. Remove and replace AC

Project Mngr. RP Drawn By: MB Checked By: RP Approved By: RP	Project No. 65225282 Scale As Shown File No. Date: 3/28/2024	Terracon 4685 South Ash Avenue, Suite H4, Tempe, AZ 85282 (480) 897-8200	PCI Survey Summary I-10 GRIC Design-Build Project 202L to Gila River Bridge ADOT General Engineering Consultant	EXHIBIT 10

APPENDIX F

Pavement Core Photographs



Photo 1: Core-2, Latitude: 33.2738° Longitude: -111.9626°



Photo 2: Core-3, Latitude: 33.2625° Longitude: -111.9538°



Photo 3: Core-4, Latitude: 33.2491° Longitude: -111.9434°



Photo 4: Core-5, Latitude: 33.2372° Longitude: -111.9342°

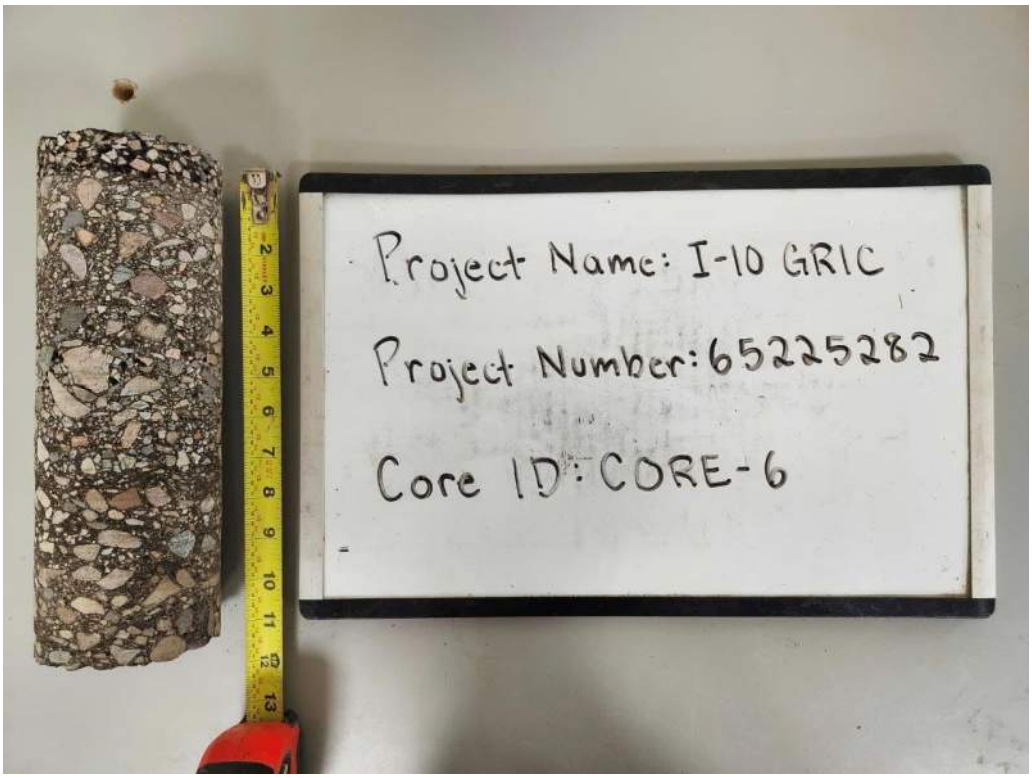


Photo 5: Core-6, Latitude: 33.2251° Longitude: -111.9249°

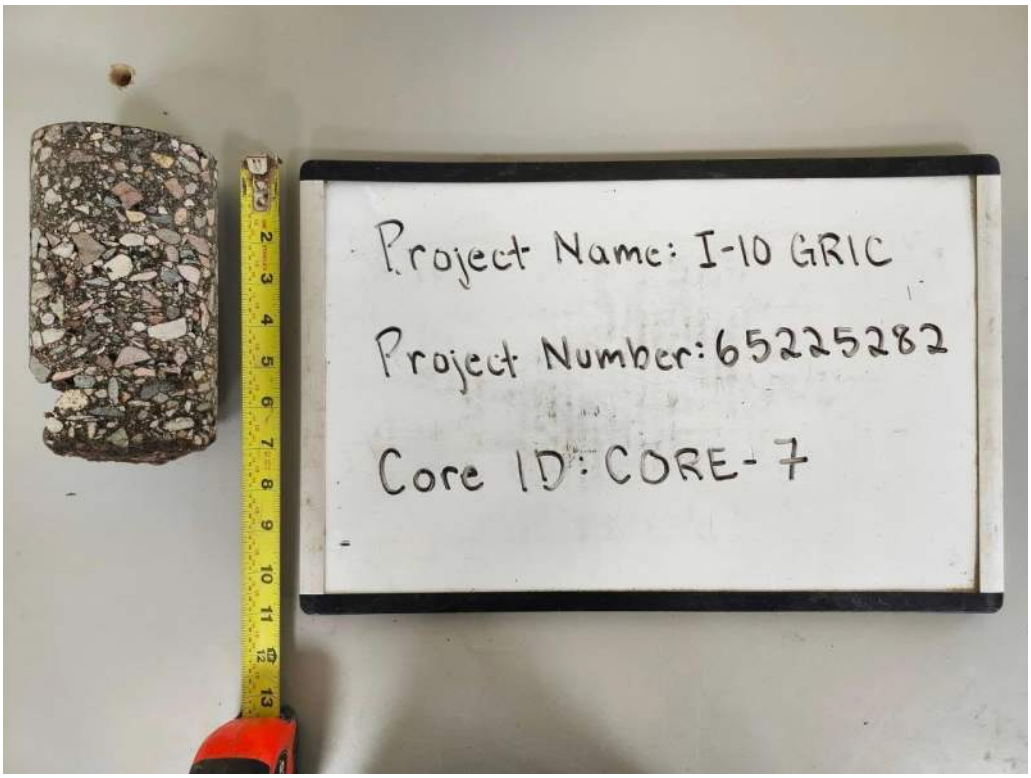


Photo 6: Core-7, Latitude: 33.2130° Longitude: -111.9156°



Photo 7: Core-8, Latitude: 33.2011° Longitude: -111.9063°



Photo 8: Core-9, Latitude: 33.1893° Longitude: -111.8973°

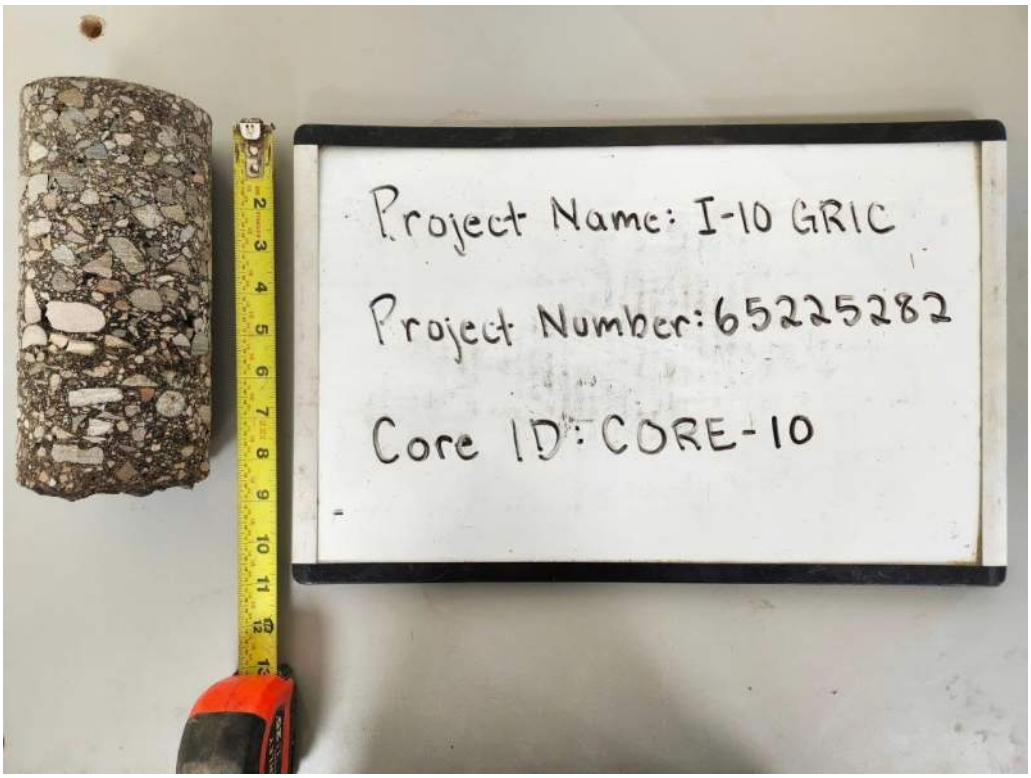


Photo 9: Core-10, Latitude: 33.1769°, Longitude: -111.8877°



Photo 10: Core-11, Latitude: 33.1649° Longitude: -111.8785°



Photo 11: Core-12, Latitude: 33.1578°, Longitude: -111.8725°



Photo 12: Core-13, Latitude: 33.1704° Longitude: -111.8822°



Photo 13: Core-14, Latitude: 33.1823° Longitude: -111.8915°



Photo 14: Core-15, Latitude: 33.1946° Longitude: -111.9009°



Photo 15: Core-16, Latitude: 33.2097° Longitude: -111.9126°



Photo 16: Core-17, Latitude: 33.2192° Longitude: -111.9199°



Photo 17: Core-18, Latitude: 33.2312° Longitude: -111.9292°

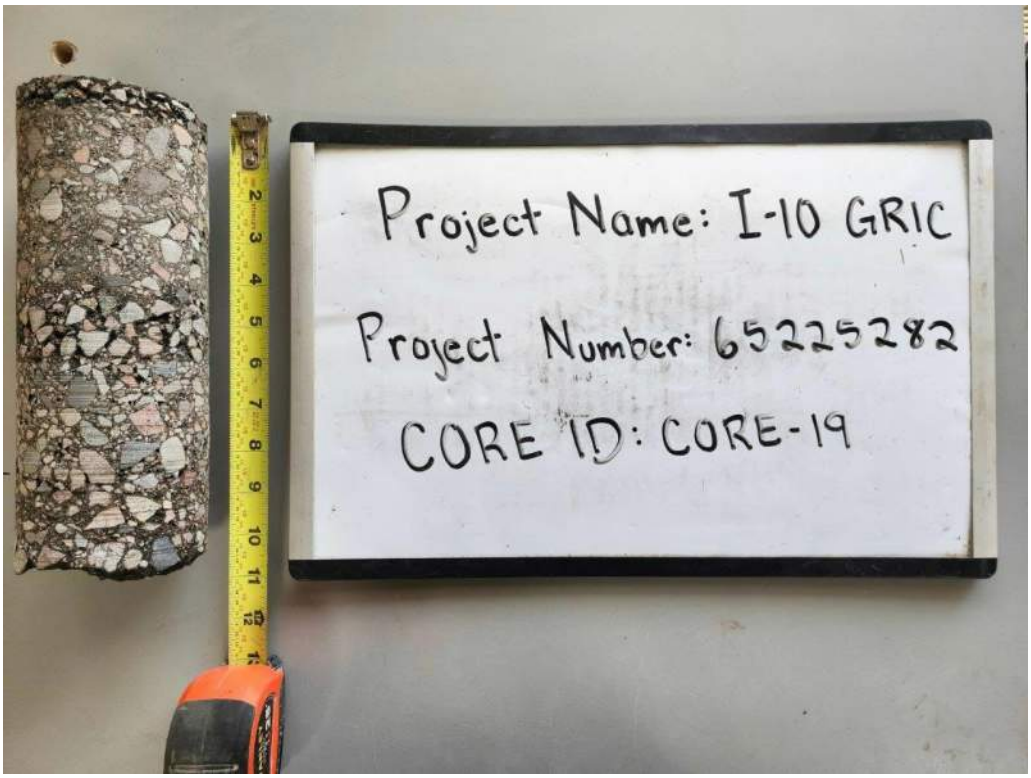


Photo 18: Core-19, Latitude: 33.2437° Longitude: -111.9388°

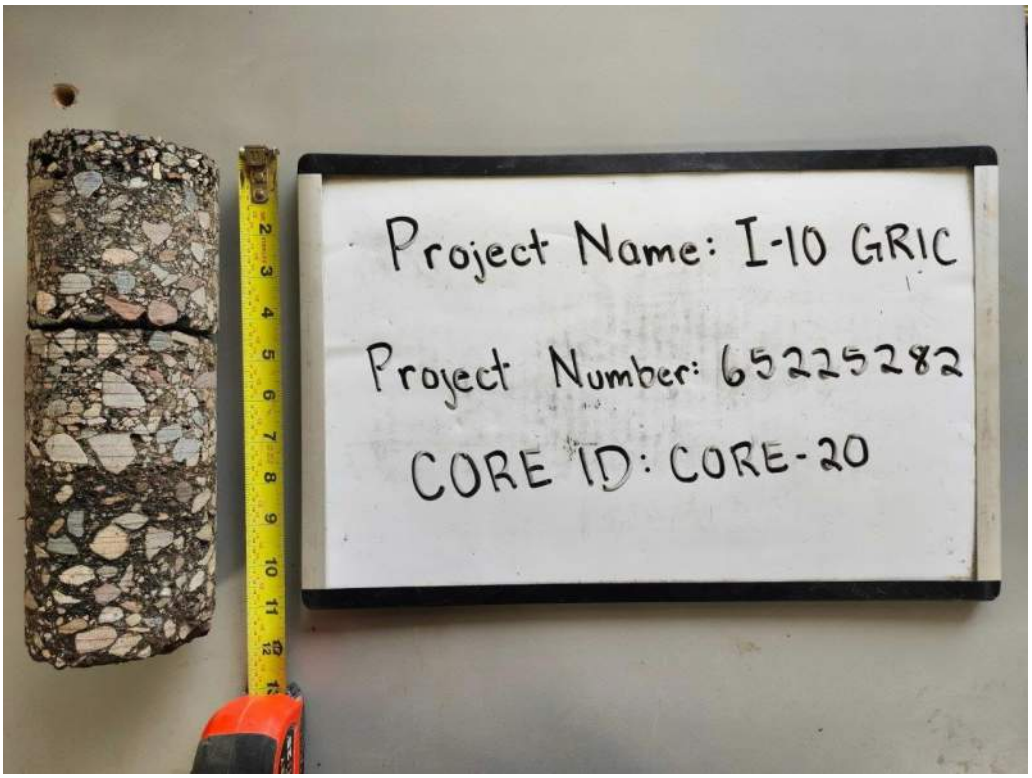


Photo 19: Core-20, Latitude: 33.2558° Longitude: -111.9482°

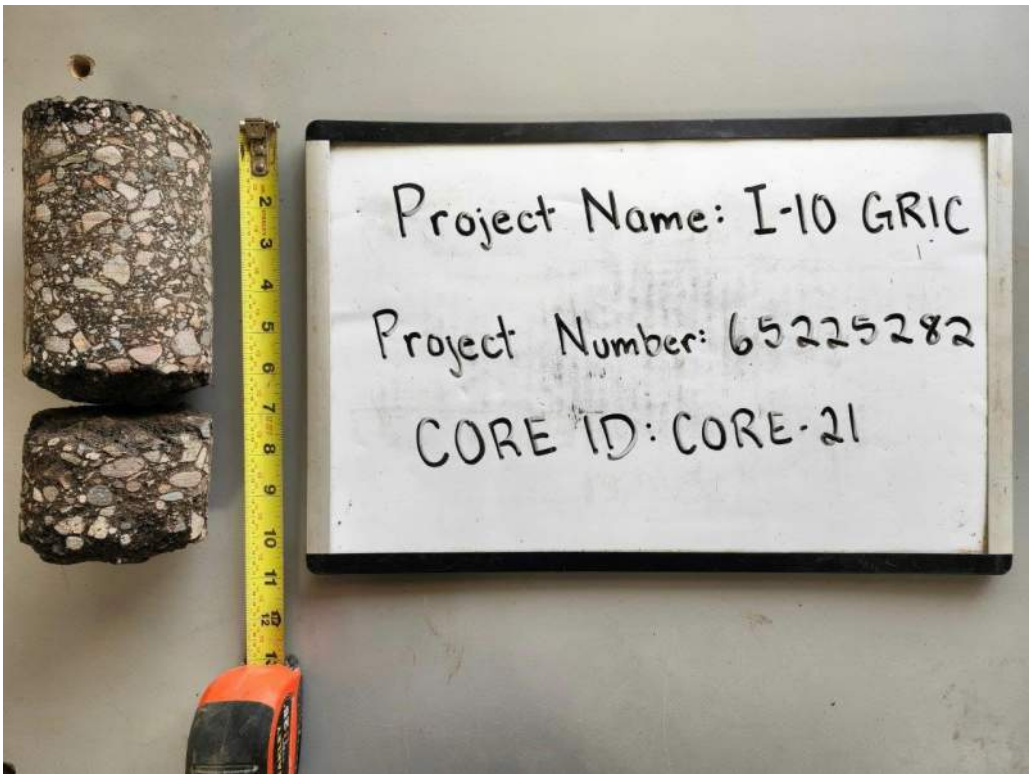


Photo 20: Core-21, Latitude: 33.2678° Longitude: -111.9575°

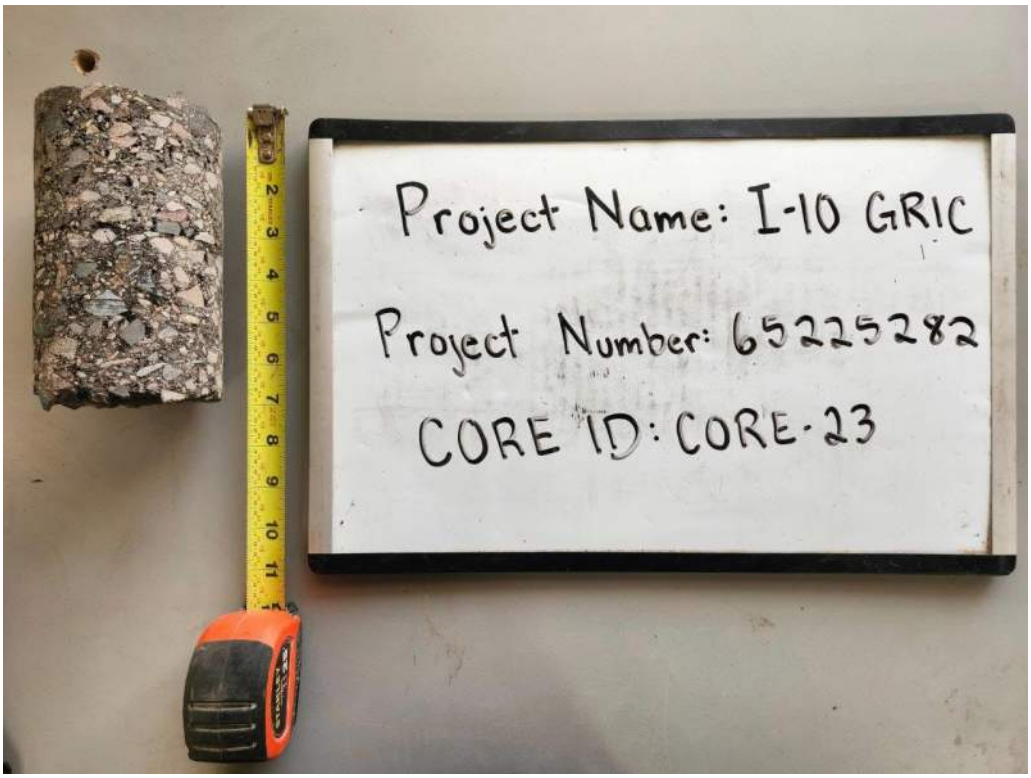


Photo 21: Core-23, Latitude: 33.2785° Longitude: -111.9691°

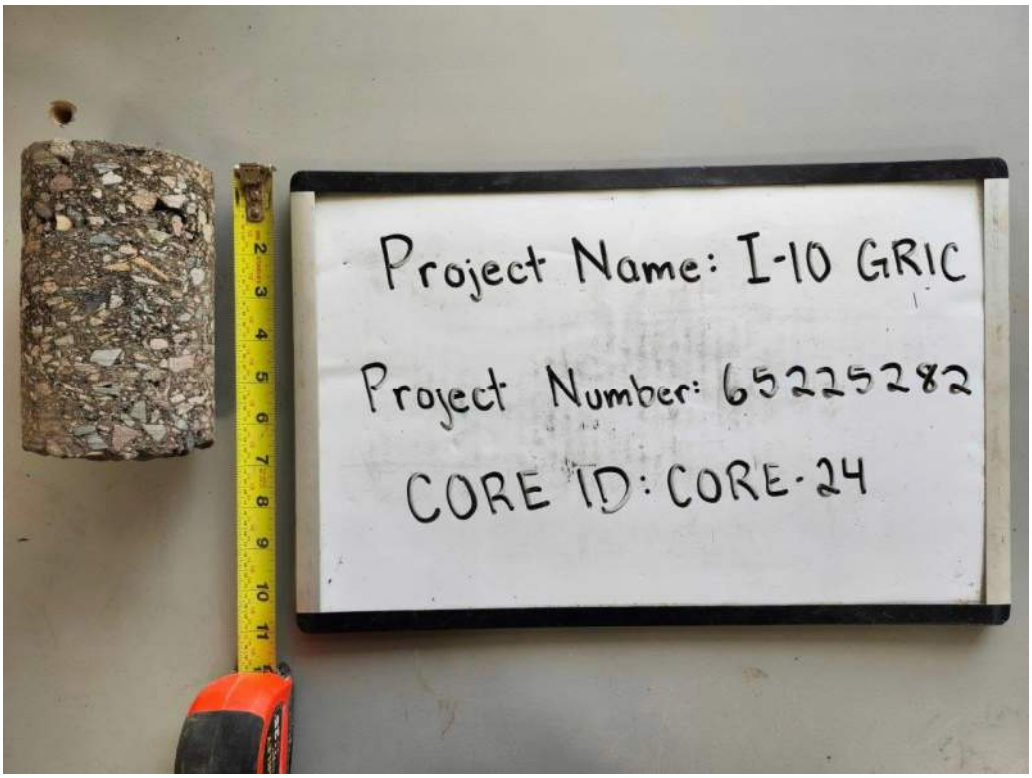


Photo 22: Core-24, Latitude: 33.2804° Longitude: -111.9646°

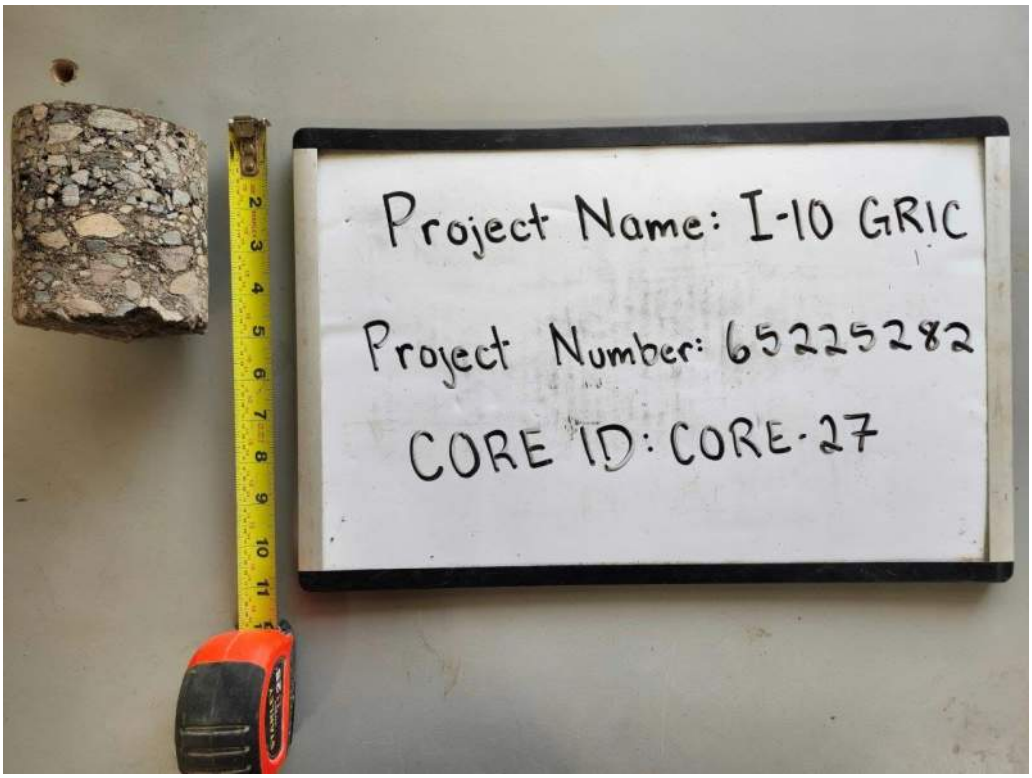


Photo 23: Core-27, Latitude: 33.2576° Longitude: -111.9504°

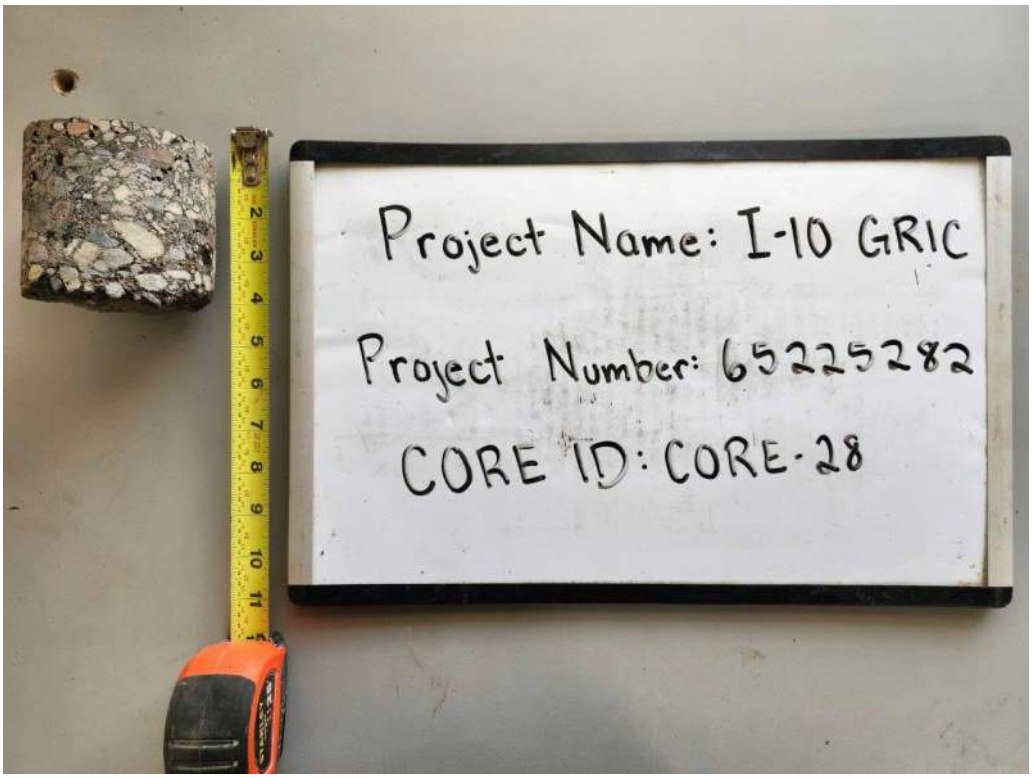


Photo 24: Core-28, Latitude: 33.2574° Longitude: -111.9486°

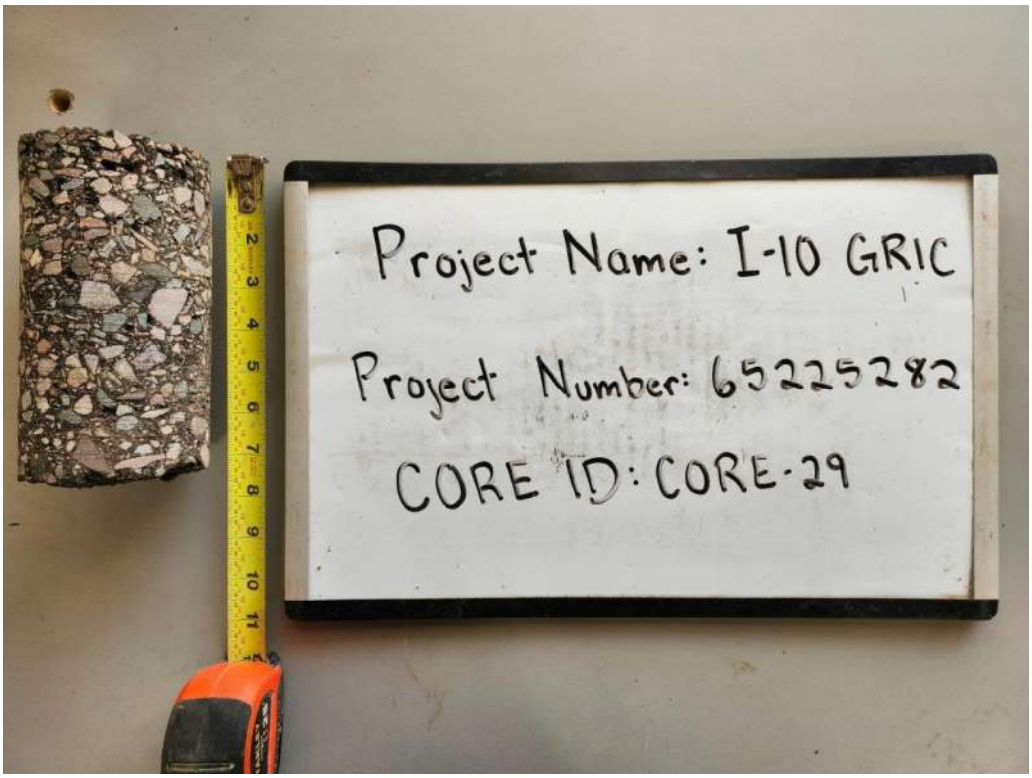


Photo 25: Core-29, Latitude: 33.2214° Longitude: -111.9213°

APPENDIX G

ADOT I-10 Pavement History Report
ADOT I-10 Pavement Condition Report

Pavement History

Route: I 010 Direction: E

MP 161 to MP 173

Route	Dir	From MP	To MP	Lane	L1	T1	L2	T2	L3	T3	L4	T4	L5	T5	L6	T6	L7	T7	Project #	Tracs #	Mo	Yr
I 010	E	160.55	161.19	1	SM	1.5	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	E	160.55	161.19	2	SM	1.5	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	E	160.55	168.68	1	SM	15.0	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	E	160.55	168.68	2	SM	15.0	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	E	161.19	163.07	1	SM	1.2	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	E	161.19	163.07	2	SM	1.2	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	E	163.07	164.68	1	SM	1.1	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	E	163.07	164.68	2	SM	1.1	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	E	164.68	167.33	1	SM	1.4	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	E	164.68	167.33	2	SM	1.4	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	E	167.33	167.62	1	SM	2.6	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	E	167.33	167.62	2	SM	2.6	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	E	167.62	168.68	1	SM	1.4	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	E	167.62	168.68	2	SM	1.4	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	E	168.68	175.95	1	SM	15.0	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 57	PMS01275	8	1968
I 010	E	168.68	175.95	2	SM	15.0	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 57	PMS01275	8	1968
I 010	E	155.67	168.68	1	FL	0.0													I 10- 3-913	PMS01279	11	1969
I 010	E	155.67	168.68	2	FL	0.0													I 10- 3-913	PMS01279	11	1969
I 010	E	168.70	197.00	1	FL	0.0													I 10- 3-917	PMS01280	8	1970
I 010	E	168.70	197.00	2	FL	0.0													I 10- 3-917	PMS01280	8	1970
I 010	E	155.10	175.90	1	FL	0.0													I 10- 3-925	PMS01281	11	1973
I 010	E	155.10	175.90	2	FL	0.0													I 10- 3-925	PMS01281	11	1973
I 010	E	167.10	175.71	1	HS	0.0	FC	0.5											I 10- 3-929	PMS01282	12	1979
I 010	E	167.10	175.71	2	HS	0.0	FC	0.5											I 10- 3-929	PMS01282	12	1979
I 010	E	160.55	163.83	1	RM	0.3	AC	2.0	FC	0.5									IR 10- 3-142	PMS01581	3	1983

Printed on: 4/25/2024

Exhibit: G1

Pavement History

Route: I 010 Direction: E

MP 161 to MP 173

Route	Dir	From MP	To MP	Lane	L1	T1	L2	T2	L3	T3	L4	T4	L5	T5	L6	T6	L7	T7	Project #	Tracs #	Mo	Yr
I 010	E	160.55	163.83	2	RC	4.5	AC	2.0	FC	0.5									IR 10- 3-142	PMS01581	3	1983
I 010	E	163.83	164.00	1	RE	12.0	AC	7.5	FC	0.5									IR 10- 3-142	PMS01581	3	1983
I 010	E	163.83	164.00	2	RE	12.0	AC	7.5	FC	0.5									IR 10- 3-142	PMS01581	3	1983
I 010	E	164.00	167.10	1	RM	0.3	AC	2.0	FC	0.5									IR 10- 3-142	PMS01581	3	1983
I 010	E	164.00	167.10	2	RC	4.5	AC	2.0	FC	0.5									IR 10- 3-142	PMS01581	3	1983
I 010	E	167.10	173.14	1	RE	2.5	AC	5.0	FC	0.5									ACIR 10- 3-264	H207701C	11	1990
I 010	E	167.10	173.14	2	RE	4.5	AC	7.0	FC	0.5									ACIR 10- 3-264	H207701C	11	1990
I 010	E	160.28	167.09	1	RE	3.5	AC	5.5	FR	0.5									IM- 10-3(272)	H356201C	10	1997
I 010	E	160.28	167.09	2	RE	5.0	AC	6.5	FR	0.5									IM- 10-3(272)	H356201C	10	1997
I 010	E	160.08	161.81	1	AB	4.0	PC	13.0											STP -600-7(1)B	H508801C	12	2003
I 010	E	160.08	161.81	2	AB	4.0	PC	13.0											STP -600-7(1)B	H508801C	12	2003
I 010	E	167.10	173.15	1	RE	4.5	AC	4.0	FR	0.5									IM-010-C(006)A	H583901C	6	2004
I 010	E	167.10	173.15	2	RE	5.5	AC	5.0	FR	0.5									IM-010-C(006)A	H583901C	6	2004
I 010	E	162.09	162.18	5	AB	4.0	PD	14.0											STP-202-C(006)B	H541701C	1	2005
I 010	E	162.09	162.27	4	AB	4.0	PD	14.0											STP-202-C(006)B	H541701C	1	2005
I 010	E	162.09	162.34	3	AB	4.0	PD	14.0											STP-202-C(006)B	H541701C	1	2005
I 010	E	162.09	163.52	1	AB	4.0	PD	14.0											STP-202-C(006)B	H541701C	1	2005
I 010	E	162.09	163.52	2	AB	4.0	PD	14.0											STP-202-C(006)B	H541701C	1	2005
I 010	E	160.59	161.99	1	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	160.59	161.99	2	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	160.59	161.99	3	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	161.99	162.12	1	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	161.99	162.12	2	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	161.99	162.12	3	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	161.99	162.12	4	FR	1.0													NON-NFA	H708201C	10	2008

Printed on: 4/25/2024

Exhibit: G2

Pavement History

Route: I 010 Direction: E

MP 161 to MP 173

Route	Dir	From MP	To MP	Lane	L1	T1	L2	T2	L3	T3	L4	T4	L5	T5	L6	T6	L7	T7	Project #	Tracs #	Mo	Yr
I 010	E	161.99	162.12	5	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	162.12	162.21	1	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	162.12	162.21	2	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	162.12	162.21	3	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	162.12	162.21	4	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	162.21	163.40	1	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	162.21	163.40	2	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	162.21	163.40	3	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	163.40	163.53	1	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	163.40	163.53	2	FR	1.0													NON-NFA	H708201C	10	2008
I 010	E	160.85	161.16	1	AC	4.0	PC	14.0	FR	1.0									STP -202-C(202)N	H745701C	10	2011
I 010	E	160.85	161.16	2	AC	4.0	PC	14.0	FR	1.0									STP -202-C(202)N	H745701C	10	2011
I 010	E	161.16	161.37	1	FR	1.0													STP -202-C(202)N	H745701C	10	2011
I 010	E	161.16	161.37	2	FR	1.0													STP -202-C(202)N	H745701C	10	2011
I 010	E	163.02	163.29	3	MS	0.2													STP -888-A(206)A	H802001C	5	2012
I 010	E	163.02	167.47	1	MS	0.2													STP -888-A(206)A	H802001C	5	2012
I 010	E	163.02	167.47	2	MS	0.2													STP -888-A(206)A	H802001C	5	2012

Printed on: 4/25/2024

Exhibit: G3

Pavement History

Route: I 010 Direction: W

MP 161 to MP 173

Route	Dir	From MP	To MP	Lane	L1	T1	L2	T2	L3	T3	L4	T4	L5	T5	L6	T6	L7	T7	Project #	Tracs #	Mo	Yr
I 010	W	160.55	161.19	1	SM	1.5	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	W	160.55	161.19	2	SM	1.5	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	W	161.19	163.07	1	SM	1.2	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	W	161.19	163.07	2	SM	1.2	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	W	163.07	164.68	1	SM	1.1	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	W	163.07	164.68	2	SM	1.1	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	W	164.68	167.33	1	SM	1.4	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	W	164.68	167.33	2	SM	1.4	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	W	167.33	167.62	1	SM	2.6	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	W	167.33	167.62	2	SM	2.6	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	W	167.62	168.68	1	SM	1.4	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	W	167.62	168.68	2	SM	1.4	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 69	PMS01278	8	1968
I 010	W	168.68	175.95	1	SM	15.0	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 57	PMS01275	8	1968
I 010	W	168.68	175.95	2	SM	15.0	AB	4.0	AC	3.5	FC	0.5							I 10- 3- 57	PMS01275	8	1968
I 010	W	155.67	168.68	1	FL	0.0													I 10- 3-913	PMS01279	11	1969
I 010	W	155.67	168.68	2	FL	0.0													I 10- 3-913	PMS01279	11	1969
I 010	W	168.70	197.00	1	FL	0.0													I 10- 3-917	PMS01280	8	1970
I 010	W	168.70	197.00	2	FL	0.0													I 10- 3-917	PMS01280	8	1970
I 010	W	155.10	175.90	1	FL	0.0													I 10- 3-925	PMS01281	11	1973
I 010	W	155.10	175.90	2	FL	0.0													I 10- 3-925	PMS01281	11	1973
I 010	W	167.10	175.71	1	HS	0.0	FC	0.5											I 10- 3-929	PMS01282	12	1979
I 010	W	167.10	175.71	2	HS	0.0	FC	0.5											I 10- 3-929	PMS01282	12	1979
I 010	W	160.55	167.10	1	AC	1.5	FC	0.5											IR-10-3-(148)	H123101C	10	1983
I 010	W	160.55	167.10	2	AC	5.0	FC	0.5											IR-10-3-(148)	H123101C	10	1983
I 010	W	161.00	167.00	1	RC	3.5	AC	1.5	FC	0.5									IR 10- 3-148	PMS01582	9	1983

Printed on: 4/25/2024

Exhibit: G4

Pavement History

Route: I 010 Direction: W

MP 161 to MP 173

Route	Dir	From MP	To MP	Lane	L1	T1	L2	T2	L3	T3	L4	T4	L5	T5	L6	T6	L7	T7	Project #	Tracs #	Mo	Yr
I 010	W	161.00	167.00	2	RC	3.5	AC	1.5	FC	0.5									IR 10- 3-148	PMS01582	9	1983
I 010	W	163.83	164.00	1	RE	12.0	AC	7.5	FC	0.5									IR 10- 3-142	PMS01581	3	1983
I 010	W	163.83	164.00	2	RE	12.0	AC	7.5	FC	0.5									IR 10- 3-142	PMS01581	3	1983
I 010	W	167.10	173.15	1	RE	2.5	AC	4.0	FC	0.5									ACIR 10- 3-264	H207701C	11	1990
I 010	W	167.10	173.15	2	RE	4.5	AC	6.0	FC	0.5									ACIR 10- 3-264	H207701C	11	1990
I 010	W	160.28	167.09	1	RE	3.5	AC	5.5	FR	0.5									IM- 10-3(272)	H356201C	10	1997
I 010	W	160.28	167.09	2	RE	5.0	AC	7.0	FR	0.5									IM- 10-3(272)	H356201C	10	1997
I 010	W	160.30	162.03	1	AB	4.0	PC	13.0											STP -600-7(1)B	H508801C	12	2003
I 010	W	160.30	162.03	2	AB	4.0	PC	13.0											STP -600-7(1)B	H508801C	12	2003
I 010	W	160.30	162.03	3	AB	4.0	PC	13.0											STP -600-7(1)B	H508801C	12	2003
I 010	W	167.10	173.15	1	RE	4.5	AC	4.0	FR	0.5									IM-010-C(006)A	H583901C	6	2004
I 010	W	167.10	173.15	2	RE	5.5	AC	5.0	FR	0.5									IM-010-C(006)A	H583901C	6	2004
I 010	W	162.09	163.05	3	AB	4.0	PD	14.0											STP-202-C(006)B	H541701C	1	2005
I 010	W	162.09	163.52	1	AB	4.0	PD	14.0											STP-202-C(006)B	H541701C	1	2005
I 010	W	162.09	163.52	2	AB	4.0	PD	14.0											STP-202-C(006)B	H541701C	1	2005
I 010	W	160.74	161.83	1	FR	1.0													NON-NFA	H708201C	10	2008
I 010	W	160.74	161.83	2	FR	1.0													NON-NFA	H708201C	10	2008
I 010	W	160.74	161.83	3	FR	1.0													NON-NFA	H708201C	10	2008
I 010	W	161.83	162.08	1	FR	1.0													NON-NFA	H708201C	10	2008
I 010	W	161.83	162.08	2	FR	1.0													NON-NFA	H708201C	10	2008
I 010	W	161.83	162.08	3	FR	1.0													NON-NFA	H708201C	10	2008
I 010	W	161.83	162.08	4	FR	1.0													NON-NFA	H708201C	10	2008
I 010	W	162.08	162.79	1	FR	1.0													NON-NFA	H708201C	10	2008
I 010	W	162.08	162.79	2	FR	1.0													NON-NFA	H708201C	10	2008
I 010	W	162.08	162.79	3	FR	1.0													NON-NFA	H708201C	10	2008

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Exhibit: G5

Pavement History

Route: I 010 Direction: W

MP 161 to MP 173

Route	Dir	From MP	To MP	Lane	L1	T1	L2	T2	L3	T3	L4	T4	L5	T5	L6	T6	L7	T7	Project #	Tracs #	Mo	Yr
I 010	W	162.79	163.09	1	FR	1.0													NON-NFA	H708201C	10	2008
I 010	W	162.79	163.09	2	FR	1.0													NON-NFA	H708201C	10	2008
I 010	W	162.79	163.09	3	FR	1.0													NON-NFA	H708201C	10	2008
I 010	W	162.79	163.09	4	FR	1.0													NON-NFA	H708201C	10	2008
I 010	W	160.85	161.16	1	AC	4.0	PC	14.0	FR	1.0									STP -202-C(202)N	H745701C	10	2011
I 010	W	160.85	161.16	2	AC	4.0	PC	14.0	FR	1.0									STP -202-C(202)N	H745701C	10	2011
I 010	W	161.16	161.37	1	FR	1.0													STP -202-C(202)N	H745701C	10	2011
I 010	W	161.16	161.37	2	FR	1.0													STP -202-C(202)N	H745701C	10	2011
I 010	W	163.02	167.47	1	MS	0.2													STP -888-A(206)A	H802001C	5	2012
I 010	W	163.02	167.47	2	MS	0.2													STP -888-A(206)A	H802001C	5	2012

Pavement Condition Report

ATIS Route ID: I.010.....,.....

MP 161 to MP 173

					Smoothness (IRI)				Mean Rutting (in)				PMS Cracking (%)			
Route	From MP	To MP	Len (ft)	Pavement Type	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
I 010 E	160.963	161.093	528.0	JPCP+FC	55.07	47.96	49.61	48.18	0.0976	0.1300	0.1019	0.0605	0	0	0	6
I 010 E	161.093	161.193	528.0	JPCP+FC	55.30	46.02	45.54	47.40	0.1159	0.1480	0.1228	0.0616	0	0	0	7
I 010 E	161.193	161.293	528.0	JPCP+FC	56.27	49.89	47.18	48.14	0.1145	0.1562	0.1331	0.0768	0	0	0	4
I 010 E	161.293	161.393	199.0	JPCP+FC		60.24	93.72	51.35	0.1099	0.1375	0.1357	0.0579	0	0	0	2
I 010 E	161.393	161.493	528.0	JPCP+FC	69.29	77.03	70.86	57.74	0.1466	0.1440	0.1581	0.0702	0	0	0	4
I 010 E	161.493	161.593	528.0	JPCP+FC	45.83	46.09	45.03	43.30	0.1452	0.1590	0.1704	0.0663	0	0	0	3
I 010 E	161.593	161.693	528.0	JPCP+FC	56.36	47.89	49.54	46.82	0.0846	0.1379	0.1010	0.0457	0	0	0	3
I 010 E	161.693	161.793	528.0	JPCP+FC	53.55	46.60	45.44	43.46	0.0837	0.1330	0.1030	0.0569	0	0	0	4
I 010 E	161.793	161.893	528.0	JPCP+FC	63.25	57.28	58.09	58.29	0.1097	0.1453	0.1284	0.0840	0	0	0	5
I 010 E	161.893	161.993	528.0	JPCP+FC	56.31	49.65	74.16	50.64	0.1203	0.1298	0.0959	0.0471	0	0	0	4
I 010 E	162.093	162.040	528.0	JPCP+FC	40.97	49.84	57.05	48.12	0.0554	0.1085	0.1244	0.0418	0	0	0	5
MP Avg					55.22	52.59	57.84	49.40	0.1076	0.1390	0.1250	0.0608	0	0	0	4
I 010 E	161.993	162.093	528.0	JPCP+FC	63.78	59.92	56.08	54.97	0.0709	0.1199	0.1032	0.0549	0	0	0	4
I 010 E	162.040	162.140	528.0	JPCP+FC	50.74	62.49	75.44	67.09	0.0783	0.1517	0.1313	0.1189	0	0	0	4
I 010 E	162.140	162.240	528.0	JPCP+FC	54.64	86.19	93.69	98.12	0.0867	0.1285	0.0979	0.0776	0	0	0	5
I 010 E	162.240	162.340	528.0	JPCP+FC	58.57	70.16	73.02	64.88	0.1334	0.1128	0.0996	0.0825	0	0	0	6
I 010 E	162.340	162.440	528.0	JPCP+FC	63.13	64.95	71.60	62.03	0.1505	0.1220	0.0859	0.0667	0	0	0	7
I 010 E	162.440	162.540	528.0	JPCP+FC	56.00	54.31	62.26	56.59	0.1576	0.1663	0.1163	0.1272	0	0	0	5
I 010 E	162.540	162.640	528.0	JPCP+FC	45.90	47.09	51.31	47.00	0.1335	0.1607	0.1587	0.1149	0	0	0	5
I 010 E	162.640	162.740	528.0	JPCP+FC	40.16	43.85	48.38	43.35	0.1447	0.1547	0.1502	0.1069	0	0	0	6
I 010 E	162.740	162.840	528.0	JPCP+FC	46.74	45.60	56.28	52.95	0.1301	0.1471	0.1321	0.0783	0	0	0	5
I 010 E	162.840	163.035	528.0	JPCP+FC	46.46	44.58	49.04	63.62	0.1227	0.1288	0.1065	0.0472	0	0	0	6
MP Avg					52.61	57.91	63.71	61.06	0.1208	0.1393	0.1182	0.0875	0	0	0	5

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Exhibit: G7

Pavement Condition Report

ATIS Route ID: I.010.....,.....

MP 161 to MP 173

					Smoothness (IRI)				Mean Rutting (in)				PMS Cracking (%)			
Route	From MP	To MP	Len (ft)	Pavement Type	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
I 010 E	163.035	163.135	528.0	JPCP+FC	43.19	43.24	52.32	60.45	0.1374	0.1419	0.1303	0.0440	0	0	0	7
I 010 E	163.135	163.235	528.0	JPCP+FC	46.28	43.50	47.53	46.20	0.1646	0.1793	0.1840	0.1268	0	0	0	7
I 010 E	163.235	163.335	528.0	JPCP+FC	53.01	57.02	60.41	59.68	0.1251	0.1531	0.1505	0.0885	0	0	0	5
I 010 E	163.335	163.435	528.0	JPCP+FC	44.47	43.33	43.95	42.27	0.1009	0.1354	0.1171	0.0634	0	0	0	5
I 010 E	163.435	163.535	528.0	JPCP+FC	65.04	61.01	67.19	63.31	0.0923	0.1092	0.0960	0.0522	0	0	0	6
I 010 E	163.535	163.635	528.0	AC	71.22	68.38	71.18	69.37	0.1769	0.1448	0.1900	0.1537	4	4	0	5
I 010 E	163.635	163.735	528.0	AC	55.84	44.48	59.08	54.85	0.1826	0.2358	0.1921	0.1537	4	6	0	5
I 010 E	163.735	163.835	528.0	AC	56.07	38.65	63.99	56.69	0.1866	0.2588	0.1423	0.0935	4	8	0	4
I 010 E	163.835	163.935	528.0	AC	58.42	48.35	55.80	48.89	0.1479	0.2106	0.1731	0.1463	3	4	0	1
I 010 E	163.935	164.015	528.0	AC	42.60	56.48	55.89	56.13	0.1255	0.2078	0.2106	0.1514	0	3	0	1
MP Avg					53.61	50.44	57.73	55.78	0.1440	0.1777	0.1586	0.1074	2	3	0	5
I 010 E	164.015	164.115	528.0	AC	51.95	39.71	36.07	33.12	0.1312	0.2014	0.1903	0.1361	2	4	0	3
I 010 E	164.115	164.215	528.0	AC	33.36	34.76	35.59	34.08	0.1638	0.1756	0.1574	0.1006	3	4	0	4
I 010 E	164.215	164.315	528.0	AC	43.99	45.45	45.12	44.09	0.1383	0.1621	0.1498	0.0963	4	5	0	5
I 010 E	164.315	164.415	528.0	AC	31.86	31.17	34.60	31.47	0.1219	0.1630	0.1489	0.0845	3	4	0	4
I 010 E	164.415	164.515	528.0	AC	35.97	34.85	32.83	34.09	0.1646	0.1885	0.1795	0.1273	2	4	0	3
I 010 E	164.515	164.615	528.0	AC	39.19	38.37	40.26	37.92	0.1760	0.1878	0.1764	0.1085	1	3	0	2
I 010 E	164.615	164.715	528.0	AC	34.75	34.67	35.76	34.32	0.1856	0.1969	0.1867	0.1338	1	4	0	1
I 010 E	164.715	164.815	528.0	AC	39.20	37.41	41.19	40.46	0.1765	0.1963	0.1980	0.1234	2	4	0	2
I 010 E	164.815	164.915	528.0	AC	38.20	38.63	36.77	34.55	0.1539	0.1766	0.1741	0.0964	3	6	0	3
I 010 E	164.915	165.020	528.0	AC	33.26	33.27	36.35	35.75	0.1326	0.1525	0.1434	0.0632	1	3	0	3
MP Avg					38.17	36.83	37.45	35.99	0.1544	0.1801	0.1705	0.1070	2	4	0	3
I 010 E	165.020	165.120	528.0	AC	40.80	34.15	40.09	40.80	0.1532	0.1520	0.1501	0.0946	1	3	0	2

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Exhibit: G8

Pavement Condition Report

ATIS Route ID: I.010.....,.....

MP 161 to MP 173

					Smoothness (IRI)				Mean Rutting (in)				PMS Cracking (%)			
Route	From MP	To MP	Len (ft)	Pavement Type	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
I 010 E	165.120	165.220	528.0	AC	34.18	35.46	36.62	35.78	0.1548	0.1806	0.1749	0.1125	2	4	0	1
I 010 E	165.220	165.320	528.0	AC	34.49	37.20	40.17	36.47	0.1545	0.1774	0.1839	0.1273	3	4	0	2
I 010 E	165.320	165.420	528.0	AC	40.74	48.65	46.86	45.15	0.1708	0.2094	0.2140	0.1606	1	3	0	2
I 010 E	165.420	165.520	528.0	AC	34.78	36.68	35.41	37.32	0.1222	0.1766	0.1770	0.0972	2	4	0	2
I 010 E	165.520	165.620	528.0	AC	40.86	42.83	42.73	42.39	0.1563	0.1774	0.1746	0.0898	1	4	0	2
I 010 E	165.620	165.720	528.0	AC	35.03	35.12	37.55	37.07	0.1613	0.1794	0.1794	0.1039	1	3	0	2
I 010 E	165.720	165.820	528.0	AC	36.47	41.12	37.72	37.16	0.1642	0.1912	0.1841	0.1154	0	3	0	2
I 010 E	165.820	165.920	528.0	AC	36.34	36.07	37.38	38.87	0.1373	0.1674	0.1545	0.0982	1	3	0	2
I 010 E	165.920	166.000	528.0	AC	33.32	32.16	34.16	31.91	0.1462	0.1823	0.1668	0.1003	1	3	0	2
MP Avg					36.70	37.94	38.87	38.29	0.1521	0.1794	0.1759	0.1100	1	3	0	2
I 010 E	166.000	166.101	528.0	AC	33.74	32.59	37.66	35.86	0.1342	0.1644	0.1224	0.1098	2	3	0	3
I 010 E	166.101	166.201	528.0	AC	33.65	31.26	33.63	34.43	0.1221	0.1595	0.0993	0.0929	1	4	0	3
I 010 E	166.201	166.301	528.0	AC	30.91	30.93	30.67	31.71	0.1266	0.1605	0.1389	0.0742	1	5	0	3
I 010 E	166.301	166.401	528.0	AC	44.17	45.24	46.33	36.26	0.1499	0.1726	0.1553	0.0859	0	3	0	2
I 010 E	166.401	166.501	528.0	AC	37.77	38.29	38.32	39.38	0.1571	0.1893	0.1823	0.1059	0	5	0	3
I 010 E	166.501	166.601	528.0	AC	35.11	43.32	43.48	44.00	0.1436	0.1881	0.1816	0.1165	0	2	0	1
I 010 E	166.601	166.701	528.0	AC	31.56	32.21	32.55	28.36	0.1502	0.1748	0.1673	0.1098	0	2	0	1
I 010 E	166.701	166.801	528.0	AC	35.92	36.49	37.59	36.81	0.1394	0.1736	0.1660	0.1064	0	3	0	1
I 010 E	166.801	166.901	528.0	AC	46.28	44.63	40.61	34.32	0.1292	0.1558	0.1510	0.1005	0	2	0	1
I 010 E	166.901	167.009	528.0	AC	39.49	40.72	39.15	37.94	0.1279	0.1547	0.1519	0.1116	0	3	0	2
MP Avg					36.86	37.57	38.00	35.91	0.1380	0.1693	0.1516	0.1014	0	3	0	2
I 010 E	167.009	167.109	528.0	AC	51.82	52.53	58.33	55.90	0.1117	0.1532	0.1415	0.0589	1	6	2	3
I 010 E	167.109	167.209	528.0	AC	62.80	73.41	66.15	69.00	0.1301	0.1814	0.1242	0.0563	6	12	9	8

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Exhibit: G9

Pavement Condition Report

ATIS Route ID: I.010.....,.....

MP 161 to MP 173

					Smoothness (IRI)				Mean Rutting (in)				PMS Cracking (%)			
Route	From MP	To MP	Len (ft)	Pavement Type	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
I 010 E	167.209	167.309	528.0	AC	53.23	78.78	65.66	67.35	0.1301	0.2257	0.1849	0.1116	11	20	23	16
I 010 E	167.309	167.409	528.0	AC	73.06	88.29	108.36	78.15	0.1645	0.2477	0.2462	0.1045	11	24	18	12
I 010 E	167.409	167.509	528.0	AC	61.00	78.17	78.57	74.98	0.1593	0.2131	0.2087	0.0951	5	10	7	5
I 010 E	167.509	167.609	528.0	AC	67.46	90.71	94.95	102.21	0.1645	0.2814	0.2762	0.1868	11	29	25	18
I 010 E	167.609	167.709	528.0	AC	52.62	74.52	67.29	85.81	0.2295	0.3051	0.2654	0.2269	14	31	29	23
I 010 E	167.709	167.809	528.0	AC	61.99	73.90	75.61	78.47	0.1736	0.2189	0.1820	0.1040	8	22	14	12
I 010 E	167.809	167.909	528.0	AC	85.24	103.70	85.22	110.21	0.1288	0.2003	0.1163	0.1127	17	34	24	19
I 010 E	167.909	168.008	528.0	AC	81.28	79.82	78.94	110.19	0.1132	0.1808	0.1512	0.1016	13	33	23	14
MP Avg					65.05	79.38	77.91	83.23	0.1505	0.2208	0.1897	0.1158	10	22	17	13
I 010 E	168.008	168.108	528.0	AC	82.67	80.76	86.64	108.78	0.1311	0.2144	0.1925	0.1226	14	32	28	14
I 010 E	168.108	168.208	528.0	AC	81.31	82.06	79.30	112.17	0.1213	0.1724	0.1625	0.0878	13	25	22	15
I 010 E	168.208	168.308	528.0	AC	74.88	69.01	79.02	102.88	0.1536	0.1971	0.1935	0.1343	12	25	22	18
I 010 E	168.308	168.408	528.0	AC	77.43	92.60	110.68	123.12	0.2240	0.2729	0.2711	0.2475	24	43	36	34
I 010 E	168.408	168.508	528.0	AC	102.67	105.48	98.41	106.88	0.2463	0.3010	0.2700	0.2722	26	53	41	38
I 010 E	168.508	168.608	528.0	AC	122.41	134.07	125.29	150.10	0.1957	0.2935	0.2509	0.2700	25	55	42	31
I 010 E	168.608	168.708	528.0	AC	114.41	137.36	420.40	148.60	0.1599	0.2377	0.6334	0.1897	16	38	34	28
I 010 E	168.708	168.808	528.0	AC	111.90	130.34	169.09	171.92	0.2017	0.1967	0.1896	0.1794	24	35	35	29
I 010 E	168.808	168.908	528.0	AC	102.06	104.99	125.92	102.46	0.2058	0.1956	0.1917	0.1549	17	26	27	23
I 010 E	168.908	169.003	528.0	AC	114.95	128.98	142.95	169.94	0.1981	0.1824	0.1955	0.1682	25	30	31	27
MP Avg					98.47	106.57	143.77	129.69	0.1838	0.2264	0.2551	0.1827	20	36	32	26
I 010 E	169.003	169.103	528.0	AC	86.49	95.39	94.13	112.32	0.1520	0.1711	0.1764	0.1216	23	33	28	26
I 010 E	169.103	169.203	528.0	AC	75.16	79.50	77.20	83.16	0.2036	0.1919	0.1465	0.0702	15	22	17	13
I 010 E	169.203	169.303	528.0	AC	81.47	69.12	85.97	132.49	0.2202	0.2015	0.1528	0.1289	18	24	20	19

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Exhibit: G10

Pavement Condition Report

ATIS Route ID: I.010.....,.....

MP 161 to MP 173

					Smoothness (IRI)				Mean Rutting (in)				PMS Cracking (%)			
Route	From MP	To MP	Len (ft)	Pavement Type	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
I 010 E	169.303	169.403	528.0	AC	66.04	74.77	87.01	91.19	0.2072	0.1853	0.1938	0.1455	17	23	18	16
I 010 E	169.403	169.503	528.0	AC	70.02	77.33	84.53	94.09	0.2116	0.1908	0.1866	0.1250	18	26	20	15
I 010 E	169.503	169.603	528.0	AC	80.31	88.68	102.46	119.40	0.2554	0.2328	0.2474	0.2058	26	34	30	23
I 010 E	169.603	169.703	528.0	AC	98.14	108.28	119.77	131.30	0.2895	0.2657	0.2765	0.2555	35	42	34	28
I 010 E	169.703	169.803	528.0	AC	75.42	93.71	98.47	110.78	0.2457	0.2095	0.2060	0.1380	18	27	22	16
I 010 E	169.803	169.903	528.0	AC	85.59	109.36	105.01	117.64	0.2689	0.2381	0.2452	0.1583	34	39	34	21
I 010 E	169.903	170.000	528.0	AC	76.64	92.26	93.54	108.10	0.2622	0.2352	0.2070	0.1744	29	39	28	23
MP Avg					79.53	88.84	94.81	110.05	0.2316	0.2122	0.2038	0.1523	23	31	25	20
I 010 E	170.000	170.101	528.0	AC	80.62	71.70	72.30	107.41	0.2804	0.2544	0.1802	0.2224	43	56	41	34
I 010 E	170.101	170.201	528.0	AC	92.59	85.50	78.92	155.96	0.2924	0.2627	0.2024	0.2959	40	54	42	40
I 010 E	170.201	170.301	528.0	AC	91.19	110.23	77.68	114.71	0.2216	0.2368	0.1436	0.1922	34	44	36	31
I 010 E	170.301	170.401	528.0	AC	91.43	101.26	111.94	128.40	0.2274	0.2214	0.2183	0.2209	35	51	39	33
I 010 E	170.401	170.501	528.0	AC	104.73	115.87	125.73	138.11	0.2454	0.2135	0.1991	0.1716	28	46	29	25
I 010 E	170.501	170.601	528.0	AC	95.27	102.35	103.66	117.94	0.2563	0.2136	0.2117	0.1846	25	37	27	27
I 010 E	170.601	170.701	528.0	AC	85.31	98.51	105.21	113.46	0.2820	0.2356	0.2355	0.1822	26	39	37	33
I 010 E	170.701	170.801	528.0	AC	91.04	109.39	118.63	133.60	0.2628	0.2507	0.2485	0.1955	31	38	34	34
I 010 E	170.801	170.901	528.0	AC	104.48	119.63	114.72	156.24	0.2367	0.2571	0.2569	0.2587	34	41	36	37
I 010 E	170.901	171.003	528.0	AC	138.73	155.15	198.64	152.11	0.3134	0.3113	0.3285	0.1413	52	54	54	21
MP Avg					97.54	106.96	110.74	131.79	0.2618	0.2457	0.2225	0.2065	35	46	38	32
I 010 E	171.003	171.103	528.0	AC	123.15	151.73	147.55	99.67	0.2764	0.2696	0.2427	0.0303	41	50	51	0
I 010 E	171.103	171.203	528.0	AC	123.15	160.73	184.38	149.18	0.2382	0.2517	0.2482	0.1939	52	57	53	29
I 010 E	171.203	171.303	528.0	AC	110.09	112.42	129.72	149.82	0.2820	0.2735	0.2726	0.2505	46	52	48	40
I 010 E	171.303	171.403	528.0	AC	126.27	136.40	146.81	200.54	0.1961	0.2207	0.1772	0.1810	35	41	36	29

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Exhibit: G11

Pavement Condition Report

ATIS Route ID: I.010.....,.....

MP 161 to MP 173

					Smoothness (IRI)				Mean Rutting (in)				PMS Cracking (%)			
Route	From MP	To MP	Len (ft)	Pavement Type	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
I 010 E	171.403	171.503	528.0	AC	107.90	86.57	155.18	185.57	0.1969	0.2217	0.2051	0.2156	44	43	43	37
I 010 E	171.503	171.603	528.0	AC	109.80	131.19	147.10	147.39	0.2646	0.2445	0.2797	0.1235	36	41	35	15
I 010 E	171.603	171.703	528.0	AC	104.50	105.51	112.15	132.45	0.2716	0.2481	0.2525	0.2424	40	49	44	40
I 010 E	171.703	171.803	528.0	AC	96.59	93.40	143.90	134.21	0.2760	0.2724	0.2966	0.2564	50	62	49	42
I 010 E	171.803	171.903	528.0	AC	103.27	112.02	141.34	140.54	0.2744	0.2526	0.2671	0.2586	43	53	44	36
I 010 E	171.903	172.004	528.0	AC	107.54	123.33	139.98	169.39	0.2825	0.2721	0.2805	0.2862	46	60	51	41
MP Avg					111.23	121.33	144.81	150.88	0.2559	0.2527	0.2522	0.2038	43	51	45	31
I 010 E	172.004	172.104	528.0	AC	83.09	95.72	96.01	112.57	0.2545	0.2301	0.2232	0.1606	33	46	33	28
I 010 E	172.104	172.204	528.0	AC	80.98	85.48	75.31	124.00	0.2597	0.2215	0.1371	0.1476	34	43	37	30
I 010 E	172.204	172.304	528.0	AC	94.80	110.21	108.91	171.21	0.2811	0.2509	0.1726	0.2125	41	50	40	30
I 010 E	172.304	172.404	528.0	AC	86.97	97.94	110.04	120.60	0.3082	0.2806	0.2378	0.2242	38	43	36	29
I 010 E	172.404	172.504	528.0	AC	104.21	120.76	143.26	157.28	0.3194	0.3019	0.3141	0.3110	44	58	41	32
I 010 E	172.504	172.604	528.0	AC	91.53	99.90	88.94	136.10	0.2766	0.2539	0.1473	0.1813	35	26	37	25
I 010 E	172.604	172.704	528.0	AC	81.09	87.85	79.17	103.80	0.2622	0.2358	0.1187	0.0898	25	24	24	19
I 010 E	172.704	172.804	528.0	AC	79.76	85.47	103.22	120.49	0.2710	0.2264	0.1963	0.1133	19	26	20	15
I 010 E	172.804	172.904	528.0	AC	43.39	48.31	52.24	67.07	0.1914	0.1605	0.1663	0.0555	9	15	11	9
I 010 E	172.904	173.002	528.0	AC	58.76	64.98	72.47	70.69	0.2139	0.1821	0.1457	0.0721	9	16	10	8
MP Avg					80.46	89.66	92.96	118.38	0.2638	0.2344	0.1859	0.1568	29	35	29	23
Dir Avg					67.12	72.01	79.70	83.09	0.1798	0.1976	0.1836	0.1321	14	19	15	14
Dir Min					30.91	30.93	30.67	28.36	0.0554	0.1085	0.0859	0.0303	0	0	0	0
Dir Max					138.73	160.73	420.40	200.54	0.3194	0.3113	0.6334	0.3110	52	62	54	42

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Exhibit: G12

Pavement Condition Report

ATIS Route ID: I.010.....,.....

MP 161 to MP 173

Note: All average values are numeric. They have not been weighted based on the length or area over which the distress was measured.

Pavement Condition Report

ATIS Route ID: I.010.....0...,.....

MP 161 to MP 173

					Smoothness (IRI)				Mean Rutting (in)				PMS Cracking (%)			
Route	From MP	To MP	Len (ft)	Pavement Type	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
I 010 W	160.952	161.087	528.0	JPCP+FC	45.90	52.09	47.62	42.13	0.0987	0.1366	0.0866	0.0620	0	7	0	5
I 010 W	161.087	161.187	528.0	JPCP+FC	52.58	53.83	48.71	60.88	0.1125	0.1227	0.0814	0.0822	0	5	0	6
I 010 W	161.187	161.287	528.0	JPCP+FC	64.04	68.19	58.29	55.40	0.1317	0.1371	0.0990	0.0611	0	4	0	3
I 010 W	161.287	161.387	256.9	JPCP+FC	93.84		90.14	76.43	0.1217	0.1759	0.1163	0.0938	0	3	0	3
I 010 W	161.387	161.487	512.3	JPCP+FC	74.61	79.59	85.22	87.90	0.1357	0.1518	0.1149	0.0990	0	4	0	3
I 010 W	161.487	161.587	528.0	JPCP+FC	59.20	59.16	50.92	49.78	0.1349	0.1315	0.0827	0.0886	0	7	0	4
I 010 W	161.587	161.687	528.0	JPCP+FC	61.67	62.46	56.78	57.34	0.1325	0.1376	0.0794	0.0719	0	5	0	4
I 010 W	161.687	161.787	528.0	JPCP+FC	54.63	58.69	49.90	51.16	0.1553	0.1381	0.0951	0.0922	0	7	0	3
I 010 W	161.787	161.887	528.0	JPCP+FC	41.80	41.35	48.76	43.63	0.1225	0.1336	0.0940	0.0783	0	8	0	6
I 010 W	161.887	161.987	528.0	JPCP+FC	43.52	45.02	51.17	52.02	0.0996	0.1151	0.0716	0.0732	0	9	0	4
I 010 W	162.087	162.022	528.0	JPCP+FC	37.68	37.14	33.36	32.55	0.1058	0.1141	0.0872	0.0593	0	8	0	5
MP Avg					57.22	55.75	56.44	55.38	0.1228	0.1358	0.0917	0.0783	0	6	0	4
I 010 W	161.987	162.087	528.0	JPCP+FC	45.13	48.26	50.01	45.26	0.0914	0.1142	0.0762	0.0752	0	9	0	7
I 010 W	162.022	162.122	528.0	JPCP+FC	48.79	53.13	45.36	41.27	0.1231	0.1287	0.0914	0.0769	0	9	0	7
I 010 W	162.122	162.222	528.0	JPCP+FC	65.13	64.79	53.56	57.59	0.1117	0.1132	0.0714	0.0711	0	9	0	6
I 010 W	162.222	162.322	528.0	JPCP+FC	48.69	53.51	56.53	48.71	0.0904	0.1106	0.0653	0.0633	0	9	0	6
I 010 W	162.322	162.422	528.0	JPCP+FC	50.29	52.35	45.93	59.52	0.1092	0.1111	0.0879	0.0815	0	9	0	5
I 010 W	162.422	162.522	528.0	JPCP+FC	43.07	43.81	41.89	37.55	0.1071	0.1286	0.0866	0.0669	0	8	0	3
I 010 W	162.522	162.622	528.0	JPCP+FC	51.53	51.73	50.44	48.65	0.1203	0.1492	0.0947	0.0585	0	6	0	4
I 010 W	162.622	162.722	528.0	JPCP+FC	50.81	55.17	54.07	50.09	0.1199	0.1489	0.1086	0.0780	0	4	0	3
I 010 W	162.722	162.822	528.0	JPCP+FC	50.57	50.98	47.51	47.55	0.1241	0.1445	0.0960	0.0680	0	4	0	3
I 010 W	162.822	163.043	528.0	JPCP+FC	42.67	47.10	50.74	41.81	0.1223	0.1466	0.1213	0.0686	0	5	0	5
MP Avg					49.67	52.08	49.60	47.80	0.1120	0.1296	0.0899	0.0708	0	7	0	5

Pavement Condition Report

ATIS Route ID: I.010.....0...,.....

MP 161 to MP 173

					Smoothness (IRI)				Mean Rutting (in)				PMS Cracking (%)			
Route	From MP	To MP	Len (ft)	Pavement Type	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
I 010 W	163.043	163.143	528.0	JPCP+FC	59.73	66.38	66.82	79.22	0.1816	0.1806	0.1595	0.1362	0	1	0	1
I 010 W	163.143	163.243	528.0	AC	35.52	35.22	37.96	37.24	0.1790	0.1725	0.1687	0.1615	3	3	0	3
I 010 W	163.243	163.343	528.0	AC	45.28	48.45	48.30	47.84	0.1589	0.1631	0.1482	0.1307	2	2	0	2
I 010 W	163.343	163.443	528.0	AC	35.64	39.06	41.49	41.75	0.1364	0.1624	0.1220	0.1087	4	3	4	4
I 010 W	163.443	163.543	528.0	AC	43.66	44.98	46.41	57.46	0.1758	0.1806	0.1184	0.1129	4	4	5	5
I 010 W	163.543	163.643	528.0	AC	55.01	56.08	57.85	51.39	0.1843	0.1912	0.1420	0.1363	2	2	4	2
I 010 W	163.643	163.743	528.0	AC	38.98	40.75	46.26	54.76	0.1695	0.1794	0.1726	0.1414	0	0	3	3
I 010 W	163.743	163.843	528.0	AC	43.74	43.22	66.00	42.79	0.1937	0.1894	0.1347	0.1931	0	0	4	1
I 010 W	163.843	163.943	528.0	AC	40.76	42.35	43.91	44.76	0.1842	0.1882	0.1409	0.2171	0	0	0	0
I 010 W	163.943	164.020	528.0	AC	41.63	52.43	48.25	43.46	0.1716	0.1492	0.1305	0.1691	0	1	1	1
MP Avg					44.00	46.89	50.33	50.07	0.1735	0.1757	0.1438	0.1507	2	2	2	2
I 010 W	164.020	164.120	528.0	AC	68.67	72.82	73.32	72.29	0.1714	0.1539	0.1444	0.1233	0	0	0	1
I 010 W	164.120	164.220	528.0	AC	49.44	50.01	50.10	51.86	0.1466	0.1661	0.1396	0.1056	0	0	0	1
I 010 W	164.220	164.320	528.0	AC	35.73	34.71	36.27	36.77	0.1490	0.1665	0.1194	0.1229	0	0	0	0
I 010 W	164.320	164.420	528.0	AC	40.01	41.28	40.96	51.49	0.1524	0.1652	0.1231	0.1343	0	0	0	0
I 010 W	164.420	164.520	528.0	AC	35.40	31.88	33.24	35.99	0.1387	0.1647	0.1161	0.1111	0	0	0	1
I 010 W	164.520	164.620	528.0	AC	45.14	47.66	54.81	44.22	0.1486	0.1555	0.1263	0.1311	0	0	0	1
I 010 W	164.620	164.720	528.0	AC	54.61	50.84	50.30	60.91	0.1418	0.1607	0.1265	0.1347	0	0	0	4
I 010 W	164.720	164.820	528.0	AC	42.41	43.65	44.44	46.43	0.1418	0.1591	0.1180	0.1194	0	0	0	0
I 010 W	164.820	164.920	528.0	AC	45.30	47.01	47.65	47.52	0.1308	0.1506	0.1212	0.1223	0	0	0	0
I 010 W	164.920	165.026	528.0	AC	37.95	40.87	42.65	38.04	0.1221	0.1388	0.1043	0.0762	0	0	0	1
MP Avg					45.47	46.07	47.37	48.55	0.1443	0.1581	0.1239	0.1181	0	0	0	1
I 010 W	165.026	165.126	528.0	AC	46.16	48.68	50.14	47.01	0.1325	0.1348	0.1099	0.0946	0	0	0	1

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Exhibit: G15

Pavement Condition Report

ATIS Route ID: I.010.....0...,.....

MP 161 to MP 173

					Smoothness (IRI)				Mean Rutting (in)				PMS Cracking (%)			
Route	From MP	To MP	Len (ft)	Pavement Type	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
I 010 W	165.126	165.226	528.0	AC	37.92	38.06	39.79	38.46	0.1170	0.1359	0.0990	0.0889	0	0	0	0
I 010 W	165.226	165.326	528.0	AC	37.55	37.67	40.28	38.30	0.1348	0.1489	0.1066	0.0961	0	0	0	0
I 010 W	165.326	165.426	528.0	AC	39.99	37.62	38.17	38.58	0.1441	0.1456	0.1177	0.1008	0	0	0	0
I 010 W	165.426	165.526	528.0	AC	47.21	50.65	53.17	52.26	0.1383	0.1456	0.1242	0.0948	0	0	0	1
I 010 W	165.526	165.626	528.0	AC	42.67	40.18	38.46	39.21	0.1438	0.1363	0.1145	0.1007	0	0	0	1
I 010 W	165.626	165.726	528.0	AC	43.17	41.45	38.78	46.77	0.1381	0.1332	0.0992	0.1093	0	0	0	1
I 010 W	165.726	165.826	528.0	AC	44.46	39.01	44.06	41.28	0.1325	0.1427	0.1089	0.0897	0	0	0	1
I 010 W	165.826	165.926	528.0	AC	45.64	48.18	49.69	46.14	0.1406	0.1531	0.1150	0.1174	0	0	0	1
I 010 W	165.926	166.013	528.0	AC	37.82	43.24	39.95	42.62	0.1493	0.1546	0.1257	0.1173	0	0	0	1
MP Avg					42.26	42.47	43.25	43.06	0.1371	0.1431	0.1121	0.1010	0	0	0	1
I 010 W	166.013	166.113	528.0	AC	47.52	54.45	57.28	48.30	0.1344	0.1451	0.1181	0.1182	0	0	0	0
I 010 W	166.113	166.213	528.0	AC	42.74	41.05	41.98	46.92	0.1537	0.1514	0.1248	0.1220	0	0	0	1
I 010 W	166.213	166.313	528.0	AC	35.17	36.03	38.45	44.26	0.1361	0.1512	0.1128	0.1193	0	0	1	1
I 010 W	166.313	166.413	528.0	AC	51.89	46.17	47.74	58.48	0.1331	0.1476	0.1125	0.1150	0	0	1	2
I 010 W	166.413	166.513	528.0	AC	37.60	37.18	36.11	38.55	0.1345	0.1550	0.1233	0.1082	0	0	0	1
I 010 W	166.513	166.613	528.0	AC	39.61	37.62	39.03	38.50	0.1444	0.1468	0.1112	0.1113	0	0	0	3
I 010 W	166.613	166.713	528.0	AC	46.88	47.27	46.47	45.44	0.1473	0.1544	0.1318	0.1265	0	0	1	3
I 010 W	166.713	166.813	528.0	AC	41.25	38.41	51.43	49.63	0.1302	0.1513	0.1142	0.0977	0	0	0	1
I 010 W	166.813	166.913	528.0	AC	43.95	42.56	44.91	46.19	0.1332	0.1454	0.1161	0.1036	0	0	0	1
I 010 W	166.913	167.012	528.0	AC	39.81	44.33	47.81	41.19	0.1165	0.1475	0.1136	0.0958	0	0	0	0
MP Avg					42.64	42.51	45.12	45.75	0.1363	0.1496	0.1178	0.1118	0	0	0	1
I 010 W	167.012	167.112	528.0	AC	98.81	105.10	115.41	110.04	0.1140	0.1375	0.1201	0.1160	4	5	6	3
I 010 W	167.112	167.212	528.0	AC	90.82	95.99	106.75	121.53	0.0964	0.1080	0.0732	0.1165	12	13	15	13

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Exhibit: G16

Pavement Condition Report

ATIS Route ID: I.010.....0...,.....

MP 161 to MP 173

					Smoothness (IRI)				Mean Rutting (in)				PMS Cracking (%)			
Route	From MP	To MP	Len (ft)	Pavement Type	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
I 010 W	167.212	167.312	528.0	AC	80.12	87.19	89.19	102.31	0.1347	0.1275	0.1150	0.1426	9	13	14	13
I 010 W	167.312	167.412	528.0	AC	76.54	88.18	103.80	101.98	0.1241	0.1532	0.1568	0.1721	12	14	15	13
I 010 W	167.412	167.512	528.0	AC	105.28	113.01	136.33	126.84	0.1459	0.1414	0.1560	0.1843	13	17	17	15
I 010 W	167.512	167.612	528.0	AC	84.92	105.72	126.17	130.48	0.1236	0.1547	0.1462	0.1688	13	19	18	13
I 010 W	167.612	167.712	528.0	AC	130.09	159.83	180.15	242.01	0.1823	0.2254	0.2383	0.3979	30	34	39	39
I 010 W	167.712	167.812	528.0	AC	123.28	156.19	176.16	222.19	0.1669	0.1703	0.1953	0.3376	21	29	36	38
I 010 W	167.812	167.912	528.0	AC	96.65	132.33	140.48	165.42	0.1347	0.1512	0.1563	0.2099	15	23	25	20
I 010 W	167.912	168.015	528.0	AC	117.44	179.42	185.41	179.38	0.1732	0.1967	0.2182	0.3167	21	29	36	30
MP Avg					100.40	122.30	135.99	150.22	0.1396	0.1566	0.1575	0.2162	15	20	22	20
I 010 W	168.015	168.115	528.0	AC	153.10	180.14	206.93	200.31	0.2316	0.2320	0.3208	0.3821	31	33	45	30
I 010 W	168.115	168.215	528.0	AC	128.73	166.43	200.89	213.83	0.1879	0.2214	0.2408	0.3809	20	25	38	34
I 010 W	168.215	168.315	528.0	AC	140.42	155.16	182.86	190.25	0.1805	0.1867	0.2009	0.3055	21	22	34	26
I 010 W	168.315	168.415	528.0	AC	115.71	129.98	151.16	149.51	0.1683	0.1815	0.1835	0.2085	20	22	29	23
I 010 W	168.415	168.515	528.0	AC	160.06	177.12	208.41	209.53	0.2314	0.2461	0.2724	0.3559	34	34	50	32
I 010 W	168.515	168.615	528.0	AC	190.89	249.55	280.09	236.61	0.2363	0.2580	0.2980	0.5234	38	41	58	56
I 010 W	168.615	168.715	528.0	AC	138.29	173.85	156.17	91.98	0.1955	0.1940	0.2122	0.2600	30	33	43	38
I 010 W	168.715	168.815	528.0	AC	147.12	179.48	170.51	184.42	0.1945	0.1773	0.2037	0.2954	24	26	38	33
I 010 W	168.815	168.915	528.0	AC	123.68	163.85	429.23	207.40	0.1951	0.2046	0.5665	0.3132	26	27	36	35
I 010 W	168.915	169.010	528.0	AC	108.93	162.21	124.48	165.11	0.1947	0.2338	0.1991	0.3393	33	31	45	41
MP Avg					140.69	173.78	211.07	184.90	0.2016	0.2135	0.2698	0.3364	28	29	42	35
I 010 W	169.010	169.110	528.0	AC	118.38	147.73	156.61	195.91	0.1807	0.2205	0.2054	0.3104	36	27	40	31
I 010 W	169.110	169.210	528.0	AC	123.18	146.28	110.86	184.58	0.2107	0.2284	0.2087	0.2736	48	25	41	31
I 010 W	169.210	169.310	528.0	AC	128.97	164.22	166.28	209.92	0.2293	0.2551	0.2403	0.2785	59	34	56	37

Pavement Condition Report

ATIS Route ID: I.010.....0...,.....

MP 161 to MP 173

					Smoothness (IRI)				Mean Rutting (in)				PMS Cracking (%)			
Route	From MP	To MP	Len (ft)	Pavement Type	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
I 010 W	169.310	169.410	528.0	AC	85.61	101.35	111.88	111.91	0.1720	0.1898	0.1730	0.2288	27	24	34	31
I 010 W	169.410	169.510	528.0	AC	79.90	98.95	104.56	109.34	0.1340	0.1532	0.1508	0.1653	25	25	29	22
I 010 W	169.510	169.610	528.0	AC	61.56	68.58	87.23	86.98	0.1254	0.1665	0.1373	0.1490	14	25	20	15
I 010 W	169.610	169.710	528.0	AC	105.58	117.60	139.00	130.47	0.1605	0.1696	0.1563	0.2020	18	31	30	21
I 010 W	169.710	169.810	528.0	AC	86.12	107.02	118.64	118.57	0.1589	0.1845	0.1772	0.2053	19	22	27	23
I 010 W	169.810	169.910	528.0	AC	122.05	133.24	161.85	124.09	0.2046	0.2416	0.2286	0.2005	30	34	49	24
I 010 W	169.910	170.008	528.0	AC	92.05	136.25	111.94	104.04	0.2628	0.2915	0.2733	0.0387	38	46	60	0
MP Avg					100.34	122.12	126.89	137.58	0.1839	0.2101	0.1951	0.2052	31	29	39	24
I 010 W	170.008	170.108	528.0	AC	93.77	122.16	124.74	102.86	0.2696	0.2913	0.3087	0.0665	38	47	71	2
I 010 W	170.108	170.208	528.0	AC	78.38	94.88	87.99	129.65	0.2151	0.2484	0.2180	0.3170	23	34	52	35
I 010 W	170.208	170.308	528.0	AC	89.86	104.26	102.77	113.98	0.1921	0.2084	0.1807	0.2297	28	32	50	26
I 010 W	170.308	170.408	528.0	AC	96.13	135.43	135.08	138.49	0.1985	0.2043	0.2040	0.2813	23	27	46	33
I 010 W	170.408	170.508	528.0	AC	140.11	162.00	154.49	186.06	0.2096	0.2459	0.2233	0.3679	32	39	60	48
I 010 W	170.508	170.608	528.0	AC	128.30	159.90	166.23	248.65	0.2128	0.2686	0.2510	0.4159	34	38	58	45
I 010 W	170.608	170.708	528.0	AC	103.58	124.39	158.32	179.87	0.1946	0.2294	0.2158	0.3299	30	34	54	40
I 010 W	170.708	170.808	528.0	AC	128.98	149.31	119.60	195.94	0.2251	0.2567	0.1996	0.2720	38	48	55	34
I 010 W	170.808	170.908	528.0	AC	155.00	183.95	192.08	250.37	0.2615	0.2935	0.2793	0.4007	50	57	68	46
I 010 W	170.908	171.010	528.0	AC	171.18	184.07	123.48	99.27	0.2477	0.2824	0.2223	0.0370	43	54	62	0
MP Avg					118.53	142.04	136.48	164.51	0.2227	0.2529	0.2303	0.2718	34	41	58	31
I 010 W	171.010	171.110	528.0	AC	169.33	194.32	173.30	91.25	0.2579	0.2956	0.2514	0.0429	49	56	69	0
I 010 W	171.110	171.210	528.0	AC	106.61	128.32	97.05	131.73	0.2194	0.2710	0.1893	0.1730	44	62	60	18
I 010 W	171.210	171.310	528.0	AC	87.34	92.33	118.30	102.31	0.2062	0.2639	0.2391	0.1417	54	69	70	21
I 010 W	171.310	171.410	528.0	AC	138.32	157.87	187.61	172.99	0.2272	0.2399	0.2392	0.2962	47	54	60	30

Pavement Condition Report

ATIS Route ID: I.010.....0...,.....

MP 161 to MP 173

					Smoothness (IRI)				Mean Rutting (in)				PMS Cracking (%)			
Route	From MP	To MP	Len (ft)	Pavement Type	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
I 010 W	171.410	171.510	528.0	AC	103.59	108.65	150.75	149.32	0.2185	0.2591	0.2348	0.3205	40	36	59	36
I 010 W	171.510	171.610	528.0	AC	157.56	165.27	185.07	171.75	0.2459	0.2706	0.2607	0.2416	45	52	63	30
I 010 W	171.610	171.710	528.0	AC	164.68	164.44	209.03	138.83	0.2780	0.2943	0.3337	0.2041	47	56	72	25
I 010 W	171.710	171.810	528.0	AC	110.51	144.93	129.64	173.28	0.2189	0.2325	0.2269	0.2725	39	42	59	38
I 010 W	171.810	171.910	528.0	AC	139.95	153.42	112.51	172.45	0.2476	0.2492	0.1166	0.2606	46	38	57	37
I 010 W	171.910	172.009	528.0	AC	122.76	170.98	167.07	100.41	0.2966	0.3214	0.3019	0.0269	58	50	67	0
MP Avg					130.07	148.05	153.03	140.43	0.2416	0.2698	0.2394	0.1980	47	52	64	24
I 010 W	172.009	172.109	528.0	AC	86.55	126.34	192.85	120.17	0.2021	0.2411	0.2810	0.1414	61	51	66	18
I 010 W	172.109	172.209	528.0	AC	111.95	120.91	75.03	148.80	0.1896	0.2225	0.1511	0.3656	40	49	67	52
I 010 W	172.209	172.309	528.0	AC	115.44	124.76	98.60	109.00	0.2141	0.2498	0.1834	0.0704	37	46	67	8
I 010 W	172.309	172.409	528.0	AC	106.38	119.13	135.16	108.44	0.2177	0.2491	0.2106	0.0300	43	42	66	0
I 010 W	172.409	172.509	528.0	AC	119.44	145.08	234.84	101.38	0.2360	0.2716	0.2716	0.0186	43	51	71	0
I 010 W	172.509	172.609	528.0	AC	112.58	123.92	137.01	101.28	0.2433	0.2659	0.2608	0.0531	47	52	71	0
I 010 W	172.609	172.709	528.0	AC	88.55	94.39	110.89	198.41	0.2310	0.2251	0.2365	0.3722	51	52	69	50
I 010 W	172.709	172.809	528.0	AC	76.96	92.21	81.40	131.50	0.1816	0.1824	0.1545	0.2617	33	38	58	35
I 010 W	172.809	172.909	528.0	AC	80.08	103.34	374.32	91.36	0.1753	0.1803	0.5491	0.2060	24	34	42	33
I 010 W	172.909	173.011	528.0	AC	77.28	95.04	118.26	121.81	0.1601	0.1863	0.1450	0.2074	23	29	37	24
MP Avg					97.52	114.51	155.84	123.22	0.2051	0.2274	0.2444	0.1726	40	44	61	22
Dir Avg					80.54	92.38	100.58	98.93	0.1680	0.1848	0.1673	0.1685	16	19	24	14
Dir Min					35.17	31.88	33.24	32.55	0.0904	0.1080	0.0653	0.0186	0	0	0	0
Dir Max					190.89	249.55	429.23	250.37	0.2966	0.3214	0.5665	0.5234	61	69	72	56

Printed on: 4/25/2024

Exhibit: G19

Pavement Condition Report

ATIS Route ID: I.010.....0...,.....

MP 161 to MP 173

Note: All average values are numeric. They have not been weighted based on the length or area over which the distress was measured.

TPA 400-1.2 Materials Design Report

See attached

I-10 Gila River Indian Community Design-Build Project
202L to Gila River Bridge
ADOT General Engineering Consultant

Final Materials Design Report

December 30, 2024 | Terracon Project No. 65225282

ADOT Report No.: 24-28-F; ADOT TRACS No.: F025201D / F072101C

Prepared for:

HDR Engineering, Inc.
20 E. Thomas Road, Suite 2500
Phoenix, Arizona 85012



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December 30, 2024

HDR Engineering, Inc.
20 E. Thomas Road, Suite 2500
Phoenix, Arizona 85012

Attn: Mr. Nick LaFronz, P.E.
Phone: (602) 522-7728 Email: nick.lafronz@hdrinc.com

Report Type: Final

Re: Final Materials Design Report
I-10 Gila River Indian Community Design-Build Project
202L to Gila River Bridge
ADOT General Engineering Consultant
ADOT Report No.: 24-28-F; ADOT TRACS No.: F025201D / F072101C
Terracon Project No. 65225282

Terracon Consultants, Inc. (Terracon) has completed the Geotechnical Engineering Services for the above referenced project in general accordance with Terracon Proposal No. P65225282 – Revision 5, dated February 14, 2023. This Materials Design Report (MDR) presents the recommendations concerning the ADOT pavement structure design for the proposed project. As a note, the pavement structure design recommendations for the roadways outlined above under MCDOT's jurisdiction are included in the PDS (and excluded from this MDR). Please refer to the PDS for the pavement structure design recommendations and the recommended MCDOT and MAG specifications for the design and construction of these roadways under MCDOT jurisdiction.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon



Ramon Padilla, P.E.
Geotechnical Department Manager

Joseph A. Phillips, P.E.
Sr. Consultant/Sr. Principal

Reviewed By: Donald R. Clark, P.E., Sr. Consultant / Sr. Principal

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Introduction

This report is the Materials Design Report (MDR) prepared as part of the General Engineering Consultant (GEC) services for the Arizona Department of Transportation (ADOT) Interstate Highway 10 (I-10) Gila River Indian Community (GRIC) Interstate Widening planned from State Route 202L (SR202L, Santan / South Mountain) to the north end of the Gila River Bridge Replacement Project (in the Phoenix to Casa Grande area in Arizona). The project limits extend from approximately I-10 Milepost (MP) 161 (north limit of the project) towards the south to the north end of the Gila River Bridge Replacement Project (or approx. MP 172.75).

HDR Engineering, Inc. (HDR) prepared a Design Concept Report (DCR) for a broader extent of the I-10 GRIC corridor and the DCR was titled: *Design Concept Report, Interstate 10 Corridor: State Route 202L to State Route 387, Maricopa and Pinal County, Arizona*, ADOT Project Nos. F0252 01L and F0252 02L, Federal Aid No. 010-C(222)S, dated October 2023. As previously mentioned, the project limits for Terracon's scope of work extended from approximately I-10 MP 161 to MP 172.75, and Terracon performed a geotechnical exploration for the project and summarized the results in a report titled: *Geotechnical Engineering Data Report, I-10 Gila River Indian Community Design-Build Project, 202L to the Gila River Bridge, ADOT General Engineering Consultant* (Terracon Project No. 65225282, dated April 2, 2024). In addition, Terracon prepared a pavement design summary (PDS) for the project in a report titled: Pavement Design Summary, *I-10 Gila River Indian Community Design-Build Project, 202L to the Gila River Bridge, ADOT General Engineering Consultant* (Terracon Project No. 65225282, dated August 1, 2024). The PDS forms the basis of the materials recommendations contained in this report. As a note, references to the depths of stone matrix asphalt (SMA) mentioned in the PDS are superseded by those in this MDR.

Based on the information provided, we understand the majority of the planned pavement improvements for the project will be based on ADOT methodologies and standards. The pavement design for the project is based on the procedures outlined in the ADOT Pavement Design Manual (2017). As exceptions, we understand the following roadways for the project will be based on Maricopa County Department of Transportation (MCDOT) methodologies and standards:

- Queen Creek Road – eastern approx. 600 feet (ft) of the roadway within the project limits.
- Riggs Road – eastern 300 ft and western 350 ft of the roadway within the project limits.

Note: The pavement structure design recommendations for the roadways outlined above under MCDOT's jurisdiction are included in the PDS (and excluded from this MDR). Please refer to the PDS for the pavement structure design recommendations and the recommended MCDOT and MAG specifications for the design and construction of these roadways under MCDOT jurisdiction.

The recommended materials specifications for construction refer to the appropriate section of the *Arizona Department of Transportation Standard Specifications for Road and Bridge Construction, 2021 Edition*, as amended by any project special provisions or other project requirements and specifications.

MATERIALS DESIGN REPORT

SECTION I – PAVEMENT STRUCTURE

ITEM 1 – STRUCTURAL THICKNESS (IN INCHES)

The following table provides the recommended pavement structural sections for the project. Pavement structural sections are provided on the Schematic Design Plots in the Exhibits section of this MDR.

MAINLINE PAVEMENT SECTIONS								
Pavement Section Number	Roadway Description [1]	Roadway Location [1]	PCCP (Plain w/ Dowels)	PCCP (Plain, no dowels)	AC SMA (3/8" Mix)	AC (EP) (3/4") Special Mix	AB Class 2	Total
M1	I-10 Mainline Seg1 - (Sta. 862WB/858EB to 944WB/968EB)	New Widening	14 [A, B]	--	--	--	4	18
M2	I-10 Mainline Seg2 - (Sta. 944WB/968EB to 1020)	New Widening	--	--	1.5	11.5	7	20
M3	I-10 Mainline Seg3 - (Sta. 1020 to 1208)	New Widening	--	--	1.5	11.5	12	25
M4	I-10 Mainline Seg4 - (Sta. 1208 to 1456)	New Widening	--	--	1.5	11.5	4	17

RAMP PAVEMENT SECTIONS								
Pavement Section Number	Roadway Description [1]	Roadway Location [1]	PCCP (Plain w/ Dowels)	PCCP (Plain, no dowels)	AC SMA (3/8" Mix)	AC (EP) (3/4") Special Mix	AB Class 2	Total
R1	I-10 TI UP at Wild Horse Pass Bvld	WB Off Ramp	9.5 [B]	--	--	--	4	13.5
R2		WB On Ramp	12.5 [B]	--	--	--	4	16.5
R3		EB Off Ramp	12 [B]	--	--	--	4	16
R4		EB On Ramp	10.5 [B]	--	--	--	4	14.5
R5	I-10 TI UP at SR 347	WB Off Ramp & EB On Ramp	--	--	1.5	10	4	15.5
R6		WB On Ramp	--	--	1.5	10	8	19.5
R7		EB Off Ramp	--	--	1.5	10	7	18.5
R8	I-10 TI UP at Riggs Rd	WB Off Ramp & EB On Ramp	--	--	1.5	9	8	18.5
R9		WB On Ramp	--	--	1.5	9	9	19.5
R10		EB Off Ramp	--	--	1.5	9	12	22.5

CROSSROAD PAVEMENT SECTIONS								
Pavement Section Number	Roadway Description [1]	Roadway Location [1]	PCCP (Plain w/ Dowels)	PCCP (Plain, no dowels)	Fog Coat	AC (Misc. Str. Special Mix)	AB Class 2	Total
C1	I-10 Crossroad – Wild Horse Pass Blvd / Sundust Rd	W & E of I-10	--	--	Yes	8	8	16
C2		PCCP Limits	--	12.5 [B]	--		4	16.5
C3	I-10 Crossroad – SR 347 / Queen Creek Rd	West of I-10	--	--	Yes	10	7	17
C4		PCCP Limits	--	13.5 [B]	--		4	17.5
--		East of I-10	See MCDOT section of PDS					
C5	I-10 Crossrd-Riggs Rd	PCCP Limits	--	10.5 [B]	--		4	14.5
--		AC E&W of TI	See MCDOT section of PDS					
C6	I-10 Crossrd-Goodyear	PCCP Limits	--	9 [B]	--		4	13

PAVEMENT REHABILITATION – MILL & FILL								
Pavement Section Number	Roadway Description [1]	Roadway Location [1]	Mill/ Remove	Diamond Grinding	AC SMA (3/8" Mix)	AC (Misc. Str. Special Mix)	AC (EP) (3/4") Special Mix	Total
MILL1	I-10 Mainline Seg1 – (Sta. 854WB/841EB to 944WB/968EB)	Existing PCCP	1	Yes	--	--	--	--
M&F1	I-10 Seg. 1 to 4 (Sta. 944WB/968EB to 1456)	Existing Travel Lanes	5.5 [C]	--	1.5	--	3.5	5
M&F2	I-10 Seg. 1 to 4 (Sta. 944WB/967EB to 1456)	Existing Shoulders	5 [C]	--	1.5	--	3.5	5
M&F3	I-10 Crossroad – Wild Horse Pass Blvd / Sundust Rd	Existing AC W & E of I-10	3	--	--	3	--	3
	I-10 Crossroad – SR 347 / Queen Creek Rd	Existing AC West of I-10	3	--	--	3	--	3

Legend: Portland Cement Concrete Pavement (PCCP); Asphaltic Concrete (AC); Stone Matrix Asphalt (SMA); End Product (EP); Aggregate Base (AB); Milepost (MP); Westbound (WB); Eastbound (EB); West (W); East (E).

Note [1]: Refer to the project plans for exact project limits and locations and stationing of each proposed improvement.

Note [A]: In planned PCCP I-10 mainline widening travel lane areas, any existing non-doweled PCCP is to be removed and replaced with doweled PCCP.

Note [B]: The longitudinal joints between the existing and proposed PCCP shall be located at the proposed lane line or at the center of the planned lane with the minimum dowel requirements outlined in this MDR including Section III Item 6. When PCCP longitudinal joints are not located within 1.0 foot of a lane line, or the center of the lane, then the minimum longitudinal dowel requirements shall be as outlined in this MDR including Section III Item 6.

Note [C]: Rehabilitation shall be across the full width of the existing roadway. The additional ½-inch of milling of I-10 travel lanes (5.5 inches) and I-10 shoulders (5 inches) is to remove existing surface AR-ACFC wherever present. Therefore, if existing surface AR-ACFC extends from the I-10 travel lanes into portions of the I-10 shoulders, then the mill depth is to be 5.5 inches in shoulder areas that include AR-ACFC.

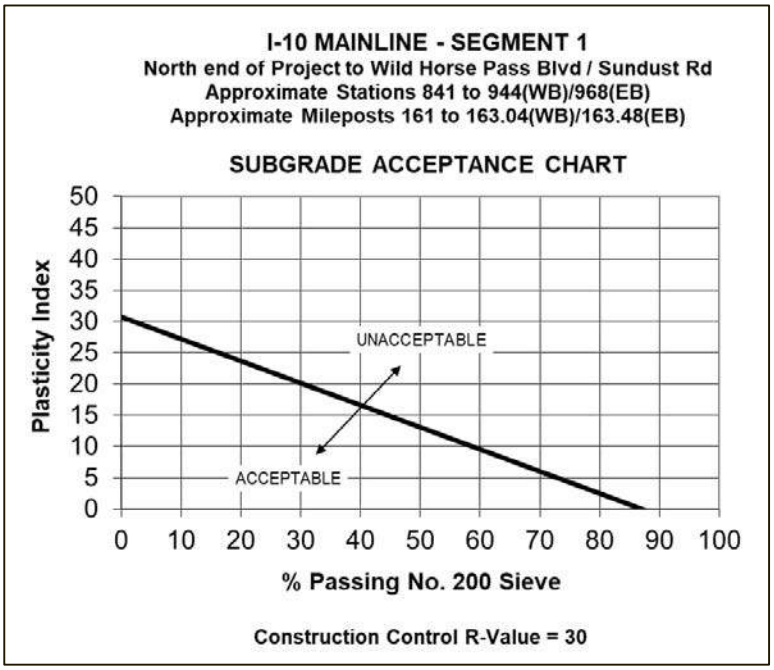
General Notes:

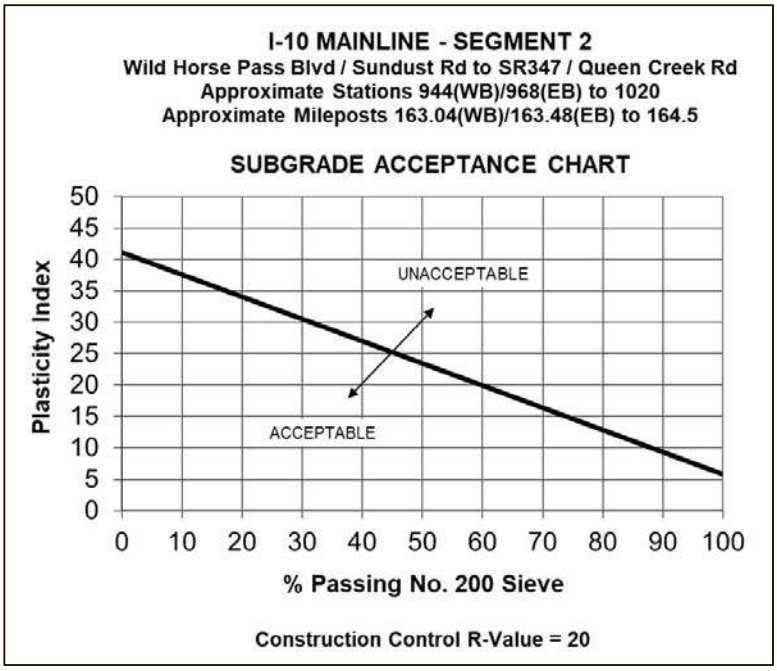
- The I-10 Mainline from MP 161 to 163.04WB/163.48EB will have the surface (AR-ACFC) course (of approximately 1-inch thick) milled, and diamond grinding is to be performed on the exposed PCCP.
- Additional location and limits information of pavement improvements are outlined in Exhibit Nos. 1 through 13. ADOT standard PCCP joint details are included on Exhibit Nos. 14 and 15.
- As outlined in the Unsuitable Material and Over-Excavation Limits section of this MDR, the alternative pavement base reinforcement (where applicable) consisting of separation geotextile and geogrid reinforcement will require a minimum aggregate base (AB) layer thickness of 8 inches.

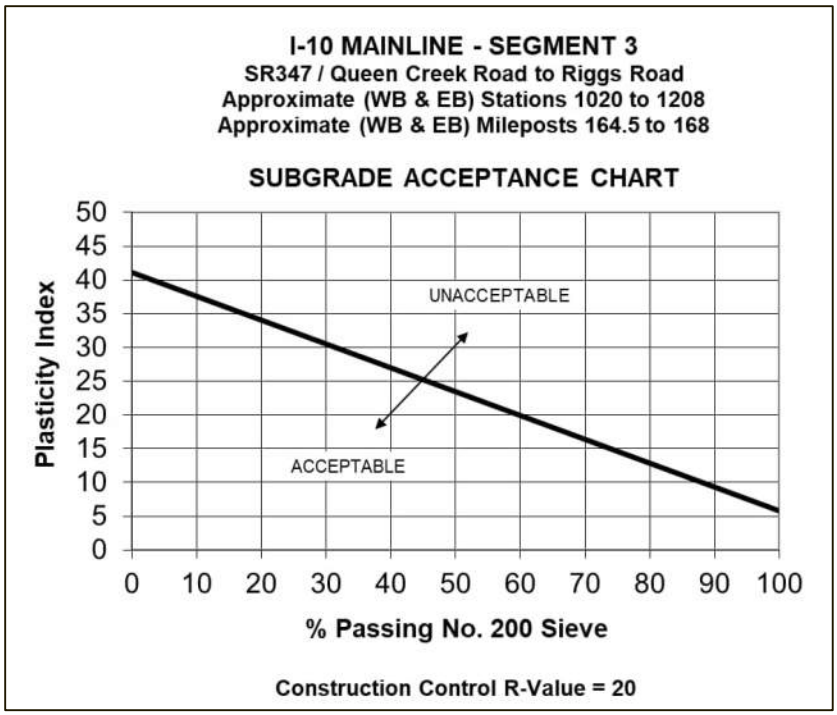
SECTION II – SUBGRADE AND BASES

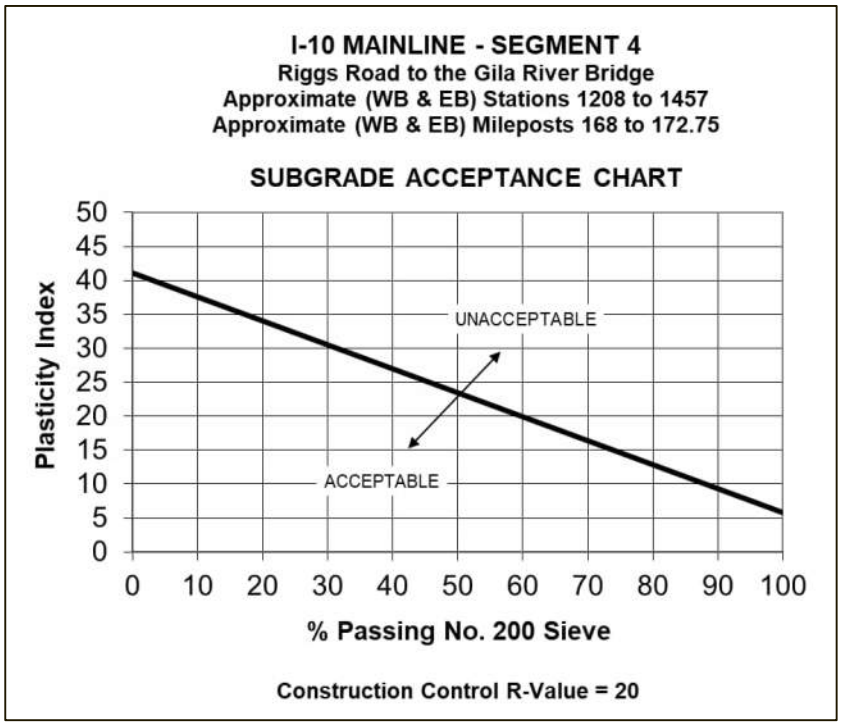
ITEM 1 – SUBGRADE

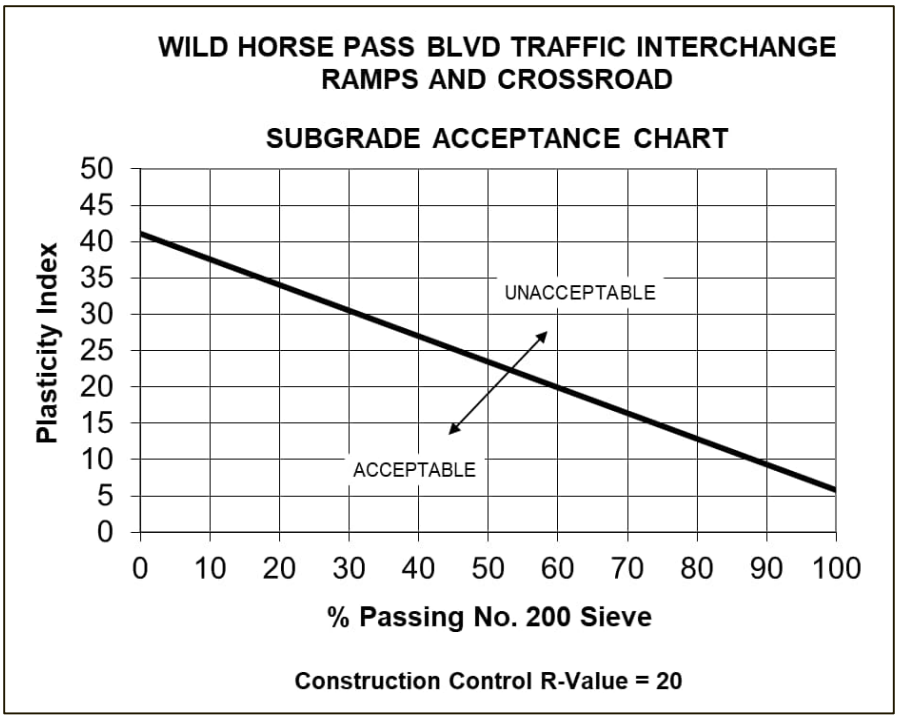
The following Subgrade Acceptance Charts shall be used during construction for determining whether subgrade materials are suitable as outlined in Section 203-3.03(D) of the ADOT Construction Manual.

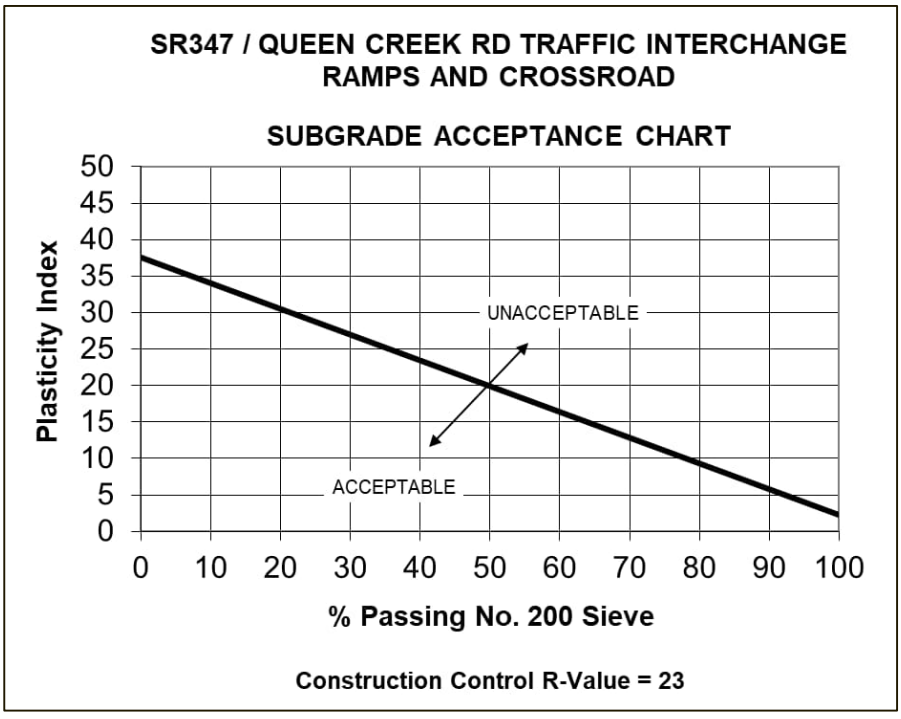




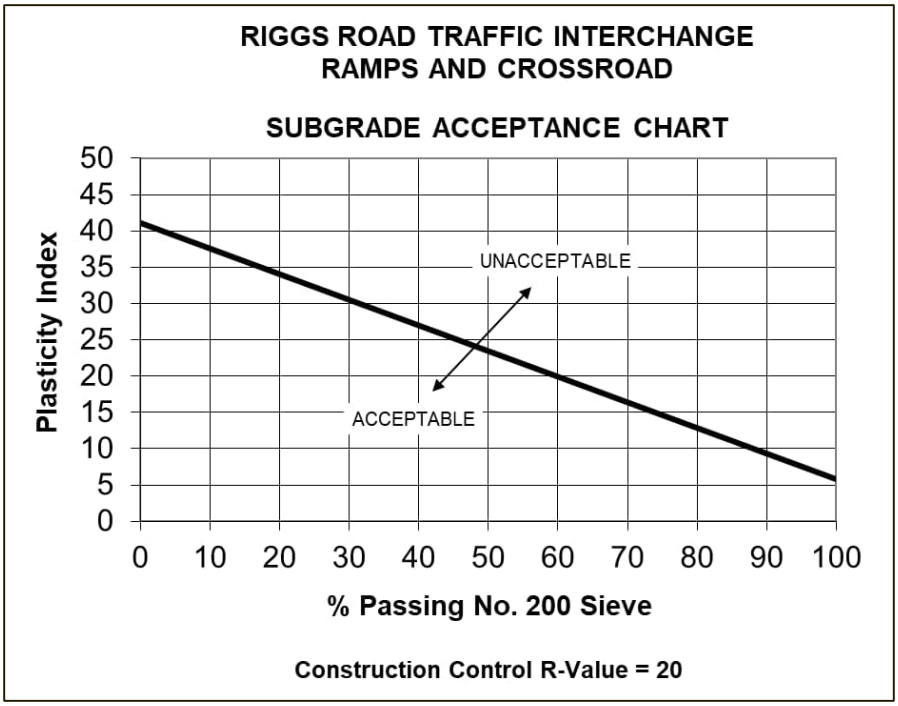

I-10 MAINLINE - SEGMENT 3
SR347 / Queen Creek Road to Riggs Road
Approximate (WB & EB) Stations 1020 to 1208
Approximate (WB & EB) Mileposts 164.5 to 168
SUBGRADE ACCEPTANCE CHART
Plasticity Index
50
45
40
35
30
25
20
15
10
5
0
UNACCEPTABLE
ACCEPTABLE
0 10 20 30 40 50 60 70 80 90 100
% Passing No. 200 Sieve
Construction Control R-Value = 20


I-10 MAINLINE - SEGMENT 4
Riggs Road to the Gila River Bridge
Approximate (WB & EB) Stations 1208 to 1457
Approximate (WB & EB) Mileposts 168 to 172.75
SUBGRADE ACCEPTANCE CHART
Plasticity Index
50
45
40
35
30
25
20
15
10
5
0
UNACCEPTABLE
ACCEPTABLE
0 10 20 30 40 50 60 70 80 90 100
% Passing No. 200 Sieve
Construction Control R-Value = 20

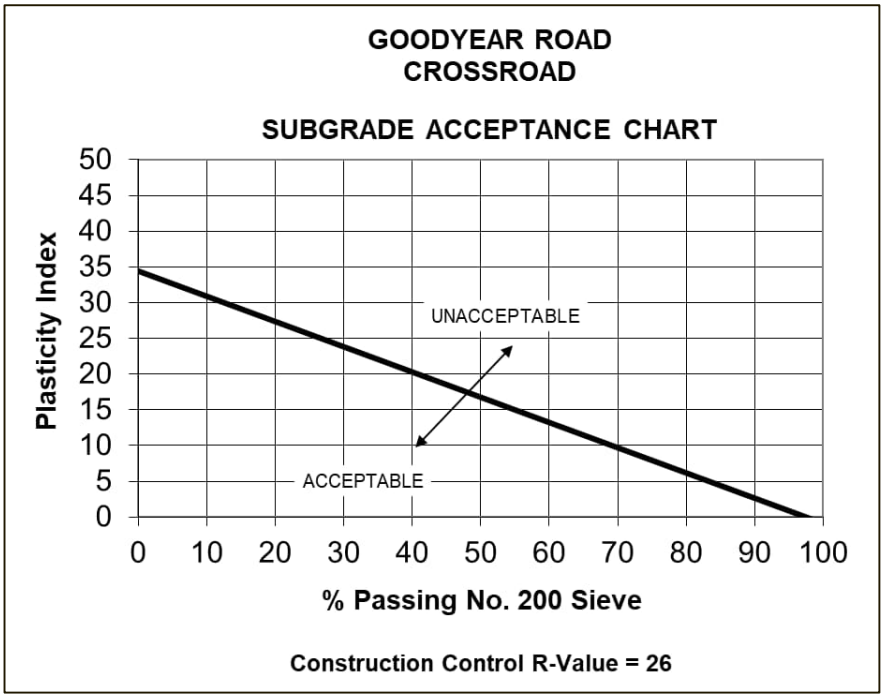




Note: Subgrade requirements for the MCDOT portion of Queen Creek Road shall be as outlined in the referenced Pavement Design Summary (PDS), and in accordance with MCDOT and MAG specifications and requirements.



Note: Subgrade requirements for the MCDOT portion of Riggs Road shall be as outlined in the referenced Pavement Design Summary (PDS), and in accordance with MCDOT and MAG specifications and requirements.



ITEM 2 – AGGREGATE BASE (CLASS 2)

The Aggregate Base shall be Class 2, and shall be as specified in Section 303 of the Standard Specifications and Contracts and Specifications Stored Specification "303RASBAB."

ITEM 3 – SEPARATION GEOTEXTILE FABRIC (WHERE USED IF APPLICABLE)

The separation geotextile fabric shall be as specified in Section 208 and 1014 of the Standard Specifications and Contracts Specifications Stored Specification "1014GEOSYN."

The type of geotextile separation fabric to be used shall meet the requirements for a high survivability fabric.

The type of separation geotextile fabric shall be nonwoven.

The lateral limits of the geotextile fabric shall extend a minimum of 2 feet beyond the edge of the pavement and match the geogrid base reinforcement limits. For new pavement planned to adjoin existing pavement, the lateral limits may be reduced if constrained by an existing pavement, and the lateral limits shall extend up to the existing pavement.

ITEM 4 – GEOGRID BASE REINFORCEMENT (WHERE USED IF APPLICABLE)

Geogrid base reinforcement shall be as specified in Section 306 and 1014 of the Standard Specifications and Contracts Specifications Stored Specification "1014GEOSYN."

The lateral limits of geogrid base reinforcement shall extend a minimum of 2 feet beyond the edge of the pavement and match the geotextile fabric limits. For new pavement planned to adjoin existing pavement, the lateral limits may be reduced if constrained by an existing pavement, and the lateral limits shall extend up to the existing pavement.

SECTION III – SURFACE TREATMENTS & PAVEMENTS

ITEM 1 – PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)(Doweled)

The work under this Item shall consist of furnishing all materials and constructing a Plain Jointed and Doweled Portland Cement Concrete Pavement as specified in Section 401 of the Standard Specifications, and Contracts and Specifications Stored Specifications "401PCCPS" and "1011APEAS."

Load transfer dowel assemblies shall be placed at each transverse weakened plane joint on the mainline in the travel lanes, shoulders and gores. The transverse weakened plane joints shall be constructed according to construction standard drawings with the exception that the joints be placed perpendicular to the center line.

> Note: Any non-standard details needed for the project, including connections to existing PCCP, joint layout details for the non-conventional traffic interchanges, or similar, shall be the responsibility of the Contractor.

ITEM 2 – LOAD TRANSFER DOWEL ASSEMBLY

The load transfer dowel assemblies shall be as specified in Contracts and Specifications Stored Spec. "401LTDA" and as detailed in Std. C-07.02.

The project engineer may permit the use of a mechanical dowel inserter in lieu of load transfer dowel assemblies, if in his opinion, the mechanical dowel inserter achieves no less tolerance than those achievable with dowel assemblies. Before the use of the mechanical dowel inserter is approved however, a plan to ensure the accurate placement of the transverse joints in relation to the location of the load transfer dowels shall be submitted to, and approved by both the project Engineer and the ADOT Materials Group.

The mechanical dowel inserter, if used, shall employ hydraulic hammers. Air driven hammers shall not be permitted.

If a mechanical dowel inserter is used, then the dowels and their placement shall be paid for at the same amount as the load transfer assembly.

> Note: For doweled PCCP with thicknesses of 10.5 inches or less, the standard dowel bar diameter of 1½-inches shall be reduced to 1¼-inches.

ITEM 3 – PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)(Plain)

The work under this Item shall consist of furnishing all materials and constructing a Plain Jointed Portland Cement Concrete Pavement as specified in Section 401 of the Standard Specifications, and Contracts and Specifications Stored Specifications "401PCCPS" and "1011APEAS."

> Note: Any non-standard details needed for the project, including connections to existing PCCP, joint layout details for the non-conventional traffic interchanges, or similar, shall be the responsibility of the Contractor.

ITEM 4 – REMOVE BITUMINOUS PAVEMENT FROM PCC (MILLING)

Removal of bituminous pavement from portland cement concrete (milling) shall be as specified in Section 202 of the Standard Specifications, and Contracts and Specifications Stored Specification "202PCMIL."

ITEM 5 – DIAMOND GRINDING OF PCCP

Diamond grinding of existing portland cement concrete pavement (PCCP) shall be as specified in the Contracts and Specifications Stored Specification "402PCCPR."

The diamond grinding limits are I-10 Mainline from MP 161 to 163.04WB/163.48EB (or Sta. 854WB/841EB to 944WB/968EB), as shown on the exhibits. The lateral limits shall be up to the edge of PCCP as shown on the exhibits.

> Note: The referenced PDS for the project (Terracon Project No. 65225282, dated August 1, 2024) noted that new mainline PCCP is also to be diamond-ground. However, based on updated information provided to Terracon, diamond grinding will only be performed on existing PCCP after removal of the existing AR-ACFC as shown on the exhibits (and the project excludes diamond grinding on new mainline PCCP).

ITEM 6 – LONGITUDINAL JOINTS BETWEEN NEW & EXISITNG PCCP

The longitudinal joints between the existing and proposed PCCP shall be located at the proposed lane line or at the center of the planned lane (and not at or near Wheel-Paths) with the following minimum dowel requirements:

- ADOT Standard epoxy-coated smooth dowel bars along the longitudinal joint (#5 x 24-inch long at 30-inch centers) when the widening width is 12 feet or more.
- ADOT Standard epoxy-coated deformed dowel bars along the longitudinal joint (#5 x 24-inch long at 30-inch centers) when the widening width is less than 12 feet.

If PCCP longitudinal joints are not located within 1.0 foot of a lane line, or the center of the lane, then the minimum longitudinal dowel requirements shall not be less than: 1½-inch diameter x 18-inch long epoxy-coated smooth dowel bars placed at 24-inch on centers; or #8 x 18-inch long epoxy-coated smooth dowel bars placed at 18-inch on centers.

Longitudinal dowel bars shall not be placed within 15 inches of a transverse joint or the bars are to be shortened in accordance with the ADOT standard drawings.

ITEM 7 – ASPHALTIC CONCRETE – END PRODUCT (3/4") (SPECIAL MIX)

The asphaltic concrete shall be as specified in Section 403 and 416 of the Standard Specifications, and Contracts and Specifications Stored Spec. "416ACES."

The effective voids shall be 5.5 ±0.2%.

The ratio of the mix design composite gradation target for the No. 200 sieve, including admixture, to the effective asphalt content shall be a minimum of 0.8 to a maximum of 1.2.

For estimating purposes the unit weight of the bituminous mix is 147 pounds per cubic foot and the asphalt cement is 5.0%.

The asphalt cement type shall be PG 76-22 PM.

ITEM 8 – STONE MATRIX ASPHALTIC CONCRETE (3/8")

The asphaltic concrete shall be as specified in Contracts and Specifications Stored Spec. "924SMA."

The type of asphaltic concrete shall be 3/8-inch mix.

For estimating purposes the unit weight of the bituminous mix is 144 pounds per cubic foot and the asphalt cement is 6.0%.

The asphalt cement type shall be PG 76-22 PM.

ITEM 9 – ASPHALT CONCRETE (MISCELLANEOUS STRUCTURAL – SPECIAL MIX)

The asphaltic concrete shall be as specified in Section 409 of the Standard Specifications, and Contracts and Specifications Stored Specification "409AGGR."

For estimating purposes the unit weight of the bituminous mix is 147 pounds per cubic foot.

The asphalt cement type shall be PG-76-22.

ITEM 10 – TACK COAT

The tack coat shall be as specified in Section 404 of the Standard Specifications, and Contracts and Specifications Stored Specification "404BITUM."

ITEM 11 – FOG COAT

The fog coat shall be as specified in Section 404 of the Standard Specifications, and Contracts and Specifications Stored Specification "404BITUM."

The bituminous material shall be CSS-1.

The bituminous material shall be applied at the approximate rate of 0.05 gallons per square yard.

The blotter material shall be applied at a total rate of approximately 2 pounds per square yard.

ITEM 12 – PAVEMENT SMOOTHNESS

The final asphaltic concrete pavement surface shall be evaluated for smoothness as specified in the Contract documents.

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SECTION IV – MATERIAL SOURCES – GEOTECHNICAL ANALYSIS

ITEM 1 – MATERIAL SOURCES

Materials sources shall be as specified in Section 104 of the Standard Specifications, and Contracts and Specifications Stored Specifications "104ENVIR" and "1001MATL."

ITEM 2 – BORROW REQUIREMENTS (Contractor Furnished Source)

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 3 feet of finished subgrade shall meet the following requirements:

> The Plasticity Index (PI) (AASHTO T90) and the percent passing the No. 200 Sieve (Minus 200) (Ariz. Test Method 201) when used in the equation below, shall give a value of X that does not exceed the following values:
>
> X = (Minus 200) + [2.83 (PI)]

Roadway	Maximum X Value
I-10 Mainline - Segment 1 - MP161 to WHP (Approx. MP 161 to 163.04(WB)/163.48(EB))	66
I-10 Mainline - Segment 2 - WHP to SR347 (Approx. MP 163.04(WB)/163.48(EB) to 164.5)	87
I-10 Mainline - Segment 3 - SR347 to Riggs Rd (Approx. MP 164.5 to 168)	97
I-10 Mainline - Segment 4 - Riggs Rd to GRB (Approx. MP 168 to 172.75)	87
Wild Horse Pass Blvd / Sundust Rd TI – Ramps & Crossroad	87
SR347 / Queen Creek Road TI – Ramps & Crossroad	80
Riggs Road TI – Ramps & Crossroad	109
Goodyear Road - Crossroad	74

Note: Borrow and subgrade requirements for the MCDOT portion of Queen Creek Road and Riggs Road shall be as outlined in the referenced Pavement Design Summary (PDS), and in accordance with MCDOT and MAG specifications and requirements.

ITEM 3 – EARTHWORK FACTORS AND SLOPES

Station	Earthwork Factor (Shrink)	Recommend Slopes (horizontal: vertical)
Project Limits (see plans for details)	10%	Fill 3H:1V Cut 3H:1V

The earthwork factor only applies to soils within the project limits and does not apply to any imported soils which will be necessary for the project.

Consideration of erosion of the slope surface for both cut and fill slopes is recommended.

All non-stabilized fill slopes should be constructed no steeper than 3(H):1(V) and in accordance with ADOT Standard Drawing C-02.10. Construction of fill slopes should be in accordance with Section 203-10 of the ADOT Standard Specifications (ADOT, 2021). Should steeper slopes be required use of mechanically stabilized embankments, concrete retaining structures, and/or adequate erosion protection is recommended provided the slopes meet minimum stability requirements.

The face of all slopes should be compacted to the minimum specification for fill embankments. Fill slopes can be over-built and trimmed to expose a compacted slope surface.

If steeper slopes are required for site development, stability analyses should be completed to design the grading plan.

ITEM 4 – GROUND COMPACTION

The following ground compaction factors shall be compensated for on embankment sections outside the existing roadway prism.

Station	Ground Compaction (ft)
Project Limits (see plans for details)	0.7

ITEM 5 – WATER

Approximately 85 gallons of water per cubic yard should be estimated for compaction of base materials. Approximately 85 gallons of water per cubic yard should be estimated for compaction of subgrade materials.

The application of water estimated for subgrade materials is considerably higher than the amount calculated based upon the difference between in-situ and optimum compaction moisture contents, and includes a conservative overrun for losses due to seepage, evaporation, inadequate mixing, spillage, etc. Precipitation during and/or before construction may reduce the required amount of water.

ITEM 6 – pH AND RESISTIVITY

If corrugated metal pipe culverts are to be used, then the type of metal pipe and coating should be determined by the pH and resistivity of in-place materials listed below:

Summary of Chemical Laboratory Testing [1]						
I-10 Mainline Roadway Borings						
Exploration Designation	Depth (ft)	Approx. Station and CL Offset	pH	Minimum Resistivity (ohm-cm)	Soluble Sulfates (mg/kg)	Soluble Chlorides (mg/kg)
R-7	0.5 - 5	933+00; 25R±	8.8	1,087	110	134
R-9	0.5 - 4	949+00; 25R±	8.1	121	1,277	3,443
R-11	1 - 5	965+00; 25R±	8.2	208	892	1,676
R-13	0.5 - 5	981+00; 25R±	8.6	201	861	1,524
R-14	1 - 5	989+00; 25L±	8.6	221	1,332	1,348
R-15	1 - 4.5	997+00; 25R±	8.4	121	1,595	4,064
R-16	0 - 4	1005+00; 25L±	7.9	46	2,055	9,455
R-17	1 - 4	1013+00; 25R±	8.2	62	1,147	7,765
R-18	0 - 4	1021+00; 25L±	8.3	87	976	9,062
R-19	3 - 5	1029+00; 25R±	9	628	398	307
R-20	0 - 5	1037+00; 25L±	8.2	86	1,525	6,384
R-21	1.5 - 4	1045+00; 25R±	8.5	220	943	4,304
R-23	1 - 5	1061+00; 25R±	8.6	354	871	1,070
R-24	1 - 5	1069+00; 25L±	8.4	226	1,131	3,175
R-25	1 - 5	1077+00; 25R±	8.3	341	851	1,399
R-26	0 - 5	1085+00; 25L±	8.1	111	2,094	8,699
R-27	1 - 5	1093+00; 25R±	8.7	389	775	736
R-29	2 - 5	1109+00; 25R±	9.3	939	413	135
R-30	1 - 5	1117+00; 25L±	9.5	1,678	5	46
R-31	0 - 5	1125+00; 25R±	8.7	161	1,331	2,438
R-32	1 - 5	1133+00; 25L±	8.6	268	1,020	430
R-33	2 - 5	1141+00; 25R±	8.6	154	1,537	2,565
R-34	0 - 5	1149+00; 25L±	8.4	87	1,437	6,787
R-35	2 - 5	1157+00; 25R±	8.9	389	816	668
R-38	0.25-4.5	1181+00; 25L±	8.4	114	994	2,009
R-40	0 - 5	1197+00; 25L±	8.5	195	2,037	789
R-41	1.5 - 5	1205+00; 25R±	8.5	188	921	910
R-42	0.25 - 5	1213+00; 25L±	8.4	121	1,279	2,905
R-43	0 - 3	1221+00; 25R±	8	671	627	108
R-45	1 - 5	1237+00; 25R±	8.3	242	1,132	1,460
R-46	0.25 - 5	1245+00; 25L±	8.7	141	1,869	1,715
R-47	1.5 - 5	1253+00; 25R±	8.7	1,610	729	123
R-48	0.25 - 5	1261+00; 25L±	8.8	141	1,718	1,949
R-49	0 - 5	1269+00; 25R±	9	81	3,065	3,223
R-50	0.5 - 5	1277+00; 25L±	8.6	295	1,293	338
R-51	1 - 5	1285+00; 25R±	8.5	134	1,585	1,995

Summary of Chemical Laboratory Testing [1]						
I-10 Mainline Roadway Borings						
Exploration Designation	Depth (ft)	Approx. Station and CL Offset	pH	Minimum Resistivity (ohm-cm)	Soluble Sulfates (mg/kg)	Soluble Chlorides (mg/kg)
R-52	0.5 - 4	1293+00; 25L±	8.8	1,855	7	56
R-54	0.5 - 5	1309+00; 25L±	8.6	178	1,092	1,731
R-55	1 - 5	1317+00; 25R±	8.8	224	905	1,096
R-56	1 - 5	1325+00; 25L±	8.8	165	1,862	1,587
R-57	1 - 3	1333+00; 25R±	8.4	704	517	86
R-58	1 - 4	1341+00; 25L±	8.7	165	1,578	1,468
R-59	1 - 5	1349+00; 25R±	8.9	706	420	200
R-60	0.5 - 3	1357+00; 25L±	8.7	2,239	9	61
R-62	1.5 - 4	1373+00; 25L±	8.8	362	484	942
R-63	0 - 4	1381+00; 25R±	8.7	3,966	4	22
R-65	0.5 - 4	1397+00; 25R±	8.7	501	734	400
R-66	1 - 3	1405+00; 25L±	8.5	2,623	3	29
R-67	1 - 4	1413+00; 25R±	8.7	2,687	7	20
R-68	2 - 5	1421+00; 25L±	8.6	768	17	68
R-69	1 - 5	1429+00; 25R±	8.4	1,535	6	28
R-70	2 - 5	1437+00; 25L±	8.5	330	541	800
R-71	1 - 5	1445+00; 25R±	8.1	2,559	3	56
R-72	1 - 5	1453+00; 25L±	8.7	3,198	4	140
R-73	1 - 4	937+00; 75R±	8.9	4,301	8	37
R-74	1 - 5	945+00; 75R±	8.9	1,815	61	32
R-75	3 - 5	953+00; 75R±	9	1,688	153	10
R-76	1 - 3	961+00; 75R±	8.5	456	766	678
R-77	1 - 5	1001+00; 75R±	8.5	275	721	1,098
R-79	3 - 5	1035+00; 75R±	9	2,214	5	45
R-82	1 - 4	1051+00; 75R±	8.5	201	653	2,565
R-88	1.5 - 5	1200+00; 75R±	8.6	832	200	30
R-90	2 - 5	1289+00; 60R±	8.6	3,959	32	44
R-91	2 - 5	1298+00; 60L±	8.7	3,838	< 3	7
R-92	2 - 5	1312+00; 60R±	8.7	4,989	3	5
R-93	0.5 - 5	1320+00; 60L±	8.9	640	186	149

Note [1]: The test results for soluble sulfates and chlorides are also included in the tables above. Test results indicate the site soils have variable low to significant concentrations of both soluble sulfates and chlorides. The minimum electrical resistivity test results indicate the site soils are variable moderately to very corrosive.

Summary of Chemical Laboratory Testing [1]						
I-10 Wild Horse Pass Boulevard TI & Ramps & Crossroad						
Exploration Designation	Depth (ft)	Latitude / Longitude	pH	Minimum Resistivity (ohm-cm)	Soluble Sulfates (mg/kg)	Soluble Chlorides (mg/kg)
R&C-1	1 - 4.5	33.278°/-111.970°	8.3	939	290	164
R&C-5	2 - 5	33.282°/-111.968°	9.1	564	257	381
R&C-8	0.5 - 5	33.281°/-111.963°	9.1	624	335	305
R&C-10	1 - 5	33.278°/-111.965°	8.2	376	297	1,262
B-2	0 - 5	33.279°/-111.967°	8.8	3,489	4	24

Summary of Chemical Laboratory Testing [1]						
I-10 Queen Creek Road TI & Ramps & Crossroad						
Exploration Designation	Depth (ft)	Latitude / Longitude	pH	Minimum Resistivity (ohm-cm)	Soluble Sulfates (mg/kg)	Soluble Chlorides (mg/kg)
R&C-14	4 - 6	33.257°/-111.949°	9.8	1,745	40	66
R&C-15	1 - 5	33.256°/-111.950°	9.5	1,275	178	70
R&C-23	1.5 - 5	33.254°/-111.948°	9.8	3,154	7	37
R&C-24	1 - 5	33.255°/-111.947°	9.3	872	215	209
B-4	4 - 8	33.255°/-111.948°	8.4	107	762	6,766

Summary of Chemical Laboratory Testing [1]						
I-10 Riggs Road TI & Ramps & Crossroad						
Exploration Designation	Depth (ft)	Latitude / Longitude	pH	Minimum Resistivity (ohm-cm)	Soluble Sulfates (mg/kg)	Soluble Chlorides (mg/kg)
R&C-25	1.5 - 4	33.222°/-111.923°	9.4	3892	6	24
R&C-26	0 - 4	33.221°/-111.921°	8.8	5502	12	23
R&C-27	0.5 - 5	33.220°/-111.923°	8.5	242	654	2046
R&C-32	0.5 - 5	33.219°/-111.917°	8.2	557	1172	405
R&C-33	0 - 4	33.219°/-111.923°	8.5	738	121	174
B-9	2 - 8	33.219°/-111.92°	8.5	114	1,931	3,948

Summary of Chemical Laboratory Testing [1]						
Goodyear Road Ramps & Crossroads at I-10						
Exploration Designation	Depth (ft)	Latitude / Longitude	pH	Minimum Resistivity (ohm-cm)	Soluble Sulfates (mg/kg)	Soluble Chlorides (mg/kg)
R&C-35	0 - 5	33.190°/-111.901°	8.2	127	260	6,739
R&C-38	0.5 - 4	33.190°/-111.895°	9.1	2,483	13	241

Note [1]: The test results for soluble sulfates and chlorides are also included in the tables above. Test results indicate the site soils have variable low to significant concentrations of both soluble sulfates and chlorides. The minimum electrical resistivity test results indicate the site soils are variable moderately to very corrosive.

ITEM 7 – UNSUITABLE MATERIAL AND OVER-EXCAVATION LIMITS

As outlined in the Pavement Design Summary, the project limits include areas where the subgrade materials do not meet the requirements of the subgrade acceptance charts for the project. Subgrade materials not meeting the subgrade acceptance for the project shall be over-excavated to a minimum depth of 3 feet below finished subgrade elevation and replaced with borrow meeting the subgrade acceptance chart for the location. The lateral limits of the removal of unsuitable material shall extend a minimum of 2 feet beyond the edge of the pavement. For new pavement planned to adjoin existing pavement, the lateral limits may be reduced if constrained by an existing pavement, and the lateral limits shall extend up to the existing pavement. Removal limits are subject to change based on subgrade acceptance testing during construction. The following tables outline areas of unsuitable subgrade materials for the project:

I-10 Mainline Lanes and Shoulders

Segment 1 - I-10 Mainline Unsuitable Subgrade Materials						
Boring No.	Boring Approx. Station and CL Offset	R-Value [1]	Construction Control R-Value	Unsuitable Subgrade Removal Area [2]	Unsuitable Subgrade Removal Station Limits	Geogrid Alternative to Subgrade Removal [3]
R-3	901+00; 25R±	15(T) 31(C)	30	Center Median Widening (WB & EB)	897+00 to 905+00	No

Segment 2 - I-10 Mainline Unsuitable Subgrade Materials						
Boring No.	Boring Approx. Station and CL Offset	R-Value [1]	Construction Control R-Value	Unsuitable Subgrade Removal Area [2]	Unsuitable Subgrade Removal Station Limits	Geogrid Alternative to Subgrade Removal [3]
R-15	997+00; 25R±	19 (C)	20	Center Median Widening (WB & EB)	985+00 to 1025+00	Yes
R-16	1005+00;25L±	17 (T&C)				
R-17	1013+00;25R±	17 (C)				
R-18	1021+00;25L±	19 (C)				
R-78	1006+00;75L±	7(T) 20(C)	20	WB Outside Shoulder Widening	1002+00 to 1010+00	No

Segment 3 - I-10 Mainline Unsuitable Subgrade Materials						
Boring No.	Boring Approx. Station and CL Offset	R-Value [1]	Construction Control R-Value	Unsuitable Subgrade Removal Area [2]	Unsuitable Subgrade Removal Station Limits	Geogrid Alternative to Subgrade Removal [3]
R-20	1037+00; 25L±	19(T) 22(C)	20	Center Median Widening (WB & EB)	1033+00 to 1041+00	Yes
R-24	1069+00; 25L±	19 (T)	20	Center Median Widening (WB & EB)	1065+00 to 1073+00	Yes
R-26	1085+00; 25L±	11 (T) 19(C)	20	Center Median Widening (WB & EB)	1081+00 to 1089+00	Yes
R-32	1133+00; 25L±	9 (T)	20	Center Median Widening (WB & EB)	1129+00 to 1137+00	No
R-36	1165+00; 25L±	13 (T)	20	Center Median Widening (WB & EB)	1161+00 to 1169+00	Yes

Segment 4 - I-10 Mainline Unsuitable Subgrade Materials						
Boring No.	Boring Approx. Station and CL Offset	R-Value [1]	Construction Control R-Value	Unsuitable Subgrade Removal Area [2]	Unsuitable Subgrade Removal Station Limits	Geogrid Alternative to Subgrade Removal [3]
R-39	1189+00; 25R±	9(T) 16(C)	20	Center Median Widening (WB & EB)	1185+00 to 1193+00	No
R-42	1213+00; 25L±	10(T) 20(C)	20	Center Median Widening (WB & EB)	1209+00 to 1217+00	Yes

Segment 4 - I-10 Mainline Unsuitable Subgrade Materials						
Boring No.	Boring Approx. Station and CL Offset	R-Value [1]	Construction Control R-Value	Unsuitable Subgrade Removal Area [2]	Unsuitable Subgrade Removal Station Limits	Geogrid Alternative to Subgrade Removal [3]
R-44	1229+00; 25L±	13(C)	20	Center Median Widening (WB & EB)	1225+00 to 1233+00	Yes
R-46	1245+00; 25L±	9(T) 16(C)	20	Center Median Widening (WB & EB)	1241+00 to 1249+00	No
R-49	1269+00; 25R±	12 (T)	20	Center Median Widening (WB & EB)	1265+00 to 1273+00	Yes
R-51	1285+00; 25R±	10(T) 22(C)	20	Center Median Widening (WB & EB)	1281+00 to 1289+00	Yes
R-55	1317+00; 25R±	16 (T)	20	Center Median Widening (WB & EB)	1313+00 to 1329+00	Yes
R-56	1325+00; 25L±	13 (T)				
R-87	1195+00; 75L±	10 (T)	20	WB Outside Shoulder Widening	1191+00 to 1207+00	Yes
R-89	1203+00; 75L±	11 (T)				
R-88	1200+00; 75R±	8 (T)	20	EB Outside Shoulder Widening	1196+00 to 1204+00	No
R-93	1320+00; 60L±	16 (T)	20	WB & EB Outside Shoulder Widening	1316+00 to 1324+00	Yes

Note [1]: Tested R-value (T); Correlated R-value (C). Note [2]: Eastbound (EB); Westbound (WB). Note [3]: The placement of geogrid as part of the pavement structure can be considered as an alternative to removal of unsuitable subgrade provided the geogrid meets the project requirements including the requirements and specifications outlined in the 2017 ADOT PDM and in the ADOT Standard Specifications. The placement of Geogrid is to include a Separation Geotextile under the Geogrid meeting the ADOT and Project requirements and specifications. Geogrid alternative is only applicable under new AC pavements. Geogrid alternative is not applicable under new PCCP. If Geogrid (with Separation Geotextile) alternative is used, a minimum aggregate base (AB) layer thickness of 8 inches is required; therefore, if the pavement structural section AB layer thickness is less than 8 inches, the AB should be increased to a minimum thickness of 8 inches.

Crossroads & Traffic Interchange Ramps

State Route 347 (SR 347) / Queen Creek Road Crossroad & Ramps at I-10						
Boring No.	Boring Approx. Latitude / Longitude	R-Value [1]	Construction Control R-Value	Unsuitable Subgrade Removal Area	Unsuitable Subgrade Removal Limits [3]	Geogrid Alternative to Subgrade Removal [4]
R&C-15	33.256°/-111.950°	16 (T)	23	EB Off-Ramp	From Approx. Ramp Station 30+00 to 35+00	No
R&C-18	33.255°/-111.950°	7 (T)		New AC and PCCP	From approximately 200 feet west of the I-10 CL to 2,100 feet west of the I-10 CL (approx. 1,900-ft length)	No
R&C-20	33.254°/-111.952°	9 (T)				
R&C-21	33.255°/-111.949°	19 (C)				

Riggs Road Crossroad & Ramps at I-10						
Boring No.	Boring Approx. Latitude / Longitude	R-Value [1]	Construction Control R-Value	Unsuitable Subgrade Removal Area [2]	Unsuitable Subgrade Removal Limits [3]	Geogrid Alternative to Subgrade Removal [4]
R&C-25	33.222°/-111.923°	19 (T)	20	EB Off-Ramp	From Approx. Ramp Station 24+00 to 30+00	Yes
R&C-31	33.219°/-111.919°	8(T) 16(C)		New PCCP	From approx. I-10 CL to 1,050 feet east of the I-10 CL (approx. 1,050-ft length)	No
R&C-32	33.219°/-111.917°	8 (T)				

Note [1]: Tested R-value (T); Correlated R-value (C). Note [2]: Eastbound (EB); Westbound (WB). Note [3]: Unsuitable Subgrade Removal Limits only applicable for existing subgrade soils within the upper 3 feet of finished subgrade under planned new pavements. Unsuitable Subgrade Removal Limits not applicable in planned new (ramp) pavement areas that will be realigned and constructed in new engineered roadway embankment fills with the upper 3 feet beneath finished subgrade meeting the project requirements including the subgrade acceptance requirements.
Note [4]: The placement of geogrid as part of the pavement structure can be considered as an alternative to removal of unsuitable subgrade provided the geogrid meets the project requirements including the requirements and specifications outlined in the 2017 ADOT PDM and in the ADOT Standard Specifications. The placement of Geogrid is to include a Separation Geotextile under the Geogrid meeting the ADOT and Project requirements and specifications. Geogrid alternative is only applicable under new AC pavements. Geogrid alternative is not applicable under new PCCP. If Geogrid (with Separation Geotextile) alternative is used, a minimum aggregate base (AB) layer thickness of 8 inches is required; therefore, if the pavement structural section AB layer thickness is less than 8 inches, the AB should be increased to a minimum thickness of 8 inches.

SECTION V – MISCELLANEOUS

ITEM 1 – BITUMINOUS PAVEMENT REMOVAL

The work under this Item consists of removal and disposal of the bituminous pavement as specified in Section 202 of the Standard Specifications.

ITEM 2 – BITUMINOUS PAVEMENT REMOVAL BY MILLING (WHEN AN ASPHALTIC CONCRETE FRICTION COURSE IS NOT TO BE PLACED ON THE MILLED SURFACE)

The work under this Item consists of removing the existing bituminous pavement as specified in Section 202-3.03 (C) of the Standard Specifications, with the following exception:

202-3.03 (C) Bituminous Pavement Removal By Milling: the title of the Standard Specifications is revised to read:

202-3.03 (C) Bituminous Pavement Removal By Milling (When an Asphaltic Concrete Friction Course is not to be Placed on the Milled Surface):

ITEM 3 – DISPOSAL OF WASTE MATERIALS

Upon removal, disposal of existing waste material generated during the construction of the project, or any asphaltic concrete not used for the project, shall be the responsibility of the Contractor unless otherwise specified in the Contract Documents.

ITEM 4 – TEMPORARY CONNECTIONS AND DETOURS

Temporary connection and detours for the project are excluded from this report and their design and construction will be the responsibility of the Contractor.

ITEM 5 – REPAIRS

The work under this item, if required, shall be as specified in Contracts and Specifications Stored Specification "402PCCPR".

The Design-Build Contract and Technical Provisions address ADOT directed Extra Work should the need for repairs arise. Repairs (e.g., joint, crack, spall, or other) if required will be performed by the Contractor as Extra Work as directed by ADOT.

PRELIMINARY PAVEMENT STRUCTURE COST ESTIMATE

Note: Intentionally left blank.

INCENTIVE COST ESTIMATE – SMOOTHNESS AND MATERIAL QUALITY

Note: Intentionally left blank.

EXHIBITS

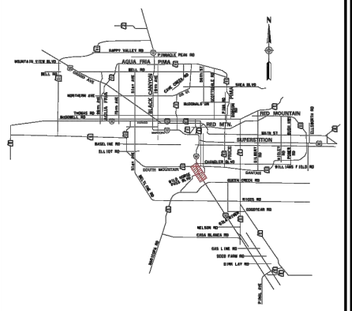
Pavement Structural Sections

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INTERMODAL TRANSPORTATION DIVISION

TRACS NO. F0721 01C
I–10
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PROJECT SCHEMATIC DESIGN

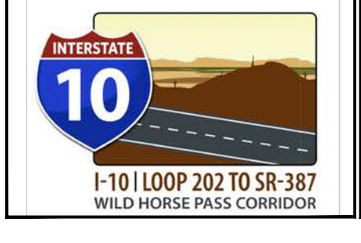


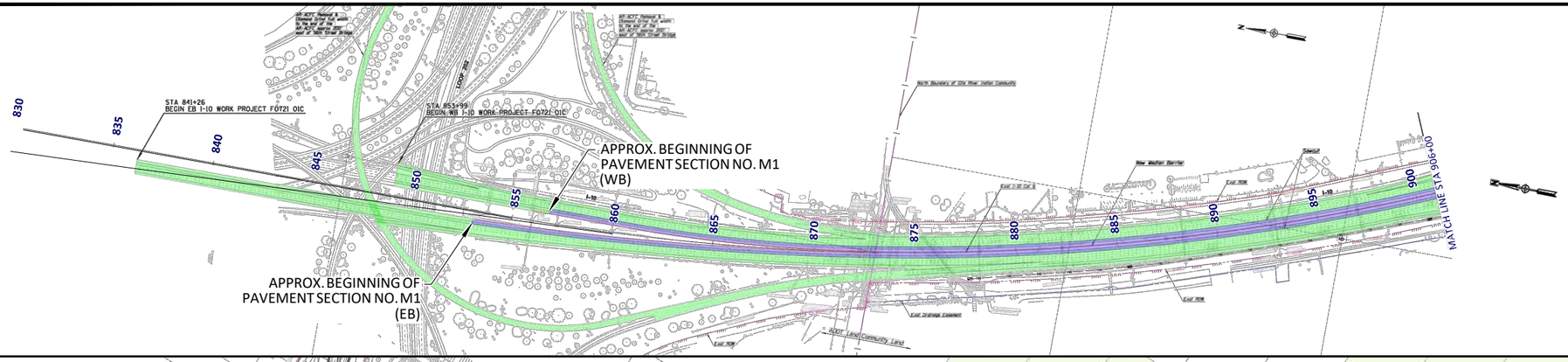
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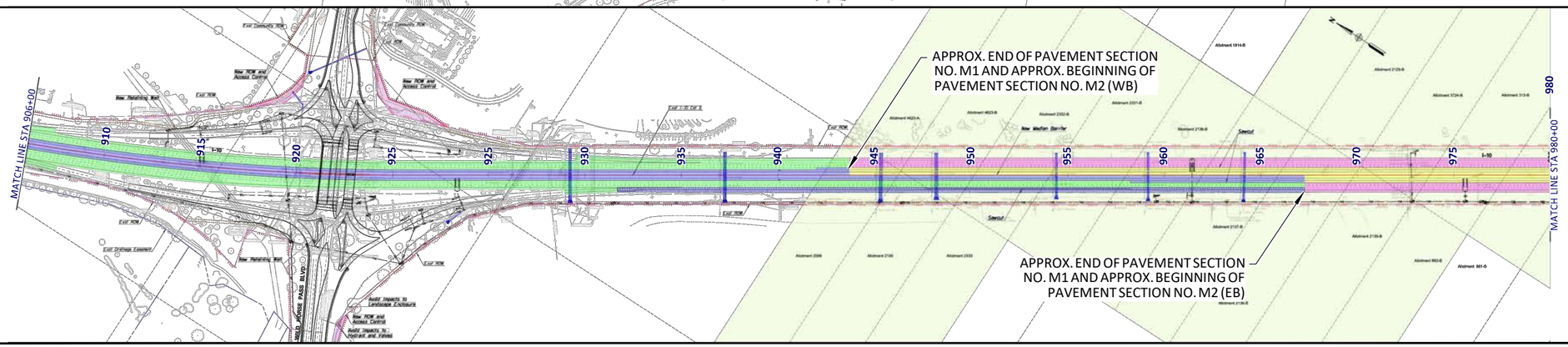
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- New Pavement (PCCP)
- New Bridge
- Exst Bridge To Remain and Be Modified
- Concrete Barrier
- Fill Line
- Cut Line
- New FMS Trunkline
- Full Access Control
- Mainenance Access Path
- Retaining Wall
- New BIA Temporary Construction Easements
- New ROW
- Allottment Parcels
- AC: Mill & Overlay
- PCCP: Mill & Diamond Grind
- New ROW
- Exst ROW (Line) Exst Access Control (Hash Marks)
- Restricted Access Control
- Exst ROW (Other Entities)
- Exst Drainage Easement
- Remove Existing Non-doweled PCCP and Place New Doweled PCCP (Approx Area)

ROLL PLOT NO. 1 OF 8

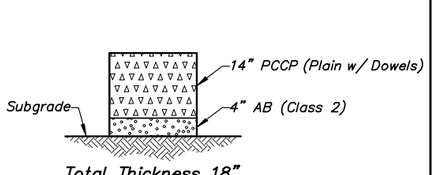
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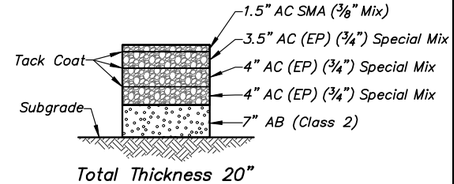
PAVEMENT SECTIONS



Total Thickness 18"

1–10 MAINLINE PAVEMENT SECTION NO. M1

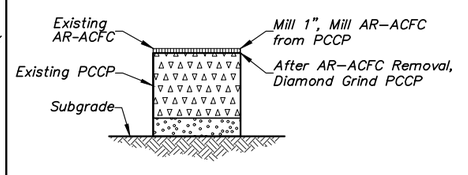
Segment 1 – MP161 to WHP
(Approx. MP 161 to 163.04(WB)/163.48(EB))
(Approx. Sta. 862(WB)/858(EB) to 944(WB)/968(EB))



Total Thickness 20"

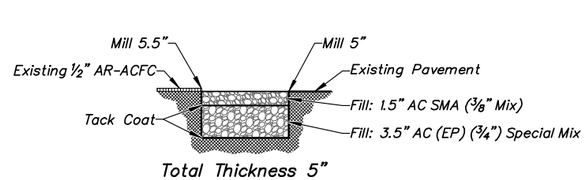
1–10 MAINLINE PAVEMENT SECTION NO. M2

Segment 2 – WHP to SR347
(Approx. MP 163.04(WB)/163.48(EB) to 164.5)
(Approx. Sta. 944(WB)/968(EB) to 1020)



1–10 MAINLINE PAVEMENT SECTION NO. MILL1

(Approx. MP 161 to 163.04(WB)/163.48(EB))
(Approx. Sta. 854(WB)/841(EB) to 944(WB)/968(EB))



Total Thickness 5"

I-10 MAINLINE PAVEMENT SECTION NOS.: M&F1 (Travel Lanes) and M&F2 (Shoulders)

(Approx. MP 163.04(WB)/163.48(EB) to 172.75)
(Approx. Sta. 944(WB)/968(EB) to 1457)

NOTE:
PAVEMENT SECTION NOs.:
MAINLINE 1 & 2
(or M1 & M2)
MILL AND FILL
(M&F1 and M&F2)

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NOTE:
I-10 GRIC Project Schematic Design (Roll Plot Nos. 1 through 6) was provided by HDR, and Terracon added pavement section information.

EXHIBIT
1

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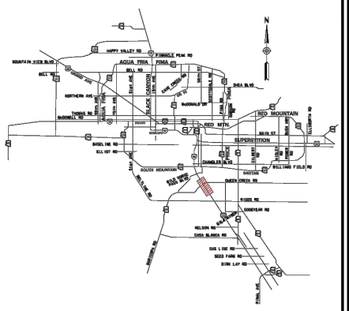


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INTERMODAL TRANSPORTATION DIVISION

TRACS NO. F0721 01C
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PROJECT SCHEMATIC DESIGN



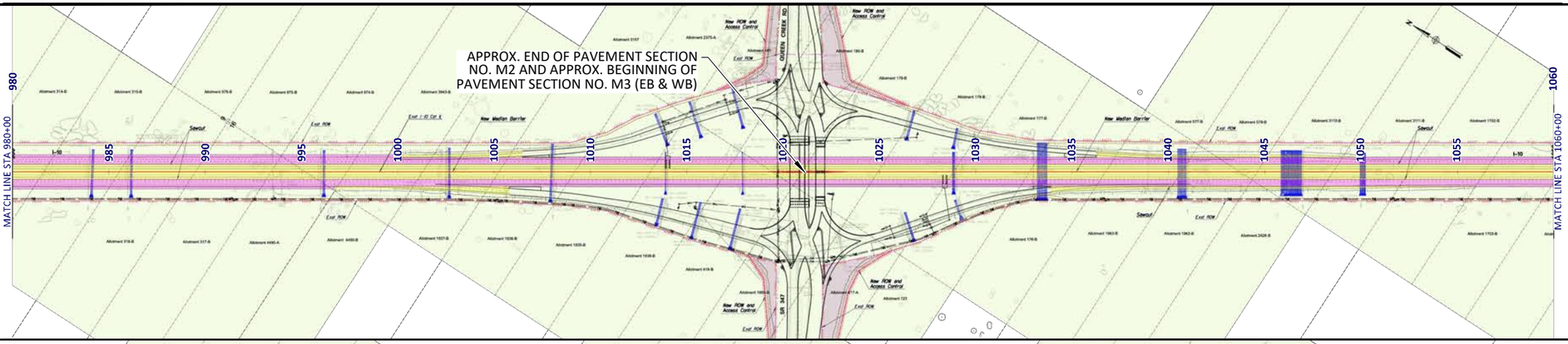
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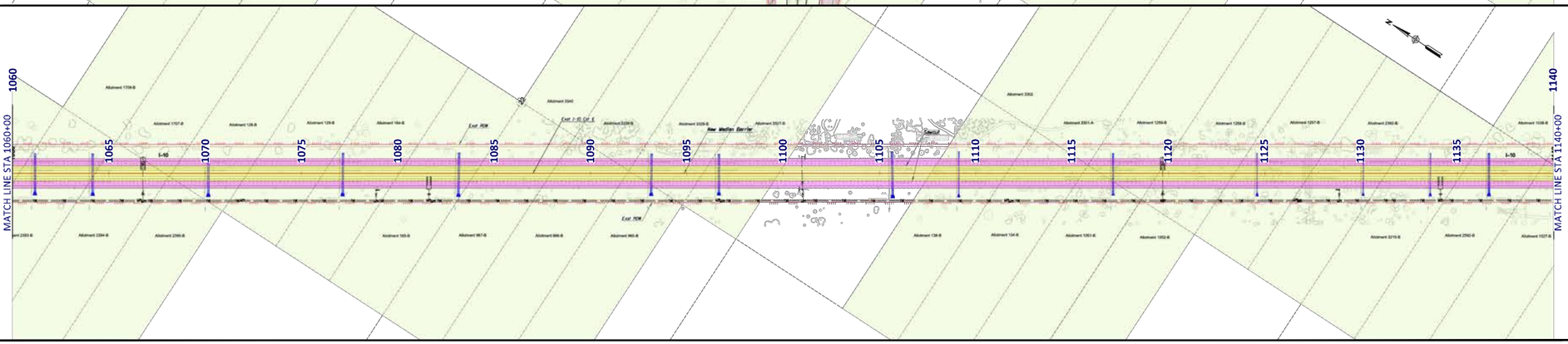
- New Pavement (Asphalt)
- New Pavement (PCCP)
- New Bridge
- Exst Bridge To Remain and Be Modified
- Concrete Barrier
- Fill Line
- Cut Line
- New FMS Trunkline
- Full Access Control
- Mainenance Access Path
- Retaining Wall
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- Allottment Parcels
- AC: Mill & Overlay
- PCCP: Mill & Diamond Grind
- New ROW
- Exst ROW (Line) Exst Access Control (Hash Marks)
- Restricted Access Control
- Exst ROW (Other Entities)
- Exst Drainage Easement
- Remove Existing Non-doweled PCCP and Place New Doweled PCCP (Approx Area)

ROLL PLOT NO.
2 OF 8

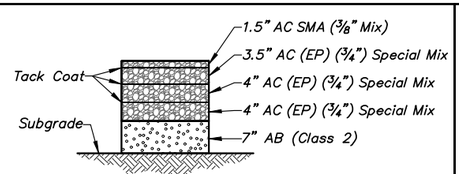
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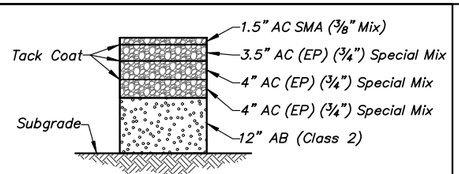
PAVEMENT SECTIONS



Total Thickness 20"

1–10 MAINLINE PAVEMENT SECTION NO. M2

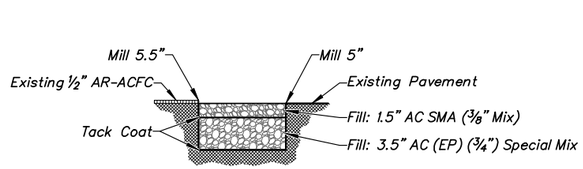
Segment 2 - WHP to SR347
(Approx. MP 163.04(WB)/163.48(EB) to 164.5)
(Approx. Sta. 944(WB)/968(EB) to 1020)



Total Thickness 25"

1–10 MAINLINE PAVEMENT SECTION NO. M3

Segment 3 - SR347 to Riggs Rd
(approx. MP 164.5 to 168)
(Approx. Sta. 1020 to 1208)



Total Thickness 5"

I-10 MAINLINE PAVEMENT SECTION NOS.: M&F1 (Travel Lanes) and M&F2 (Shoulders)

(Approx. MP 163.04(WB)/163.48(EB) to 172.75)
(Approx. Sta. 944(WB)/968(EB) to 1457)

NOTE:
PAVEMENT SECTION NOs.:
MAINLINE 2 & 3
(or M2 & M3)
MILL AND FILL
(M&F1 and M&F2)

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NOTE:
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EXHIBIT
2

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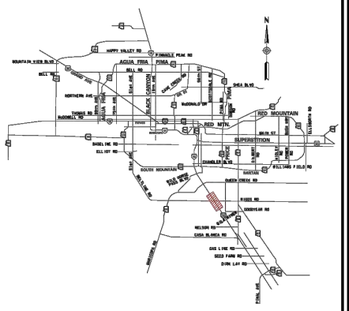


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INTERMODAL TRANSPORTATION DIVISION

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GILA RIVER INDIAN COMMUNITY
PROJECT SCHEMATIC DESIGN

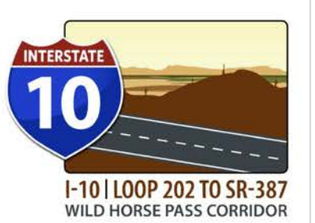


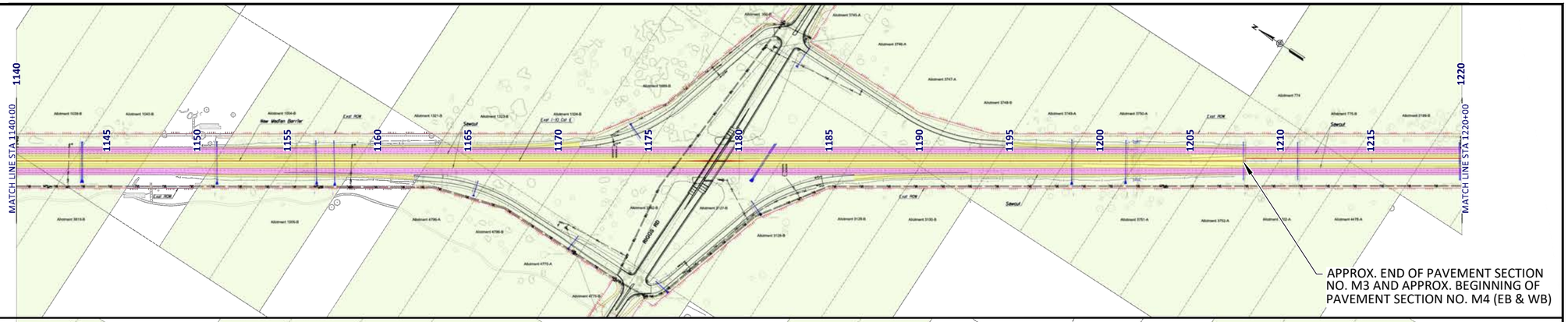
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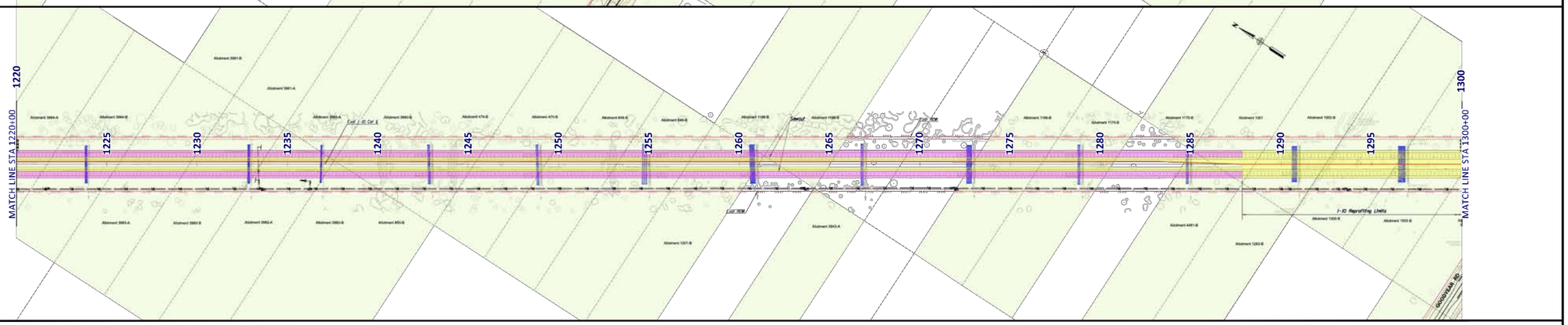
- New Pavement (Asphalt)
- New Pavement (PCCP)
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- Restricted Access Control
- Exst ROW (Other Entities)
- Exst Drainage Easement
- Remove Existing Non-doweled PCCP and Place New Doweled PCCP (Approx Area)

ROLL PLOT NO. 3 OF 8

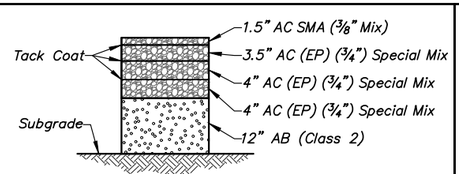
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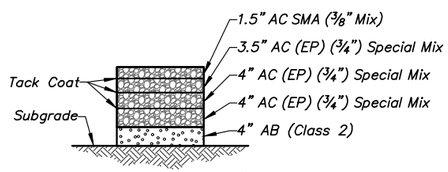




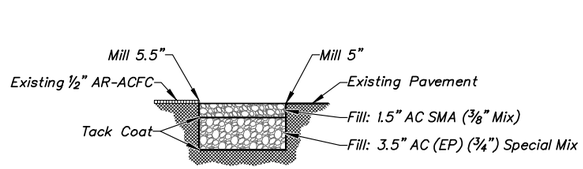
PAVEMENT SECTIONS



Total Thickness 25"
1–10 MAINLINE PAVEMENT SECTION NO. M3
Segment 3 - SR347 to Riggs Rd
(approx. MP 164.5 to 168)
(Approx. Sta. 1020 to 1208)



Total Thickness 17"
1–10 MAINLINE PAVEMENT SECTION NO. M4
Segment 4 – Riggs Rd to GRB
(Approx. MP 168 to 172.75)
(Approx. Sta. 1208 to 1457)



Total Thickness 5"
I-10 MAINLINE PAVEMENT SECTION NOS.: M&F1 (Travel Lanes) and M&F2 (Shoulders)
(Approx. MP 163.04(WB)/163.48(EB) to 172.75)
(Approx. Sta. 944(WB)/968(EB) to 1457)

NOTE:
PAVEMENT SECTION NOs.:
MAINLINE 3 & 4
(or M3 & M4)
MILL AND FILL
(M&F1 and M&F2)

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EXHIBIT
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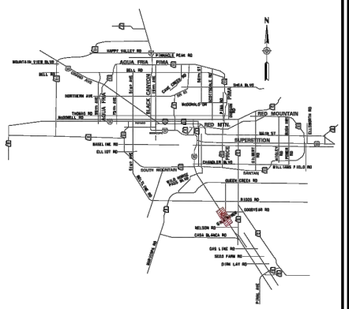


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INTERMODAL TRANSPORTATION DIVISION

TRACS NO. F0721 01C
I–10
GILA RIVER INDIAN COMMUNITY
PROJECT SCHEMATIC DESIGN

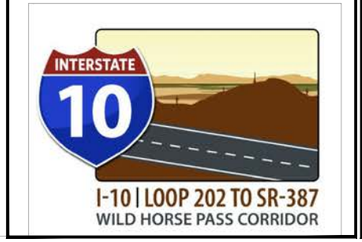


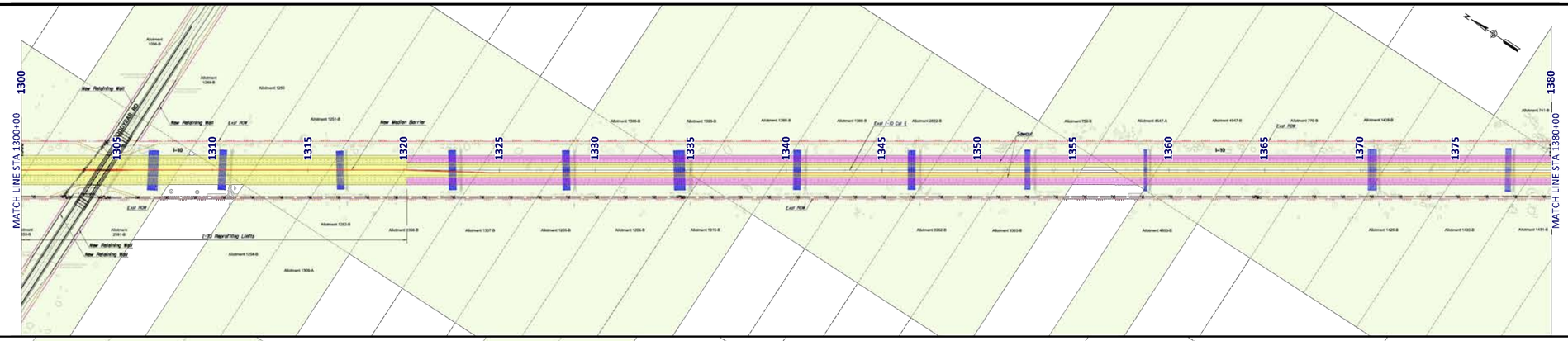
LEGEND

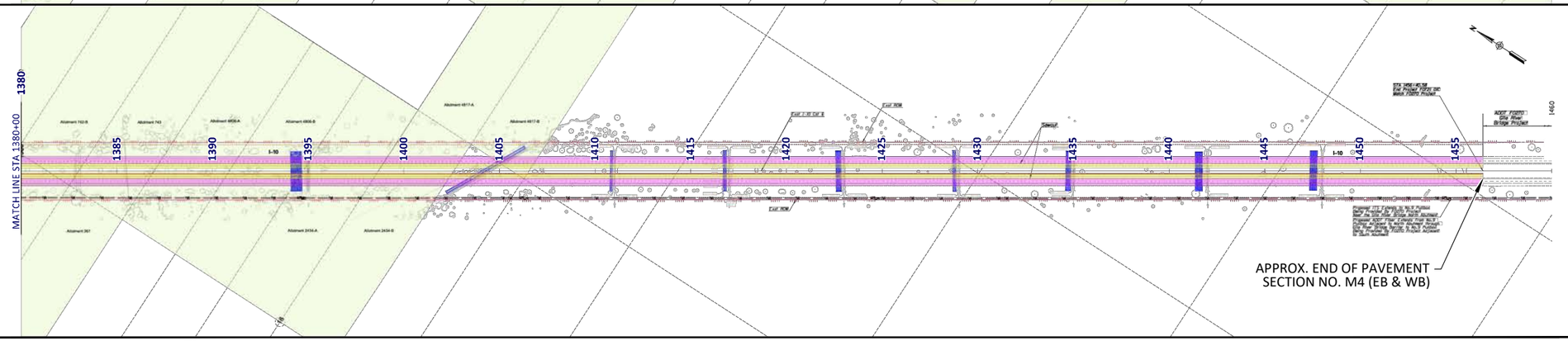
- New Pavement (Asphalt)
- New Pavement (PCCP)
- New Bridge
- Exst Bridge To Remain and Be Modified
- Concrete Barrier
- Fill Line
- Cut Line
- New FMS Trunkline
- Full Access Control
- Mainenance Access Path
- Retaining Wall
- New BIA Temporary Construction Easements
- New ROW
- Allottment Parcels
- AC: Mill & Overlay
- PCCP: Mill & Diamond Grind
- New ROW
- Exst ROW (Line) Exst Access Control (Hash Marks)
- Restricted Access Control
- Exst ROW (Other Entities)
- Exst Drainage Easement
- Remove Existing Non-doweled PCCP and Place New Doweled PCCP (Approx Area)

ROLL PLOT NO.
4 OF 8

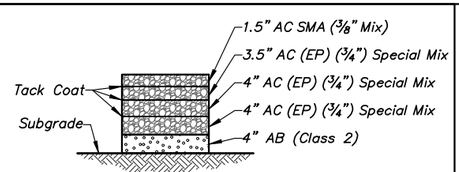
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SCALE IN FEET







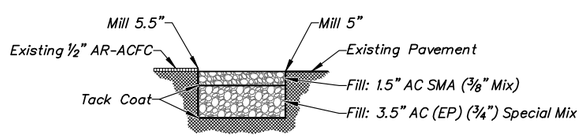
PAVEMENT SECTIONS



Total Thickness 17"

1–10 MAINLINE PAVEMENT SECTION NO. M4

Segment 4 – Riggs Rd to GRB
(Approx. MP 168 to 172.75)
(Approx. Sta. 1208 to 1457)



Total Thickness 5"

I-10 MAINLINE PAVEMENT SECTION NOS.: M&F1 (Travel Lanes) and M&F2 (Shoulders)

(Approx. MP 163.04(WB)/163.48(EB) to 172.75)
(Approx. Sta. 944(WB)/968(EB) to 1457)

NOTE:
PAVEMENT SECTION NOs.:
MAINLINE 4
(or M4)
MILL AND FILL
(M&F1 and M&F2)

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NOTE:
I-10 GRIC Project Schematic Design (Roll Plot Nos. 1 through 6) was provided by HDR, and Terracon added pavement section information.

EXHIBIT
4

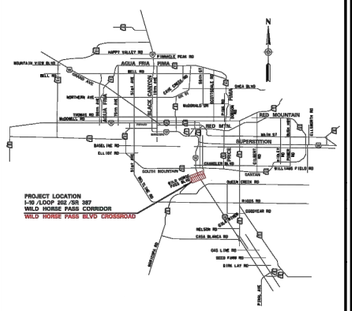
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ADOT

HDR

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

TRACS NO. F0721 01C
I–10
GILA RIVER INDIAN COMMUNITY
PROJECT SCHEMATIC DESIGN



LEGEND

- New Pavement (Asphalt)
- New Pavement (PCCP)
- New Bridge
- Exst Bridge To Remain and Be Modified
- Concrete Barrier
- Fill Line
- Cut Line
- New FMS Trunkline
- Full Access Control
- Mainenance Access Path
- Retaining Wall
- New BIA Temporary Construction Easements
- New ROW
- Allottment Parcels
- AC: Mill & Overlay
- PCCP: Mill & Diamond Grind
- New ROW
- Exst ROW (Line) Exst Access Control (Hash Marks)
- Restricted Access Control
- Exst ROW (Other Entities)
- Exst Drainage Easement
- Remove Existing Non–doweled PCCP and Place New Doweled PCCP (Approx Area)

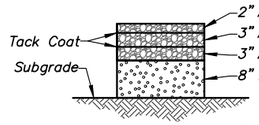
ROLL PLOT NO.
5 OF 8

100 0 100 200
SCALE IN FEET

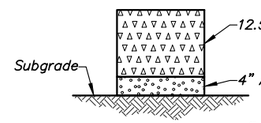


I-10 | LOOP 202 TO SR-387
WILD HORSE PASS CORRIDOR

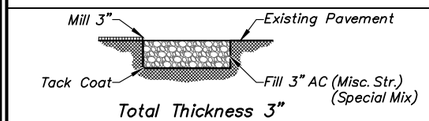
PAVEMENT SECTIONS - CROSSROADS



Total Thickness 16"
PAVEMENT SECTION NO. C1
AC CROSSROAD –
WEST and EAST of I-10



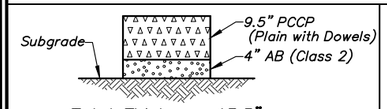
Total Thickness 16.5"
PAVEMENT SECTION NO. C2
PCCP LIMITS of CROSSROAD at I-10



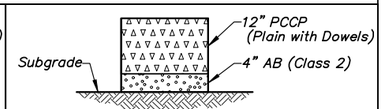
Total Thickness 3"
PAVEMENT SECTION NO.: M&F3
AC CROSSROAD - WEST and EAST of I-10

NOTE:
PAVEMENT SECTION NOs.:
CROSSROAD 1 & 2
(or C1 & C2)
MILL AND FILL
(M&F3)

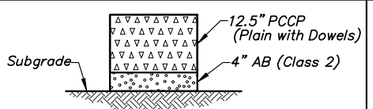
PAVEMENT SECTIONS - RAMPS



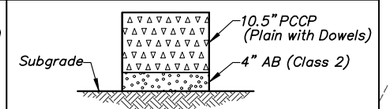
Total Thickness 13.5"
PAVEMENT SECTION NO. R1
WEST–BOUND OFF–RAMP



Total Thickness 16"
PAVEMENT SECTION NO. R3
EAST–BOUND OFF–RAMP



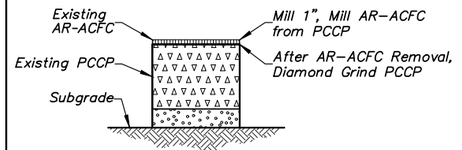
Total Thickness 16.5"
PAVEMENT SECTION NO. R2
WEST–BOUND ON–RAMP



Total Thickness 14.5"
PAVEMENT SECTION NO. R4
EAST–BOUND ON–RAMP

NOTE:
PAVEMENT SECTION NOs.:
RAMPS 1, 2, 3, & 4
(or R1, R2, R3 & R4)

PAVEMENT SECTIONS - RAMPS - CONTINUED



ON– & OFF–RAMP PCCP
PAVEMENT SECTION NO. MILL1
(LIMITS: As Shown on the Plans)

Wild Horse Pass Blvd/ Sundust Rd TI

EASTBOUND OFF-RAMP
WESTBOUND ON-RAMP
EASTBOUND ON-RAMP
WESTBOUND OFF-RAMP
Wild Horse Pass Blvd
Marcopa Rd
N. Nelson Rd
S. 56th St
Sundust Rd
Exst I-10 Cst ℄
New Retaining Wall
New ROW and Access Control
New BIA TCE
Avoid Impacts to Hydrant, Valves, and Cabinets
Avoid Impacts to Landscape Enclosure
Avoid Impacts to Marquee Sign
New Access Control
WB Wild Horse Pass Blvd Ramp A Cst ℄
WB Wild Horse Pass Blvd Ramp AI Cst ℄
WB Wild Horse Pass Blvd Ramp B Cst ℄
WB Wild Horse Pass Blvd Ramp BI Cst ℄
WB Wild Horse Pass Blvd Ramp C Cst ℄
WB Wild Horse Pass Blvd Ramp CI Cst ℄
EB Wild Horse Pass Blvd Cst ℄
EB Wild Horse Pass Blvd Ramp D Cst ℄
EB Wild Horse Pass Blvd Ramp DI Cst ℄
New EB Wild Horse Pass Blvd Bridge
Exst Wild Horse Pass Blvd Bridge
Exst ROW
Exst Drainage Easement
Exst Drainage
Exst Community ROW
910
915
920
925
930
935

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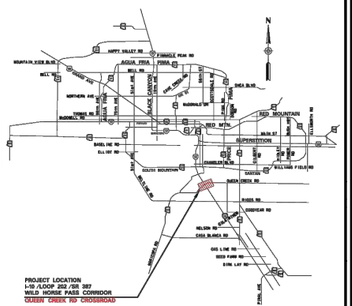
NOTE:
I-10 GRIC Project Schematic Design (Roll Plot Nos. 1 through 6) was provided by HDR, and Terracon added pavement section information.

EXHIBIT
5

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STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

TRACS NO. F0721 01C
I–10
GILA RIVER INDIAN COMMUNITY
PROJECT SCHEMATIC DESIGN



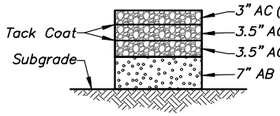
LEGEND

- New Pavement (Asphalt)
- New Pavement (PCCP)
- New Bridge
- Exst Bridge To Remain and Be Modified
- Concrete Barrier
- Fill Line
- Cut Line
- New FMS Trunkline
- Full Access Control
- Mainenance Access Path
- Retaining Wall
- New BIA Temporary Construction Easements
- New ROW
- Allottment Parcels
- AC: Mill & Overlay
- PCCP: Mill & Diamond Grind
- New ROW
- Exst ROW (Line) Exst Access Control (Hash Marks)
- Restricted Access Control
- Exst ROW (Other Entities)
- Exst Drainage Easement
- Remove Existing Non-doweled PCCP and Place New Doweled PCCP (Approx Area)

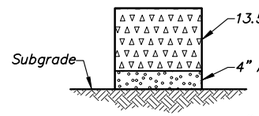
ROLL PLOT NO.
6 OF 8

100 0 100 200
SCALE IN FEET

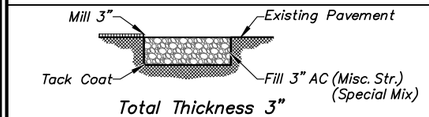
PAVEMENT SECTIONS - CROSSROADS



Total Thickness 17"
PAVEMENT SECTION NO. C3
AC CROSSROAD – WEST of I-10



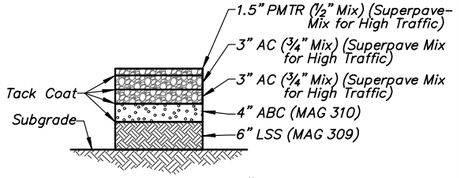
Total Thickness 17.5"
PAVEMENT SECTION NO. C4
PCCP LIMITS of CROSSROAD at I-10



Total Thickness 3"
PAVEMENT SECTION NO.: M&F3
AC CROSSROAD – WEST and EAST of I-10

NOTE:
PAVEMENT SECTION NOs.:
CROSSROAD 3 & 4
(or C3 & C4)
MILL AND FILL
(M&F3)

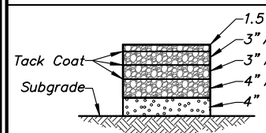
MCDOT PAVEMENT SECTION (Refer to PDS)



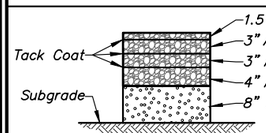
Total Thickness 17.5"
MCDOT PAVEMENT SECTION FOR QUEEN CREEK ROAD

NOTE: Pavement requirements for the MCDOT portion of the roadway shall be as outlined in the Pavement Design Summary (PDS), and in accordance with MCDOT and MAG specifications and requirements.

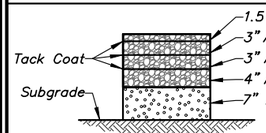
PAVEMENT SECTIONS - RAMPS



Total Thickness 15.5"
PAVEMENT SECTION NO. R5
WEST-BOUND OFF-RAMP
AND EAST-BOUND ON-RAMP



Total Thickness 19.5"
PAVEMENT SECTION NO. R6
WEST-BOUND ON-RAMP



Total Thickness 18.5"
PAVEMENT SECTION NO. R7
EAST-BOUND OFF-RAMP

NOTE:
PAVEMENT SECTION NOs.:
RAMPS 5, 6, & 7
(or R5, R6 & R7)

SR 347 / Queen Creek TI

EASTBOUND OFF-RAMP
WESTBOUND ON-RAMP
EASTBOUND ON-RAMP
WESTBOUND OFF-RAMP

Exst I-10 Cst ℄
Exst ROW
New ROW and Access Control
New ROW
EB Queen Creek Rd Cst ℄
Exst Queen Creek Rd Bridge
Queen Creek Rd Ramp A Cst ℄
Queen Creek Rd Ramp D Cst ℄
Queen Creek Rd Ramp DI Cst ℄
Queen Creek Rd Ramp AI Cst ℄
Queen Creek Rd Ramp CI Cst ℄
Queen Creek Rd Ramp C Cst ℄
Queen Creek Rd Ramp BI Cst ℄
Queen Creek Rd Ramp B Cst ℄
New EB Queen Creek Rd Bridge
Exst Maricopa County ROW
Queen Creek Rd
Mid Section Line
Allottment 1936-B
Allottment 1935-B
Allottment 1938-B
Allottment 3157
Allottment 2064
Allottment 2065
Allottment 416-B
Allottment 1868-B
Allottment 2375-A
Allottment 1361
Allottment 2376
Allottment 417-A
Allottment 123
Allottment 180-B
Allottment 179-B
Allottment 2377
Allottment 178-B
Allottment 176-B
Allottment 177-B
Allottment 1961

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NOTE:
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EXHIBIT
6

INTERSTATE 10
I-10 | LOOP 202 TO SR-387
WILD HORSE PASS CORRIDOR

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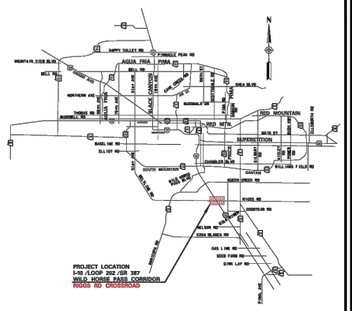
ADOT

HDR

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

TRACS NO. F0721 01C

I-10
GILA RIVER INDIAN COMMUNITY
PROJECT SCHEMATIC DESIGN



LEGEND

- New Pavement (Asphalt)
- New Pavement (PCCP)
- New Bridge
- Exst Bridge To Remain and Be Modified
- Concrete Barrier
- Fill Line
- Cut Line
- New FMS Trunkline
- Full Access Control
- Mainenance Access Path
- Retaining Wall
- New BIA Temporary Construction Easements
- New ROW
- Allottment Parcels
- AC: Mill & Overlay
- PCCP: Mill & Diamond Grind
- New ROW
- Exst ROW (Line) Exst Access Control (Hash Marks)
- Restricted Access Control
- Exst ROW (Other Entities)
- Exst Drainage Easement
- Remove Existing Non-doweled PCCP and Place New Doweled PCCP (Approx Area)

ROLL PLOT NO.
7 OF 8

100 0 100 200
SCALE IN FEET



I-10 | LOOP 202 TO SR-387
WILD HORSE PASS CORRIDOR

PAVEMENT SECTIONS - RAMPS

NOTE:
PAVEMENT SECTION NOs.: RAMPS 8, 9, & 10 (or R8, R9 & R10)

Total Thickness 18.5"
PAVEMENT SECTION NO. R8
WEST-BOUND OFF-RAMP
and EAST-BOUND ON-RAMP

Total Thickness 19.5"
PAVEMENT SECTION NO. R9
WEST-BOUND ON-RAMP

Total Thickness 22.5"
PAVEMENT SECTION NO. R10
EAST-BOUND OFF-RAMP

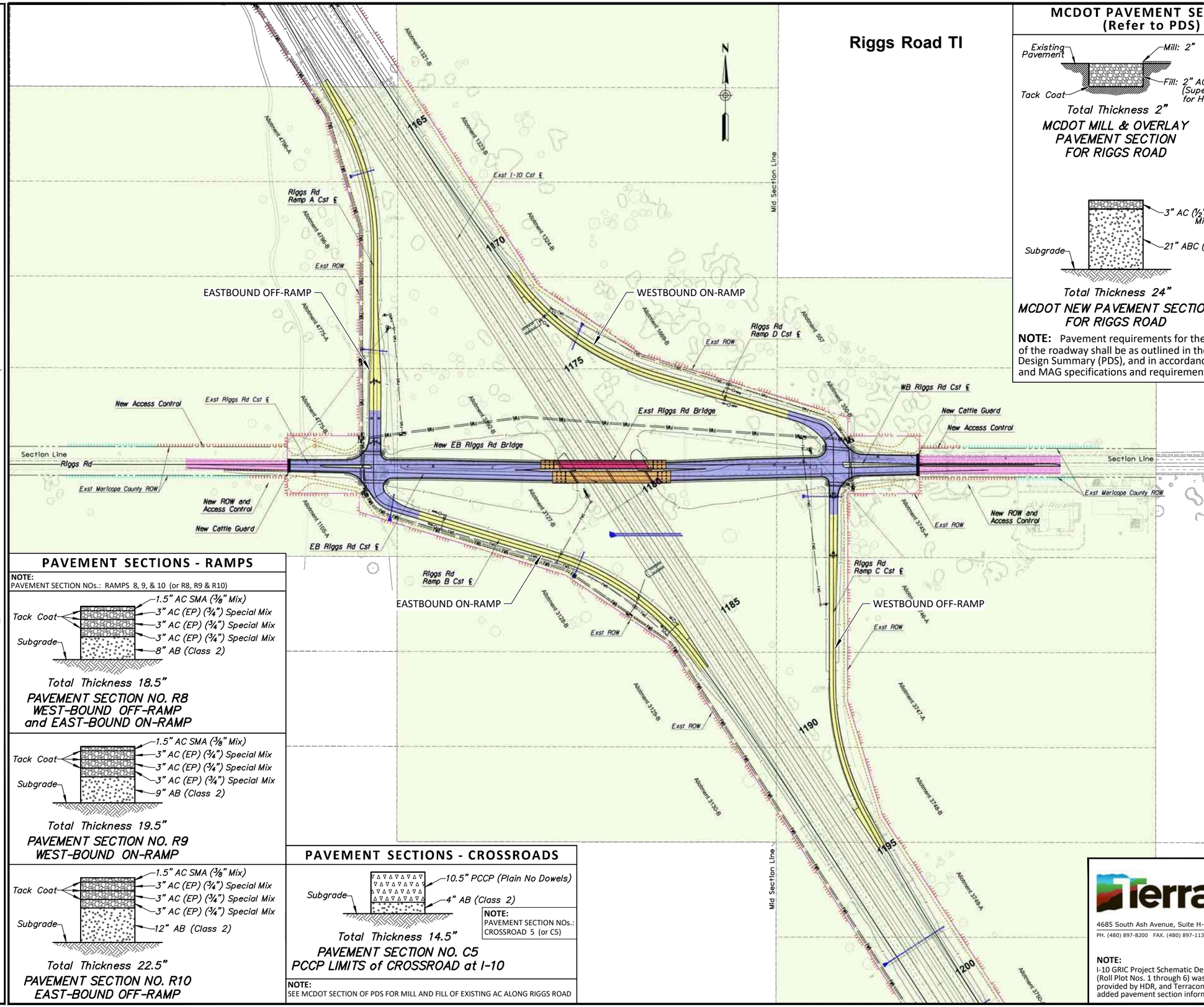
PAVEMENT SECTIONS - CROSSROADS

Total Thickness 14.5"
PAVEMENT SECTION NO. C5
PCCP LIMITS of CROSSROAD at I-10

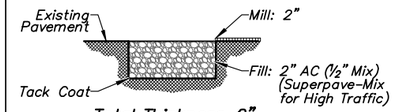
NOTE:
PAVEMENT SECTION NOs.:
CROSSROAD 5 (or C5)

NOTE:
SEE MCDOT SECTION OF PDS FOR MILL AND FILL OF EXISTING AC ALONG RIGGS ROAD

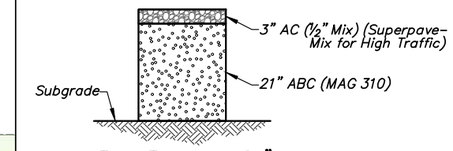
Riggs Road TI



MCDOT PAVEMENT SECTIONS (Refer to PDS)



Total Thickness 2"
MCDOT MILL & OVERLAY
PAVEMENT SECTION
FOR RIGGS ROAD



Total Thickness 24"
MCDOT NEW PAVEMENT SECTION
FOR RIGGS ROAD

NOTE: Pavement requirements for the MCDOT portion of the roadway shall be as outlined in the Pavement Design Summary (PDS), and in accordance with MCDOT and MAG specifications and requirements.

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NOTE:
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EXHIBIT 7

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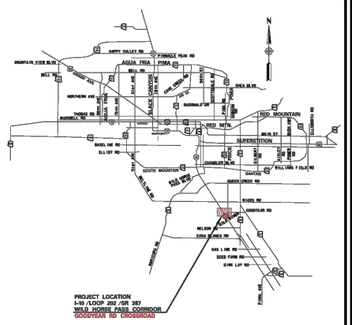
ADOT

HDR

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

TRACS NO. F0721 01C

I–10
GILA RIVER INDIAN COMMUNITY
PROJECT SCHEMATIC DESIGN



LEGEND

- New Pavement (Asphalt)
- New Pavement (PCCP)
- New Bridge
- Exst Bridge To Remain and Be Modified
- Concrete Barrier
- Fill Line
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- New FMS Trunkline
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- Mainenance Access Path
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- Restricted Access Control
- Exst ROW (Other Entities)
- Exst Drainage Easement
- Remove Existing Non–doweled PCCP and Place New Doweled PCCP (Approx Area)

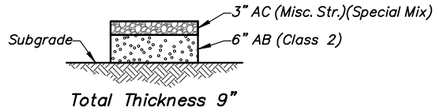
ROLL PLOT NO.
8 OF 8

100 0 100 200
SCALE IN FEET



I-10 | LOOP 202 TO SR-387
WILD HORSE PASS CORRIDOR

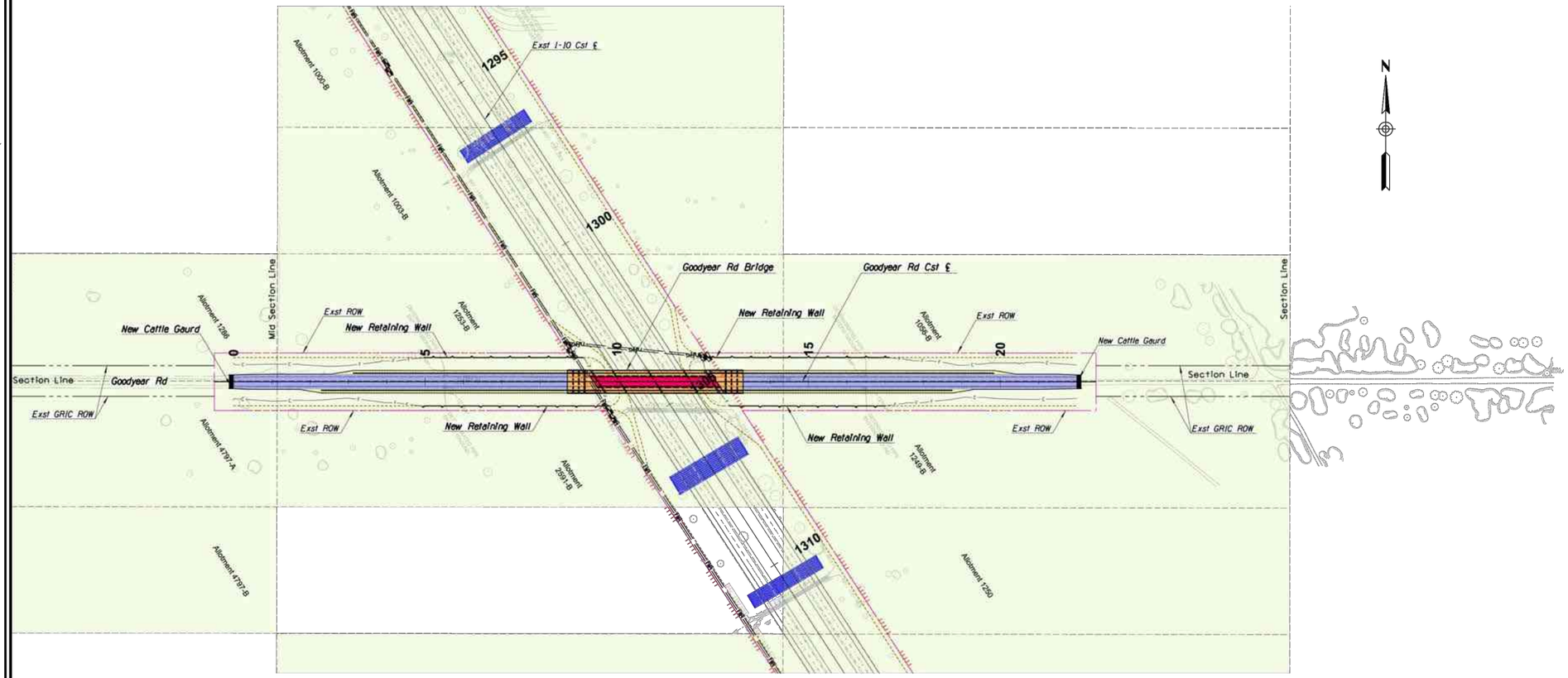
PAVEMENT SECTION FOR CROSS ROAD EDGE CONDITION (Behind Guardrail)



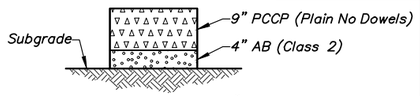
Total Thickness 9"

NOTE: Minimum pavement section for no to minimal traffic loadings. No pavement structure design performed.

Goodyear Road



PAVEMENT SECTIONS - CROSSROADS



Total Thickness 13"

PAVEMENT SECTION NO. C6
PCCP LIMITS of CROSSROAD at I-10

NOTE:
PAVEMENT SECTION NOs.:
CROSSROAD 6 (or C6)

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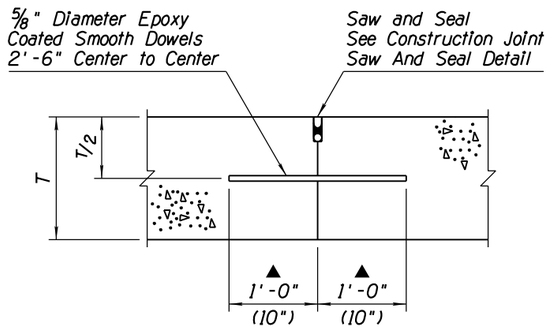
NOTE:
I-10 GRIC Project Schematic Design (Roll Plot Nos. 1 through 6) was provided by HDR, and Terracon added pavement section information.

EXHIBIT
8

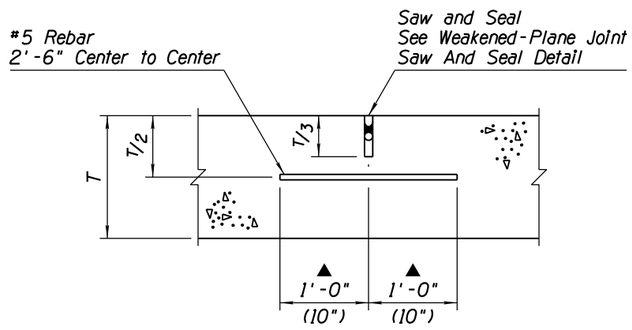
n:\projects\2022\65225282\working files\drafts\civil\draft\figures\cost\65225282_pav_rev 24.12.10.dwg / tab: Exh 8

ADOT Standard PCCP Joint Details

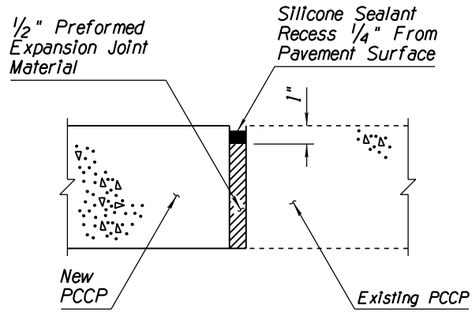
NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	ADDED DEFINITION FOR 'PE'	RLF	9/04
2	REVISED DIMENSION FORMAT	RLF	7/05
3	REMOVED 'INITIAL SAWCUT' NOTATION	RLF	7/05
4			



LONGITUDINAL CONSTRUCTION JOINT
LC Joint



LONGITUDINAL WEAKENED-PLANE JOINT
LWP Joint



EXPANSION JOIN
H Joint

GENERAL NOTES

▲ 1. When load transfer dowel assemblies are required, use dimensions shown in ( )'s. See Assembly Placement And Edge Clearance Detail, Std Dwg C-07.02.

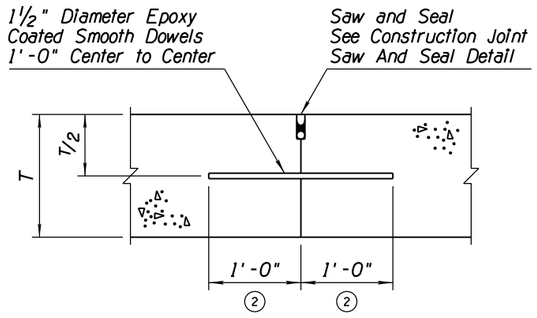
2. In slip form type pavement construction, LWP joints shall be used. In fixed form construction either LWP or LC joints may be used.

3. K joints shall be constructed around the complete perimeter of miscellaneous structures, or as directed by the Engineer.

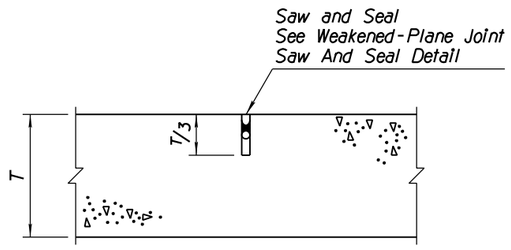
4. Miscellaneous structures include, but are not limited to, catch basins, sign structure foundations, piers, abutments, barrier transitions, slotted drains and other concrete facilities, constructed within the right-of-way.

JOINT ABBREVIATIONS

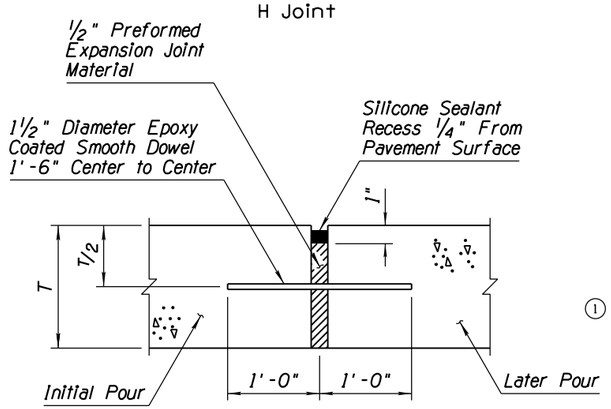
LWP	-	Longitudinal Weakened-Plane Joint
TWP	-	Transverse Weakened-Plane Joint
LC	-	Longitudinal Construction Joint
TC	-	Transverse Construction Joint
E, H, K	-	Expansion Joints
S	-	AC/PCCP Edge-Seal Joint
T	-	PCCP Thickness
① PE	-	Polyethylene



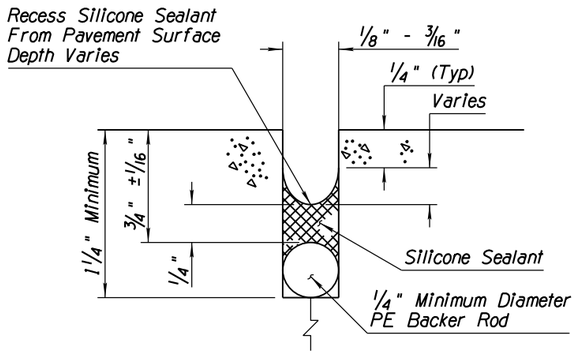
TRANSVERSE CONSTRUCTION JOINT
TC Joint
Non-Skewed & Skewed Joints



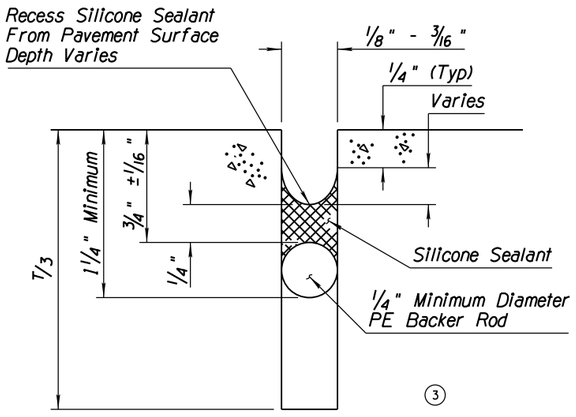
TRANSVERSE WEAKENED-PLANE JOINT
TWP Joint
W/O Load Transfer Dowel Assemblies



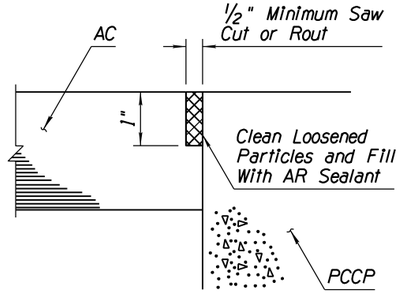
EXPANSION JOINT
E Joint



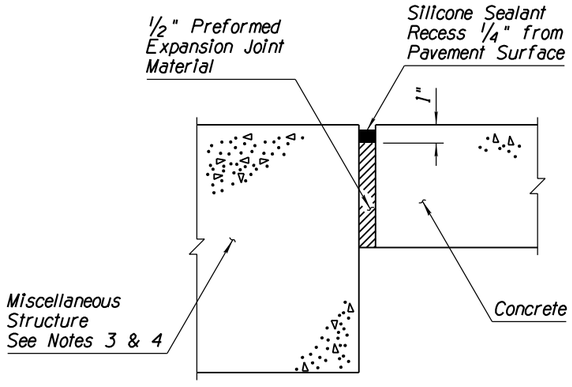
CONSTRUCTION JOINT
SAW AND SEAL DETAIL



WEAKENED-PLANE JOINT
SAW AND SEAL DETAIL



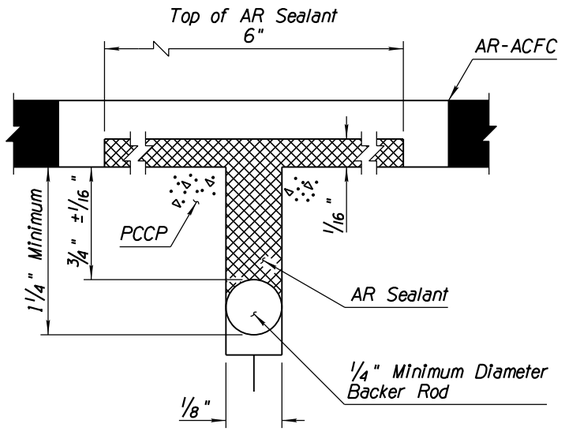
AC/PCCP EDGE-SEAL JOINT
S Joint
(Where Specified on Plans)



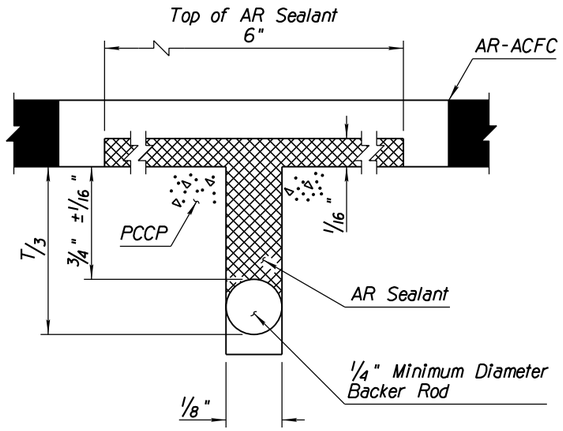
EXPANSION JOINT
K Joint (See Notes 3 & 4)

APPROVED FOR DESIGN	STATE OF ARIZONA DEPARTMENT OF TRANSPORTATION ROADWAY STANDARD DRAWINGS	REV. 5/12
APPROVED FOR DISTRIBUTION	PCCP JOINTS	DRAWING NO. C-07.01 Sheet 1 of 2

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	REISSUED STANDARD DRAWING	RLF	7/05
2	REVISED SECTION VIEW AND NOTE	RLF	5/12
3			
4			



LONGITUDINAL CONSTRUCTION
JOINT DETAIL
(WITH AR-ACFC)



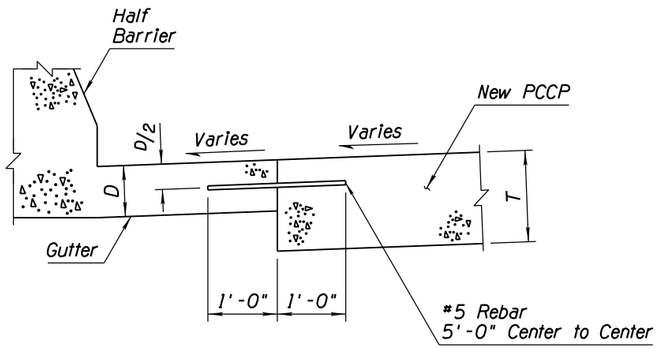
WEAKENED-PLANE
JOINT DETAIL
(WITH AR-ACFC)

GENERAL NOTES

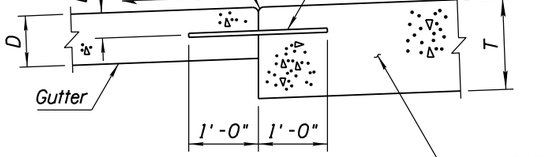
1. Joints are generally shown with pavement sloping toward the joint.

JOINT ABBREVIATIONS

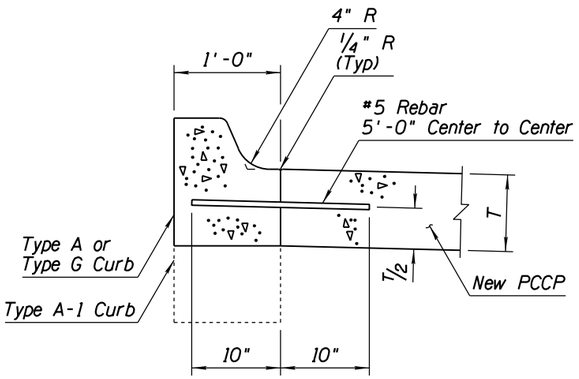
G - Gutter Joint
T - PCCP Thickness
D - Gutter Thickness
B - Barrier Joint
② F - Barrier Footing Concrete Thickness (Full-depth Concrete Shown)



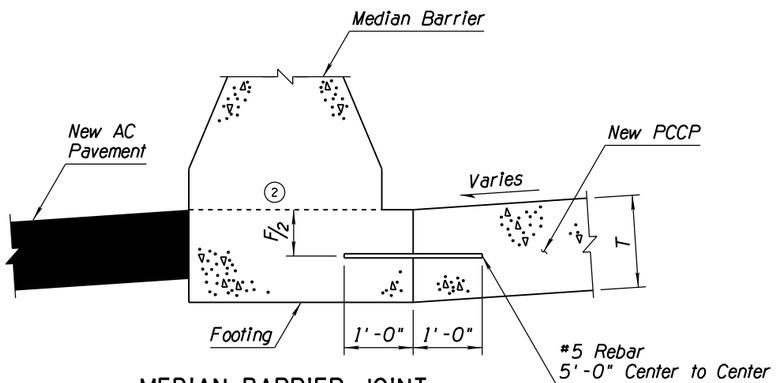
HALF BARRIER JOINT
B Joint



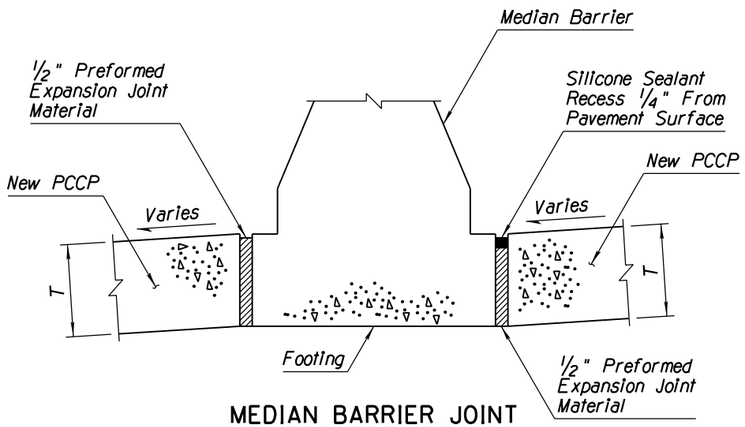
CURB & GUTTER JOINT
G Joint



SINGLE CURB JOINT
A Joint



MEDIAN BARRIER JOINT
B Joint
AC Pavement on Back Side of Barrier



MEDIAN BARRIER JOINT
B Joint
PCCP on Both Sides of Barrier

APPROVED FOR DESIGN	STATE OF ARIZONA DEPARTMENT OF TRANSPORTATION ROADWAY STANDARD DRAWINGS	REV. 5/12
APPROVED FOR DISTRIBUTION	PCCP JOINTS	DRAWING NO. ① C-07.01 Sheet 2 of 2

normal.tbl

Exhibit 10

TPA 400-1.3 Pavement Design Summary – Koli Road TI

See attached

I-10 Gila River Indian Community Design-Build Project

I-10 Koli Road Traffic Interchange

ADOT General Engineering Consultant

Pavement Design Summary

ADOT Report No. 25-20-F; ADOT TRACS No. F025201D

June 3, 2025 | Terracon Project No. 65225282

Prepared for:

HDR Engineering, Inc.
20 E. Thomas Road, Suite 2500
Phoenix, Arizona 85012



EXPIRES 6/30/2026

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June 3, 2025

HDR Engineering, Inc.
20 E. Thomas Road, Suite 2500
Phoenix, Arizona 85012

Attn: Mr. Nick LaFronz, P.E.
Phone: (602) 522-7728
Email: nick.lafronz@hdrinc.com

Report Type: Final

Re: Pavement Design Summary
I-10 Gila River Indian Community Design-Build Project
I-10 Koli Road Traffic Interchange (TI)
ADOT General Engineering Consultant
ADOT Report No. 25-20-F; ADOT TRACS No. F025201D
Terracon Project No. 65225282

Dear Mr. LaFronz:

Terracon Consultants, Inc. (Terracon) has completed the Geotechnical Engineering Services for the above referenced project in general accordance with the Terracon Change Order No. 1 for Geotechnical Engineering Services – Revision 2, dated August 17, 2023. This Pavement Design Summary (PDS) report presents the findings of the subsurface exploration and provides recommendations concerning pavement thickness design for the proposed I-10 Koli Road TI project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon

Ramon Padilla, P.E.
Geotechnical Services Manager



Donald R. Clark, P.E. EXPIRES 6/30/2026
Sr. Consultant/Sr. Principal

Reviewed By: Joseph A. Phillips, P.E., Sr. Consultant / Sr. Principal

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Pavement Structural Sections ..... Exhibit 1

Appendix A

Traffic Interchange Ramps Calculation Package ..... A-1 to A-14

Appendix B

Crossroad Calculation Package ..... B-1 to B-13

Introduction

Terracon performed the pavement engineering services as part of the General Engineering Consultant (GEC) services for the Arizona Department of Transportation (ADOT) Interstate Highway 10 (I-10) Gila River Indian Community (GRIC) Interstate Widening planned from State Route 202L (SR202L, Santan / South Mountain) to the north end of the Gila River Bridge Replacement Project (in the Phoenix to Casa Grande area in Arizona). The overall project limits extend from approximately I-10 Milepost (MP) 161 (north limit of the project) towards the south to the north end of the Gila River Bridge Replacement Project (or approx. MP 172.75).

HDR Engineering, Inc. (HDR) prepared a Design Concept Report (DCR) for a broader extent of the I-10 GRIC corridor and the DCR was titled: *Design Concept Report, Interstate 10 Corridor: State Route 202L to State Route 387, Maricopa and Pinal County, Arizona*, ADOT Project Nos. F0252 01L and F0252 02L, Federal Aid No. 010-C(222)S, dated October 2023. Terracon's scope of work for the I-10 corridor extended from approximately I-10 MP 161 to MP 172.75, and the reports previously prepared by Terracon for this corridor include the following:

- *Geotechnical Engineering Data Report, I-10 Gila River Indian Community Design-Build Project, 202L to the Gila River Bridge, ADOT General Engineering Consultant* (Terracon Project No. 65225282, dated April 2, 2024).
- *Pavement Design Summary, I-10 Gila River Indian Community Design-Build Project, 202L to the Gila River Bridge, ADOT General Engineering Consultant, ADOT Report No. 24-28-F; ADOT TRACS No. F025201D* (Terracon Project No. 65225282, dated August 1, 2024).
- *Final Materials Design Report, I-10 Gila River Indian Community Design-Build Project, 202L to the Gila River Bridge, ADOT General Engineering Consultant, ADOT Report No. 24-28-F; ADOT TRACS No. F025201D / F072101C* (Terracon Project No. 65225282, dated Dec. 30, 2024).

The I-10 Koli Road Traffic Interchange (TI) Underpass (UP) was added to the project and is planned at approximately I-10 Milepost (MP) 163.5 between the I-10 traffic interchanges at Wild Horse Pass Boulevard and Queen Creek Road. Terracon subsequently performed additional geotechnical exploration for the I-10 Koli Road TI and summarized the results in a report titled: *Geotechnical Engineering Data Report, I-10 Gila River Indian Community Design-Build Project, I-10 Koli Road Traffic Interchange (TI), ADOT General Engineering Consultant* (Terracon Project No. 65225282, draft dated April 18, 2025). The results of the additional geotechnical exploration were used to prepare this Pavement Design Summary (PDS) report and present the pavement structure design recommendations for the new I-10 Koli Road TI ramps and crossroad within the ADOT right-of-way (ROW).

The purpose of the pavement engineering services summarized in this report is to support HDR as the ADOT GEC for the project for the planned I-10 Koli Road TI improvements. The pavement design recommendations presented in this PDS report are based on the results of the field and laboratory testing, our experience with similar soil conditions, our understanding of the proposed project, and the ADOT methodologies, standards and procedures outlined in the ADOT Pavement Design Manual (PDM)(2017).

Project Description

Our initial understanding of the project was provided in the previously referenced change order proposal and our final understanding of the project conditions is as follows:

Item	Description
Project Description	Based on the information provided, we understand the project will include widening I-10 with 1 general purpose lane and 1 High-Occupancy Vehicle (HOV) lane in each direction from SR202L to Riggs Road. This PDS report is limited to the proposed new I-10 Koli Road TI planned between the I-10 traffic interchanges at Wild Horse Pass Boulevard and State Route (SR) 347 / Queen Creek Road.
I-10 and Koli Road Traffic Interchange Bridge Structures	The new I-10 Koli Road TI is planned to consist of a Diverging Diamond Interchange (DDI). Based on the information provided, the proposed bridge structures for the scope of work presented in this report consist of the following: • I-10 Koli Road TI UP o New 2 span bridge over I-10 for Koli Road WB traffic. o New 2 span bridge over I-10 for Koli Road EB traffic.
Pavements	New pavements consisting of both asphaltic concrete (AC) and portland cement concrete pavements (PCCP) are anticipated in order to integrate the proposed improvements with the existing roadway. Based on the information provided, the new pavement areas within the I-10 Koli Road TI limits for this report consist of the following: ■ I-10 Koli Road TI ramps (both east- and west-bound) ■ I-10 Koli Road TI crossroad improvements within the ADOT ROW Note: Based on the latest I-10 GRIC Project Koli Road TI Schematic Design (Roll Plot), includes PCCP from I-10 Mainline up to back of gore for the eastbound off ramp.
Grading / Slopes	Minor cuts and fills are generally anticipated for the I-10 Koli Road TI. As an exception, the traffic interchange improvements are anticipated to include the construction of new embankments to elevate the new alignments of on- and off-ramps to the crossroad underpass bridge structures.

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration:

Item	Description
Location	The I-10 Koli Road TI study limits are from MP 162.5 to 165, and the proposed I-10 Koli Road TI is planned at approximately MP 163.5 between the I-10 traffic interchanges at Wild Horse Pass Boulevard and SR 347 / Queen Creek Road. See referenced I-10 Koli Road TI *Geotechnical Engineering Data Report* for Site Vicinity Map and additional site location information.
Existing Improvements	The I-10 corridor at the proposed I-10 Koli Road TI consists of a 6-lane mainline freeway. The area of the planned I-10 Koli Road TI beyond the existing freeway consists of native desert land to the east, and of vacant land, gravel paved areas, and portions of the former Firebird Lake, which operated in the past as a boat racing facility to the southwest.
Current Ground Cover / Pavements	The majority of the existing pavements across the I-10 freeway consist of asphaltic concrete pavements. The ground cover across the eastern portion of the I-10 Koli Road TI consists of native desert with a sparse to moderate growth of desert vegetation. The ground cover across the southwestern portion of the I-10 Koli Road TI includes bare soil, areas with approximately 6 inches of gravel cover, & softened surficial soils from the former Firebird Lake.
Existing Topography	The topography along the I-10 and Koli Road TI area appears to be fairly flat, but overall the ground surface increases in elevation from south to north. Based on boring survey data obtained from the EPS Group, the ground surface elevation in the area of the I-10 Koli Road TI is roughly 1,147 feet above mean sea level (AMSL) to 1,153 feet AMSL.

Planned Pavement Improvements Overview

The I-10 Koli Road TI improvements will consist of the addition of a new traffic interchange to the I-10 GRIC corridor roadway improvements. The overall planned pavement improvements for the I-10 GRIC corridor roadway improvements include new pavements for: general purpose and HOV lane widening, minor shoulder widening, traffic interchange ramp improvements, and for traffic interchange crossroads. I-10 mainline pavement improvements are included in the previously referenced reports for the overall I-10 GRIC project (and are excluded from this report). The I-10 Koli Road TI pavement improvements presented in this PDS report are limited to the following roadways within the ADOT ROW:

- New Koli Road crossroad over I-10
- East- and West-Bound On- and Off-Ramps for the I-10 Koli Road TI

Crossroad Improvements

Based on the information provided including the referenced Schematic Design Roll Plot, the planned new pavement crossroad improvements for the I-10 Koli Road TI within the ADOT ROW are summarized in the following table:

I-10 Koli Road

Roadway Description	Planned Pavement Improvement
Koli Road (East) - From approximately 850 feet northeast of the I-10 CL to the ADOT ROW limit at approx. 1,000 feet northeast of the I-10 CL (approx. 150-ft length along the Koli Road alignment).	New AC Pavement
Koli Road (I-10 Crossing) - From approximately 700 feet southwest of the I-10 CL to 850 feet northeast of the I-10 CL (approx. 1,550-ft length along the Koli Road alignment).	New Portland Cement Concrete Pavement (PCCP) & Bridge Structure
Koli Road (West) - From approximately 700 feet southwest of the I-10 CL to the ADOT ROW limit at approx. 800 feet southwest of the I-10 CL (approx. 100-ft length along the Koli Road alignment).	New AC Pavement

Note: Based on the information provided, we understand the Koli Road new AC pavement sections beyond the ADOT ROW limits will be designed by others.

Traffic Interchange Ramp Improvements

The proposed new I-10 traffic interchange ramps at Koli Road are planned as (new) AC pavements. The following table outlines the planned improvements for the ramps:

Ramps – I-10 Traffic Interchange at Koli Road

Ramp	Summary of Planned Improvements
EB Off-Ramp	1 lane and widens to 3 lanes Note: Due to the existing I-10 mainline pavement consisting of PCCP at the intersection of this ramp, PCCP will extend from I-10 EB mainline PCCP up to back of gore of the EB Off-Ramp, and then AC for the remainder of the EB Off-Ramp up to the Koli Road PCCP limit.
EB On-Ramp	2 lanes tapers to 1 lane nearing I-10
WB Off-Ramp	1 lane and widens to 2 lanes
WB On-Ramp	3 lanes tapers to 1 lane nearing I-10

Pavement History

Existing Site Conditions



The overall project consists of the I-10 corridor extending from approximately SR202L (Santan) to SR387 between Phoenix and Casa Grande, Arizona. The project limits for this report are limited to the proposed I-10 Koli Road TI planned between the I-10 traffic interchanges at Wild Horse Pass Boulevard and SR 347 / Queen Creek Road.

The I-10 corridor at the proposed I-10 Koli Road TI consists of a 6-lane mainline freeway. The area of the planned I-10 Koli Road TI beyond the existing freeway consists of native desert land to the east, and of vacant land, gravel paved areas, and portions of the former Firebird Lake to the southwest (with softened surficial soils).





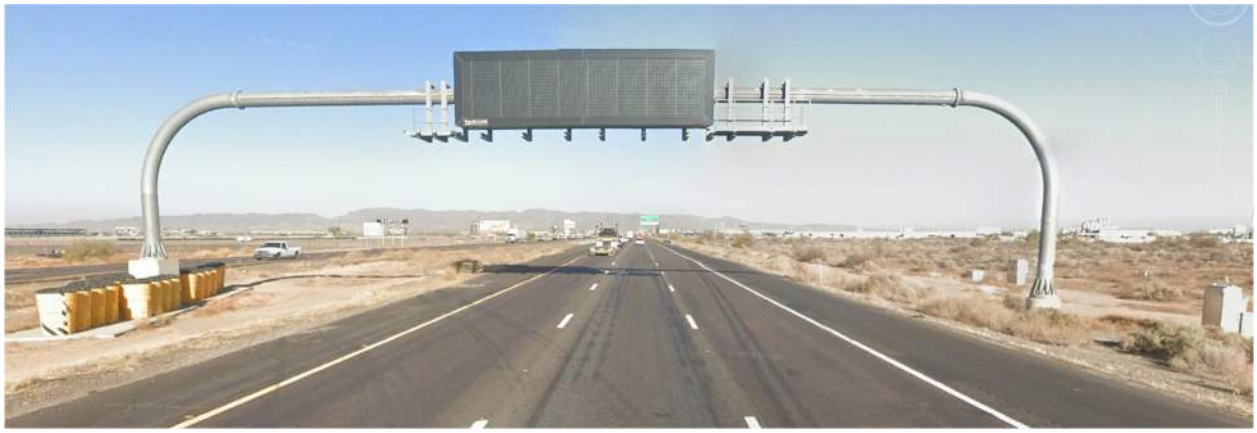
Project Alignment Overview

The project limits of this report are comprised of the planned new I-10 Koli Road TI. The following provides a general overview of the site utilizing photographs of I-10 at the approximate location of the proposed I-10 Koli Road TI area. The following photographs shown in this section are extracted images compiled from Google Earth Pro Street View.

I-10 facing south at the location of the proposed I-10 Koli Road TI:



I-10 facing north at the location of the proposed I-10 Koli Road TI:



Previous ADOT Projects

A summary of previous ADOT projects is presented in the previously referenced report titled *Geotechnical Engineering Data Report, I-10 Gila River Indian Community Design-Build Project, 202L to Gila River Bridge, ADOT General Engineering Consultant* (Terracon Project No. 65225282, final report dated April 2, 2024).

Subsurface Conditions

Existing Pavement Core Exploration Results

The existing pavements within the overall project were cored at 29 locations across the project site with an electric core rig and a 4-inch diameter core barrel. The cores were performed from January 22 to 25, 2024. A detailed summary of the cores is presented in the previously referenced report titled *Geotechnical Engineering Data Report, I-10 Gila River Indian Community Design-Build Project, 202L to the Gila River Bridge, ADOT General Engineering Consultant* (Terracon Project No. 65225282, dated April 2, 2024). The following table summarizes the pavement thicknesses measured from core explorations performed on I-10 in the general area of the proposed I-10 Koli Road TI between Wild Horse Pass Boulevard and SR 347 / Queen Creek Road:

Core No.	Existing Pavement Thicknesses (inches)				Roadway (and Approx. I-10 Station)	Approx. Latitude	Approx. Longitude
	AC	PCCP	AC	ABC			
2	1	15	--	4	I-10,EB,Far Right Lane (Sta 940)	33.27381°	-111.96262°
3	--	--	12	±6	I-10, EB, Far Left Lane (Sta 990)	33.26250°	-111.95379°
21	--	--	9	>9 [A]	I-10,WB,Far Right Lane (Sta 970)	33.26784°	-111.95746°

Legend: Portland Cement Concrete Pavement (PCCP); Asphaltic Concrete (AC); Aggregate Base Course (ABC); Interstate 10 (I-10); Eastbound (EB); Westbound (WB); Station (Sta).

Note [A]: Manual excavation refusal and/or difficulties prevented entire ABC thicknesses measurement.

Subsurface Soil Conditions

Specific conditions encountered at each boring location are indicated on the individual boring logs included in Appendix A of the previously referenced *Geotechnical Engineering Data Report* for the I-10 Koli Road TI. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. The results of the field and laboratory testing indicated variations in subsurface conditions and engineering characteristics throughout the site. The subsurface conditions for the project can be generalized as listed in the following table:

Generalized Subsurface Soil Conditions Summary			
Planned I-10 Koli Road Traffic Interchange & Ramps & Crossroad			
Description	Approx. Depth to Bottom of Stratum (feet bgs)	Material Encountered	Relative Density / Consistency
Stratum 1	4 to 14	Coarse-Grained Soils with variable amounts of Gravel, Silt and Clay; and stratified with Fine Grained Soils	Loose to Medium Dense / Stiff to Very Stiff
Stratum 2	49 to 59	Stratified deposits of Lean Clay, Sandy Lean Clay, Fat Clay, Silt, and Coarse-Grained Soils with variable amounts of Gravel	Variable Medium Dense to Very Dense / Variable Stiff to Hard
Groundwater at approx. 62 to 76 feet deep bgs (approx. Elev. 1,075 to 1,090 ft. amsl)			
Stratum 3 [A]	120½ (maximum depth explored)	Coarse-Grained Soils with variable amounts of Silt, Gravel and Cobbles	Dense to Very Dense

A. Auger refusal encountered in Stratum 3 soils due to gravels and possible cobbles at a depth of approximately 101½ feet and 109 feet below the existing ground surface (bgs) at the location of Boring B-21 and Boring B-24, respectively.

Pavement Subgrade Parameters

Based on the results of the pavement subgrade soil conditions encountered during our field exploration and laboratory testing for the project, the following sections provide a summary of the R-Values and Correlated R-Values for the project. Pavement subgrade evaluation was performed based on the results of the laboratory testing, including correlated and tested R-values, and in accordance with the 2017 ADOT Pavement Design Manual (PDM). The correlated R-Values presented in the following tables are in general accordance with Section 2.1.5.1 (Correlated R-value) and Table 2-3 (Correlated R-value at 300 psi) of the ADOT PDM (2017). Based on the Seasonal Variation Factors outlined on Table 2-4 of the ADOT PDM (2017) for Phoenix, Chandler and Casa Grande, a SVF of 1.0 was used for the project. All soils placed within 3 feet of finished pavement subgrade should meet the R-value requirements for the project.

Crossroad & Traffic Interchange Ramps – Pavement Subgrade Parameters

The R-Values and Correlated R-Values for the I-10 Koli Road TI crossroad and ramps are summarized in the following table:

Summary of Tested and Correlated R-Values								
Koli Road - Crossroad & Ramps at I-10								
Boring No.	Approx. Elevation (ft) [A]	Approx. Latitude / Longitude; and Approx. Station and CL Offset	Depth (ft)	LL	PI	-#200	Tested R-Value	Correlated R-Value [B]
R&C-39	1,150.86	33.267°/ -111.958°	0.5 – 6	19	3	33	--	56
R&C-40	1,150.98	33.267°/ -111.958°	1 – 6	22	8	37	--	44
R&C-41	1,151.41	33.266°/ -111.955°	1 – 6	22	10	38	--	40
R&C-42	1,151.59	33.265°/ -111.956°	0 – 3	0	0	59	--	44
R&C-43	1,149.01	33.270°/ -111.959°	0 – 4	24	9	40	--	41
R&C-44	1,151.37	33.268°/ -111.957°	2 – 7	0	0	27	--	69
R&C-45	1,151.85	33.267°/ -111.953°	0 – 4	20	6	39	--	46
R&C-46	1,152.63	33.266°/ -111.955°	0 – 2	0	0	37	--	60
R&C-47	1,151.97	33.268°/ -111.956°	0 – 5	0	0	28	--	68
R&C-48	1,153.05	33.269°/ -111.954°	0 – 4	0	0	39	--	58
R&C-49	1,150.02	33.266°/ -111.959°	3 - 8	25	9	29	--	47
R&C-50	1,150.30	33.266°/ -111.959°	2 - 7	27	15	36	21	34
R&C-51	Note [D]	33.265°/ -111.960°	3 - 8	24	7	31	--	50
R&C-52	Note [D]	33.263°/ -111.962°	0.5 - 6	23	9	35	35	43
R&C-53	1,147.11	33.263°/ -111.962°	1 - 6	25	9	47	--	37
TP-1	Note 3	33.266°/ -111.960°	2 - 4	33	15	29	--	37
						Count:	2	16
						Average:	28.0	48.4
						Adjusted Average:	28.0	47.5
						Standard Deviation:	9.9	10.9
						R_{mean}:	45	
						Design R_{mean}:	20 [C]	
						Construction Control R-Value (R_C):	20 [C]	

Legend: Liquid Limit (LL); Plastic Index (PI); Percent Passing the No. 200 Sieve (-#200).

Note [A]: Approximate existing ground surface elevation at the surveyed boring location at the time of the geotechnical field exploration.

Note [B]: The Correlated R-values and R_{MEAN} outlined in the table above were correlated in general accordance with the 2017 ADOT PDM (Sections 2.1.5.1, 2.1.5.2 and 2.1.5.2), including determining R-value Adjusted Averages for standard deviations greater than 10.

Note [C]: Koli Road and the majority of the TI Ramps will be elevated above existing grade on embankment (imported borrow). Therefore, the design and control R-value are equal to the minimum required for borrow (2017 ADOT PDM Section 1.7.2).

Note [D]: Planned exploration location not accessible due to soft surficial soils within the former Firebird Lake area, exploration location was moved to the edge of the area and was not surveyed.

Unsuitable Subgrade and Over-Excavation Limits

The recommended R-value requirements were compared to the correlated R-values previously tabulated, and the tested and correlated R-values were greater than the Construction Control R-Value. Therefore, no areas of unsuitable subgrade were identified based on the exploration location and correlated R-value information. If areas of the proposed roadway alignment include (unsuitable) subgrade soils/materials with an R-value of less than the requirements, then these areas will require over-excavation to a minimum depth of 3 feet below finished subgrade elevation. The over-excavated areas should be replaced with suitable soils meeting the project R-value requirements for the project. The over-excavation of unsuitable subgrade should extend across the entire proposed pavement width plus a minimum lateral extent of 5 feet.

> Note: Koli Road and the majority of the TI Ramps will be elevated above existing grade, and existing subgrade only is a consideration where the ramps touch down close to I-10 mainline grade and where Koli Road reaches existing grade.

Traffic and ESALs Overview

Terracon was provided traffic data for the Koli Road TI proposed ramps and crossroad in a memorandum prepared by HDR and titled *I-10 Koli Road Traffic Interchange Traffic Memo, I-10 Loop 202 to SR-387 Wild Horse Pass Corridor*, dated December 20, 2024. As outlined in the 2017 ADOT PDM (Appendix A, Table A-3), the design Equivalent Single Axle Loads (ESALs) should be a minimum 10% for Ramps and 5% for Crossroads of total (one-way) mainline ESALs, unless site specific traffic data indicates a higher value. Therefore, ESALs for the I-10 Koli Road ramps and crossroad were calculated based on the Average Annual Daily Traffic (AADT) and truck percentages presented in the referenced traffic memorandum, then compared to the minimum required percentages of mainline ESALs (for ramps and crossroads), and the greater ESAL values were used for the design of the pavement structures. The design ESALs for the I-10 Koli Road ramps and crossroad pavements planned for the project were determined using the following parameters:

- Two-way traffic outlined in the memorandum and/or minimum mainline percentage
- Annual growth rates derived for the I-10 Mainline Segment (based on the DCR and/or ADOT AADT projections)
- Truck Load Factor Clusters and associated cluster distribution
- Truck Traffic Classification (TTC) with associated Vehicle Class Distribution (VCD)
- A Directional Distribution (D_D) Factor and a Lane Distribution (D_L) Factor
- An initial design year of 2027 (anticipated build year)

The new pavements planned for the I-10 Koli Road TI consist of the ramps and crossroad within the ADOT ROW. The I-10 Koli Road TI Ramps are planned to be constructed with new AC pavements. Koli Road pavements extending beyond the I-10 bridge structure are planned to consist of new PCCP followed by new AC as the roadway extends further away from the I-10 crossing. The Design Traffic, Traffic Design Parameters, and the Design ESALs for the I-10 Koli Road TI Ramps and Crossroad are outlined in the following sections.

Design Traffic

As previously mentioned, ESALs for the I-10 Koli Road ramps and crossroad were calculated based on the Average Annual Daily Traffic (AADT) and truck percentages presented in the referenced traffic memorandum, then compared to the minimum percentages of mainline ESALs, and the greater ESAL values were used for the design of the pavement structures. Also, as previously mentioned, a PDS report was prepared for the I-10 corridor from State Route 202L to the Gila River Bridge, and this previous PDS was titled *Pavement Design Summary, I-10 Gila River Indian Community Design-Build Project, 202L to the Gila River Bridge, ADOT General Engineering Consultant, ADOT Report No. 24-28-F; ADOT TRACS No. F025201D* (Terracon Project No. 65225282, dated August 1, 2024). Various growth rates were calculated in this previous PDS based on traffic information presented in the project DCR, the ADOT 2022 AADT Report, the ADOT Multimodal Planning Transportation Data Management System, and the Maricopa County Traffic Counts database.

The *I-10 Koli Road Traffic Interchange Traffic Memo* generally included 2050 AADT information, however, existing/current AADT data to estimate growth rates does not exist or was limited as the I-10 Koli Road TI will be a new interchange. Therefore, the growth rate estimated for the I-10 Mainline segment (Segment 2) that includes the I-10 Koli Road TI was used where appropriate. The following table summarizes the AADT and estimated growth rate for the I-10 Mainline Segment 2 that includes the proposed I-10 Koli Road TI:

I-10 Mainline Segment	2019 AADT (DCR)	2040 AADT (DCR)	2050 AADT (DCR)	2022 AADT (ADOT)	2042 AADT (ADOT)
Segment 2 (WHP to SR347)	107,000	171,000	198,000	112,237	189,400
Estimated Growth Rate:	2.26%			2.65%	
	2.01%				
Design Value:	2027 AADT:	127,924	2022 ADOT Truck %:	Singles:	4.14%
	Growth Rate:	2.65%		Combos:	9.57%
Note:	AADT and Growth Rate selected for project based on ADOT Report.				

Legend: Wild Horse Pass Boulevard (WHP); State Route 347 (SR347).

Traffic Interchange Ramps

The following table presents the projected traffic data for the I-10 Koli Road TI Ramps based on the *I-10 Koli Road Traffic Interchange Traffic Memo* and the I-10 Mainline Segment 2 growth rate outlined above:

Ramps – I-10 Traffic Interchange at Koli Road				
Ramp	2027 AADT (back-calculated)	2047 AADT (back-calculated)	2050 AADT (Memo)	Growth Rate
EB Off-Ramp	1,009	1,702	1,840	2.65%
EB On-Ramp	1,087	1,835	1,985	
WB Off-Ramp	4,975	8,396	9,080	
WB On-Ramp	19,977	33,712	36,465	

Crossroad

The following table presents the projected traffic data for the I-10 Koli Road TI Crossroad based on the *I-10 Koli Road Traffic Interchange Traffic Memo* and the I-10 Mainline Segment 2 growth rate outlined above:

Koli Road Crossroad at the I-10 Traffic Interchange				
Roadway	AADT 2027 (back-calculated)	2047 AADT (back-calculated)	2050 AADT (Memo)	Growth Rate
West of I-10	12,241	20,658	22,345	2.65%
Between Ramps	6,057	10,221	11,055	
East of I-10	5,175	8,732	9,445	

Traffic Design Parameters and ESALs

The Truck Traffic Classification (TTC), Lane Distribution Factor (D_L), and the Truck Load Factor Cluster were selected based on Tables A-1, A-2 and A-4 in the ADOT PDM (2017), respectively. The Directional Distribution Factor (D_D) of 50% was assumed for the I-10 Koli Road TI crossroad traffic. The Truck Volumes (of Singles and Combos) were obtained from the *I-10 Koli Road Traffic Interchange Traffic Memo (Memo)*. ESALs for the I-10 Koli Road ramps and crossroad were calculated based on the Average Annual Daily Traffic (AADT) and truck percentages presented in the referenced traffic memorandum, then compared to the ADOT PDM (2017) minimum

required percentages of mainline ESALs (for ramps and crossroads), and the greater ESALs values were used for the design of the pavement structures.

Traffic Interchange Ramps

The traffic design parameters used for Traffic Interchange Ramps pavement thickness design and their estimated design Equivalent Single Axle Loads (ESALs) are outlined in the following tables:

Ramps – I-10 Traffic Interchange at Koli Road				
Ramp	Cluster No.	Truck Traffic Classification	Lane Distribution Factor (D_L)	Directional Distribution Factor (D_D)
EB Off-Ramp	1	AZ-6	1.0	1.0
EB On-Ramp	1	AZ-6	1.0	1.0
WB Off-Ramp	1	AZ-6	1.0	1.0
WB On-Ramp	1	AZ-5	1.0	1.0

Ramps – I-10 Traffic Interchange at Koli Road						
Ramp	2027 AADT	Truck Percentage Singles (Combos)	Growth Rate (%)	Design Period (years)	ESALs (Memo)	Pavement Type
EB Off-Ramp	1,009	4.9% (0.3%)	2.65%	20	277,468	Flexible (AC)
EB On-Ramp	1,087	5.3% (0.3%)			318,713	
WB Off-Ramp	4,975	7.2% (1.3%)			2,305,299	
WB On-Ramp	19,977	5.1% (1.6%)			9,813,511	

Note: The Truck Volumes (Singles and Combos) are based on the percentages outlined in the *I-10 Koli Road Traffic Interchange Traffic Memo*.

Ramps – I-10 Traffic Interchange at Koli Road			
Ramp	ESALs (Memo)	ADOT PDM Minimum ESALs (10% of I-10 Mainline)	Design ESALs
EB Off-Ramp	277,468 [A]	11,697,009	11,697,009
EB On-Ramp	318,713 [A]		11,697,009
WB Off-Ramp	2,305,299 [A]		11,697,009
WB On-Ramp	9,813,511 [A]		11,697,009

Note [A]: Calculated Ramp ESALs less than 10% of Mainline ESALs. Therefore, Design ESALs based on 10% of ADOT PDM Mainline minimum requirement for Ramps.

Crossroad

The traffic design parameters used for the Crossroad pavement thickness design and the estimated design Equivalent Single Axle Loads (ESALs) are outlined in the following tables:

Koli Road Crossroad at the I-10 Traffic Interchange				
Roadway	Cluster No.	Truck Traffic Classification	Lane Distribution Factor (D_L)	Directional Distribution Factor (D_D)
West of I-10	3	AZ-6	0.9	0.5
I-10 Crossing	3	AZ-6	0.9	0.5
East of I-10	3	AZ-6	0.9	0.5

Koli Road Crossroad at the I-10 Traffic Interchange						
Roadway	2027 AADT	Truck Percentage Singles (Combos)	Growth Rate (%)	Design Period (years)	Design ESALs	Pavement Type
West of I-10	12,241	6.7% (1.1%)	2.65%	20	1,974,290	Flexible (AC)
I-10 Crossing	6,057	6.9% (1.1%)			1,233,403	Rigid (PCCP)
East of I-10	5,175	6.9% (1.2%)			859,307	Flexible (AC)

Koli Road Crossroad at the I-10 Traffic Interchange			
Ramp	ESALs (Memo)	ADOT PDM Minimum ESALs (5% of I-10 Mainline)	Design ESALs
West of I-10	1,974,290 [A]	5,853,387	5,853,387
I-10 Crossing	1,233,403		16,199,164 [B]
East of I-10	859,307 [A]		5,853,387

Note [A]: Calculated Crossroad ESALs less than 5% of Mainline ESALs. Therefore, Design ESALs based on 5% of ADOT PDM Mainline minimum requirement for Crossroads.

Note [B]: PCCP limits for the I-10 Crossing extend into the I-10 Koli Road TI ramp areas. Therefore, Design ESALs based on 10% of ADOT PDM Mainline minimum requirement for Ramps (and on PCCP ESAL design criteria).

Pavement Design Parameters

Pavement design parameters were utilized based on the 2017 ADOT Pavement Design Manual. The following tables summarize the design parameters that were utilized for the rigid and flexible pavement thickness designs.

Traffic Interchange Ramps

Design Parameter		Ramps – I-10 Traffic Interchange at State Route 347 (SR347) / Queen Creek Road			
		EB I-10 Off-Ramp	EB I-10 On-Ramp	WB I-10 Off-Ramp	WB I-10 On-Ramp
Design ESALs		11,697,009	11,697,009	11,697,009	11,697,009
Design R-value		20	20	20	20
Subgrade Resilient Modulus (psi)		12,125	12,125	12,125	12,125
Level of Reliability		99%	99%	99%	99%
Standard Normal Deviate		-2.327	-2.327	-2.327	-2.327
Standard Deviation		0.45	0.45	0.45	0.45
Initial PSI		4.2	4.2	4.2	4.2
Terminal PSI		3.0	3.0	3.0	3.0
Layer Coefficient	Asphaltic Concrete (AC)	0.44	0.44	0.44	0.44
	Aggregate Base (Class 2)	0.14	0.14	0.14	0.14
Seasonal Variation Factor		1.0	1.0	1.0	1.0
Drainage Coefficient for Class 2 layer (fair)		1.0	1.0	1.0	1.0
Flexible Pavement Structural Number (SN)		5.62	5.62	5.62	5.62

Crossroad

Design Parameter		Crossroad – Koli Road at I-10		
		AC Crossroad West of I-10	PCCP Limits of Crossroad at I-10	AC Crossroad East of I-10
Design ESALs		5,853,387	16,199,164	5,853,387
Design R-value		20	20	20
Subgrade Resilient Modulus (psi)		12,125	12,125	12,125
Level of Reliability		95%	95%	95%
Standard Normal Deviate		-1.645	-1.645	-1.645
Standard Deviation		0.45	0.25	0.45
Initial PSI		4.2	4.2	4.2
Terminal PSI		2.8	2.8	2.8
Layer Coefficient	Asphaltic Concrete (AC)	0.44	--	0.44
	Aggregate Base (Class 2)	0.14	--	0.14
Seasonal Variation Factor		1.0	1.0	1.0
Drainage Coefficient for Class 2 layer (fair)		1.0	1.0	1.0
Base Material		--	AB Class 2	--
Base Material Modulus (psi)		--	36,000	--
Base Material Thickness (in)		--	4	--
Composite Modulus k_m (pci)		--	650	--
Loss of Subgrade Support		--	0	--
Modulus of Subgrade Reaction (pci)		--	650	--
Modulus of Rupture for Concrete (psi)		--	670	--
Compressive Strength of Concrete f'c (psi)		--	5,000	--
Modulus of Elasticity (ksi)		--	4,000	--
Rigid Pavement Type		--	Plain Jointed	--
Load Transfer (J)		--	3.9	--
Flexible Pavement Structural Number (SN)		4.33	--	4.33

Design Thickness Recommendations

Based on the information provided as outlined in this report and in accordance with the ADOT pavement design procedures, the pavement improvements presented in the following tables are recommended for the project.

Traffic Interchange Ramps

Ramps I-10 Traffic Interchange at Koli Road	Thicknesses shown are in inches			
	PCCP (Plain w/ Dowels)	AC	AB	Total
East-Bound Off-Ramp [A]	14		4	18
East-Bound Off-Ramp [B]	--	8.5	14	22.5
East-Bound On-Ramp	--	8.5	14	22.5
West-Bound Off-Ramp	--	8.5	14	22.5
West-Bound On-Ramp	--	8.5	14	22.5

Note [A]: Ramp from existing I-10 Mainline PCCP to a point at the back of gore to match the I-10 Mainline PCCP structural sections specified for the I-10 median widening.

Note [B]: Remainder of Ramp extending from a point at the back of gore up to the Koli Road PCCP limit.

The following are dowel requirements for the PCCP portion of the EB Off-Ramp extending from the I-10 Mainline PCCP that will be constructed to match the I-10 Mainline PCCP to a point at the back of gore. Any existing non-doweled PCCP that is proposed to be a traffic lane as part of this project is recommended to be removed and replaced with doweled PCCP. The longitudinal joints of proposed PCCP should be located at the proposed lane line or at the center of the planned lane (and not at or near wheel paths) with the following minimum dowel requirements:

- ADOT Standard epoxy-coated smooth dowel bars along the longitudinal joint (#5 x 24-inch long at 30-inch centers) when the widening width is 12 feet or more.
- ADOT Standard epoxy-coated deformed dowel bars along the longitudinal joint (#5 x 24-inch long at 30-inch centers) when the widening width is less than 12 feet.

If PCCP longitudinal joints are not located at the lane line or center of the lane, then the minimum longitudinal dowel requirements shall not be less than: 1½-inch diameter x 18-inch long epoxy-coated smooth dowel bars placed at 24-inch on centers; or #8 x 18-inch long epoxy-coated smooth dowel bars placed at 18-inch on centers. Longitudinal dowel bars shall not be placed within 15 inches of a transverse joint.

Crossroad

Crossroad Koli Road at I-10	Thicknesses shown are in inches			
	PCCP (Plain)	AC	AB	Total
AC Crossroad - West of I-10	--	6.5	11	17.5
PCCP Limits of Crossroad at I-10	11.5	--	4	15.5
AC Crossroad - East of I-10	--	6.5	11	17.5

Summary of Design Thickness Recommendations

The Design Thickness Recommendations presented in the previous tables for the Ramps and Crossroad on the ADOT I-10 Koli Road TI are summarized into the following single table:

Summary of Structural Thicknesses (in inches)

Roadway Description [1]	Roadway Location [A]	PCCP (Plain w/ Dowels)	PCCP (Plain)	AC	AB	Total
I-10 TI UP at Koli Road	EB Off-Ramp	14	--	--	4	18 [B]
			--	8.5	14	22.5 [C]
	EB On-Ramp		--	8.5	14	22.5
	WB Off-Ramp		--	8.5	14	22.5
	WB On-Ramp		--	8.5	14	22.5
I-10 Crossroad Koli Road	West of I-10 [D]		--	6.5	11	17.5
	PCCP Limits		11.5	--	4	15.5
	East of I-10 [D]		--	6.5	11	17.5

Note [A]: Refer to the project plans for exact project limits and locations and stationing of each proposed improvement.
Note [B]: Ramp from existing I-10 Mainline PCCP to a point at the back of gore to match the I-10 Mainline PCCP structural sections specified for the I-10 median widening.
Note [C]: Remainder of Ramp extending from a point at the back of gore up to the Koli Road PCCP limit.
Note [D]: AC pavement crossroad future improvement by others.

General Comments

This report was prepared as part of the General Engineering Consultant (GEC) services for the project. Any other geotechnical and/or pavement structure recommendations for the design and construction of the project that are required to complement the information and considerations presented in this report will be the responsibility of the awarded design-build team for the project. The information and considerations presented in this report are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. We understand it will be the responsibility of the awarded design-build team to retain a qualified and experienced geotechnical engineer to provide any supplemental design recommendations that may be required for the project and to provide observation and testing services during pertinent construction phases. If variations appear, further evaluation by the retained qualified and experienced geotechnical engineer will be required to develop any necessary supplemental recommendations for the project.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration and/or modification of groundwater/surface water flow during construction. Evaluation of these items on nearby properties are commonly

associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

EXHIBITS

Pavement Structural Sections



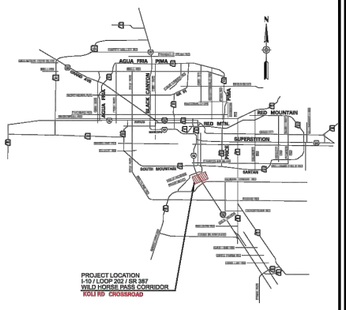
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INTERMODAL TRANSPORTATION DIVISION

TRACS NO. F0701 01L

I–10 KOLI ROAD INTERCHANGE PLAN AND PROFILES



MIDPOINT OF PROJECT
Central Zone
State Plane Coordinates
X=687,772
Y=824,860

DESIGN DATA

I-10
2019 ADT = 107,000
2040 ADT = 171,000
2050 ADT = 198,000

Koli Rd
2023 ADT = To Be Provided
2050 ADT = To Be Provided

DESIGN SPEEDS:

I-10
Mainline = 65 MPH (Posted)

Koli Rd
Outside TI = 40 MPH
Inside TI = 30 MPH

Koli Rd DDI
CrossOver Curves = 20 MPH
CrossOver Angle = 50 Degrees
Turning Roadways = 20 MPH

Ramps
Body = 50 MPH
@ Entrance Gore = 55 MPH
@ Exit Gore = 60 MPH
@ TI Terminal = 20 MPH

LENGTH OF PROJECT

I-10
Mile Post 162.50 to 165.00

EB Koli Rd Cst CL
Sta 121+24.83 to Sta 136+82.69 = 1,557.86'

WB Koli Rd Cst CL
Sta 221+68.94 to Sta 237+67.96 = 1,599.02'

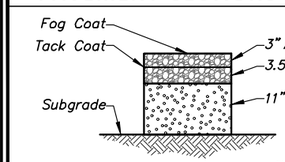
LEGEND

- New Pavement (PCCP)
- New Pavement (Asphalt)
- New Bridge
- Fill Line
- Cut Line
- New FMS
- New Full Access Control
- Median
- GRIC Ownership Parcels
- Concrete Sidewalk
- New R/W
- Exst R/W (Line) Exst Access Control (Hash Marks)
- New Retaining Wall
- Land Boundary

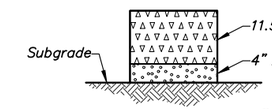
100 0 100 200
1"=100'
SCALE

I-10/Koli Road Traffic Interchange Study

PAVEMENT SECTIONS - CROSSROADS



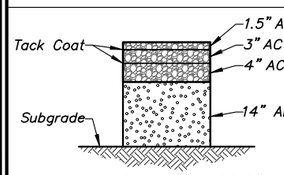
Total Thickness 17.5"
PAVEMENT SECTION NO. C7-K
AC CROSSROAD –
WEST & EAST of I-10



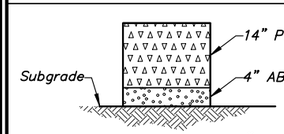
Total Thickness 15.5"
PAVEMENT SECTION NO. C8-K
PCCP LIMITS of CROSSROAD at I-10

NOTE:
PAVEMENT SECTION NOs.:
CROSSROAD C7-K & C8-K

PAVEMENT SECTIONS - RAMPS



Total Thickness 22.5"
PAVEMENT SECTION NO. R11-K
EAST BOUND OFF-RAMP,
EAST BOUND ON-RAMP,
WEST BOUND OFF-RAMP
AND WEST BOUND ON-RAMP



Total Thickness 18"
1-10 MAINLINE
PAVEMENT SECTION NO. M1-K
EB OFF-RAMP from
I-10 MAINLINE to a POINT
at BACK of GORE

NOTE:
Refer to Project Contract Documents for the exact project limits, locations, and stationing of each proposed improvement.

NOTE:
PAVEMENT SECTION NOs.:
RAMPS R11-K

I-10 Koli Road TI

NOTE:
EB Off-Ramp from existing I-10 Mainline PCCP to a point at the back of gore.
See Detail M1-K, this sheet

EASTBOUND OFF-RAMP

WESTBOUND ON-RAMP

EASTBOUND ON-RAMP

WESTBOUND OFF-RAMP

KOLI RD

Exst R/W

Protect In Place

Maintenance Access Rd (Typ)

Exst I-10 Cst ℄

WB Koli Rd Ramp A Cst ℄

WB Koli Rd Ramp B Cst ℄

WB Koli Rd Ramp B1 Cst ℄

WB Koli Rd Ramp A1 Cst ℄

WB Koli Rd Cst ℄
POB 221+59.92

WB Koli Rd Cst ℄
POE 237+90.99

No Local Access
Future Connection By Others

Future Community Project
Connections Shown For Information Only

New R/W and Access Control

Proposed 14' x 16'
Equipment Underpass

EB Koli Rd Cst ℄
POB 121+07.31

EB Koli Rd Cst ℄
POE 136+99.87

EB Koli Rd Ramp D Cst ℄

EB Koli Rd Ramp D1 Cst ℄

WB Koli Rd Ramp C Cst ℄

WB Koli Rd Ramp C1 Cst ℄

New 30" CMP

Remove By Others
Exst Aluminum or
Similar Bleacher

Terracon
Explore with us
4685 South Ash Avenue, Suite H-4 Tempe, AZ 85282
PH. (480) 897-8200 FAX. (480) 897-1133 www.Terracon.com

NOTE:
I-10 GRIC Project Schematic Design (Roll Plot) was provided by HDR, and Terracon added pavement section information.

EXHIBIT
1

n:\projects\2022\65225282\working files\drafts\roh\drafts\figures\cad\65225282_pav_rev 25.06.02.dwg / tab: Exh 1 (Koli Rd TI)

MARCH 26, 2025

APPENDIX A

Traffic Interchange Ramps Calculation Package
I-10 Koli Road TI

Design Resilient Modulus Analysis

Project Data

PROJECT NAME, LOCATION and SEASONAL VARIATION FACTOR

Project Name:	I-10 GRIC - Koli Rd TI
Location:	
Seasonal Variation Factor:	1.0

Laboratory Test Data

Boring No. Point ID	Boring Location	Depth (ft)	LL	PI	-#200	Laboratory R-Value	Correlated R-Value
R&C-39	33.267°/ -111.958°	0.5 - 6	19	3	33		56
R&C-40	33.267°/ -111.958°	1 - 6	22	8	37		44
R&C-41	33.266°/ -111.955°	1 - 6	22	10	38		40
R&C-42	33.265°/ -111.956°	0 - 3	0	0	59		44
R&C-43	33.270°/ -111.959°	0 - 4	24	9	40		41
R&C-44	33.268°/ -111.957°	2 - 7	0	0	27		69
R&C-45	33.267°/ -111.953°	0 - 4	20	6	39		46
R&C-46	33.266°/ -111.955°	0 - 2	0	0	37		60
R&C-47	33.268°/ -111.956°	0 - 5	0	0	28		68
R&C-48	33.269°/ -111.954°	0 - 4	0	0	39		58
R&C-49	33.266°/ -111.959°	3 - 8	25	9	29		47
R&C-50	33.266°/ -111.959°	2 - 7	27	15	36	21	34
R&C-51	33.265°/ -111.960°	3 - 8	24	7	31		50
R&C-52	33.263°/ -111.962°	0.5 - 6	23	9	35	35	43
R&C-53	33.263°/ -111.962°	1 - 6	25	9	47		37
TP-1	33.266°/ -111.960°	2 - 4	33	15	29		37

Mean R-Value and Modulus Calculations

Number of Laboratory Tested R-Values:	2	(Nt)
Average of Laboratory Tested R-Value Results:	28.00	(Rt)
Standard Deviation of Laboratory Tested R-Values:	9.90	(SDt)
Number of Correlated R-Value:	16	(Nc)
Average of Correlated R-Value Results:	48.39	(Rc)
Standard Deviation of Correlated R-Values:	10.87	(SDc)
Adjusted Average of Tested R-Values:	28.00	(Rt)
Adjusted Average of Correlated R-Values:	47.52	(Rc)

Control R-Value (Rc): 33.7

90% t Value: 1.356

Calculation for Mean R-Value:

$$R_{mean} = \frac{N_t \times R_t \times SD_c^2 + N_c \times R_c \times SD_t^2}{N_t \times SD_c^2 + N_c \times SD_t^2}$$

R_{mean} = **45.0**

Seasonal Variation Factor for Project Location= **1.0**

Design Resilient Modulus M_r (adjusted for SVF)= **26,000** psi

Note: Koli Road and the majority of the TI Ramps will be elevated above existing grade on embankment (imported borrow). Therefore, the design and control R-value are equal to the minimum ADOT requirement for borrow (of R-value = 20).

Figure 1: Proposed Location of Koli Road Traffic Interchange

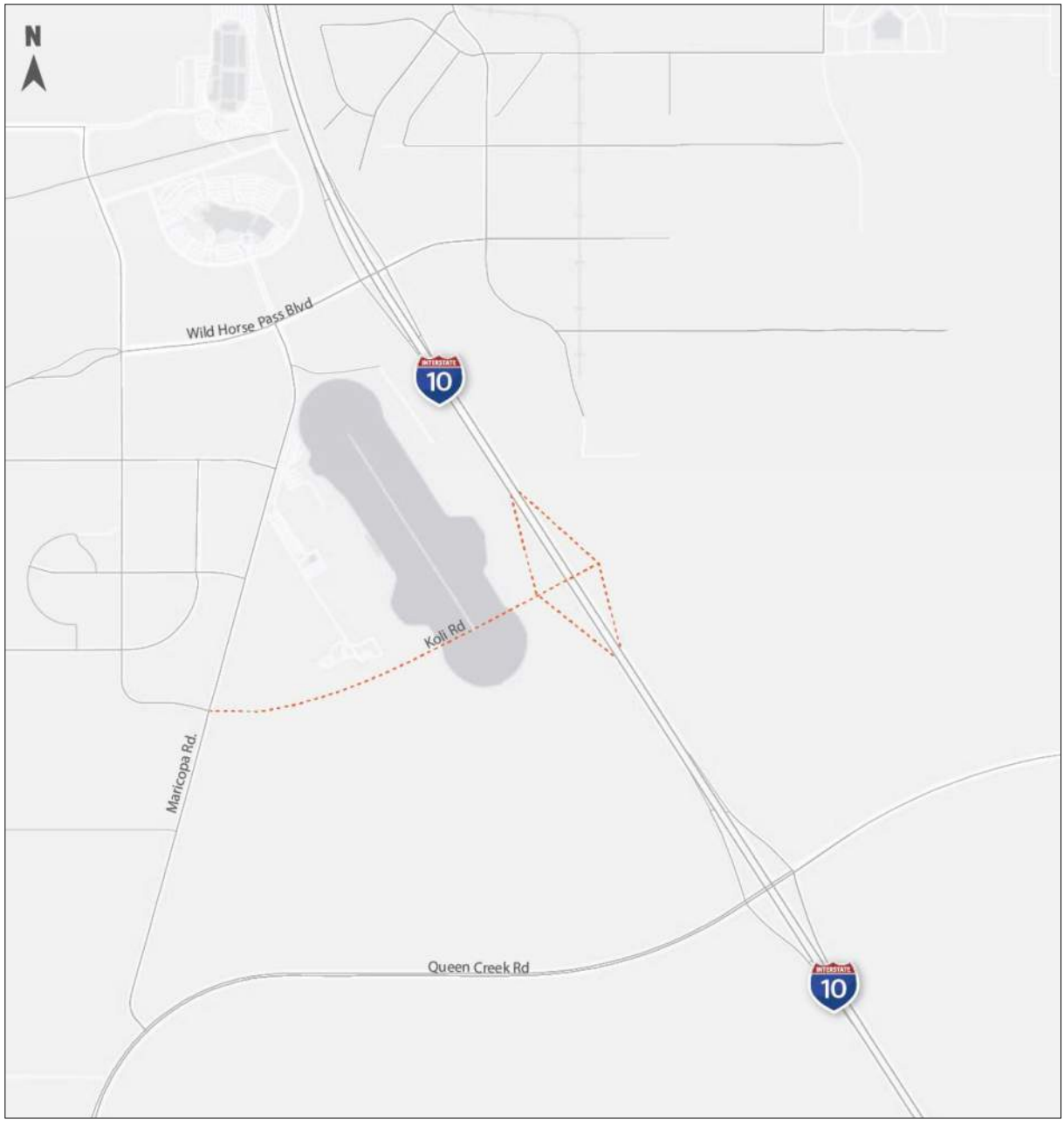


Table 5: Roadway Average Daily Traffic & Truck Volumes

Segment	2023 Existing				2050 No-Build Alternative				2050 Build Alternative				Total Truck ADT Difference (Build - No-Build)
	ADT	Total Truck ADT	MT ADT	HT ADT	ADT	Total Truck ADT	MT ADT	HT ADT)	ADT	Total Truck ADT	MT ADT	HT ADT)	
I-10: Wild Horse Pass Blvd to Koli Rd	104,245	22,465	11,400	11,065	180,235	46,290	21,580	24,710	189,375	47,130	22,370	24,760	840
I-10: At the Koli Rd TI	104,245	22,465	11,400	11,065	180,235	46,290	21,580	24,710	170,855	45,595	21,060	24,535	-695
I-10: Koli Rd to Queen Creek Rd	104,245	22,465	11,400	11,065	180,235	46,290	21,580	24,710	174,675	45,805	21,265	24,540	-485
Koli Road: Maricopa Rd to I-10	0	0	0	0	0	0	0	0	22,345	1,745	1,505	240	1,745
Koli Road: Between I-10 Ramps	0	0	0	0	0	0	0	0	11,055	885	760	125	885
Koli Road: East of I-10	0	0	0	0	0	0	0	0	9,445	765	655	110	765
Koli Road: I-10 EB Off-Ramp	0	0	0	0	0	0	0	0	1,840	95	90	5	95
Koli Road: I-10 EB On-Ramp	0	0	0	0	0	0	0	0	1,985	110	105	5	110
Koli Road: I-10 WB Off-Ramp	0	0	0	0	0	0	0	0	9,080	775	655	120	775
Koli Road: I-10 WB On-Ramp	10,550	480	360	120	30,280	1,775	1,395	380	36,465	2,415	1,840	575	640
Maricopa Road: South of Koli Road	8,355	405	305	100	33,955	2,375	1,975	400	27,490	1,885	1,490	395	-490
Maricopa Road: North of Koli Road	5,850	235	205	30	24,645	1,485	1,370	115	22,510	1,380	1,280	100	-105
48th Street: West of Maricopa Road	104,245	22,465	11,400	11,065	180,235	46,290	21,580	24,710	189,375	47,130	22,370	24,760	840

Notes: ADT – Average daily traffic

MT – Medium Trucks (vehicles with 2 axles & 6 wheels; gross vehicle weight – 10,000 to 26,400 pounds).

HT – Heavy Trucks (vehicles with 3 or more axles; gross vehicle weight greater than 26,400 pounds).

Source: MAG

I-10 Koli Road TI RAMP - EASTBOUND OFF-RAMP

YEAR	I-10 Growth Rate Of Mainline Segment	ADT
2022		885
2023	2.651%	908
2024	2.651%	933
2025	2.651%	957
2026	2.651%	983
2027	2.651%	**1,009**
2028	2.651%	1,035
2029	2.651%	1,063
2030	2.651%	1,091
2031	2.651%	1,120
2032	2.651%	1,150
2033	2.651%	1,180
2034	2.651%	1,211
2035	2.651%	1,244
2036	2.651%	1,277
2037	2.651%	1,310
2038	2.651%	1,345
2039	2.651%	1,381
2040	2.651%	1,417
2041	2.651%	1,455
2042	2.651%	1,494
2043	2.651%	1,533
2044	2.651%	1,574
2045	2.651%	1,615
2046	2.651%	1,658
2047	2.651%	**1,702**
2048	2.651%	1,747
2049	2.651%	1,794
2050	2.651%	**1,841**
		1,840

	Trucks			
	Combo HT	**Single MT**	**Total**	**ADT Total**
ADT:	5	90	95	1,840
Truck Percent	5.3%	94.7%	100%	
Total ADT Percent:	0.272%	4.891%	5.163%	

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project-KOLI RD TI RAMP EB OFF (Memo)		
Route:	RmpEB-OFF	BMP:	163.10	Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate)		
		EMP:	164.50	Growth Rate (%):	2.7	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2022	885	Data Year	43.288043	2.4048913	4.89%	0.27%	95%	5%	AZ-6
AADT	2027	1,009	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	7.8	65.8	4.4	0.2	11.7	9.1	0.7	0.2	0.0	0.1	100
Class Volume (daily)	957	4	34	2	0	6	5	0	0	0	0	1008
Growth Factor (G)	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	
Class Volume (total)	9060972	37872	321915	18936	0	56809	47341	0	0	0	0	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	7249	40523	106232	12119	0	34653	76692	0	0	0	0	277,468

Total Number of Trucks	482,873
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	1.00
Design ESAL's	277,468

Notes:

1) Shaded cells in the Worksheet are user input values. All other cells are calculated values and are locked.
2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

I-10 Koli Road TI RAMP - EASTBOUND ON-RAMP

YEAR	I-10 Growth Rate Of Mainline Segment	ADT
2022		954
2023	2.651%	979
2024	2.651%	1,005
2025	2.651%	1,032
2026	2.651%	1,059
2027	2.651%	**1,087**
2028	2.651%	1,116
2029	2.651%	1,146
2030	2.651%	1,176
2031	2.651%	1,207
2032	2.651%	1,239
2033	2.651%	1,272
2034	2.651%	1,306
2035	2.651%	1,341
2036	2.651%	1,376
2037	2.651%	1,413
2038	2.651%	1,450
2039	2.651%	1,488
2040	2.651%	1,528
2041	2.651%	1,568
2042	2.651%	1,610
2043	2.651%	1,653
2044	2.651%	1,696
2045	2.651%	1,741
2046	2.651%	1,788
2047	2.651%	**1,835**
2048	2.651%	1,884
2049	2.651%	1,934
2050	2.651%	**1,985**
		1,985

	Trucks			
	Combo HT	**Single MT**		**ADT Total**
ADT:	5	105	110	1,985
Truck Percent	4.5%	95.5%	100%	
Total ADT Percent:	0.252%	5.290%	5.542%	

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project-KOLI RD TI RAMP EB ON (Memo)		
Route:	RmpEB-ON	BMP:	163.10	Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate)		
		EMP:	164.50	Growth Rate (%):	2.7	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2022	954	Data Year	50.463476	2.4030227	5.29%	0.25%	95%	5%	AZ-6
AADT	2027	1,087	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	7.8	65.8	4.4	0.2	11.7	9.1	0.7	0.2	0.0	0.1	100
Class Volume (daily)	1,027	5	40	3	0	7	5	0	0	0	0	1087
Growth Factor (G)	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	
Class Volume (total)	9723739	47341	378724	28404	0	66277	47341	0	0	0	0	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	7779	50655	124979	18179	0	40429	76692	0	0	0	0	318,713

Total Number of Trucks	568,087
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	1.00
Design ESAL's	318,713

Notes:

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4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
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6)

I-10 Koli Road TI RAMP - WESTBOUND OFF-RAMP

YEAR	I-10 Growth Rate Of Mainline Segment	ADT
2022		4,365
2023	2.651%	4,481
2024	2.651%	4,599
2025	2.651%	4,721
2026	2.651%	4,847
2027	2.651%	**4,975**
2028	2.651%	5,107
2029	2.651%	5,242
2030	2.651%	5,381
2031	2.651%	5,524
2032	2.651%	5,670
2033	2.651%	5,821
2034	2.651%	5,975
2035	2.651%	6,133
2036	2.651%	6,296
2037	2.651%	6,463
2038	2.651%	6,634
2039	2.651%	6,810
2040	2.651%	6,991
2041	2.651%	7,176
2042	2.651%	7,366
2043	2.651%	7,562
2044	2.651%	7,762
2045	2.651%	7,968
2046	2.651%	8,179
2047	2.651%	**8,396**
2048	2.651%	8,618
2049	2.651%	8,847
2050	2.651%	**9,081**
		9,080

	Trucks			
	Combo HT	**Single MT**	**Total**	**ADT Total**
ADT:	120	655	775	9,080
Truck Percent	15.5%	84.5%	100%	
Total ADT Percent:	1.322%	7.214%	8.535%	

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project-KOLI RD TI RAMP WB OFF (Memo)		
Route:	R-WB-OFF	BMP:	163.10	Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate)		
		EMP:	164.50	Growth Rate (%):	2.7	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2022	4,365	Data Year	314.8761	57.687225	7.21%	1.32%	85%	15%	AZ-6
AADT	2027	4,975	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	7.8	65.8	4.4	0.2	11.7	9.1	0.7	0.2	0.0	0.1	100
Class Volume (daily)	4,551	33	279	19	1	50	39	3	1	0	0	4976
Growth Factor (G)	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	
Class Volume (total)	43089323	312447	2641600	179894	9468	473405	369256	28404	9468	0	0	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	34471	334318	871728	115132	5491	288777	598195	40618	16569	0	0	2,305,299

Total Number of Trucks	4,023,942
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	1.00
Design ESAL's	2,305,299

Notes:

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4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

I-10 Koli Road TI RAMP - WESTBOUND ON-RAMP

YEAR	I-10 Growth Rate Of Mainline Segment	ADT
2022		17,527
2023	2.651%	17,992
2024	2.651%	18,469
2025	2.651%	18,958
2026	2.651%	19,461
2027	2.651%	**19,977**
2028	2.651%	20,506
2029	2.651%	21,050
2030	2.651%	21,608
2031	2.651%	22,181
2032	2.651%	22,769
2033	2.651%	23,372
2034	2.651%	23,992
2035	2.651%	24,628
2036	2.651%	25,281
2037	2.651%	25,951
2038	2.651%	26,639
2039	2.651%	27,345
2040	2.651%	28,070
2041	2.651%	28,814
2042	2.651%	29,578
2043	2.651%	30,362
2044	2.651%	31,167
2045	2.651%	31,993
2046	2.651%	32,842
2047	2.651%	**33,712**
2048	2.651%	34,606
2049	2.651%	35,523
2050	2.651%	**36,465**
		36,465

	Trucks			
	Combo HT	**Single MT**		**ADT**
			Total	**Total**
ADT:	575	1,840	2,415	36,465
Truck Percent	23.8%	76.2%	100%	
Total ADT Percent:	1.577%	5.046%	6.623%	

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project-KOLI RD TI RAMP WB ON (Memo)		
Route:	RmpWB-ON	BMP:	163.10	Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate)		
		EMP:	164.50	Growth Rate (%):	2.7	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2022	17,527	Data Year	884.40093	276.37529	5.05%	1.58%	76%	24%	AZ-5
AADT	2027	19,977	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	5.3	46.3	5.7	0.7	16.1	24.1	1.1	0.3	0.1	0.3	100
Class Volume (daily)	18,652	70	613	76	9	213	319	15	4	1	4	19976
Growth Factor (G)	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	
Class Volume (total)	176599001	662767	5803945	719576	85213	2016705	3020324	142022	37872	9468	37872	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	141279	709161	1915302	460529	49424	1230190	4892925	203091	66276	12403	132931	9,813,511

Total Number of Trucks	12,535,764
Directional Distribution Factor (D_D)	1.00
Lane Distribution Factor (D_L)	1.00
Design ESAL's	9,813,511

Notes:

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2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project-KOLI RD TI RAMPS (10% of I-10 Mainlin		
Route:	RAMP	BMP:	163.10	Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate)		
		EMP:	164.50	Growth Rate (%):	2.7	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2022	11,224	Data Year	465.2	1073.7	4.14%	9.57%	30%	70%	AZ-2
AADT	2027	12,792	Build Year					Select appropriate TTC from Table A-1 using % Combos above		

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	11,039	54	258	51	2	163	1129	23	33	26	14	12792
Growth Factor (G)	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	
Class Volume (total)	104518356	511277	2442770	482873	18936	1543300	10689485	217766	312447	246171	132553	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	83615	547066	806114	309039	10983	941413	17316966	311405	546782	322484	465261	21,661,128
											Total Number of Trucks	16,597,578
											Directional Distribution Factor (D_D)	0.54
											Lane Distribution Factor (D_L)	1.00
											Design ESAL's	11,697,009

Notes:

1) Shaded cells in the Worksheet are user input values. All other cells are calculated values and are locked.
2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	Koli Ramps
Design Life (years)	20
Equivalent Axle Loads/Day	1602
Total ESALs	11,697,009
Seasonal Variation Factor	1.0
Reliability	99%
Overall Standard Deviation	0.45

EB Off-Ramp
EB On-Ramp
WB Off-Ramp
WB On-Ramp
(10% of Mainline)

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	20.0
Resilient Modulus MR (psi)	12,125
Design Modulus (psi)	12,125

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	3.0

LAYER COEFFICIENTS	**Structural**	**Drainage**
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: **5.62**

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		8.5	14	22.5	5.70	0.08
B		13		13	5.72	0.10

APPENDIX B

Crossroad Calculation Package
I-10 Koli Road TI

Design Resilient Modulus Analysis

Project Data

PROJECT NAME, LOCATION and SEASONAL VARIATION FACTOR

Project Name:	I-10 GRIC - Koli Rd TI
Location:	
Seasonal Variation Factor:	1.0

Laboratory Test Data

Boring No. Point ID	Boring Location	Depth (ft)	LL	PI	-#200	Laboratory R-Value	Correlated R-Value
R&C-39	33.267°/ -111.958°	0.5 - 6	19	3	33		56
R&C-40	33.267°/ -111.958°	1 - 6	22	8	37		44
R&C-41	33.266°/ -111.955°	1 - 6	22	10	38		40
R&C-42	33.265°/ -111.956°	0 - 3	0	0	59		44
R&C-43	33.270°/ -111.959°	0 - 4	24	9	40		41
R&C-44	33.268°/ -111.957°	2 - 7	0	0	27		69
R&C-45	33.267°/ -111.953°	0 - 4	20	6	39		46
R&C-46	33.266°/ -111.955°	0 - 2	0	0	37		60
R&C-47	33.268°/ -111.956°	0 - 5	0	0	28		68
R&C-48	33.269°/ -111.954°	0 - 4	0	0	39		58
R&C-49	33.266°/ -111.959°	3 - 8	25	9	29		47
R&C-50	33.266°/ -111.959°	2 - 7	27	15	36	21	34
R&C-51	33.265°/ -111.960°	3 - 8	24	7	31		50
R&C-52	33.263°/ -111.962°	0.5 - 6	23	9	35	35	43
R&C-53	33.263°/ -111.962°	1 - 6	25	9	47		37
TP-1	33.266°/ -111.960°	2 - 4	33	15	29		37

Mean R-Value and Modulus Calculations

Number of Laboratory Tested R-Values:	2	(Nt)
Average of Laboratory Tested R-Value Results:	28.00	(Rt)
Standard Deviation of Laboratory Tested R-Values:	9.90	(SDt)
Number of Correlated R-Value:	16	(Nc)
Average of Correlated R-Value Results:	48.39	(Rc)
Standard Deviation of Correlated R-Values:	10.87	(SDc)
Adjusted Average of Tested R-Values:	28.00	(Rt)
Adjusted Average of Correlated R-Values:	47.52	(Rc)

Control R-Value (Rc): 33.7

90% t Value: 1.356

Calculation for Mean R-Value:

$$R_{mean} = \frac{N_t \times R_t \times SD_c^2 + N_c \times R_c \times SD_t^2}{N_t \times SD_c^2 + N_c \times SD_t^2}$$

R_{mean} = **45.0**

Seasonal Variation Factor for Project Location= **1.0**

Design Resilient Modulus M_r (adjusted for SVF)= **26,000** psi

Note: Koli Road and the majority of the TI Ramps will be elevated above existing grade on embankment (imported borrow). Therefore, the design and control R-value are equal to the minimum ADOT requirement for borrow (of R-value = 20).

Figure 1: Proposed Location of Koli Road Traffic Interchange

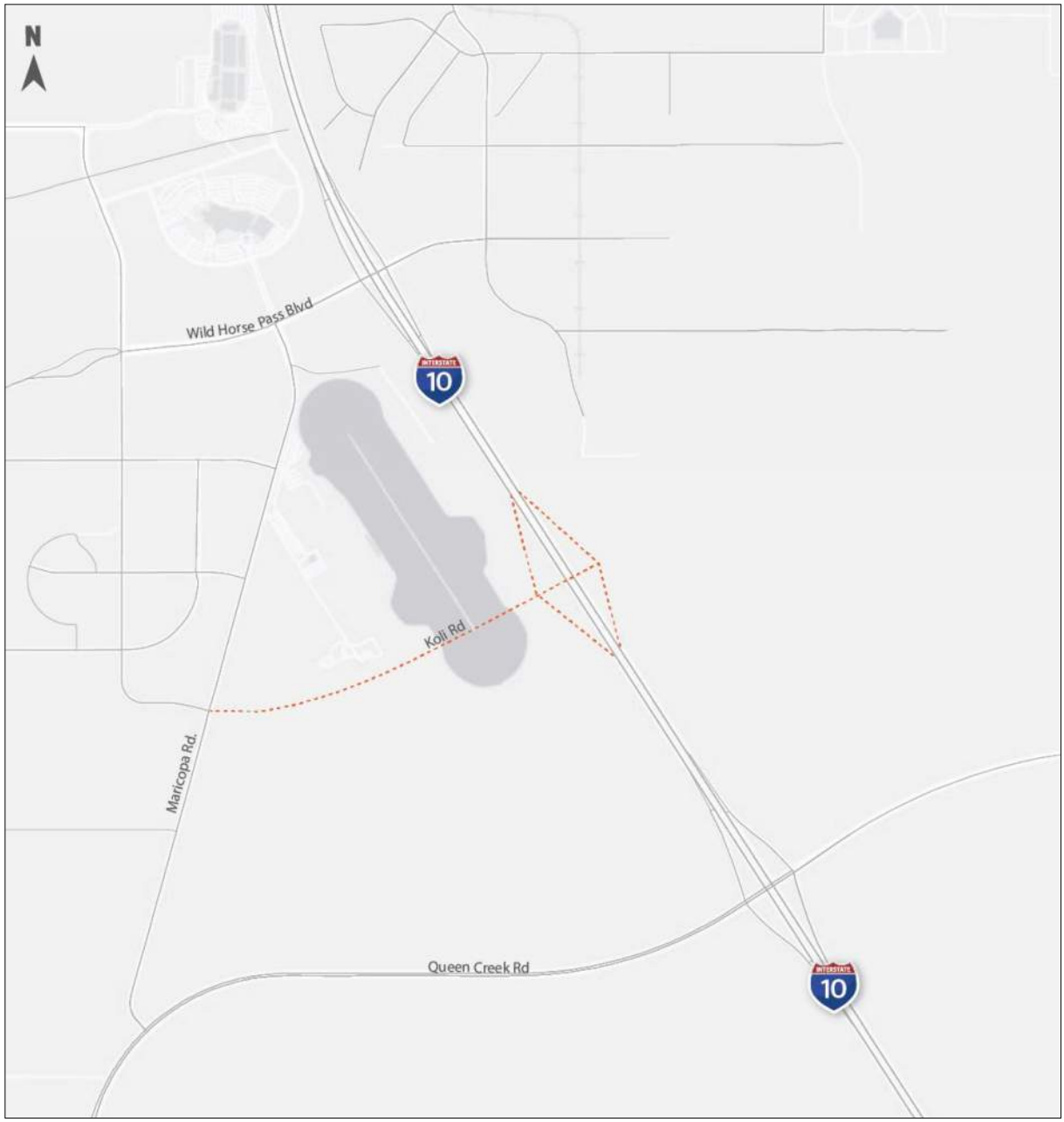


Table 5: Roadway Average Daily Traffic & Truck Volumes

Segment	2023 Existing				2050 No-Build Alternative				2050 Build Alternative				Total Truck ADT Difference (Build - No-Build)
	ADT	Total Truck ADT	MT ADT	HT ADT	ADT	Total Truck ADT	MT ADT	HT ADT)	ADT	Total Truck ADT	MT ADT	HT ADT)	
I-10: Wild Horse Pass Blvd to Koli Rd	104,245	22,465	11,400	11,065	180,235	46,290	21,580	24,710	189,375	47,130	22,370	24,760	840
I-10: At the Koli Rd TI	104,245	22,465	11,400	11,065	180,235	46,290	21,580	24,710	170,855	45,595	21,060	24,535	-695
I-10: Koli Rd to Queen Creek Rd	104,245	22,465	11,400	11,065	180,235	46,290	21,580	24,710	174,675	45,805	21,265	24,540	-485
Koli Road: Maricopa Rd to I-10	0	0	0	0	0	0	0	0	22,345	1,745	1,505	240	1,745
Koli Road: Between I-10 Ramps	0	0	0	0	0	0	0	0	11,055	885	760	125	885
Koli Road: East of I-10	0	0	0	0	0	0	0	0	9,445	765	655	110	765
Koli Road: I-10 EB Off-Ramp	0	0	0	0	0	0	0	0	1,840	95	90	5	95
Koli Road: I-10 EB On-Ramp	0	0	0	0	0	0	0	0	1,985	110	105	5	110
Koli Road: I-10 WB Off-Ramp	0	0	0	0	0	0	0	0	9,080	775	655	120	775
Koli Road: I-10 WB On-Ramp	10,550	480	360	120	30,280	1,775	1,395	380	36,465	2,415	1,840	575	640
Maricopa Road: South of Koli Road	8,355	405	305	100	33,955	2,375	1,975	400	27,490	1,885	1,490	395	-490
Maricopa Road: North of Koli Road	5,850	235	205	30	24,645	1,485	1,370	115	22,510	1,380	1,280	100	-105
48th Street: West of Maricopa Road	104,245	22,465	11,400	11,065	180,235	46,290	21,580	24,710	189,375	47,130	22,370	24,760	840

Notes: ADT – Average daily traffic

MT – Medium Trucks (vehicles with 2 axles & 6 wheels; gross vehicle weight – 10,000 to 26,400 pounds).

HT – Heavy Trucks (vehicles with 3 or more axles; gross vehicle weight greater than 26,400 pounds).

Source: MAG

I-10 Koli Road TI CROSSROAD - WEST

YEAR	I-10 Growth Rate Of Mainline Segment	ADT
2022		10,740
2023	2.651%	11,025
2024	2.651%	11,317
2025	2.651%	11,617
2026	2.651%	11,925
2027	2.651%	**12,241**
2028	2.651%	12,566
2029	2.651%	12,899
2030	2.651%	13,241
2031	2.651%	13,592
2032	2.651%	13,952
2033	2.651%	14,322
2034	2.651%	14,702
2035	2.651%	15,091
2036	2.651%	15,491
2037	2.651%	15,902
2038	2.651%	16,324
2039	2.651%	16,756
2040	2.651%	17,201
2041	2.651%	17,657
2042	2.651%	18,125
2043	2.651%	18,605
2044	2.651%	19,098
2045	2.651%	19,605
2046	2.651%	20,124
2047	2.651%	**20,658**
2048	2.651%	21,205
2049	2.651%	21,768
2050	2.651%	**22,345**
		22,345

	Trucks			
	Combo HT	**Single MT**		**ADT**
			Total	**Total**
ADT:	240	1,505	1,745	22,345
Truck Percent	13.8%	86.2%	100%	
Total ADT Percent:	1.074%	6.735%	7.809%	

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project-KOLI RD CrossRD-WEST (Traffic Memo)		
Route:	KOLI - W	BMP:	163.10	Design Life (years):	20.0	Functional Class:	Principal Arterial - Crossroad		
		EMP:	164.50	Growth Rate (%):	2.7	Pavement Type:	Flexible	Cluster Number:	3

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2022	10,740	Data Year	723.36988	115.35467	6.74%	1.07%	86%	14%	AZ-6
AADT	2027	12,241	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	7.8	65.8	4.4	0.2	11.7	9.1	0.7	0.2	0.0	0.1	100
Class Volume (daily)	11,285	75	629	42	2	112	87	7	2	0	1	12242
Growth Factor (G)	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	
Class Volume (total)	106847509	710108	5955435	397660	18936	1060427	823725	66277	18936	0	9468	
Truck Load Factor (T_{LF})	0.0008	1.20	0.13	0.86	0.64	0.52	1.93	1.78	2.25	1.17	2.07	
Class ESAL's	85478	852130	774207	341988	12119	551422	1589789	117973	42606	0	19599	4,387,311
											Total Number of Trucks	9,060,972
											Directional Distribution Factor (D_D)	0.50
											Lane Distribution Factor (D_L)	0.90
											Design ESAL's	1,974,290

Notes:

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3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

I-10 Koli Road TI CROSSROAD - PCCP Limits at I-10 Crossing

YEAR	I-10 Growth Rate Of Mainline Segment	ADT
2022		5,314
2023	2.651%	5,455
2024	2.651%	5,599
2025	2.651%	5,748
2026	2.651%	5,900
2027	2.651%	**6,057**
2028	2.651%	6,217
2029	2.651%	6,382
2030	2.651%	6,551
2031	2.651%	6,725
2032	2.651%	6,903
2033	2.651%	7,086
2034	2.651%	7,274
2035	2.651%	7,467
2036	2.651%	7,665
2037	2.651%	7,868
2038	2.651%	8,077
2039	2.651%	8,291
2040	2.651%	8,511
2041	2.651%	8,736
2042	2.651%	8,968
2043	2.651%	9,206
2044	2.651%	9,450
2045	2.651%	9,700
2046	2.651%	9,957
2047	2.651%	**10,221**
2048	2.651%	10,492
2049	2.651%	10,770
2050	2.651%	**11,056**
		11,055

	Trucks			
	Combo HT	**Single MT**	**Total**	**ADT Total**
ADT:	125	760	885	11,055
Truck Percent	14.1%	85.9%	100%	
Total ADT Percent:	1.131%	6.875%	8.005%	

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project-KOLI RD CrossRD-PCCP (Traffic Memo)		
Route:	KOLI-PCCP	BMP:	163.10	Design Life (years):	20.0	Functional Class:	Principal Arterial - Crossroad		
		EMP:	164.50	Growth Rate (%):	2.7	Pavement Type:	Rigid	Cluster Number:	3

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2022	5,314	Data Year	365.32248	60.085934	6.87%	1.13%	86%	14%	AZ-6
AADT	2027	6,057	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	7.8	65.8	4.4	0.2	11.7	9.1	0.7	0.2	0.0	0.1	100
Class Volume (daily)	5,572	38	319	21	1	57	44	3	1	0	0	6056
Growth Factor (G)	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	
Class Volume (total)	52756253	359788	3020324	198830	9468	539682	416596	28404	9468	0	0	
Truck Load Factor (T_{LF})	0.0008	1.48	0.12	1.15	0.90	0.55	2.80	2.94	2.09	1.12	3.20	
Class ESAL's	42205	532486	362439	228655	8521	296825	1166469	83508	19788	0	0	2,740,896

Total Number of Trucks	4,582,560
Directional Distribution Factor (D_D)	0.50
Lane Distribution Factor (D_L)	0.90
Design ESAL's	1,233,403

Notes:

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3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project-KOLI RD CrossRD - PCCP Limits		
Route:	KOLI RD	BMP:	163.10	Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate) - (10% of Mainline)		
		EMP:	164.50	Growth Rate (%):	2.7	Pavement Type:	Rigid	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2022	11,224	Data Year	465.2	1073.7	4.14%	9.57%	30%	70%	AZ-2
AADT	2027	12,792	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	11,039	54	258	51	2	163	1129	23	33	26	14	12792
Growth Factor (G)	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	
Class Volume (total)	104518356	511277	2442770	482873	18936	1543300	10689485	217766	312447	246171	132553	
Truck Load Factor (T_{LF})	0.0008	1.29	0.30	0.82	0.80	0.62	2.35	2.32	1.61	1.19	5.53	
Class ESAL's	83615	659547	732831	395956	15149	956846	25120290	505217	503040	292943	733018	29,998,452

Total Number of Trucks	16,597,578
Directional Distribution Factor (D_D)	0.54
Lane Distribution Factor (D_L)	1.00
Design ESAL's	16,199,164

Notes:

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2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

I-10 Koli Road TI CROSSROAD - EAST

YEAR	I-10 Growth Rate Of Mainline Segment	ADT
2022		4,540
2023	2.651%	4,660
2024	2.651%	4,784
2025	2.651%	4,911
2026	2.651%	5,041
2027	2.651%	**5,175**
2028	2.651%	5,312
2029	2.651%	5,453
2030	2.651%	5,597
2031	2.651%	5,745
2032	2.651%	5,898
2033	2.651%	6,054
2034	2.651%	6,215
2035	2.651%	6,379
2036	2.651%	6,548
2037	2.651%	6,722
2038	2.651%	6,900
2039	2.651%	7,083
2040	2.651%	7,271
2041	2.651%	7,464
2042	2.651%	7,662
2043	2.651%	7,865
2044	2.651%	8,073
2045	2.651%	8,287
2046	2.651%	8,507
2047	2.651%	**8,732**
2048	2.651%	8,964
2049	2.651%	9,202
2050	2.651%	**9,446**
		9,445

	Trucks			
	Combo HT	**Single MT**	**Total**	**ADT Total**
ADT:	110	655	765	9,445
Truck Percent	14.4%	85.6%	100%	
Total ADT Percent:	1.165%	6.935%	8.100%	

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project-KOLI RD CrossRD-EAST (Traffic Memo)		
Route:	KOLI - E	BMP:	163.10	Design Life (years):	20.0	Functional Class:	Principal Arterial - Crossroad		
		EMP:	164.50	Growth Rate (%):	2.7	Pavement Type:	Flexible	Cluster Number:	3

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2022	4,540	Data Year	314.84383	52.874537	6.93%	1.16%	86%	14%	AZ-6
AADT	2027	5,175	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	7.8	65.8	4.4	0.2	11.7	9.1	0.7	0.2	0.0	0.1	100
Class Volume (daily)	4,756	33	275	18	1	49	38	3	1	0	0	5174
Growth Factor (G)	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	
Class Volume (total)	45030284	312447	2603728	170426	9468	463937	359788	28404	9468	0	0	
Truck Load Factor (T_{LF})	0.0008	1.20	0.13	0.86	0.64	0.52	1.93	1.78	2.25	1.17	2.07	
Class ESAL's	36024	374936	338485	146566	6060	241247	694391	50559	21303	0	0	1,909,571

Total Number of Trucks	3,957,666
Directional Distribution Factor (D_D)	0.50
Lane Distribution Factor (D_L)	0.90
Design ESAL's	859,307

Notes:

1) Shaded cells in the Worksheet are user input values. All other cells are calculated values and are locked.
2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Design ESAL Calculation Worksheet

TRACS:	F0252 01D		Project No.	F0252 01D		Project Name:	I-10 GRIC DB Project-KOLI RD CrossRD - WEST & EAST		
Route:	KOLI RD	BMP:	163.10	Design Life (years):	20.0	Functional Class:	Principal Arterial (Interstate) - (5% of Mainline)		
		EMP:	164.50	Growth Rate (%):	2.7	Pavement Type:	Flexible	Cluster Number:	1

				Truck Volumes		Percent Trucks (% of total AADT)		Percent Trucks (% of total AADTT)		
				Singles	Combos	Singles	Combos	Singles	Combos	TTC
AADT	2022	5,612	Data Year	232.6	536.85	4.14%	9.57%	30%	70%	AZ-2
AADT	2027	6,396	Build Year							

Select appropriate TTC from Table A-1 using % Combos above

Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)	N/A	3.1	14.7	2.9	0.1	9.3	64.4	1.3	1.9	1.5	0.8	100
Class Volume (daily)	5,519	27	129	25	1	82	565	11	17	13	7	6396
Growth Factor (G)	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	
Class Volume (total)	52254444	255639	1221385	236703	9468	776384	5349477	104149	160958	123085	66277	
Truck Load Factor (T_{LF})	0.0008	1.07	0.33	0.64	0.58	0.61	1.62	1.43	1.75	1.31	3.51	
Class ESAL's	41804	273534	403057	151490	5491	473594	8666153	148933	281677	161241	232632	10,839,606

Total Number of Trucks	8,303,525
Directional Distribution Factor (D_D)	0.54
Lane Distribution Factor (D_L)	1.00
Design ESAL's	5,853,387

Notes:

1) Shaded cells in the Worksheet are user input values. All other cells are calculated values and are locked.
2) Data in light blue cells will generally come from ADOT's MPD published sources.
3) All values are rounded to the number of decimal places shown in each cell.
4) VCD data (Class 4 through 13) from Table A-1, and Truck Load Factors from Table A-5 and A-6, can copied and pasted into the Worksheet.
5)
6)

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Designation	Koli E&W
Design Life (years)	20
Equivalent Axle Loads/Day	802
Total ESALs	5,853,387
Seasonal Variation Factor	1.0
Reliability	95%
Overall Standard Deviation	0.45

Koli Rd East
Koli Rd West
(5% of Mainline)

SUBGRADE CONDITIONS

Mean R-Value, R_{Mean}	20.0
Resilient Modulus MR (psi)	12,125
Design Modulus (psi)	12,125

SERVICEABILITY

Initial Design Serviceability Index	4.2
Terminal Design Serviceability Index	2.8

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete	0.44	N/A
Aggregate Base Course	0.14	1.00

Design Calculations

Required Structural Number SN: 4.33

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Rubber	Asphalt Concrete Surface	Aggregate Base Course	Total Thickness		
A		6.5	11	17.5	4.40	0.07
B		10		10	4.40	0.07

Rigid Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Classification	Koli PCCP
Design Life (years)	20
Equivalent Axle Loads/Day	2219.06356
Total EAL's	16,199,164
Seasonal Variation Factor	1
Reliability	95%
Overall Standard Deviation	0.25
Drainage Coefficient	1.00

SUBGRADE SOIL DATA

Mean R-Value, R_{Mean}	20	
Resilient Modulus MR (psi)	12,125	
Design Subgrade Modulus (psi)	12,125	
Modulus of Subgrade Reaction k (pci)	625	This is the k value w/o modification for loss of subgrade support or base material.

DESIGN SUBGRADE FOR PAVEMENT

Design Subgrade or Base Material	Aggregate Base	
Base Material Modulus (psi)	36,000	
Base Material Thickness (inches)	4.0	
Composite Modulus k_m (pci)	650	Enter the composite modulus or subgrade
Loss of Subgrade Support	0.0	modulus if there is no base material
Modulus of Subgrade Reaction k (pci)	650	

SERVICEABILITY

Present (2.5 to 5.0)	4.2
Terminal (1.5 to 4.1)	2.8

CONCRETE PROPERTIES

Modulus of Rupture (psi), approximate	670
Compressive Strength f'c (psi)	5,000
Modulus of Elasticity (psi)	4,030,509
Pavement Type	Plain Jointed (no dowels)
Load Transfer J	3.9

Design Calculations

Design Slab Thickness	**11.5**	**Inches**	**Plain Jointed (no dowels)**
Design Base Thickness	**4.0**	**Inches**	**Aggregate Base**
Total Section Thickness	**15.5**	**Inches**	

TPA 400-1.4 Materials Design Report – Koli Road TI

See attached

I-10 Gila River Indian Community Design-Build Project

I-10 Koli Road Traffic Interchange

ADOT General Engineering Consultant

Materials Design Report

ADOT Report No.: 25-20-F; ADOT TRACS No.: F025201D / F072101C

June 3, 2025 | Terracon Project No. 65225282

Prepared for:

HDR Engineering, Inc.
20 E. Thomas Road, Suite 2500
Phoenix, Arizona 85012



EXPIRES 6/30/2026

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June 3, 2025

HDR Engineering, Inc.
20 E. Thomas Road, Suite 2500
Phoenix, Arizona 85012

Attn: Mr. Nick LaFronz, P.E.
Phone: (602) 522-7728 Email: nick.lafronz@hdrinc.com

Report Type: FINAL

Re: Materials Design Report
I-10 Gila River Indian Community Design-Build Project
I-10 Koli Road Traffic Interchange (TI)
ADOT General Engineering Consultant
ADOT Report No.: 25-20-F; ADOT TRACS No.: F025201D / F072101C
Terracon Project No. 65225282

Terracon Consultants, Inc. (Terracon) has completed the Geotechnical Engineering Services for the above referenced project in general accordance with the Terracon Change Order No. 1 for Geotechnical Engineering Services – Revision 2, dated August 17, 2023. This Materials Design Report (MDR) presents the recommendations concerning the ADOT pavement structure design for the proposed I-10 Koli Road TI project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon





Ramon Padilla, P.E.
Geotechnical Services Manager

Donald R. Clark, P.E. EXPIRES 6/30/2026
Sr. Consultant/Sr. Principal

Reviewed By: Joseph A. Phillips, P.E., Sr. Consultant / Sr. Principal

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Introduction

Terracon performed the pavement engineering services as part of the General Engineering Consultant (GEC) services for the Arizona Department of Transportation (ADOT) Interstate Highway 10 (I-10) Gila River Indian Community (GRIC) Interstate Widening planned from State Route 202L (SR202L, Santan / South Mountain) to the north end of the Gila River Bridge Replacement Project (in the Phoenix to Casa Grande area in Arizona). The overall project limits extend from approximately I-10 Milepost (MP) 161 (north limit of the project) towards the south to the north end of the Gila River Bridge Replacement Project (or approx. MP 172.75).

HDR Engineering, Inc. (HDR) prepared a Design Concept Report (DCR) for a broader extent of the I-10 GRIC corridor and the DCR was titled: *Design Concept Report, Interstate 10 Corridor: State Route 202L to State Route 387, Maricopa and Pinal County, Arizona*, ADOT Project Nos. F0252 01L and F0252 02L, Federal Aid No. 010-C(222)S, dated October 2023. Terracon's scope of work for the I-10 corridor extended from approximately I-10 MP 161 to MP 172.75, and the reports previously prepared by Terracon for this corridor include the following:

- *Geotechnical Engineering Data Report, I-10 Gila River Indian Community Design-Build Project, 202L to the Gila River Bridge, ADOT General Engineering Consultant* (Terracon Project No. 65225282, dated April 2, 2024).
- *Pavement Design Summary, I-10 Gila River Indian Community Design-Build Project, 202L to the Gila River Bridge, ADOT General Engineering Consultant, ADOT Report No. 24-28-F; ADOT TRACS No. F025201D* (Terracon Project No. 65225282, dated August 1, 2024).
- *Final Materials Design Report, I-10 Gila River Indian Community Design-Build Project, 202L to the Gila River Bridge, ADOT General Engineering Consultant, ADOT Report No. 24-28-F; ADOT TRACS No. F025201D / F072101C* (Terracon Project No. 65225282, dated Dec. 30, 2024).

The I-10 Koli Road Traffic Interchange (TI) Underpass (UP) was added to the project and is planned at approximately I-10 Milepost (MP) 163.5 (and the limits of the TI are I-10 MP 162.5 to 165). Terracon subsequently prepared the following additional reports for the I-10 Koli Road TI:

- *Geotechnical Engineering Data Report, I-10 Gila River Indian Community Design-Build Project, I-10 Koli Road Traffic Interchange (TI), ADOT General Engineering Consultant* (Terracon Project No. 65225282, draft dated April 18, 2025).
- *Pavement Design Summary, I-10 Gila River Indian Community Design-Build Project, I-10 Koli Road Traffic Interchange (TI), ADOT General Engineering Consultant, ADOT Report No. 25-20-F; ADOT TRACS No. F025201D* (Terracon Project No. 65225282, draft report dated May 2024).

This Materials Design Report (MDR) was prepared for the new I-10 Koli Road TI ramps and crossroad within the ADOT right-of-way (ROW), and based on the information provided, we understand the planned pavement improvements will be based on ADOT methodologies and standards. The recommended materials specifications for construction refer to the appropriate section of the *ADOT Standard Specifications for Road and Bridge Construction, 2021 Edition*, as amended by any project specific technical provisions, special provisions or other project requirements and specifications.

MATERIALS DESIGN REPORT

SECTION I – PAVEMENT STRUCTURE

ITEM 1 – STRUCTURAL THICKNESS (IN INCHES)

The following table provides the recommended pavement structural sections for the I-10 Koli Road TI ramps and crossroad within the ADOT right-of-way (ROW). Pavement structural sections are provided on the Schematic Design Plots in the Exhibits section of this MDR.

I-10 KOLI ROAD TI - RAMP PAVEMENT SECTIONS							
Pavement Section Number	Roadway Description [1]	Roadway Location [1]	PCCP (Plain w/ Dowels)	AC SMA (1/2" Mix)	AC (EP) (3/4") Special Mix	AB Class 2	Total
R11-K	I-10 TI UP at Koli Rd	EB Off-Ramp, EB On-Ramp, WB Off-Ramp, & WB On-Ramp	--	1.5	7	14	22.5
Note [A]		EB Off-Ramp	14	--	--	4	18

I-10 KOLI ROAD TI - CROSSROAD PAVEMENT SECTIONS							
Pavement Section Number	Roadway Description [1]	Roadway Location [1]	PCCP (Plain, no dowels)	Fog Coat	AC (Misc. Str. Special Mix)	AB Class 2	Total
C7-K	I-10 Crossroad – Koli Rd TI	West of I-10	--	Yes	6.5	11	17.5
C8-K		PCCP Limits	11.5	--	--	4	15.5
C7-K		East of I-10	--	Yes	6.5	11	17.5

Legend: Portland Cement Concrete Pavement (PCCP); Asphaltic Concrete (AC); Stone Matrix Asphalt (SMA); End Product (EP); Aggregate Base (AB); Milepost (MP); Westbound (WB); Eastbound (EB).

Note [1]: Refer to the project plans for exact project limits and locations and stationing of each proposed improvement.

Note [A]: Ramp from existing I-10 Mainline PCCP to a point at the back of gore to match the I-10 Mainline PCCP structural sections specified for the I-10 median widening (and remainder of Ramp extending from a point at the back of gore up to the Koli Road PCCP limit to be constructed with the AC pavement section).

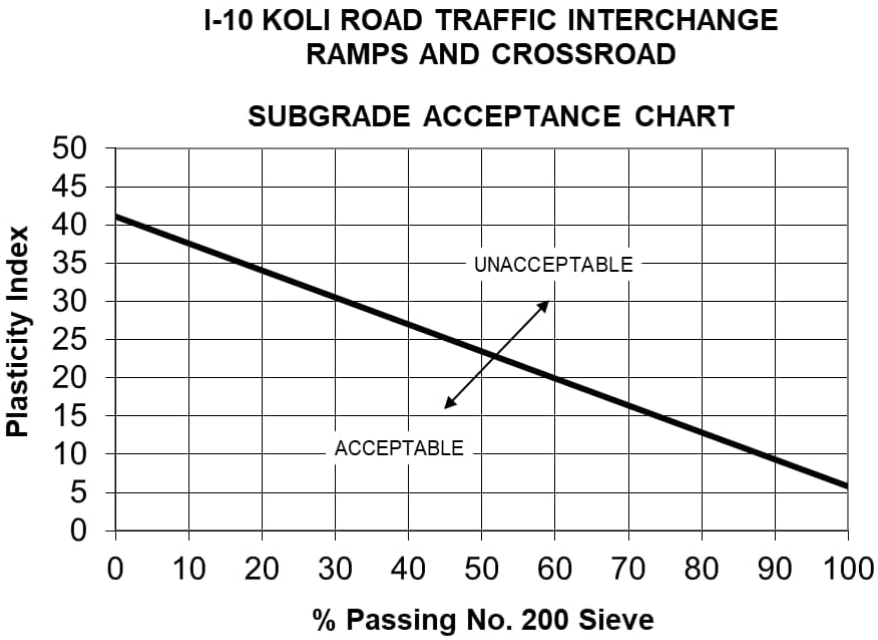
General Notes:

- Additional location and limits information of pavement improvements are outlined in Exhibit No. 1. ADOT standard PCCP joint details are included on Exhibit Nos. 2 and 3.

SECTION II – SUBGRADE AND BASES

ITEM 1 – SUBGRADE

The following Subgrade Acceptance Chart shall be used during construction for determining whether subgrade materials are suitable as outlined in Section 203-3.03(D) of the ADOT Construction Manual.



Construction Control R-Value = 20

ITEM 2 – AGGREGATE BASE (CLASS 2)

The Aggregate Base shall be Class 2, and shall be as specified in Section 303 of the Standard Specifications and Contracts and Specifications Stored Specification "303RASBAB."

SECTION III – SURFACE TREATMENTS & PAVEMENTS

ITEM 1 – PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)(Plain)

The work under this Item shall consist of furnishing all materials and constructing a Plain Jointed Portland Cement Concrete Pavement as specified in Section 401 of the Standard Specifications, and Contracts and Specifications Stored Specifications “401PCCPS” and “1011APEAS.”

> Note: Any non-standard details needed for the project, including connections to existing PCCP, joint layout details for the non-conventional traffic interchanges, or similar, shall be the responsibility of the Contractor.

ITEM 2 – PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)(Doweled)

> Note: This item is for the portion of the East-Bound Off-Ramp (of the I-10 Koli Road TI) that will match the existing I-10 Mainline PCCP. Ramp to match the I-10 Mainline PCCP from existing I-10 Mainline PCCP to a point at the back of gore.

The work under this Item shall consist of furnishing all materials and constructing a Plain Jointed and Doweled Portland Cement Concrete Pavement as specified in Section 401 of the Standard Specifications, and Contracts and Specifications Stored Specifications “401PCCPS” and “1011APEAS.”

Load transfer dowel assemblies shall be placed at each transverse weakened plane joint on the mainline in the travel lanes, shoulders and gores. The transverse weakened plane joints shall be constructed according to construction standard drawings with the exception that the joints be placed perpendicular to the center line.

> Note: Any non-standard details needed for the project, including connections to existing PCCP, joint layout details for the non-conventional traffic interchanges, or similar, shall be the responsibility of the Contractor.

ITEM 3 – LOAD TRANSFER DOWEL ASSEMBLY

> Note: This item is for the portion of the East-Bound Off-Ramp (of the I-10 Koli Road TI) that will match the existing I-10 Mainline PCCP. Ramp to match the I-10 Mainline PCCP from existing I-10 Mainline PCCP to a point at the back of gore.

The load transfer dowel assemblies shall be as specified in Contracts and Specifications Stored Spec. “401LTDA” and as detailed in Std. C-07.02.

The project engineer may permit the use of a mechanical dowel inserter in lieu of load transfer dowel assemblies, if in his opinion, the mechanical dowel inserter achieves no less tolerance than those achievable with dowel assemblies. Before the use of the mechanical dowel inserter is approved however, a plan to ensure the accurate placement of the transverse joints in relation to the location of the load transfer dowels shall be submitted to, and approved by

both the project Engineer and the ADOT Materials Group.

The mechanical dowel inserter, if used, shall employ hydraulic hammers. Air driven hammers shall not be permitted.

If a mechanical dowel inserter is used, then the dowels and their placement shall be paid for at the same amount as the load transfer assembly.

> Note: For doweled PCCP with thicknesses of 10.5 inches or less, the standard dowel bar diameter of 1½-inches shall be reduced to 1¼-inches.

ITEM 4 – LONGITUDINAL JOINTS BETWEEN NEW & EXISTING PCCP

> Note: This item is for the portion of the East-Bound Off-Ramp (of the I-10 Koli Road TI) that will match the existing I-10 Mainline PCCP. Ramp to match the I-10 Mainline PCCP from existing I-10 Mainline PCCP to a point at the back of gore.

The longitudinal joints between the existing and proposed PCCP shall be located at the proposed lane line or at the center of the planned lane (and not at or near Wheel-Paths) with the following minimum dowel requirements:

- ADOT Standard epoxy-coated smooth dowel bars along the longitudinal joint (#5 x 24-inch long at 30-inch centers) when the widening width is 12 feet or more.
- ADOT Standard epoxy-coated deformed dowel bars along the longitudinal joint (#5 x 24-inch long at 30-inch centers) when the widening width is less than 12 feet.

If PCCP longitudinal joints are not located within 1.0 foot of a lane line, or the center of the lane, then the minimum longitudinal dowel requirements shall not be less than: 1½-inch diameter x 18-inch long epoxy-coated smooth dowel bars placed at 24-inch on centers; or #8 x 18-inch long epoxy-coated smooth dowel bars placed at 18-inch on centers.

Longitudinal dowel bars shall not be placed within 15 inches of a transverse joint or the bars are to be shortened in accordance with the ADOT standard drawings.

ITEM 5 – ASPHALTIC CONCRETE – END PRODUCT (3/4") (SPECIAL MIX)

The asphaltic concrete shall be as specified in Section 403 and 416 of the Standard Specifications, and Contracts and Specifications Stored Spec. "416ACES" (dated 7/18/2024 unless otherwise specified in the contract).

The effective voids shall be 5.5 ±0.2%.

The ratio of the mix design composite gradation target for the No. 200 sieve, including admixture, to the effective asphalt content shall be a minimum of 0.8 to a maximum of 1.2.

For estimating purposes the unit weight of the bituminous mix is 147 pounds per cubic foot and the asphalt cement is 5.0%.

The asphalt cement type shall be PG 76-22 PM.

ITEM 6 – STONE MATRIX ASPHALTIC CONCRETE (1/2")

The asphaltic concrete shall be as specified in TPA 400-2.

The type of asphaltic concrete shall be ½-inch mix.

For estimating purposes the unit weight of the bituminous mix is 144 pounds per cubic foot and the asphalt cement is 6.0%.

The asphalt cement type shall be PG 76-22 PM.

ITEM 7 – ASPHALT CONCRETE (MISCELLANEOUS STRUCTURAL – SPECIAL MIX)

The asphaltic concrete shall be as specified in Section 409 of the Standard Specifications, and Contracts and Specifications Stored Specification "409AGGR."

For estimating purposes the unit weight of the bituminous mix is 147 pounds per cubic foot.

The asphalt cement type shall be PG-76-22.

ITEM 8 – TACK COAT

The tack coat shall be as specified in Section 404 of the Standard Specifications, and Contracts and Specifications Stored Specification "404BITUM."

ITEM 9 – FOG COAT

The fog coat shall be as specified in Section 404 of the Standard Specifications, and Contracts and Specifications Stored Specification "404BITUM."

The bituminous material shall be CSS-1.

The bituminous material shall be applied at the approximate rate of 0.05 gallons per square yard.

The blotter material shall be applied at a total rate of approximately 2 pounds per square yard.

ITEM 10 – PAVEMENT SMOOTHNESS

The final asphaltic concrete pavement surface shall be evaluated for smoothness as specified in the Contract documents.

SECTION IV – MATERIAL SOURCES – GEOTECHNICAL ANALYSIS

ITEM 1 – MATERIAL SOURCES

Materials sources shall be as specified in Section 104 of the Standard Specifications, and Section 104.12 of the Technical Provisions.

ITEM 2 – BORROW REQUIREMENTS (Contractor Furnished Source)

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 3 feet of finished subgrade shall meet the following requirements:

> The Plasticity Index (PI) (AASHTO T90) and the percent passing the No. 200 Sieve (Minus 200) (Ariz. Test Method 201) when used in the equation below, shall give a value of X that does not exceed the following values:
>
> X = (Minus 200) + [2.83 (PI)]

Roadway	Maximum X Value
I-10 Koli Road TI – Ramps & Crossroad	116

ITEM 3 – EARTHWORK FACTORS AND SLOPES

Station	Earthwork Factor (Shrink)	Recommend Slopes (horizontal: vertical)
Project Limits (see plans for details)	10%	Fill 3H:1V Cut 3H:1V

The earthwork factor only applies to soils within the project limits and does not apply to any imported soils which will be necessary for the project.

Consideration of erosion of the slope surface for both cut and fill slopes is recommended. All non-stabilized fill slopes should be constructed no steeper than 3(H):1(V) and in accordance with ADOT Standard Drawing C-02.10. Construction of fill slopes should be in accordance with Section 203-10 of the ADOT Standard Specifications (ADOT, 2021). Should steeper slopes be required use of mechanically stabilized embankments, concrete retaining structures, and/or adequate erosion protection is recommended provided the slopes meet minimum stability requirements.

The face of all slopes should be compacted to the minimum specification for fill embankments. Fill slopes can be over-built and trimmed to expose a compacted slope surface.

If steeper slopes are required for site development, stability analyses should be completed to design the grading plan.

ITEM 4 – GROUND COMPACTION

The following ground compaction factors shall be compensated for on embankment sections outside the existing roadway prism.

Station	Ground Compaction (ft)
Project Limits (see plans for details)	0.7

ITEM 5 – WATER

Approximately 85 gallons of water per cubic yard should be estimated for compaction of base materials. Approximately 85 gallons of water per cubic yard should be estimated for compaction of subgrade materials.

The application of water estimated for subgrade materials is considerably higher than the amount calculated based upon the difference between in-situ and optimum compaction moisture contents, and includes a conservative overrun for losses due to seepage, evaporation, inadequate mixing, spillage, etc. Precipitation during and/or before construction may reduce the required amount of water.

ITEM 6 – pH AND RESISTIVITY

If corrugated metal pipe culverts are to be used, then the type of metal pipe and coating should be determined by the pH and resistivity of in-place materials listed below:

Summary of Chemical Laboratory Testing [1]						
Koli Road TI: Ramps, Crossroad & Underpass Bridge						
Exploration Designation	Depth (ft)	Latitude / Longitude	pH	Minimum Resistivity (ohm-cm)	Soluble Sulfates (mg/kg)	Soluble Chlorides (mg/kg)
R&C-39	0.5 - 6	33.267°/-111.958°	9.3	2,349	268	43
R&C-46	2 - 8	33.266°/-111.955°	8.3	268	562	1,264
R&C-50	2 - 7	33.266°/-111.959°	8.6	483	666	555
R&C-52	0.5 - 6	33.263°/-111.962°	8.6	2,013	1,251	397
B-20	0 - 4	33.267°/-111.958°	8.2	315	1,392	2,719
B-21	1 - 6	33.267°/-111.957°	8.5	872	253	156
B-25	0 - 5	33.267°/-111.957°	9.6	1,879	78	400

Note [1]: Test results indicate the site soils have variable low to significant concentrations of both soluble sulfates and chlorides. The minimum electrical resistivity test results indicate the site soils are variable moderately to very corrosive.

SECTION V – MISCELLANEOUS

ITEM 1 – DISPOSAL OF WASTE MATERIALS

Removal and/or disposal of existing waste material generated during the construction of the project, or any asphaltic concrete not used for the project, shall be the responsibility of the Contractor unless otherwise specified in the Contract Documents.

ITEM 2 – TEMPORARY CONNECTIONS AND DETOURS

Temporary connection and detours for the project are excluded from this report and their design and construction will be the responsibility of the Contractor.

PRELIMINARY PAVEMENT STRUCTURE COST ESTIMATE

Note: Intentionally left blank.

INCENTIVE COST ESTIMATE – SMOOTHNESS AND MATERIAL QUALITY

Note: Intentionally left blank.

EXHIBITS

Pavement Structural Sections



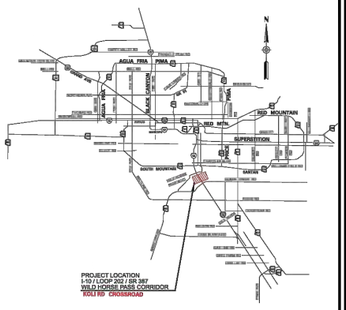
ARIZONA DEPARTMENT OF TRANSPORTATION

HDR

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

TRACS NO. F0701 01L

I–10 KOLI ROAD INTERCHANGE PLAN AND PROFILES



MIDPOINT OF PROJECT
Central Zone
State Plane Coordinates
X=687,772
Y=824,860

DESIGN DATA

I-10
2019 ADT = 107,000
2040 ADT = 171,000
2050 ADT = 198,000

Koli Rd
2023 ADT = To Be Provided
2050 ADT = To Be Provided

DESIGN SPEEDS:

I-10
Mainline = 65 MPH (Posted)

Koli Rd
Outside TI = 40 MPH
Inside TI = 30 MPH

Koli Rd DDI
CrossOver Curves = 20 MPH
CrossOver Angle = 50 Degrees
Turning Roadways = 20 MPH

Ramps
Body = 50 MPH
@ Entrance Gore = 55 MPH
@ Exit Gore = 60 MPH
@ TI Terminal = 20 MPH

LENGTH OF PROJECT

I-10
Mile Post 162.50 to 165.00

EB Koli Rd Cst CL
Sta 121+24.83 to Sta 136+82.69 = 1,557.86'

WB Koli Rd Cst CL
Sta 221+68.94 to Sta 237+67.96 = 1,599.02'

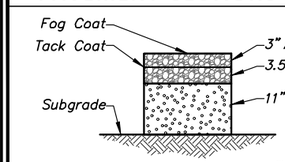
LEGEND

- New Pavement (PCCP)
- New Pavement (Asphalt)
- New Bridge
- Fill Line
- Cut Line
- New FMS
- New Full Access Control
- Median
- GRIC Ownership Parcels
- Concrete Sidewalk
- New R/W
- Exst R/W (Line) Exst Access Control (Hash Marks)
- New Retaining Wall
- Land Boundary

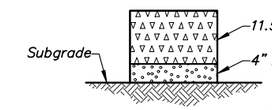
100 0 100 200
1"=100'
SCALE

I-10/Koli Road Traffic Interchange Study

PAVEMENT SECTIONS - CROSSROADS



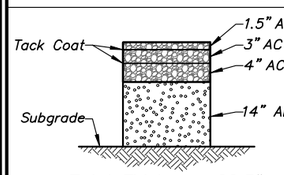
Total Thickness 17.5"
PAVEMENT SECTION NO. C7-K
AC CROSSROAD –
WEST & EAST of I-10



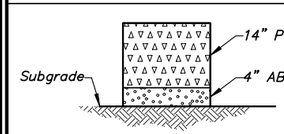
Total Thickness 15.5"
PAVEMENT SECTION NO. C8-K
PCCP LIMITS of CROSSROAD at I-10

NOTE:
PAVEMENT SECTION NOs.:
CROSSROAD C7-K & C8-K

PAVEMENT SECTIONS - RAMPS



Total Thickness 22.5"
PAVEMENT SECTION NO. R11-K
EAST BOUND OFF-RAMP,
EAST BOUND ON-RAMP,
WEST BOUND OFF-RAMP
AND WEST BOUND ON-RAMP



Total Thickness 18"
1-10 MAINLINE
PAVEMENT SECTION NO. M1-K
EB OFF-RAMP from
I-10 MAINLINE to a POINT
at BACK of GORE

NOTE:
Refer to Project Contract Documents for the exact project limits, locations, and stationing of each proposed improvement.

NOTE:
PAVEMENT SECTION NOs.:
RAMPS R11-K

I-10 Koli Road TI

NOTE:
EB Off-Ramp from existing I-10 Mainline PCCP to a point at the back of gore.
See Detail M1-K, this sheet

EASTBOUND OFF-RAMP

WESTBOUND ON-RAMP

EASTBOUND ON-RAMP

WESTBOUND OFF-RAMP

KOLI RD

Exst R/W

Protect In Place

Maintenance Access Rd (Typ)

Exst I-10 Cst ℄

WB Koli Rd Ramp A Cst ℄

WB Koli Rd Ramp B Cst ℄

WB Koli Rd Ramp B1 Cst ℄

WB Koli Rd Ramp A1 Cst ℄

WB Koli Rd Cst ℄
POB 221+59.92

WB Koli Rd Cst ℄
POE 237+90.99

No Local Access
Future Connection By Others

Future Community Project
Connections Shown For Information Only

New R/W and Access Control

Proposed 14' x 16'
Equipment Underpass

EB Koli Rd Cst ℄
POB 121+07.31

EB Koli Rd Cst ℄
POE 136+99.87

EB Koli Rd Ramp D Cst ℄

EB Koli Rd Ramp D1 Cst ℄

WB Koli Rd Ramp C Cst ℄

WB Koli Rd Ramp C1 Cst ℄

New 30" CMP

Remove By Others
Exst Aluminum or
Similar Bleacher

Terracon
Explore with us
4685 South Ash Avenue, Suite H-4 Tempe, AZ 85282
PH. (480) 897-8200 FAX. (480) 897-1133 www.Terracon.com

NOTE:
I-10 GRIC Project Schematic Design (Roll Plot) was provided by HDR, and Terracon added pavement section information.

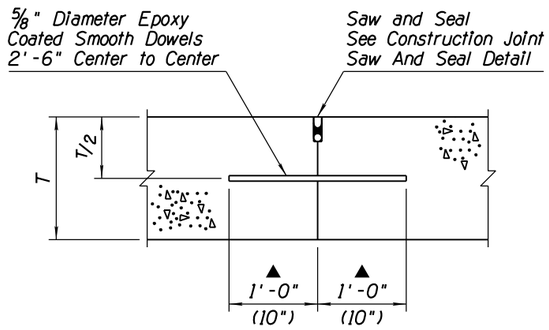
EXHIBIT
1

n:\projects\2022\65225282\working files\drafts\roh\drafts\figures\cad\65225282_pav_rev 25.06.02.dwg / tab: Exh 1 (Koli Rd TI)

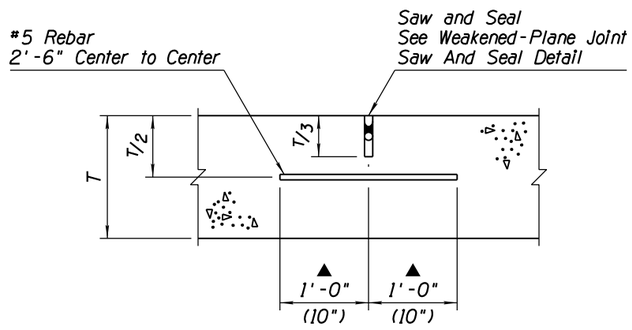
MARCH 26, 2025

ADOT Standard PCCP Joint Details

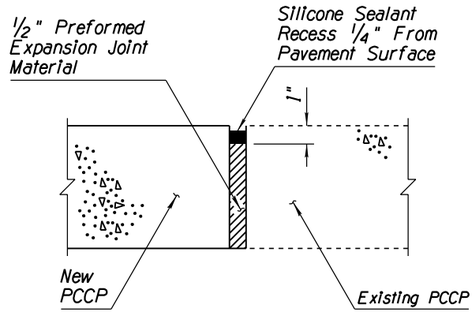
NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	ADDED DEFINITION FOR 'PE'	RLF	9/04
2	REVISED DIMENSION FORMAT	RLF	7/05
3	REMOVED 'INITIAL SAWCUT' NOTATION	RLF	7/05
4			



LONGITUDINAL CONSTRUCTION JOINT
LC Joint



LONGITUDINAL WEAKENED-PLANE JOINT
LWP Joint



EXPANSION JOIN
H Joint

GENERAL NOTES

▲ 1. When load transfer dowel assemblies are required, use dimensions shown in ( )'s. See Assembly Placement And Edge Clearance Detail, Std Dwg C-07.02.

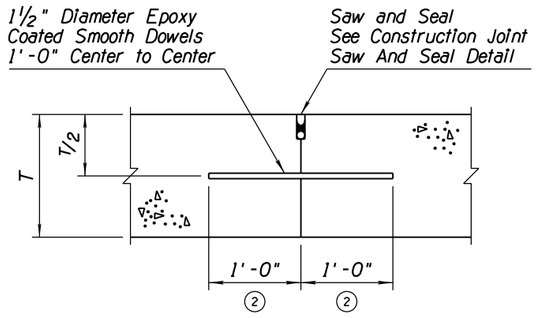
2. In slip form type pavement construction, LWP joints shall be used. In fixed form construction either LWP or LC joints may be used.

3. K joints shall be constructed around the complete perimeter of miscellaneous structures, or as directed by the Engineer.

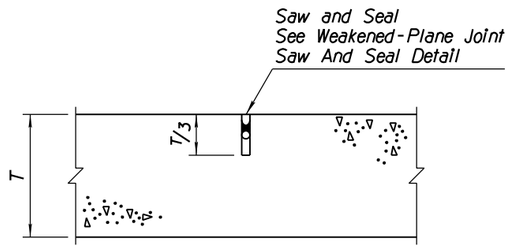
4. Miscellaneous structures include, but are not limited to, catch basins, sign structure foundations, piers, abutments, barrier transitions, slotted drains and other concrete facilities, constructed within the right-of-way.

JOINT ABBREVIATIONS

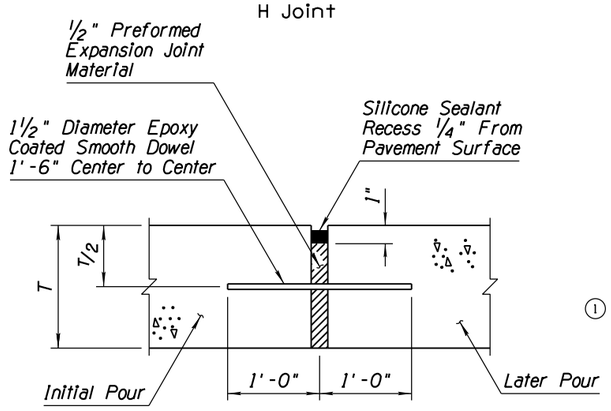
LWP	-	Longitudinal Weakened-Plane Joint
TWP	-	Transverse Weakened-Plane Joint
LC	-	Longitudinal Construction Joint
TC	-	Transverse Construction Joint
E, H, K	-	Expansion Joints
S	-	AC/PCCP Edge-Seal Joint
T	-	PCCP Thickness
① PE	-	Polyethylene



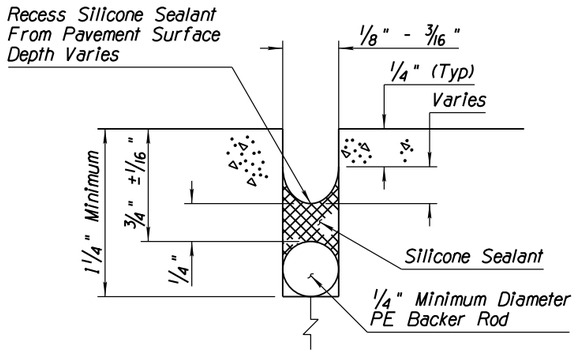
TRANSVERSE CONSTRUCTION JOINT
TC Joint
Non-Skewed & Skewed Joints



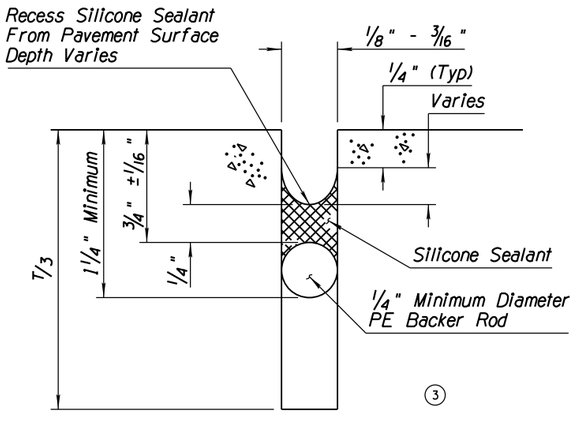
TRANSVERSE WEAKENED-PLANE JOINT
TWP Joint
W/O Load Transfer Dowel Assemblies



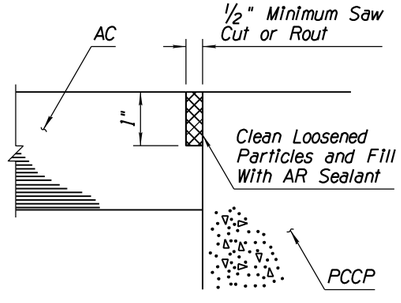
EXPANSION JOINT
E Joint



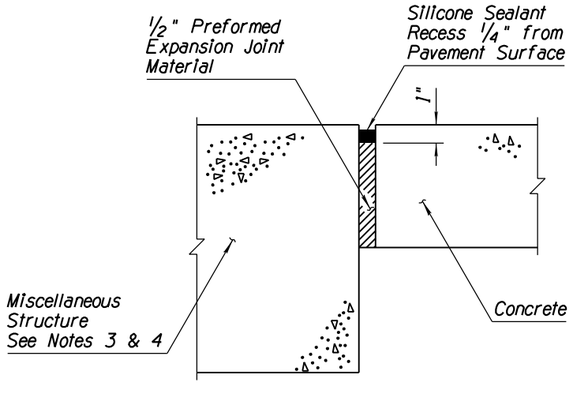
CONSTRUCTION JOINT
SAW AND SEAL DETAIL



WEAKENED-PLANE JOINT
SAW AND SEAL DETAIL



AC/PCCP EDGE-SEAL JOINT
S Joint
(Where Specified on Plans)



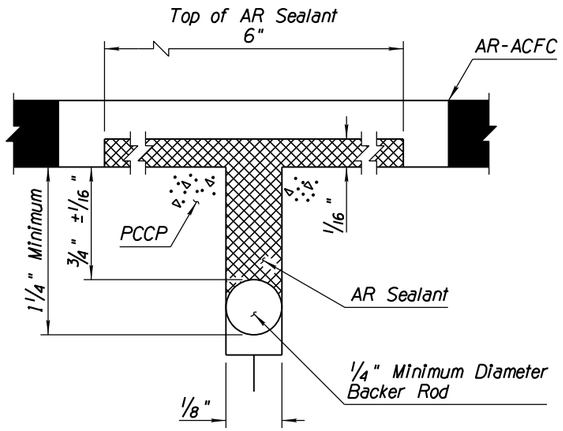
EXPANSION JOINT
K Joint (See Notes 3 & 4)

APPROVED FOR DESIGN	STATE OF ARIZONA DEPARTMENT OF TRANSPORTATION ROADWAY STANDARD DRAWINGS	REV. 5/12
APPROVED FOR DISTRIBUTION	PCCP JOINTS	DRAWING NO. C-07.01 Sheet 1 of 2

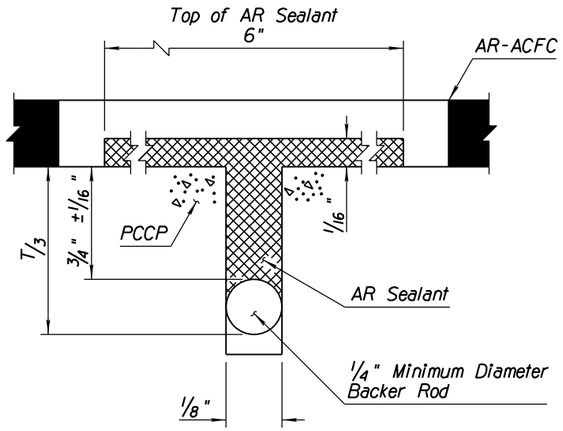
V:/Roadway\users\td036\ 11:29:29 AM normal.tbl

Exhibit 2

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	REISSUED STANDARD DRAWING	RLF	7/05
2	REVISED SECTION VIEW AND NOTE	RLF	5/12
3			
4			



LONGITUDINAL CONSTRUCTION
JOINT DETAIL
(WITH AR-ACFC)



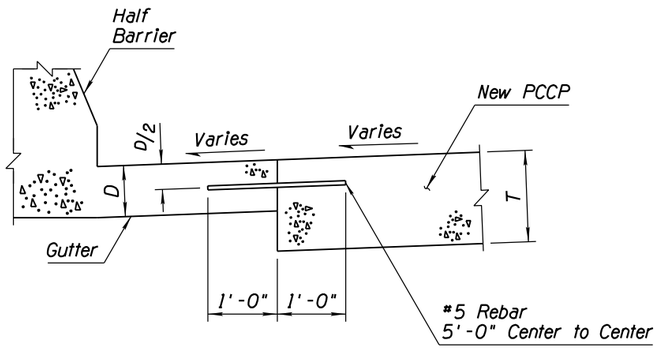
WEAKENED-PLANE
JOINT DETAIL
(WITH AR-ACFC)

GENERAL NOTES

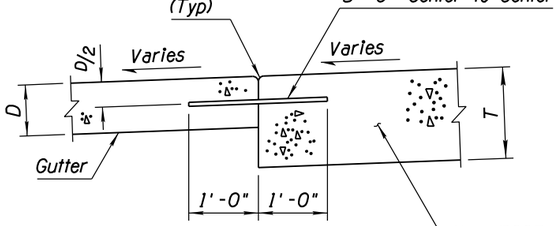
1. Joints are generally shown with pavement sloping toward the joint.

JOINT ABBREVIATIONS

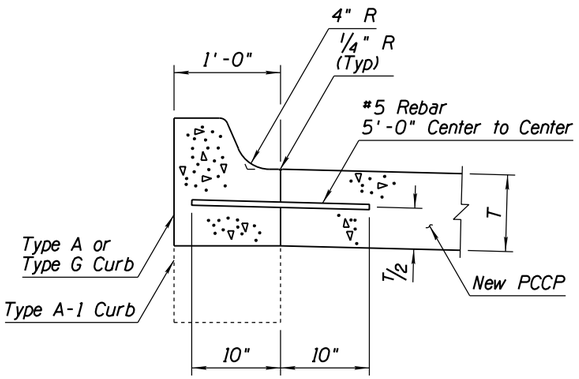
G - Gutter Joint
T - PCCP Thickness
D - Gutter Thickness
B - Barrier Joint
② F - Barrier Footing Concrete Thickness (Full-depth Concrete Shown)



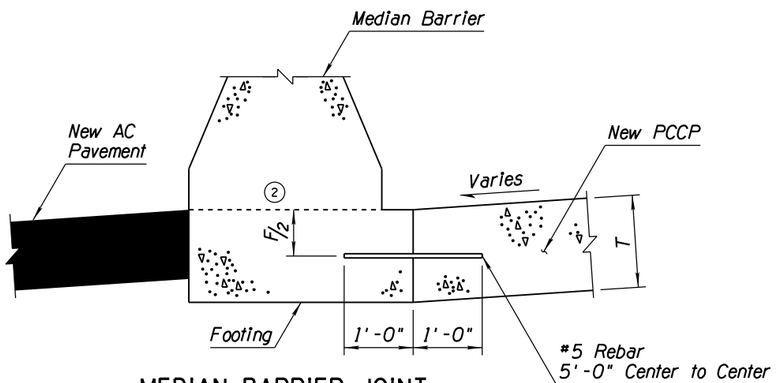
HALF BARRIER JOINT
B Joint



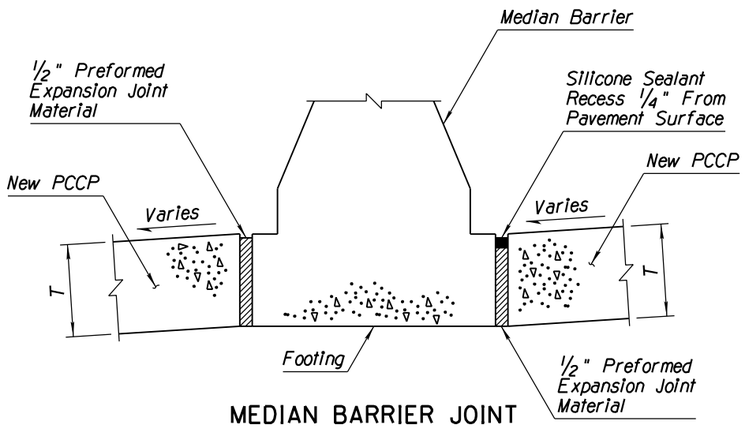
CURB & GUTTER JOINT
G Joint



SINGLE CURB JOINT
A Joint



MEDIAN BARRIER JOINT
B Joint
AC Pavement on Back Side of Barrier



MEDIAN BARRIER JOINT
B Joint
PCCP on Both Sides of Barrier

APPROVED FOR DESIGN	STATE OF ARIZONA DEPARTMENT OF TRANSPORTATION ROADWAY STANDARD DRAWINGS	REV. 5/12
APPROVED FOR DISTRIBUTION	PCCP JOINTS	DRAWING NO. ① C-07.01 Sheet 2 of 2

normal.tbl

Exhibit 3

TPA 600-1 Soil Nailed Wall Systems

Description:

General:

The work under this item shall consist of furnishing all materials, equipment, tools, and labor to construct permanent soil nail wall systems per the applicable sections of the TPs.

The work under this item shall include excavation in staged lifts; drilling of the soil nail drill holes to the diameter and length required to develop the required capacity; providing and installing the specified nail bars; grouting the nails; verification and proof testing of the nails; providing and installing the specified drainage features; constructing the required reinforced shotcrete facing; and providing and installing bearing plates, washers, nuts, headed studs, and other required miscellaneous materials. The permanent soil nail wall shotcrete facing consists of a layer of reinforced shotcrete applied to the exposed soil/rock wall face as excavation proceeds.

The permanent soil nail wall system shall be designed in accordance with the requirements of Federal Highways Administration (FHWA) *Geotechnical Engineering Circular No. 7: Soil Nail Walls Reference Manual* (FHWA-NHI-14-007) and the American Association of State Highway and Transportation (AASHTO) *LRFD Bridge Design Specifications* (8th edition, 2020). If the system is designed to use a pre-tensioned anchor system, the system shall be designed in accordance with the requirements of FHWA *Geotechnical Engineering Circular No. 4: Ground Anchors and Anchored Systems*.

Review of Subsurface Information, Site Visit, & Certification:

Design-Builder shall be responsible to review all available subsurface geotechnical information and reports and shall visit the site to assess the site geometry, equipment access conditions, and location of any existing structures and above- and below-ground utilities.

Submittals & Meetings:

Design-Builder shall submit material certifications, Shop Drawings and Working Drawings, and Project Special Provisions in accordance with the requirements of TP Section 113 (*Submittal Management*) as modified herein.

The submittal shall include:

(A) The proposed schedule and construction sequence.

(B) Method of staged excavation and excavation equipment.

(C) Drilling method(s) and equipment.

(D) Certified shotcrete mix design.

(E) Soil nail testing equipment including jack or loading ram, pump, dial gauges (minimum of two dial gauges), bracing, and current calibrations of the jack/pump/pressure gauges as a system.

(F) Example verification test and proof test data sheets.

(G) Design-Builder shall submit a project reference list verifying the successful construction/completion of at least three permanent soil nail wall system projects during the past three years totaling at least 40,000 square feet of finished wall face area and at least 2,000 permanent soil nails. A brief description of each project with the owner's name and current phone number shall be included.

(H) A registered Professional Engineer having experience in the construction of permanent soil nail wall system projects during the past three years shall supervise the work. The on-site supervisor and drill

rig operators shall have experience installing permanent soil nail wall systems on at least three completed projects over the past three years.

No testing or excavation work shall be performed until after the approval of the submittal. All excavation shall be carried out in accordance with the construction sequence plan approved by ADOT.

A soil nail system Pre-Construction Meeting shall be scheduled prior to commencement of soil nail system construction activity. No soil nail system work shall commence until Design-Builder's final submittal has been approved by the ADOT.

Shotcrete Nozzlemen Certification/Qualification:

All shotcrete nozzlemen shall have experience on at least three projects within the past three years in similar shotcrete application work and shall demonstrate ability to satisfactorily place the shotcrete. Initial prequalification of nozzlemen will be based either on previous American Concrete Institute (ACI) certification or on satisfactory completion of pre-construction test panels. The requirement for nozzlemen to shoot pre-construction qualification test panels will be waived for nozzlemen who can submit documented proof of certification in accordance with ACI 506.3R "*Guide to Certification of Shotcrete Nozzlemen*". The certification shall have been done by an ACI-recognized shotcrete testing laboratory and/or recognized shotcrete consultant and shall have covered the type of shotcrete to be used for this Project. All nozzlemen will be required to periodically shoot production test panels during the course of the work as required by the IQF.

Each nozzleman without previous ACI certification shall furnish at least two pre-construction test panels for each proposed shotcrete mixture being considered and for each shooting position to be encountered on the job. Pre-construction test panels shall be made prior to the commencement of production work using the same equipment, materials, mix proportions and procedures proposed for this Project.

Pre-construction test panels shall be made with minimum dimensions of 30 x 30 inches square and shall be at least 4 inches thick. The sides of pre-construction and production test panels shall be sloped at 45 degrees over the full panel thickness to release rebound. One pre-construction test panel shall include the maximum anticipated reinforcing congestion (welded wire reinforcing with vertical and horizontal reinforcing bars) shown on the Plans. Cores extracted from the test panel shall demonstrate encapsulation of the reinforcement in accordance with ACI 506.2 Specification for Shotcrete equal to core grade 2 or better. The second pre-construction test panel shall be constructed without reinforcement and shall have cores extracted for compressive strength testing.

The IQF shall be notified not less than 2 Days prior to the shooting of the preconstruction test panels to be used to qualify nozzlemen without previous ACI certification. The same shotcrete mix and equipment shall be used to make qualification test panels as is to be used for the work. Initial qualification of the nozzlemen will be based on a visual inspection of the shotcrete density and void structure and on achieving the specified 3-day and 28-day compressive strength requirements determined from test specimens extracted from the preconstruction test panels. Pre-construction and production test panels, core extraction, and compressive strength testing shall be conducted in accordance with ACI 506.2 and AASHTO T24/ASTM C42, unless otherwise specified herein. Nozzlemen without ACI certification will be allowed to begin production shooting based on satisfactory completion of the pre-construction test panels and on achieving 3-day strength test requirements. Continued qualification will be subject to passing the 28-day strength tests and shooting satisfactorily during production test panels.

Existing Utilities:

Design-Builder is responsible for field locating and verifying the location of all utilities shown on the Plans prior to starting the work. Design-Builder shall maintain uninterrupted service of those utilities designated to remain in service throughout the work.

Materials:

Drainage Network:

The drainage network shall consist of installing vertical prefabricated geocomposite wall drain strips with geotextile wall drain fabric (filter fabric), and weep hole drains.

The geocomposite wall drain strips shall be a minimum of 18 inches wide and shall be secured to the cut face in between vertical nail rows (the nominal horizontal spacing between drain strips shall be 6 feet), with the filter fabric side against the exposed soil/rock of the excavation face, before application of the shotcrete facing. The applicable requirements of Section 203-5 of the ADOT *Standard Specifications* shall be followed in installing the wall drain strips and filter fabric. Geocomposite wall drain strips and filter fabric shall be continuous from a point 6 inches below the top of the shotcrete wall facing to the bottom of the wall, provided with perforated connections to the weep hole drains. Geocomposite wall drain strips and filter fabric shall meet the requirements of Section 1014-6 of the ADOT *Standard Specifications*.

Weep hole drain perforations through the geocomposite wall drain strip and filter fabric shall be capped with geotextile filter fabric. Weep hole drains shall consist of 4-inch diameter, Schedule 40 PVC pipe.

Nail Bars:

Nail bars shall be solid, deformed bar or threadbar, minimum Grade 75 steel, conforming to American Society for Testing and Materials (ASTM) A615, or ASTM A722 for Type 1 bars. Nail bars shall be continuous without welds, and shall be new, straight, undamaged, and encapsulated as described below. All nail bars shall be clean and free of excessive rust and mill scale at the time of installation. Nail bars shall be threaded a minimum of 6 inches on the wall anchorage end to permit proper attachment of the bearing plate, wedge washer and nut. Threading may be continuous spiral deformed ribbing provided by the bar deformations or may be cut into a deformed bar.

Nail Bar Encapsulation:

All nail bars shall be encapsulated in a corrugated plastic sheath consisting of a minimum 0.04-inch-thick corrugated HDPE tube conforming to AASHTO M252 or corrugated PVC tube conforming to ASTM D1784, Class 13464-B. Encapsulation shall provide a minimum of 0.40 inches of neat cement grout cover over the nail bar and be resistant to ultraviolet light degradation, normal handling stresses, and grouting pressures. Encapsulation shall be done in the factory at the point of origin and not in the field. Encapsulation at the wall anchorage end of the encapsulated bars may be omitted over the length provided for threading the nut against the washer and bearing plate.

Nail Grout:

Nail grout shall comply with all applicable requirements of ACI 318 *Building Code Requirements for Structural Concrete* and the ADOT *Standard Specifications*. Nail grout shall consist of either a neat cement grout or a sand-cement grout. Cement shall be Type V conforming to AASHTO M85/ASTM C150. The proposed nail grout mix design shall be submitted to ADOT for review and approval. The mix design submittal shall include compressive strength test results verifying that the proposed mix will have a minimum 3-day compressive strength of 1,500 psi and a minimum 28-day compressive strength of 3,000 psi. All mix design and compression tests shall be performed by a qualified independent testing laboratory.

Previous test results for the proposed grout mix completed within one year or less of the start of work may be submitted for initial verification of the required compressive strengths, for installation of preproduction verification (sacrificial) test nails and initial production nails. During production, nail grout shall be sampled and tested by ADOT in accordance with AASHTO T106/ASTM C109, at a frequency of no less than one sample/test for every 20 cubic yards of grout placed or no less than one sample/test per work shift.

Welded Wire Mesh and Reinforcing Steel:

Welded wire mesh reinforcing to be used in the temporary structural shotcrete facing shall be minimum 4x4 – W4.0xW4.0 Grade 60 conforming to Section 1003 of the ADOT *Standard Specifications* and the TPs. Welded wire mesh reinforcing shall be placed over the exposed soil/rock face using spacers to keep mesh at least 2 inches from the exposed face. Welded wire reinforcing laps shall be 8 inches minimum and in accordance with Section 605 of the ADOT *Standard Specifications*.

Vertical (bearing) reinforcing bars and continuous horizontal (waler) reinforcing bars for the structural shotcrete facing shall be No. 6, Grade 60 deformed steel bars conforming to ASTM A615, and shall be attached to the mesh. Waler bars shall be lapped a minimum of 24 inches with laps staggered at 3 feet from laps on adjacent bars.

Shotcrete:

Shotcrete shall conform to the requirements of Section 912 of the ADOT *Standard Specifications*, except as otherwise specified in the TPs. The minimum structural shotcrete facing thickness shall be 4 inches, and the shotcrete shall be applied to the lines and thickness shown on the Plans. Shotcrete shall be applied in the same work shift as the excavation face is trimmed to final line. All voids created between shotcrete placed on the previous lift and the excavation face shall be filled with shotcrete. Shotcrete shall be a pumpable mixture with a minimum 3-day compressive strength of 1,500 psi and a minimum 28-day compressive strength of 3,000 psi. The average compressive strength of each set of three test cores extracted from test panels or from the shotcrete wall face shall equal or exceed 90% of the specified compressive strength, with no individual core strength less than 80% of the specified compressive strength, in accordance with ACI 506.2. Design-Builder shall submit the proposed shotcrete mix design to the IQF for review and approval.

Water for shotcrete shall be clean and potable. At all times, the water temperature shall be maintained below 85 degrees F.

Admixtures shall not be used unless approved by the IQF. Admixtures shall meet the requirements of Section 1006-2.04 of the ADOT *Standard Specifications*. The shotcrete shall be proportioned to be pumpable with the concrete pump furnished for the work. Admixtures shall be thoroughly mixed into the shotcrete at the rate specified by the admixture manufacturer. Use of accelerators shall not be permitted. The maximum allowable chloride ion content of all ingredients shall not exceed 0.10% when tested by AASHTO T260.

Curing materials shall meet the requirements of Section 1006-2.05 of the ADOT *Standard Specifications*, and AASHTO M148, Type 1-D or Type 2.

Design-Builder must receive notification from the IQF that the proposed mix design and method of placement are acceptable before shotcrete placement can begin.

Air entrainment shall be required for wet-mix shotcrete. The amount of air entrained in the shotcrete measured at the truck shall be not less than 4%, nor more than 7%, by volume, when tested in accordance with AASHTO T152/ASTM C231. Air entrainment shall not be required in dry mix shotcrete.

Nail Head Assemblies Structural Steel:

Structural steel, including for bearing plates, wedge washers, nuts and welded headed-stud shear connectors shall be in accordance with Subsection 604-2 of the ADOT *Standard Specifications*. All nail head assembly elements, including headed-stud shear connectors/bearing plate assembly, wedge washer and hexagonal nut, shall be galvanized to meet the requirements of Section 604-3.05 (ASTM A153) of the ADOT *Standard Specifications*. All welding and inspection of headed-stud shear connectors shall be performed in accordance with the requirements of American Welding Society (AWS) D1.1/D1.1M: (2004), Section 7. Welds for attachment of headed-stud shear connectors to the bearing plate shall be full-penetration buttwelds.

Handling & Storage:

Cement shall be stored to prevent moisture degradation and partial hydration. Cement that has become caked or lumpy shall not be used. Aggregates shall be stored so that segregation and inclusion of foreign materials are prevented.

Steel reinforcing and nail bars shall be stored on supports to prevent the steel from contacting the ground. Damage to the nail bars or encapsulated due to abrasion, cuts, nicks, welds, and weld splatter shall be cause for rejection. Welding leads shall not be grounded to nail bars. Nail bars shall be protected from dirt, rust, and other deleterious substances prior to installation. Heavy corrosion or pitting of nail bars shall be cause for rejection. Light rust that has

not resulted in pitting shall be acceptable. Protective wrap shall be placed over the anchorage end of each nail bar to which the bearing plate, wedge washer and nut will be attached, to protect the bar during handling, installing, grouting, and shotcreting. Weep hole PVC pipe shall have ends capped, wrapped, and/or otherwise covered and protected during shotcreting.

Encapsulated nail bars shall not be moved or transported until the encapsulation grout has reached sufficient strength to resist damage during handling. Encapsulated nail bars shall be handled and stored in a way that will prevent large deflections, distortions, and damage. Damaged encapsulated nail bars shall be repaired in accordance with the manufacturers' recommendations and as approved by ADOT or shall be removed from the Project. Encapsulated nail bars that are determined to be defective in accordance with the manufacturer's recommendations shall be removed from the Project.

Construction Requirements:

General:

All materials and workmanship shall conform to the requirements of the Technical Provisions.

Equipment:

All equipment shall be maintained to ensure continuous and efficient production during soil nailing and associated operations. Design-Builder shall provide equipment with specialty drilling bits capable of advancing through the site surface and subsurface conditions including, but not limited to rock, concrete, brick, metal, wood, cobbles and boulders.

Monitoring:

Surface settlement survey points shall be installed at ground level along the soil nail wall. In addition, survey points shall be installed on the face of the wall in two rows, one at the top row of nails and the second at mid-height of the wall. These survey points shall be located at a maximum horizontal spacing of 75 feet. Initial surface elevation readings shall be obtained by a Registered Land Surveyor in the State of Arizona at least one week before the start of excavation. All points shall be monitored by Design-Builder no less than once weekly during excavation and twice a month thereafter until the permanent soil nail wall is completed.

Design-Builder shall take precautions to prevent damage to survey points. Survey points which are damaged during or after installation, shall be replaced by Design-Builder, to the satisfaction of the IQF.

Soil Nail System Excavation:

Soil nail wall system excavation near the finished excavation face will require special care and effort. Excavation to the final face, defined as the back of the structural shotcrete facing, shall use procedures which:

(A) Prevent over-excavation.

(B) Prevent ground loss, swelling, air slaking, or mass loosening.

(C) Prevent loss of support for completed portions of the wall.

(D) Prevent gain or loss of soil moisture at the face; and

(E) Prevent ground freezing.

Drilling of closely-spaced presplit line holes along the final excavation line shall be allowed to assist in excavation of a clean finished face in bedrock materials. Blasting of presplit line holes along the final excavation line shall not be allowed.

Design-Builder shall notify the IQF immediately if raveling or local instability of the final wall face excavation occurs. Unstable areas shall be temporarily stabilized by means of buttressing the exposed face with an earthen berm or by

other methods, as approved by the IQF. All work in unstable areas shall be suspended until remedial measures are developed and implemented. Design-Builder shall be responsible for maintaining stable and safe slopes. Remedial measures shall be proposed by Design-Builder and submitted for review and approval by ADOT.

The exposed, unsupported, excavation lift height shall not exceed half the vertical nail spacing plus the required reinforcing lap, or the short-term stand-up height of the ground, whichever is less. Design-Builder shall complete excavation of (a portion of) a lift to the final excavation line, drilling and installation of (a portion of) a row of nails, and application of the structural shotcrete facing in the same work shift unless otherwise approved by the IQF. Application of the structural shotcrete facing may be delayed up to 24 hours if Design-Builder can show that the delay will not adversely affect the excavation face stability. Should damage occur to existing structures, the damage shall be repaired by Design-Builder at no additional cost to ADOT. In the event of precipitation, Design-Builder shall place a polyethylene film over the face of the excavation to reduce degradation of the cut face by erosion or moisture increase.

Excavation of the next lower lift shall not proceed until nail installation, reinforced shotcrete placement, attachment of bearing plates and nail head assemblies, and nail testing have been completed and accepted in the current lift. Nail grout and shotcrete shall have cured for at least 72 hours or attained at least the specified 3-day compressive strength before excavating the next underlying lift.

Wall Discontinuities:

Where Design-Builder's excavation and installation methods result in a discontinuous shotcrete facing along any nail row, the ends of the constructed shotcrete facing section shall extend beyond the ends of the next lower excavation lift by at least 10 feet. Temporary slopes at these discontinuities shall be constructed to prevent sloughing or failure of the temporary slopes. If sections of the shotcrete facing are to be constructed at different times, then sloughing or failure of the temporary slopes at the end of each shotcrete facing section shall be prevented.

Excavation Face Protrusions, Voids, or Obstructions:

Design-Builder shall remove all or portions of all cobbles, boulders, rubble, miscellaneous fills, or other subsurface obstructions encountered at the final excavation face and which protrude into the structural shotcrete facing. Design-Builder shall determine methods for removal of face protrusions, including methods to secure remnant pieces left behind the excavation face and to promptly backfill voids resulting from removal of protrusions extending behind the excavation face. The IQF shall be notified in writing of the proposed method(s) for removal of face protrusions at least 24 hours prior to beginning removal. Voids, over-break or over-excavation operations shall be backfilled immediately with shotcrete or concrete, following approval by ADOT. Removal of face protrusions and backfilling of voids or over-excavation is considered incidental to the work.

Nail Layout:

The soil nail layout shall be a uniform grid (square and rectangular) with the nail spacing as shown on the Plans and with nail inclinations at 15 degrees below the horizontal. The top row of nails shall be no lower than 3.0 feet from the top of the shotcrete wall facing. The bottom row of the nails shall be no higher than 5.0 feet from the bottom of the wall excavation.

Drilling of Soil Nails:

No drilling or installation of production nails shall be permitted in any soil/rock unit until successful preproduction verification testing of sacrificial nails is completed in that unit and approved by the IQF. Verification test nails shall be installed by using the same equipment, methods, nail inclination, and drillhole diameter as for the production nails. Pre-production verification tests shall be performed in accordance with the Verification Testing subsection of this TPA 600-1, prior to both the start of the soil nail system mass excavation and the installation of production nails in the specific lift in which the designated verification test nails are located. Locations of verification test nails are specified in this TPA 600-1. The IQF may revise or add to the specified locations based on the encountered field conditions. Verification test nails may be installed into any of the following features of the construction:

(A) Existing slope face prior to start of the soil nail system mass excavation;

(B) Drill platform work bench, or

(C) Slot cuts made for the particular lift in which the verification test nails are located.

Slot cuts shall be large enough only to safely accommodate the drill and test nail reaction setup safely. Subject to the IQF's approval, verification test nails may also be installed at locations different from those specified, as long as Design-Builder can demonstrate that the verification test nails are bonded into ground that is representative of the ground at the verification test nail locations specified herein.

The drill-holes for the soil nails shall be made at the locations, orientations, and lengths as directed by the soil nail wall system engineer. The minimum drill-hole diameter shall be 6 inches and shall be large enough to develop the specified pullout resistance and provide a minimum 2.0 inches of grout cover over the encapsulated nail bar.

Drilling equipment and methods suitable for the ground conditions described in the geotechnical investigation reports and as described herein shall be selected. The use of drilling muds, such as bentonite slurry, in dry drill-holes to assist in drill cutting removal shall not be permitted. Drilling with water shall not be permitted. Cased drilling methods shall be used to prevent drill-hole caving, if observed. Where hard drilling conditions are encountered such as through rock, cobbles, boulders, cemented materials (caliche) or other difficult materials, percussion or other suitable drilling equipment capable of advancing and maintaining stable drill-holes through such materials will be used.

Use of bentonite slurry during drilling shall be permitted only if groundwater is encountered and is required to stabilize the drill-hole. It is Design-Builder's responsibility to flush the drill-hole adequately, upon completion of drilling, to obtain the required nail bond strength in accordance with the design. The IQF shall be notified immediately if groundwater is encountered in drill-holes.

Design-Builder shall immediately suspend drilling operations if ground subsidence is observed, the soil nail wall system is adversely affected, or adjacent structures are damaged by the drilling operation. Design-Builder shall immediately stabilize adverse conditions and shall notify the IQF of actions taken.

Nail Installation:

Centralizers sized to position the bar within 1 inch of the center of the drill-hole shall be provided.

Centralizers shall be positioned within the drill-hole such that their maximum center-to-center spacing does not exceed 10 feet. Centralizers shall also be located within 1.5 feet from both the top and bottom of the drill-hole. Centralizers shall be securely attached to the bar such that they do not shift during handling or insertion into the drill-hole yet will still permit insertion of the grout tremie pipe to the bottom of the drill-hole and allow grout to flow freely up the hole.

Design-Builder shall inspect each nail bar before installation and shall repair or replace damaged bars or corrosion protection. Nail bars with centralizers shall be inserted into the drill-hole to the required length without difficulty and in a way that prevents damage to the drill-hole, nail bar, corrosion protection and centralizers. Design-Builder shall not drive or force partially-inserted soil nails into the drill-hole. Nails that cannot be fully inserted to the design depth shall be removed and the drill-hole cleaned to permit unobstructed installation.

All production soil nails shall be installed before the application of the structural reinforced shotcrete facing. In the event of cut face sloughing, at Design-Builder's request and subject to ADOT's written approval, the shotcrete facing may be placed before drilling and installing all the production soil nails on that face. Should this occur, a block-out through the shotcrete facing shall be provided. The block-out shall be placed at drill-hole locations and shall consist of PVC pipe or other suitable material, to prevent damage to the shotcrete facing during subsequent drilling. As part of the required construction submittals, Design-Builder shall provide ADOT with acceptable structural design calculations demonstrating that the structural capacity of the shotcrete facing will not be reduced and that the bearing plates (size and thickness) will be adequate to span the nail drill-hole block-out through the shotcrete facing.

In the event additional soil nails are required, Design-Builder shall be prepared to penetrate the existing shotcrete with minimal disturbance to the surrounding shotcrete at no additional cost to ADOT. Details of the procedure proposed by Design-Builder to penetrate the shotcrete shall be subject to ADOT's written approval.

Nail Installation Tolerances:

The allowable tolerances shall be as follows:

No.	Item	Asset Type
1.	Soil Nail Position	± 6 inches in any direction on wall excavation face
2.	Soil Nail Length	± 0.5 inches (10-foot minimum length)
3.	Soil Nail Inclination	± 3 degrees
4.	Shotcrete Thickness	± 0.25 inches (4-inch minimum thickness)
5.	Minimum Drill-Hole Diameter	6 inches

Soil nail position tolerances are applicable to only one soil nail and are not accumulative over large wall areas. Nail bars shall be centered within 1 inch of the center of the drill-hole and the specified minimum required grout cover maintained.

Installed soil nails which do not satisfy the specified tolerances in the TPs due to Design-Builder's installation methods, shall be replaced.

Soil nails shall be installed in a horizontal sequence, with the ground level on the excavated side no more than four feet below the nails to be installed. Soil or rock below the level from which nails are installed may be excavated no sooner than two Days after nail installation or after the shotcrete on the preceding lift has reached 25% of its 28-day strength and the nail grout has reached 50% of its 28-day strength.

For open-hole drilling, as soon as each drill-hole is completed, a clean encapsulated nail bar with centralizers shall be placed in the drill-hole and the hole shall be tremie-grouted. The space remaining between the top of the grout column and the top of the drill-hole shall be filled with shotcrete.

If groundwater is encountered in the drill-hole, the drill-hole shall be flushed with air before grout placement and the nail shall be tested as specified in the Nail Testing section of this TPA 600-1.

Abandoned Drill-Holes:

Soil nail drill-holes encountering unanticipated obstructions or caving materials during drilling that prevent installation of soil nails shall be relocated as approved by ADOT. Abandoned soil nail drill-holes shall be backfilled with tremie-placed nail grout.

Grouting Equipment:

Grouting equipment shall produce a uniformly mixed grout free of lumps and undispersed cement and shall be capable of continuously agitating the mix. A positive-displacement grout pump equipped with a pressure gauge with pressure range of at least twice but no more than three times the intended grout pressure shall be used. The grouting equipment shall be of a size adequate to enable the entire soil nail to be grouted in one continuous operation. Grout shall be placed within 60 minutes after mixing or within the time recommended by the admixture manufacturer if admixtures are used. Grout not placed in the allotted time limit will be rejected. Design-Builder is responsible for keeping the grout mix uniform and workable in hot weather without diluting the grout.

Grouting Methods:

Design-Builder shall grout the drill-hole immediately after installation of the soil nail bar. A soil nail bar shall be installed in each drill-hole and the drill-hole shall be grouted within 2 hours of completion of drilling, unless otherwise approved by the IQF. Grout will be injected at the lowest point of each drill-hole through a grout tremie tube, casing, or drill rod. The outlet end of the conduit (tremie) delivering the grout shall be kept a minimum of 12 inches below the surface of the grout as the tremie is withdrawn to prevent the creation of voids. The drill-hole shall be completely filled with grout in one continuous operation. Cold joints in the grout column shall not be permitted except at the top of the test bond length of proof-tested production nails. At Design-Builder's option, the grout tube may remain in-place in the drill-hole provided the tube is filled with grout.

During casing or auger extraction for drill-holes advanced by either cased or hollow-stem auger methods, sufficient grout level shall be maintained within the casing or auger to offset the external groundwater pressure and soil (overburden) pressure and prevent hole caving. Sufficient grout head or grout pressure shall be maintained to ensure that the drill-hole will be completely filled with grout and to prevent unstable soil or groundwater from contaminating or diluting the grout. The grout pressures for soil nails installed using pressure-grouting techniques shall be recorded. Grout pressures shall be controlled to prevent excessive ground heave or hydraulic fracturing.

Design-Builder shall remove the grout and soil nail if grouting is suspended for more than 30 minutes, or if the grout or grouting procedures do not satisfy the requirements of this TPA 600-1, the ADOT *Standard Specifications*, or the Plans. In such a case, Design-Builder shall install a new soil nail with fresh grout.

Nail Testing:

General:

Design-Builder shall perform both verification and proof tests of designated soil nails. Pre-production verification tests shall be performed on sacrificial test nails at the locations specified in this TPA 600-1. The IQF may revise or add to the specified locations based on the encountered field conditions. A sacrificial test soil nail is also known as a verification test soil nail and shall not be used as a production soil nail. The verification test soil nail is subjected to a load test to confirm the nail can meet the minimum required design adhesion (bond strength) with the indicated factor of safety. Proof tests shall be performed on production soil nails at locations selected by the IQF. Verification (sacrificial) soil nails shall not be allowed for proof tests. A proof test soil nail is defined as a production soil nail on which a pullout load test is performed, and which demonstrates the ability to withstand design loads without excessive movement or long-term creep.

Soil nail test data shall be recorded by Design-Builder and furnished to the IQF. Soil nail testing shall not be performed until the nail grout and shotcrete facing have cured for at least 72 hours and have attained their specified 3-day compressive strength. Testing in less than 72 hours shall be permitted only if Design-Builder submits compressive strength test results, for tests performed by a qualified independent testing lab approved by the IQF, verifying that the nail grout and shotcrete mixes being used will provide the specified 3-day compressive strengths in the shorter time frame.

Testing Equipment:

Testing equipment shall include dial gauges, dial gauge support assemblies, jack and pressure gauge unit, electronic load cell, and reaction frame. Design-Builder shall provide a description of the test setup, and jack, pressure gauge and load cell calibrations.

Design-Builder shall provide a testing reaction frame of sufficient stiffness and of adequate dimensions such that excessive deformation of the testing equipment does not occur during testing of the soil nails. If the reaction frame is to bear directly on the shotcrete facing, it should be designed to prevent damage to the shotcrete. The jack shall be independently supported and centered over the soil nail bar such that the bar does not carry the weight of the testing equipment. The jack, bearing plates, and stressing anchorage shall be aligned with the bar such that unloading and repositioning of the equipment will not be required during the test.

Design-Builder shall apply and measure the test load with a hydraulic jack and pressure gauge unit. The pressure gauge unit shall be graduated in 50-psi increments or less. The jack and pressure gauge shall have a pressure range not exceeding twice the anticipated maximum test pressure. Hydraulic jack ram travel shall be sufficient to permit completion of the test without resetting the equipment. Design-Builder shall monitor the soil nail load during verification tests with both the pressure gauge and the load cell. The load cell shall be used to maintain constant load during the creep test phase of the tests.

Design-Builder shall measure the soil nail head movement with dial gauges capable of measuring to 0.001 inch. The dial gauges shall have travel sufficient to permit completion of the test without resetting the gauges. The gauges shall be aligned visually to be parallel with the axis of the soil nail. The gauges shall be supported independently from the jack, wall face, or reaction frame. A minimum of two dial gauges shall be used. All dial gauges shall have been calibrated within the last year.

Pre-production Verification Testing of Sacrificial Test Nails:

A sufficient number of sacrificial test soil nails shall be installed prior to installation of production soil nails in order to verify Design-Builder's installation methods and the soil nail pullout resistance. Pre-production verification tests shall be performed at locations and elevations as directed by the IQF.

IQF may revise or add to the above-specified locations based on the encountered field conditions.

Verification test soil nails shall be sacrificial and shall not be incorporated as production soil nails.

Verification test soil nails shall have both bonded and unbonded lengths. Prior to testing, only the bonded length of the test soil nail shall be grouted. The unbonded length of the verification test soil nail shall be at least 3 feet. The bonded length of the test soil nail shall be determined based on the production soil nail bar grade and size such that the allowable structural load of the bar is not exceeded during testing but shall not be less than 10 feet. The verification test soil nail maximum bonded length (L_{BV}) shall not exceed either the allowable structural load of the bar under test divided by 2 times the allowable pullout resistance value (Q_d), or 10 feet, whichever is greater. Design-Builder shall install the bonded length of the verification test soil nail completely into the specified soil or rock unit.

The following equation shall be used to determine the verification test soil nail maximum bonded length (L_{BV}) in order that structural overstress of the verification test soil nail bar is avoided:

$$L_{BV} = \frac{C\ F_y\ A_s}{2\ Q_d}$$ or 10 feet, whichever is greater.

where:

L_{BV} = Verification Test Soil Nail maximum bonded length (ft)
C = 0.9 for Grade 60 and 75 bars (yield stress basis), 0.8 for pre-stress Type I bars (ultimate stress basis)
F_y = soil nail bar yield, ultimate stress (ksi)
2 = Pullout resistance factor of safety
Q_d = allowable pullout resistance (kips/foot of grouted soil nail length, specified on the Plans)
A_s = soil nail bar steel cross-sectional area (in^2)

The allowable structural load of the soil nail bar during testing shall not be greater than 90% of the yield strength for Grade 60 and 75 bar steel, or 80% of the ultimate strength for pre-stress Type I bars. Design-Builder shall provide larger verification test bar sizes, if required, to safely accommodate the 10-foot minimum test bond length and testing to two times the allowable pullout resistance requirements at no additional cost to ADOT. However, the diameter of the verification test soil nail drill-hole shall not exceed that of the production soil nails.

The Design Test Load (DTL) during verification testing shall be determined by the following equation:

$$DTL = L_{BVF}\ Q_d$$

where:

DTL = Design Test Load (kips)
L_{BVF} = actual field value of Verification Test Soil Nail bonded test length (feet)
Q_d = allowable pullout resistance (kips/foot of grouted soil nail length, specified on the Plans)

Verification test soil nails shall be loaded incrementally to a Maximum Test Load (MTL) of 200% of DTL. The Alignment Load (AL) should be the minimum load required to align the testing apparatus. The Alignment Load shall not exceed 5% of the DTL. Dial gauges should be set to "zero" after the alignment load has been applied, and the remainder of the test shall be performed in accordance with the following verification test loading schedule:

No.	Load	Hold Time
1.	AL (0.05 DTL max.)	1 minute
2.	0.25 DTL	10 minutes
3.	0.50 DTL	10 minutes
4.	0.75 DTL	10 minutes
5.	1.00 DTL	10 minutes
6.	1.25 DTL	10 minutes
7.	1.50 DTL (creep test)	60 minutes
8.	1.75 DTL	10 minutes
9.	2.00 DTL (MTL)	10 minutes
10.	1.75 DTL	until stable
11.	1.50 DTL	until stable
12.	1.00 DTL	until stable
13.	0.75 DTL	until stable
14.	0.50 DTL	until stable
15.	0.25 DTL	until stable

All load increments shall be maintained within 5% of the intended load. Each load increment shall be held for at least 10 minutes except as noted for the creep test. The soil nail movement shall be recorded at the end of the specified time interval for each load increment. The verification test soil nail shall be monitored for creep at the 1.50 DTL load increment. Soil nail movement during the creep portion of the test shall be measured and recorded by Design-Builder at the following time intervals after application of the full load:

(A) 1 minute.

(B) 2 minutes.

(C) 3 minutes.

(D) 4 minutes.

(E) 5 minutes.

(F) 6 minutes.

(G) 10 minutes.

(H) 20 minutes.

(I) 30 minutes.

(J) 50 minutes; and

(K) 60 minutes.

The load during the creep test shall be maintained within 2% of the intended load by use of the load cell.

Design-Builder shall develop and submit the details for production verification testing including the method of distributing test load pressures to the excavation surface (reaction frame), test soil nail bar size, grouted drill-hole diameter, and reaction frame dimensioning, to the IQF for approval. Pre-production verification testing of sacrificial test soil nails shall be performed by using the same drilling equipment, installation methods, soil nail inclination, and drill-hole diameter used for the production soil nails. Changes in the drilling or installation method may require additional verification testing as determined by the IQF.

Verification tests performed by Design-Builder without the presence of the IQF shall be considered invalid. Design-Builder shall notify the IQF at least 3 Business Days prior to the verification test so that suitable arrangements may be made by the IQF to observe the test(s).

Proof Testing of Production Nails:

Design-Builder shall perform proof testing on a minimum of 5% (minimum of 1 in 20) of the production soil nails in each nail row with a minimum of one test per each soil nail row. The locations of the proof test soil nails shall be designated by the IQF. At his discretion, the IQF may revise or add to the required minimum number of proof test soil nails based on the encountered field conditions. A verification test soil nail successfully installed and tested during production work shall be considered equivalent to the first proof test soil nail and shall be accounted for in determining the number of proof tests required in that particular row. A verification test soil nail, however, shall not be considered a production soil nail.

Proof Test Nail Unbonded Length:

Design-Builder shall provide a temporary unbonded length for each proof test soil nail. The proof test soil nail bar shall be isolated from the shotcrete facing and/or the reaction frame used during testing. Isolation of a proof test soil nail from the shotcrete facing shall not affect the location of the reinforcing steel under the bearing plate. Accepted proof test soil nails may be incorporated as production soil nails provided the temporary test unbonded length is fully grouted subsequent to testing. Design-Builder shall submit the proposed proof test soil nail isolation method(s), method(s) for providing an unbonded test length, and method(s) for grouting the unbonded length subsequent to testing to the IQF for review and approval. Where temporary casing of the unbonded length of proof test soil nails is provided, the casing shall be installed in a way that prevents any reaction between the casing and the grouted bond length of the soil nail and/or the nail testing apparatus.

Production proof test soil nails shall have both bonded and temporary unbonded lengths. Prior to testing, only the bonded length of the production proof test soil nail shall be grouted. The temporary unbonded length of the production proof test soil nail from the surface of the grout to the back face of the shotcrete facing shall be at least 3 feet. The bonded length of the production proof test soil nail shall be determined based on the production soil nail bar grade and size such that the allowable structural load of the bar is not exceeded during testing but shall not be

less than 9 feet for soil nails greater than 12 feet in length. Production proof test soil nails shorter than 12 feet in length may be constructed with less than the minimum 9-foot bonded length, with the unbonded length from the surface of the grout to the back face of the structural shotcrete facing limited to 3 feet. The allowable structural load of a soil nail bar during testing shall not be greater than 90% of the yield strength for Grade 60 bars and 80% of the ultimate strength for pre-stress Type I bars.

The proof test bonded length (LBP) shall not exceed the test allowable nail bar load divided by 1.5 times the allowable pullout resistance value, or the above minimum bonded lengths, whichever is greater. The following equation shall be used for sizing the proof test nail bonded length (LBP) to avoid overstressing the production nail bar:

$$L_{BP} = \frac{C\ F_y\ A_s}{1.5\ Q_d}$$ or the above-specified minimum bonded lengths, whichever is greater.

where:

L_{BP} = Proof Test Soil Nail bonded length (ft)
C = 0.9 for Grade 60 and 75 bars (yield stress basis), 0.8 for pre-stress Type I bars (ultimate stress basis)
F_y = bar yield, ultimate stress (ksi)
1.5 = Pullout resistance factor of safety
Q_d = allowable pullout resistance (kips/foot of grouted soil nail length, specified on the Plans)
A_s = bar steel cross-sectional area (in^2)

The DTL during proof testing shall be determined by the following equation:

$$DTL = L_{BPF}\ Q_d$$

where:

DTL = Design Test Load (kips)
L_{BPF} = actual field value of Proof Test Soil Nail bonded test length (feet)
Q_d = allowable pullout resistance (kips/foot of grouted soil nail length, specified on the Plans)

Proof tests shall be performed by loading the proof test soil nail incrementally to a Maximum Test Load (MTL) of 150% of the DTL. The soil nail movement at each load increment shall be measured and recorded by ADOT in the same manner as for verification tests. The test load shall be monitored by a jack pressure gauge with a sensitivity and range meeting the requirements of pressure gauges used for verification test soil nails. At load increments other than MTL, the load shall be held long enough to obtain a stable reading. The AL is the minimum load required to align the testing apparatus. The alignment load shall not exceed 5% of the DTL. Dial gauges should be set to “zero” after the alignment load has been applied, and the remainder of the test shall be performed in accordance with the following loading schedule. The soil nail movements shall be recorded at each load increment.

No.	Load	Hold Time
1.	AL (0.05 DTL max.)	until stable
2.	0.25 DTL	until stable
3.	0.50 DTL	until stable
4.	0.75 DTL	until stable
5.	1.00 DTL	until stable
6.	1.25 DTL	until stable
7.	1.50 DTL (MTL/creep test)	see below

No.	Load	Hold Time
8.	AL (0.05 DTL max.)	until stable
9.	1.00 DTL	until stable

All load increments shall be maintained within 5% of the intended load. Depending on performance, either a 10-minute or 60-minute creep test shall be performed at the maximum test load (1.50 DTL). The creep period shall start as soon as the maximum test load is applied, and the soil nail movement shall be measured and recorded by the IQF at the following time intervals after the maximum test load is applied:

(A) 1 minute.

(B) 2 minutes.

(C) 3 minutes.

(D) 4 minutes.

(E) 5 minutes.

(F) 6 minutes; and

(G) 10 minutes.

If the soil nail movement between 1 minute and 10 minutes exceeds 0.04 inch, the maximum test load shall be maintained for an additional 50 minutes and movement shall be recorded at 20, 30, 50 and 60 minutes.

Test Nail Acceptance Criteria:

A verification test soil nail or proof test soil nail shall be considered acceptable when:

(A) For verification tests, the total creep movement is less than 0.08 inch per log cycle of time between the 6- and 60-minute readings as measured during creep testing, and the creep rate is linear or decreasing throughout the specified period of the creep test.

(B) For proof tests, the total creep movement is less than 0.04 inch as measured between the 1- and 10-minute readings, or the total creep movement is less than 0.08 inch as measured between the 6- and 60-minute readings, and the creep rate is constant or decreasing throughout the specified period of the creep test.

(C) For either test, the total measured movement at the maximum test load exceeds 80% of the theoretical elastic elongation of the test soil nail unbonded length.

(D) For either test, a pullout failure does not occur at the maximum test load. Pullout failure is defined as the load at which attempts to further increase the test load are unsuccessful and simply result in continued pullout movement of the test soil nail. The pullout failure load shall be recorded as part of the test data.

Successfully proof-tested soil nails meeting the above test acceptance criteria may be incorporated as production soil nails, provided that:

(A) The temporary unbonded length of the test soil nail drill-hole has not collapsed during testing.

(B) The minimum required drill-hole diameter has been maintained.

(C) The specified corrosion protection is provided, and

(D) The test soil nail length is equal to or greater than the scheduled production nail length.

Test soil nails meeting these requirements shall be completed by satisfactorily grouting the unbonded test length. Maintaining the temporary unbonded length for subsequent grouting is Design-Builder's responsibility. If the temporary unbonded length of production proof test soil nails cannot be grouted satisfactorily subsequent to testing, the proof test soil nail shall become sacrificial and shall be abandoned. An additional production nail shall be installed adjacent to the abandoned soil nail and shall be proof-tested at no additional cost to ADOT. Proof test soil nails which do not meet all the above-listed criteria shall be abandoned and shall not be considered part of the soil nail wall system. Retesting of either a verification test soil nail or a proof test soil nail is not allowed.

Test Nail Rejection:

Test soil nail failures may require additional nails to be tested to further assess the reason(s) for failure or to verify the existing soil conditions. If a test soil nail does not satisfy the applicable acceptance criterion specified herein, Design-Builder shall determine and correct the cause(s).

Verification Test Nails:

The IQF will evaluate the results of each verification test. Installation methods which fail to satisfy the soil nail testing requirements shall be rejected. Design-Builder shall propose alternative methods and install replacement verification test soil nails. Replacement test soil nails shall be installed and tested at no additional cost to ADOT.

Proof Test Nails:

The IQF may require Design-Builder to abandon and replace some or all of the installed production soil nails between a failed proof test soil nail and an adjacent passing proof test soil nail. Alternatively, the IQF may require the installation and testing of additional proof test soil nails to verify that adjacent previously installed production soil nails have sufficient load-carrying capacity. Design-Builder modifications may include, but are not limited to:

(A) Installing additional proof test soil nails.

(B) Increasing the drill-hole diameter to provide increased capacity.

(C) Modifying the installation and/or grouting methods.

(D) Reducing the production nail spacing from that shown on the Plans.

(E) Installing more production soil nails at a reduced capacity; or

(F) Installing longer production soil nails if sufficient right-of-way and/or underground easement is available and the pullout capacity behind the theoretical failure surface controls the allowable soil nail design capacity.

Soil nails may not be lengthened beyond the temporary construction easements or the permanent right-of-way.

Installation Records:

Records documenting the soil nail wall system construction shall be maintained by Design-Builder and provided to the IQF. Design-Builder shall also provide the IQF with record drawings showing as-built soil nail locations and as-built shotcrete facing line and grade.

TPA 600-2 Mechanically Stabilized Earth (MSE) Wall Systems

929-1.01 General

The work under this section consists of designing, furnishing all materials and constructing Mechanically Stabilized Earth (MSE) retaining walls in accordance with this TPA 600-2 and in compliance with the lines and grades, dimensions and details shown on the Plans.

Design-Builder shall provide the MSE Wall Designer with a complete set of Plans and Project Special Provisions and shall ensure that the MSE wall design is compatible with all other project features that can impact the design and construction of the MSE wall.

The terms used in this TPA 600-2 for identification of various entities responsible for MSE Wall designs are defined in Table 929-1.

Table 929-1: MSE Wall Design Responsibilities

No.	Term	Entity Responsibilities
1.	Wall Manufacturer/Supplier	The entity contractually retained by Design-Builder to provide materials and construction support services for an accepted MSE wall system as identified in Subsection 929-1.03 of this TPA 600-2 or as approved pursuant to Subsection 929-1.04 of this TPA 600-2.
2.	Wall Designer	The entity contractually retained by Design-Builder to provide internal design of an accepted MSE wall system as identified in Subsection 929-1.03 or as approved pursuant to Subsection 929-1.04 of this TPA 600-2. The Wall Designer is also responsible for evaluating certain aspects of external stability as discussed herein using the geotechnical information provided by the Geotechnical Engineer. The Wall Designer may be a representative of the Wall Manufacturer/Supplier. Internal design includes evaluation of compound stability, which is defined as a failure mode passing through the reinforced soil mass and the retained fill and/or foundation. Geotechnical properties for the retained fill and foundation are to be obtained from the Geotechnical Engineer. The aspects of external stability as discussed below for the Geotechnical Engineer that are the responsibility of the Wall Designer to evaluate are as follows: (A) Verify the bearing pressures do not exceed the bearing resistance of the foundation soils shown on the bearing resistance charts provided by the Geotechnical Engineer. (B) Estimate the settlements along the length of the MSE wall system using the Service I Limit State settlement curves shown on the bearing resistance charts provided by the Geotechnical Engineer. (C) Evaluate limited eccentricity and sliding of the MSE wall system using the geotechnical properties for the retained fill and foundation material provided by the Geotechnical Engineer.

No.	Term	Entity Responsibilities
3.	Geotechnical Engineer	The entity responsible to evaluate or provide geotechnical information needed for the Wall Designer to evaluate certain aspects of external stability of the accepted MSE wall system as identified in Subsection 929-1.03 of this TPA 600-2. External stability includes the analysis of: (A) Bearing Capacity (B) Settlement (short-term and post-construction) (C) Limited Eccentricity (D) Sliding (E) Global slope stability The bearing capacity and settlement (short-term) shall be evaluated by the Geotechnical Engineer and provided to the Wall Designer in the form of a bearing resistance chart developed in accordance with ADOT SF-1 (2010) Memorandum (2). Bearing resistance charts shall be developed for each boring advanced along the length of the proposed MSE walls. Long-term settlements (post-construction) shall be evaluated by the Geotechnical Engineer and provided to the Wall Designer so that the Wall Designer can account for such settlements in their design. Geotechnical properties of the retained fill and foundation material shall be provided by the Geotechnical Engineer to the Wall Designer to allow the Wall Designer to evaluate limited eccentricity and sliding of the accepted MSE wall system, as identified in Subsection 929-1.03 of this TPA 600-2.

Notes:

(A) The geotechnical properties for the retained fill provided by the Geotechnical Engineer to the Wall Designer are minimum properties based on global stability analysis performed by the Geotechnical Engineer, and the Wall Designer may elect to use material exceeding those minimum property values for design. In such case, the geotechnical properties used by the Wall Designer exceeding those provided by the Geotechnical Engineer shall become the required geotechnical properties for the retained fill during construction.

(B) ADOT SF-1 (2010): Development of Factored Bearing Resistance Chart by a Geotechnical Engineer for Use by a Bridge Engineer to Size Spread Footings on Soils for Service and Strength Limit States Based on Load and Resistance Factor Design (LRFD) Methodology, Memorandum from N. H. Wetz and J. D. Wilson to J. Lawson, dated March 19, 2008 (Revision 1).

929-1.02 Certifications

(A) Certification of Review of Geotechnical Report(s)

Design-Builder shall be responsible to review all available geotechnical investigation reports, and Design-Builder's signature on the proposal form shall certify that this review has been performed and that this TPA 600-2 and any relevant geotechnical information has been provided to the firms designing and supplying the MSE wall.

The ADOT-provided geotechnical investigation reports are available in the RIDs

(B) Certification of Design Parameters

See Subsection 929-2.01 of this TPA 600-2.

(C) Certification of Materials

See Subsections 929-3.04, 929-3.06 and 929-3.09 of this TPA 600-2.

929-1.03 Accepted Systems

Unless Design-Builder uses an earth retaining system approved by ADOT pursuant to Subsection 929-1.04 of this TPA 600-2, Design-Builder shall select one of the appropriate ADOT pre-approved earth retaining systems to be constructed for the MSE walls designated on the Plans.

Pre-approved systems are listed on the ADOT Product Evaluation Program website:

Product Evaluation Program | ADOT of Transportation (azdot.gov)

The features of the system(s) furnished, including design and configuration of precast elements, fasteners, connections, soil reinforcements, joint fillers, geotextile filter, and other necessary components shall be those that meet the requirements of Subsection 929-2 of this TPA 600-2.

Heights and lengths of earth retaining MSE walls may vary from, but shall not be less than, those shown on the Plans. The height and length to be used for any system shall be the minimum for that system that will effectively retain the earth behind the wall for the loading conditions and the contours, profile, or slope lines shown on the Plans, in accordance with all relevant internal and external stability design criteria.

929-1.04 Unlisted Systems Acceptance Process

If Design-Builder elects to use an earth retaining system not listed on the ADOT Product Evaluation Program website, the approval process for such systems is as follows:

(A) No consideration will be given to a request for approval of an unlisted system prior to contract award. After award, and in time to allow for consideration without delaying work, Design-Builder shall submit a written request for approval of a new system.

(B) If Design-Builder wishes to propose multiple systems, separate written requests shall be submitted for each system. All requests must be received within the timeframes specified herein.

(C) Design-Builder's progress schedule shall indicate when the proposed system is to be used on the project. The schedule shall include time for ADOT to evaluate the proposed system and shall demonstrate that there will be no impacts to the Critical Path. If, in the opinion of ADOT, the schedule shows that the evaluation and approval timeframe of the proposed system is not reasonable, ADOT will not consider the proposed system.

(D) A request for the use of an unlisted system shall include all information necessary to determine that a system is an equal, including samples for testing, if required. Unlisted systems will not be entertained as Value Engineering (VE) Proposals.

(E) ADOT will evaluate the information submitted, perform tests when necessary and make comparisons. ADOT will then make the final decision as to whether the proposed system is an equal. ADOT will neither be liable for any delay in acting upon any request nor for any failure to approve a request pursuant to the use of an unlisted system.

(F) ADOT will review Design-Builder's request for the use of an unlisted system within 45 Days of Design-Builder's submittal and inform Design-Builder in writing if the request is rejected, approved, or if ADOT will take additional time for evaluation. If any additional information is needed to evaluate the proposed system, Design-Builder shall submit the information in a timely manner, at which point the 45-day review period is restarted. Untimely submittals of additional information shall result in rejection of the proposed system.

(G) Design-Builder shall not be entitled to additional compensation or an extension of Contract Time resulting from ADOT's acceptance or rejection of a proposed system.

929-1.05 Manufacturer's Field Representative

The manufacturer's field representative performing the work described in this TPA 600-2 shall have, in the past three years, successfully installed at least four MSE retaining walls of heights, lengths and complexity similar to those shown on the Plans and meeting the tolerances specified in this TPA 600-2. The manufacturer's field representative may make field changes subject to the approval of the Wall Designer prior to any modifications. Any such changes shall be documented in writing within 24 hours of the approved changes. This written document shall be sealed by the manufacturer's design engineer, who is registered as a Professional Engineer.

929-1.06 MSE Pre Activity Meeting

A pre-activity meeting will be scheduled prior to commencement of MSE wall construction activity. As a minimum, this meeting shall be attended by the IQF, ADOT, Design-Builder (including wall construction crew chiefs), the MSE wall subcontractor, and MSE wall manufacturer's and MSE Wall Designer's representatives. No wall construction activity shall be performed until Design-Builder's final submittals have been approved as having satisfactorily resolved all review comments and the pre-activity meeting has been held.

929-1.07 Wall Aesthetics

Wall aesthetics shall be as specified in the Technical Provisions.

929-2 Submittals (Shop Drawings and Working Drawings and Design)

929-2.01 Submittals

The submittals required shall include Shop Drawings and Working Drawings, construction procedures, supporting design calculations, verification of experience, and a transmittal letter. The transmittal letter shall only list the documents included in the submittal. No technical information shall be included in the transmittal letter.

Working drawings and calculations shall be signed and sealed by a Professional Engineer, who is registered as a Civil Engineer in the State of Arizona. The MSE Wall Designer/wall supplier shall document on the Shop Drawings and Working Drawings all assumptions made in the design. The following statement shall be included near the P.E. seal on the first sheet of the Shop Drawings and Working Drawings: "All design assumptions are validated through notes or details on these drawings."

Working drawings, design calculations, and MSE wall supplier's construction procedures modified as necessary by Design-Builder and Wall Designer for site-specific conditions shall be submitted for review.

Construction of the MSE wall shall not commence until the complete wall package (Shop Drawings and Working Drawings, calculations, and construction procedures) is accepted. Fabrication of any of the wall components before the NTP shall be at the sole risk of Design-Builder.

929-2.02 Working Drawings

Design-Builder shall submit complete Shop Drawings and Working Drawings and Project Special Provisions for each installation of the MSE wall system in accordance with the requirements of TP Section 116 (*Community Relations and Public Involvement Program*) as modified herein.

Working drawings shall include the following at a minimum:

(A) Layout of the wall including plan and elevation views.

(B) All design parameters and assumptions including design life.

(C) Existing ground elevations and utilities impacted by the wall shall be field verified by Design-Builder for each location.

(D) Complete details of all elements and component parts required for the proper construction of the system at each location and any required accommodations for drainage systems, foundation subgrades or other facilities shown on the Contract Documents.

(E) Clear details of any special design requirements. These special design requirements may include, but are not limited to; structural frames to place reinforcements around obstructions such as deep foundations and storm drain crossings, drainage systems within the reinforced backfill, placement sequence of drainage and unit core fill with respect to reinforced (structure) fill behind a wall face using modular block facing units, guardrail post installation, scour protection, foundation subgrade modification, all corner details (acute, obtuse and 90 degrees), slip joints, connection details of MSE walls with other cast-in-place structures, wedges, shims and other devices such as clamps and bracing to establish and maintain vertical and horizontal wall facing alignments;

(F) A complete listing of components and materials specifications; and

(G) Other site-specific or project specific information required by the Contract Documents.

929-2.03 MSE Wall Design

(A) General

The Shop Drawings and Working Drawings shall be supplemented with all design calculations for the particular installation as required herein.

The proposed design shall satisfy the design parameters shown on the Plans and listed in this TPA 600-2, and comply with the design requirements of the following documents:

(1) FHWA (2009), “Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes; Publication Nos. FHWA-NHI-10-024 and FHWA NHI 10 025; Authors: Berg, R. R., Christopher, B. R., and Samtani, N. C.

(2) AASHTO (2017), “AASHTO LRFD Bridge Design Specifications”, 8th Edition, including latest Interims.

All references made to AASHTO (2017) herein shall mean “AASHTO LRFD Bridge Design Specifications”, 8th Edition, including latest Interims.

Maximum reinforcement loads shall be calculated using the “Simplified Method” as presented in AASHTO (2017) and as per the requirements specified herein. No other design method will be allowed.

Sample analyses and hand-calculations shall be submitted to verify the output from software used by the MSE Wall Designer. Sample analyses and hand-calculations shall be required for complex walls having geometries and loading conditions that are not readily amenable to computer analysis. Failure modes, including circular, non-circular, and multi-part wedge shall be analyzed for compound stability to verify the most critical failure case (slip surface with lowest factor of safety) within each section of the wall where the length of the reinforcement changes. For compound stability, all potential slip surfaces for each failure mode passing through all three Search Zones shown in Figure 929-2.03(A) shall be analyzed to determine the most critical failure case. Each failure mode shall be analyzed individually and not be forced to mimic the results of other failure modes. The compound stability analyses are required for all wall geometries including walls with level ground in front of the wall and level backfill behind the wall. Global stability requirements are contained in the MSE Wall Design Summary Plan Sheet.

Design-Builder and Wall Designer shall identify the specific locations on working drawing plan and profiles based on subgrade evaluation and at other key locations to control the deformation along the wall. The soil reinforcements

attached to the slip joints shall be oriented perpendicular to the slip joint panels and shall be the full design length. Special connection and compaction details shall be provided on the Shop Drawings and Working Drawings.

At all corners formed by two MSE walls, the leveling pad along the shorter wall forming the corner shall be at the same elevation as the leveling pad for the taller wall for a distance of at least 80% of the height of the taller wall or a distance of 10 feet, whichever is greater.

All structures shall be designed to conform to the requirements shown in Table 929-2 and other requirements of this TPA 600-2.

Table 929-2: Design Parameters

No.	Description	Limit State	Value	Note
1.	Design Life	All limit states	75 Years	
2.	Effective (Drained) Friction Angle		(Project specific as detailed in the MSE Wall Design Summary Plan Sheet)	
a.	Retained Backfill	All limit states	34 deg., 110 pcf	1
b.	Reinforced Backfill	All limit states	0.7H min or 8-ft whichever is more	1
3.	Length of soil reinforcement, B	All limit states	B/3 (soil), 0.45B (rock)	2
4.	Limiting eccentricity	Strength (all)	B/6 (soil), B/4 (rock)	
		Service I	tan [min(ϕ_r, ϕ_f, ϕ_i)]	
5.	Coefficient of Sliding Friction	Strength (all)	(Project specific as detailed in the MSE Wall Design Summary Plan Sheet)	3
6.	Resistance factors			
a.	Sliding	Strength (all)	1.0	4
b.	Bearing	Strength (all)	0.65	5
c.	Overall (slope) stability			
I.	Deep Seated Stability	Service I	0.65	6
II.	Compound Stability	Service I	0.65	6
d.	Pullout resistance			
I.	Static	Strength (all)	0.90	7
II.	Combined static/earthquake	Strength (all)	1.20	7
e.	Tensile resistance of metallic reinforcements and connectors			

No.	Description	Limit State	Value	Note
I.	Static			
	- Strip reinforcement	Strength (all)	0.75	8
	- Grid reinforcement	Strength (all)	0.65	8, 9
II.	Combined static/earthquake			
	- Strip reinforcement	Strength (all)	1.00	8
	- Grid reinforcement	Strength (all)	0.85	8, 9
f.	Tensile resistance of geosynthetic reinforcements and connectors			
I.	Static	Strength (all)	0.90	
II.	Combined static/earthquake	Strength (all)	1.20	

Notes:

1	Retained backfill requirements shall be project specific as noted on the MSE Wall Design Summary Plan Sheet developed by the Geotechnical Engineer.
2	H is the design height of the wall and is defined as the difference in elevation between the finished grade at top of wall and the top of leveling pad. The top of the leveling pad shall always be below the minimum embedment reference line as indicated on the Plans for that location. The length of the soil reinforcement, B, is measured from the back face of the wall facing unit. In case of grid type reinforcements, the length of the soil reinforcement is measured from the back face of the wall to the last full transverse member. For modular block facing units, the total length of the reinforcement, BT, as measured from the front face of the wall is the length B as defined above plus the width of the modular block unit (the horizontal dimension of the block unit measured perpendicular to the wall face). Depending on the configuration of the reinforcements and properties of the various actual fills selected by Design-Builder, the minimum length of the reinforcement may need to be increased to satisfy the required resistance factors for compound stability analyses.
3	ϕ_r = friction angle of reinforced wall fill. ϕ_f = friction angle of foundation soil (as reported on the MSE Wall Design Summary Plan Sheet). ϕ_i = friction angle of the interface between reinforcement and soil for cases of sheet reinforcement such as geotextiles. All friction angles are effective (drained) friction angles. Refer to the MSE Wall Design Summary Plan Sheet for friction angle and unit weight of foundation soil.
4	Passive resistance shall not be considered in evaluation of sliding resistance.
5	For all limit states, the design loading for the MSE retaining wall system shall not exceed the factored general and local bearing resistances specified in the Geotechnical Report(s).
6	For earthquake loading condition, a resistance factor of 0.90 shall be used.
7	Live load due to vehicular traffic shall be included in the computations to determine the maximum tensile forces in reinforcement layers but shall be neglected in the computations for pullout resistance. Intensity of live load shall be considered as a uniform surcharge using the equivalent height of soil in accordance with Section Article 3.11.6.4 of AASHTO (2017).
8	Apply to gross cross-section less sacrificial area. For sections with holes, reduce gross area in accordance with Article 6.8.3 of AASHTO (2017) and apply to net section less sacrificial area.

No.	Description	Limit State	Value	Note
9	Applies to grid reinforcements connected to a rigid facing element, e.g., a concrete panel or block. For grid reinforcements connected to a flexible facing mat or which are continuous with the facing mat, use the resistance factor for strip reinforcements.			
10	Unless otherwise specified, all resistance factors shall be taken as 1.0 when investigating an extreme event limit state.			

(B) Subsurface Drainage Systems

MSE Walls shall be provided with subsurface drainage measures as shown on the Plans and Project Special Provisions. As a minimum, an underdrain system shall be provided for leading subsurface and surface water away from the backfill and outside the limits of the wall. Geocomposite drains, if used for subsurface drainage, shall be in accordance with Subsections 203-5.02 and 203-5.03(C) of the ADOT *Standard Specifications*.

The Wall Designer is responsible for drainage measures within the reinforced backfill. Drainage measures outside the MSE wall backfill shall be designed by Design-Builder's project civil designer.

(C) Obstructions in Backfill

(1) General

Where obstructions, such as deep foundations or storm drain crossings, are located in the reinforced backfill zone, cutting of reinforcements to avoid obstructions shall not be permitted. A minimum offset of one pipe diameter but not less than 3 feet shall be maintained between the face of any pipe crossings and the back face of MSE retaining wall panels. A minimum clearance of 3 feet shall be maintained between the face of any other obstruction and the back face of MSE retaining wall panels.

(2) Horizontal Deflection of Reinforcements

In the horizontal plane at a reinforcing level, a deviation up to 15 degrees from normal to the face of the wall may be allowed for strip reinforcement and bolted connection. This deviation is herein referred to as the splay angle. Grid reinforcements may not be splayed unless connection has been specifically fabricated to accommodate a splay and connection detail has been approved by ADOT. If used, the splay in grid reinforcements is limited to five degrees. For obstructions that cannot be accommodated with splayed reinforcement, structural frames and connections shall be required, and shall be designed in accordance with Section 10 ("Steel Structures") of AASHTO (2017) for the maximum tension in the reinforcements. The structural frame design shall be such that bending moments are not generated in the soil reinforcement or the connection at the wall face. The design, along with supporting calculations, shall be included in the Shop Drawings and Working Drawings.

(3) Vertical Deflection of Reinforcements

Vertical deflection of the reinforcement to avoid obstructions such as utilities along the wall face shall be limited to a maximum of 15 degrees from normal to face of wall. Bends in the reinforcement shall be smooth and gradual to ensure that galvanization remains intact.

(D) Hydrostatic Pressures

For walls potentially subject to inundation, such as those located adjacent to rivers, canals, detention basins or retention basins, a minimum hydrostatic pressure equal to three feet shall be applied at the high-water level for the design flood event. Effective unit weights shall be used in the calculations for internal and external stability beginning at levels just below the equivalent surface of the pressure head line. Where the wall is influenced by water fluctuations, the wall shall be designed for rapid drawdown conditions which could result in differential hydrostatic pressure greater than 3 feet. As an alternative to designing for rapid drawdown conditions, Size No. 57 coarse aggregate, as specified in AASHTO M 43, shall be provided as reinforced backfill for the full length of the wall and to the maximum height of submergence of the wall. Separation fabric shall be Class I needle-punched polypropylene

non-woven geotextile with the highest permittivity specified in AASHTO M 288. The fabric shall be provided at the interface of the Size No. 57 coarse aggregate and reinforced backfill above it, and at the interface of the retained backfill behind it. Adjoining sections of separation fabric shall be overlapped by a minimum of 12 inches.

(E) Acute Angle Corners

Wall corners with an included angle of less than 70 degrees shall be designed for bin-type lateral pressures for the extent of the wall where the full length of the reinforcement cannot be installed without encountering a wall face. Acute angle corner structures shall not be standalone separate structures. Computations shall be provided that demonstrate deformation compatibility between the acute angle corner structure and the rest of the MSE wall. Full height vertical slip joints shall be provided at the acute angle corner and after the last column of panels where full length of the reinforcements can be placed. The soil reinforcement attached to the slip joints shall be oriented perpendicular to the slip joint panels and shall be the full design length. Special connection and compaction details shall be provided on the Shop Drawings and Working Drawings.

(F) Slip Joints

For walls with precast concrete panels, vertical slip joints shall be included in the wall face at the following locations and as shown on the Plans, whichever is more stringent:

(1) Boundaries of limits where differential settlement exceeds 1/100.

(2) All locations where a wall height changes by more than 5 feet.

(3) All corners within an MSE wall.

(4) Each side of a stiff element such as a reinforced concrete box culvert (RCBC), abutment wing walls, or any other wall face penetration larger than 5 feet.

(5) Each side of a drilled shaft foundation constructed prior to and within 8 feet of the face of wall. Approximate locations of slip joints shall be shown on the Plans and Shop Drawings and Working Drawings.

(G) Spacing of Metallic Reinforcement for Flexible Face Wall Systems

For permanent walls, vertical and horizontal spacing of metallic reinforcements for flexible face (welded wire or similar) wall systems shall not exceed 18 inches. The stiffness of the facing and spacing of reinforcements shall be such that the maximum local deformation between soil reinforcement layers shall be limited to less than 1½ inches. Facing elements shall not yield in bending and tension.

For temporary walls, i.e., walls with less than 36 months service life, Design-Builder may adjust the stiffness of the facing and spacing of the reinforcements such that the local deformation between the reinforcement is within the elastic range in bending and tension, and the overall geometry meets the line and grade requirements for the temporary walls.

(H) Soil Reinforcement for Modular Block Wall (MBW) Systems

The soil reinforcement lengths and percent coverage at a given reinforcement level shall be in accordance with the Plans. All soil reinforcement shall be positively connected to the modular block facing units by a connection that is capable of resisting 100% of the maximum tension in the soil reinforcements at any level within the wall. Detailed documentation for connection strength shall be submitted as noted in Subsection 929-3.09 of TPA 600-2. The vertical spacing of the soil reinforcement for walls with modular block facing units shall be as follows:

(1) The first (bottom) layer of soil reinforcement shall be no further than 16 inches above the top of the leveling pad.

(2) The last (top) layer of soil reinforcement shall be no further than 20 inches on the average below the top of the uppermost MBW unit.

(3) The maximum vertical spacing between layers of adjacent soil reinforcement shall not exceed 24 inches. For walls deriving any part of their connection capacity by friction the maximum vertical spacing of the reinforcement shall be limited to two times the block depth (front face to back face) to assure construction and long-term stability. The top row of reinforcement shall be placed at a depth no more than two times the block height from the top of finished grade.

(I) Initial Batter of Wall

The initial batter of the wall, both during construction and upon completion, shall be within the vertical and horizontal alignment tolerances included in this TPA 600-2. The initial batter of the wall at the start of construction and the means and methods necessary to achieve the batter shall be provided on the Shop Drawings and Working Drawings. The initial batter may be modified at the start of construction by the manufacturer's field representative based on the evaluation of the backfill material selected by Design-Builder subject to the approval of the Wall Designer prior to any modifications. Any such changes shall be documented in writing within 24 hours of the approved changes. This written document shall be sealed by the manufacturer's design engineer who is registered as a Professional Engineer. Details of the wedges or shims or other devices, such as clamps and external bracing used to achieve or maintain the wall batter, shall be as shown on the Shop Drawings and Working Drawings and/or accompanying construction manual. Permanent shims shall comply with the design life criteria and shall maintain the design stress levels required for the walls.

929-3 Material Requirements

929-3.01 Precast Concrete Elements

Precast concrete elements shall conform to the requirements for precast minor structures in Sections 601 and 1006 of the ADOT *Standard Specifications*. The concrete shall be Class S with minimum design strength of 4,000 pounds per square inch. The mix design shall conform to the requirements of Subsection 1006-3 of the ADOT *Standard Specifications*.

Prior to casting, all embedded components shall be set in place to the dimensions and tolerances designated in the Plans and Project Special Provisions. Rustication for wall aesthetics shall be in accordance with the Plans, special provisions, the TPs, and applicable requirements of Sections 601, 610, 1002, and 1006 of the ADOT *Standard Specifications*.

(A) Concrete Testing and Inspection

Precast concrete elements shall be subjected to compressive strength testing in accordance with Subsection 1006-7 of the ADOT *Standard Specifications* and inspected for surface conditions and dimensional tolerances in accordance with Subsections 601-3.05 and 601 4.02 respectively of the ADOT *Standard Specifications*. Panels delivered to the site without the ADOT acceptance stamp will be rejected.

(B) Casting

Precast concrete face panels shall be cast on a horizontal surface with the front face of the panel at the bottom of the form. Connection hardware shall be set in the rear face. The concrete in each precast concrete panel shall be placed without interruption and shall be consolidated by deploying an approved vibrator, supplemented by such hand tamping as may be necessary to force the concrete into the corner of the forms, and to eliminate the formation of stone pockets or cleavage planes. Form release agents as specified in Subsection 601-3.02(C)(1) of the ADOT *Standard Specifications* shall be used on all form faces for all casting operations.

Design-Builder shall advise the IQF and ADOT of the starting date for concrete panel casting at least 14 Days prior to beginning the operation if the casting operation is within the State of Arizona, or 21 Days if the casting operation is outside the State of Arizona.

(C) Finish

(1) Non-Exposed Surfaces

Rear faces of precast concrete panels shall receive a Class I finish in accordance with Subsection 601-3.05 of the ADOT *Standard Specifications*.

(2) Exposed Surfaces

The type of finish required on exposed surfaces shall be as shown in the Plans.

(a) Exposed Aggregate Finish:

(i) Prior to placing concrete, a set retardant shall be applied to the casting forms in accordance with the manufacturer's instructions.

(ii) After removal from the forms and after the concrete has set sufficiently to prevent its dislodging, the aggregate shall be exposed by a combination of brushing and washing with clear water. The depth of exposure shall be between ⅜ inch and ½ inch.

(iii) An acrylic resin sealer consisting of 80% thinner and 20% acrylic solids by weight shall be applied to the exposed aggregate surface at a rate of 1 gallon per 250 square feet.

(b) Concrete Panel Finish

Concrete panel finish shall be in accordance with Subsection 601-3.05 of the ADOT *Standard Specifications*.

(D) Tolerances

Precast concrete elements shall comply with Subsection 601-4.02(B)(1) and 601-4.02(B)(4) of the ADOT *Standard Specifications*. Connection device placement shall be within ±⅜ inch of the dimensions shown on the approved Shop Drawings and Working Drawings. Panel squareness as determined by the difference between the two diagonals shall not exceed ½ inch.

(E) Identification and Markings

The date of manufacture, the production lot number, and the piece mark shall be inscribed on a non-exposed surface of each precast concrete element.

(F) Handling, Storage, and Shipping

All panels shall be handled, stored, and shipped in such a manner to eliminate the dangers of chipping, discoloration, cracks, fractures, and excessive bending stresses. Panels in storage shall be supported in firm blocking to protect panel connection devices and the exposed exterior finish. Storing and shipping shall be in accordance with the manufacturer's recommendations.

(G) Compressive Strength

Precast concrete elements shall not be shipped or placed in the wall until a compressive strength of 3,400 pounds per square inch has been attained. The facing elements shall be cast on a flat and level area and shall be fully supported until a compressive strength of 1,000 pounds per square inch has been attained.

(H) Precast Concrete Panel Joints

(1) General

Where the wall wraps around an inside corner, a corner block panel shall be provided with flange extensions that will allow for differential movement without exposing the panel joints. The back face of vertical and horizontal joints shall be covered with geotextile filter. Joint filler, bearing pads, and geotextile filter shall be as recommended by the wall manufacturer and shall meet the requirements shown on the approved Shop Drawings and Working Drawings.

If required, as indicated on the Plans, flexible open-cell polyurethane foam strips shall be used for filler for vertical joints between panels, and in horizontal joints where pads are used.

All joints between panels on the back side of the wall shall be covered with a geotextile meeting the requirements for filtration applications as specified by AASHTO M 288. The minimum width shall be 12 inches.

(2) Bearing Pads

All horizontal and diagonal joints between panels shall include bearing pads. Bearing pads shall meet or exceed the following material requirements:

(a) Preformed EPDM (Ethylene Propylene Diene Monomer) rubber pads conforming to ASTM D2000 Grade 2, Type A, Class A with a Durometer Hardness of 70.

(b) Preformed HDPE (High Density Polyethylene) pads with a minimum density of 0.946 grams per cubic centimeter in accordance with ASTM D1505.

The stiffness (axial and lateral), size, and number of bearing pads shall be determined such that the final joint opening shall be ¾ inches within +1/8 inch unless otherwise shown on the Shop Drawings and Working Drawings. The MSE Wall Designer shall submit substantiating calculations verifying the stiffness (axial and lateral), size, and number of bearing pads assuming, as a minimum, a vertical loading at a given joint equal to 2.5 times the weight of facing panels directly above that level. As part of the substantiating calculations, the MSE Wall Designer shall submit results of certified laboratory tests in the form of vertical load-vertical strain and vertical load-lateral strain curves for the specific bearing pads proposed by the MSE Wall Designer. The vertical load vertical strain curve shall extend beyond the first yield point of the proposed bearing pad.

929-3.02 Steel Components

Steel components shall conform to the applicable requirements of Sections 605 and 1003 of the ADOT *Standard Specifications*.

(A) Galvanization

Soil reinforcement steel shall be hot-dip galvanized in accordance with AASHTO M 111 (ASTM A123). Connection hardware steel can be galvanized by hot-dipping or other means, provided the method satisfies the requirements of AASHTO M 111 (ASTM A123). A minimum galvanization coating of 2.0 oz./ft^2 (605 g/m^2) or 3.4 mils (85 µm) thickness is required. Soil reinforcement steel shall be adequately supported while lifting and placing such that the galvanization remains intact. Steel members with damaged (peeled) galvanization shall be repaired according to ASTM A780-01 and as specified in the approved Shop Drawings and Working Drawings.

(B) Metallic Reinforcing Strips and Tie Strips

Reinforcing strips shall be hot-rolled from bars to the required shape and dimensions. The strips' physical and mechanical properties shall conform to the requirements of ASTM A572, Grade 65 minimum.

Tie strips shall be shop fabricated of hot-rolled steel conforming to the requirements of ASTM A1101, Grade 50 minimum. The minimum bending radius of the tie strips shall be ⅜ inch. Galvanization shall be applied after the strips are fabricated, inclusive of punch holes for bolts as shown on the approved Shop Drawings and Working Drawings.

(C) Metallic Reinforcing Mesh

Reinforcing mesh shall be shop fabricated of cold-drawn steel wire conforming to the requirements of AASHTO M 32 and shall be welded into the finished mesh fabric in accordance with AASHTO M 55. Galvanization shall be applied after the mesh is fabricated. A minimum galvanization coating of 2.0 oz./ft2 (605 g/m2) or 3.4 mils (85 µm) thickness is required.

(D) Connector Pins

Connector pins and mat bars shall be fabricated and connected to the soil reinforcement mats as shown in the approved Shop Drawings and Working Drawings. Connector bars shall be fabricated of cold drawn steel wire conforming to the requirements of AASHTO M 32.

(E) Welded Wire Fabric

All welded wire fabric shall conform to the requirements of AASHTO M 32, AASHTO M 55, and the approved Shop Drawings and Working Drawings. Welded wire fabric shall be galvanized in conformance with the requirements of ASTM A123.

(F) Fasteners

Connection hardware shall conform to the requirements shown in the approved Shop Drawings and Working Drawings. Connection hardware shall be cast in the precast concrete panels such that all connectors are in alignment and able to transfer full and even load to the soil reinforcement. Once the reinforcement is connected to the panel, the amount of slack shall not exceed ⅛ inch between the connector and the reinforcement during field installation. Fasteners shall be galvanized and conform to the requirements of AASHTO M 164 or equivalent.

929-3.03 Geosynthetic Reinforcement

Geosynthetic soil reinforcement shall be limited to geosynthetics manufactured from polypropylene, high-density polyethylene, and polyester. Geosynthetic reinforcement shall be evaluated through the National Transportation Product Evaluation Program – Geosynthetic Reinforcements (NTPEP REGEO) for the installation damage reduction factor RFID and creep reduction factor RFCR. The geogrid shall be a regular network of integrally connected polymer tensile elements, with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil. Geogrid structure shall be dimensionally stable and able to retain its geometry under manufacture, transport, and installation. Geosynthetic reinforcements other than geogrids may be utilized if an independent evaluation has been performed through the NTPEP REGEO program.

The nominal long-term tensile design strength (T-AL) of specific geosynthetic material shall meet or exceed the creep and durability reduction factors required by the wall manufacturer, as well as those required by AASHTO (2017). The Wall Designer may not select installation damage reduction factor RFID and creep reduction factor RFCR to be less than the results obtained through the NTPEP REGEO program.

929-3.04 Certificate of Analysis for Soil Reinforcements

Design-Builder shall submit a Certificate of Analysis conforming to the requirements of Subsection 106.05 of the ADOT *Standard Specifications* and TP Sections 106 (*Control of Materials*) and 113 (*Submittal Management*) all materials.

For geosynthetics, the Certificate of Analysis shall verify that the supplied geosynthetic is the type approved by ADOT and as measured in full accordance with all test methods and standards specified herein. The manufacturer's certificate shall state that the furnished geosynthetics meet the requirements of the specifications, as evaluated by the NTPEP REGEO program.

For metallic wall reinforcement, a mill test report containing the ultimate tensile strength for the soil reinforcement shall be included in the certification. For metallic wall reinforcement, a mill test report containing the galvanization

coverage shall be included in the certification. For metallic mesh wall reinforcement, a mill test report containing the ultimate weld strength for the soil reinforcement shall be included in the certification.

929-3.05 Reinforced and Retained Backfill Material

(A) General

Reinforced backfill material shall be free of shale, organic matter, mica, gypsum, smectite, montmorillonite, or other soft poor durability particles. No salvaged material, such as asphaltic concrete millings or Portland Cement Concrete rubble, etc., will be allowed.

Retained backfill material shall be project specific as noted on the MSE Wall Design Summary Plan Sheet developed by the Geotechnical Engineer.

(B) Soundness

The reinforced backfill material shall have a soundness loss of 30% or less when tested in accordance with AASHTO T 104 using a magnesium sulfate solution with test duration of four cycles. Alternatively, the material shall have a soundness loss of 15% or less when tested in accordance with AASHTO T 104 using a sodium sulfate solution with test duration of five cycles. Aggregate sources with recent testing data within the past year may submit previous testing results for soundness determination.

(C) Gradation and Fractured Coarse Aggregates

Gradations will be determined by AASHTO T 27 and T 11 and shall be in accordance with Table 929-3, unless otherwise specified.

Material retained on the #4 and larger sieves must have a minimum of 50% particles with two or more mechanically induced crushed faces when tested by AASHTO T 84.

Table 929-3: Backfill Gradation Requirements

No.	Sieve Size	Percent Passing
1.	4 inch	100
2.	No. 40	0 - 60
3.	No. 200	0 - 15

(D) Separation Fabric

A Class I needle-punched polypropylene non-woven separation geotextile fabric, meeting the minimum requirements for filtration applications specified in AASHTO M 288 and Subsection 1014-4 of the ADOT *Standard Specifications* shall encapsulate the rock backfill. Adjoining sections of separation fabric shall be overlapped by a minimum of 12 inches.

(E) Limits of Reinforced Backfill

For all walls, except back-to-back walls, the reinforced backfill shall extend to at least 2 feet beyond the free end of the reinforcement. For back-to-back walls wherein the free ends of the reinforcement of the two walls are spaced apart less than or equal to one half the design height of the taller wall, reinforced wall fill shall be used for the space between the free ends of the reinforcements as well. The design height of the wall is defined as the difference in elevation between the top of coping and the top of leveling pad. The top of the leveling pad shall always be below the minimum embedment reference line as indicated on the Plans for the location under consideration.

929-3.06 Certificate of Analysis for Reinforced Backfill Materials

At least three weeks prior to construction of the MSE wall, Design-Builder shall submit test results for an 80-pound representative sample of the reinforced backfill material, and a Certificate of Analysis conforming to the requirements of Subsection 106.05 of the ADOT *Standard Specifications* and certifying that the reinforced backfill material complies with the requirements of TP Sections 106 (*Control of Materials*) and 113 (*Submittal Management*) specified herein. During construction, the reinforced backfill material shall be sampled and tested by the IQF for acceptance and by Design-Builder for quality control testing in accordance with the requirements stated in Table 929-4. A new sample and Certificate of Analysis shall be provided any time the reinforced backfill material changes as noted in Table 929-4.

Table 929-4: Quality Control Testing Requirements

No.	Test	Frequency
1.	Gradation (AASHTO T 27 & T 11) Plasticity Index (AASHTO T 90) Fractured Coarse Aggregate Particles (AASHTO T 335)	One per 500 CY At production facility

929-3.07 Cast-in-Place Concrete

Cast-in-place concrete shall conform to the requirements of Sections 601 and 1006 of the ADOT *Standard Specifications*. Unless otherwise approved, all cast in place concrete shall be Class S with a minimum compressive strength of 4,000 pounds per square inch.

929-3.08 Modular Block (Segmental) Facing Units

This section covers dry cast hollow and solid wet cast concrete masonry structural retaining wall units, machine made from Portland cement, water, and suitable mineral aggregates. The units are intended for use as facing units in the construction of mortarless, modular block walls (MBW) also known as segmental retaining walls (SRW). Metallic or geosynthetic reinforcement specified in Section 929-3.02 and 929-3.03 of this TPA 600-2, respectively, may be used as soil reinforcement in the reinforced (structure) backfill zone.

(A) Casting

Cementitious material in the modular block facing unit shall be Portland cement conforming to the requirements of ASTM C150. If fly ash is used it shall not exceed 20% by weight of the total cement content and shall conform to ASTM C618. Aggregates used in concrete blocks shall conform to ASTM C33 for normal weight concrete aggregate. Efflorescence control agent shall be used in concrete mix design to prevent efflorescence on the block.

Design-Builder shall advise ADOT of the starting date for concrete panel casting at least 14 Days prior to beginning the operation if the casting operation is within the State of Arizona, or 21 Days if the casting operation is outside the State of Arizona.

(B) Physical Requirements

At the time of delivery to the work site, the modular block facing units shall conform to the following physical requirements:

(1) Minimum required compressive strength of 4,000 psi (average of 3 coupons)

(2) Minimum required compressive strength of 3,500 psi (individual coupon)

(3) Minimum oven dry unit weight of 125 pcf

(4) Maximum water absorption of 5% after 24 hours

(5) Maximum number of blocks per lot of 2,000. Tests on blocks shall be submitted at the frequency of one set per lot.

Acceptance of the concrete block, with respect to compressive strength, water absorption and unit weight, will be determined on a lot basis. The lot shall be randomly sampled and tested in accordance with ASTM C140. The manufacturer shall perform the tests at an ADOT approved laboratory and submit the results to the IQF and ADOT for approval. Compressive strength test specimens shall be cored or shall conform to the saw cut coupon provisions of ASTM C140. Block lots represented by test coupons that do not reach an average compressive strength of 4,000 psi will be rejected.

(C) Freeze-Thaw Durability:

In areas above 3,000 feet elevation, where repeated freezing and thawing under saturated conditions occur, the units shall be tested to demonstrate freeze-thaw durability in accordance with ASTM C1262. Freeze-thaw durability shall be based on tests from five specimens made with the same materials, concrete mix design, manufacturing process, and curing method, conducted not more than 18 months prior to delivery. Specimens used for absorption testing shall not subsequently be used for freeze-thaw testing. Specimens shall comply with either or both of the following acceptance criteria depending on the severity of the project location as determined by ADOT:

(1) The weight loss of four out of five specimens at the conclusion of 150 cycles shall not exceed 1% of its initial weight when tested in water.

(2) The weight loss of each of four out of the five test specimens at the conclusion of 50 cycles shall not exceed 1.5% of its initial mass when tested in a saline (3% sodium chloride by weight) solution.

(D) Tolerances for Modular Block Dimensions

Modular blocks shall be manufactured within the following tolerances:

(1) The length and width of each individual block shall be within ± ⅛ inch of the specified dimension. Hollow units shall have a minimum wall thickness of 1¼ inches.

(2) The height of each individual block shall be within ± 1/16 inch of the specified dimension.

(3) When a broken (split) face finish is required, the dimension of the front face shall be within ± 1.0 inch of the theoretical dimension of the unit.

(E) Finish and Appearance

Units that indicate imperfect molding, honeycomb or open texture concrete and color variation on front face of block due to excess form oil or other reasons shall be rejected. All units shall be visually efflorescence free. All units shall be sound and free of cracks or other Defects that would interfere with the proper placing of the unit or significantly impair the strength or permanence of the construction. Minor cracks (e.g., no greater than 1/50 inch in width and no longer than 25% of the unit height) incidental to the usual method of manufacture or minor chipping resulting from shipment and delivery, are not grounds for rejection.

The exposed faces shall be free of chips, cracks or other imperfections when viewed from a distance of 30 feet under diffused lighting. Up to 5% of a shipment may contain slight cracks or small chips not larger than 1.0 inch.

Color and finish shall be as shown on the Plans and shall be erected with a running bond configuration.

(F) Pins

If pins are required to align modular block facing units, they shall consist of a non-degrading polymer or hot-dipped galvanized steel and be made for the express use with the modular block units supplied. Connecting pins shall be capable of holding the geogrid in the proper design position during backfilling.

(G) Cap Units and Adhesive

The cap unit connection to the block unit immediately under it shall be of a positive interlocking type and not frictional. Cap units shall be cast to or attached to the top of modular block facing units in strict accordance with the requirements of the manufacturer of the blocks and the adhesive. The surface of the block units under the cap units shall be clear of all debris and standing water before the approved adhesive is placed. Design-Builder shall provide ADOT in writing an acceptable 10-year warranty that the integrity of the materials used to attach the cap blocks will preclude separation and displacement of the cap blocks for the warranty period.

(H) Unit (Core) Fill

Unit (core) fill is defined as free draining, coarse grained material that is placed within the empty cores of the modular block facing units. Unit (core) fill shall be a crushed stone or granular fill.

929-3.09 Certificate of Analysis for Modular Block Connection

For modular block facing units, a certification shall be provided with detailed calculations according to AASHTO (2017) and the results of laboratory test results performed in accordance with Section A.3 in Appendix A of FHWA NHI-00-043, dated March 2001 ("Mechanically Stabilized Earth Walls and Reinforced Soil Slopes"). Such certification shall demonstrate that all connections, including block-to-reinforcement and block to block connections, and all related components meet or exceed the current AASHTO 75-year design life requirements and are capable of resisting 100% of the maximum tension in the soil reinforcements at any level within the wall. Long-term connection testing for extensible reinforcements is also required. The effect of wall batter and normal pressures representative of the full range of wall configurations and heights shall be incorporated in the tests.

929-4 Construction Requirements

929-4.01 Excavation

Design-Builder shall ensure that temporary slopes are safe during the period of wall construction, and shall adhere to all applicable local, state, and federal regulations. During construction of the MSE walls, Design-Builder shall design, construct, maintain, and when called for, remove temporary excavation support systems (shoring). Temporary excavation support systems may be left in place if approved by ADOT. The back slope of the excavation shall be benched. Where shoring is required, Design-Builder shall submit the shoring design, and a plan outlining construction and removal procedures for review and approval prior to proceeding with the work. Shoring Plans shall be prepared and submitted as part of the Shop Drawings and Working Drawings, as specified in TP Section 116 (*Community Relations and Public Involvement Program*), and shall bear the seal and signature of a licensed Professional Civil or Structural Engineer, registered in the State of Arizona. All shoring design shall include appropriate input and review by Design-Builder's Professional Engineer.

929-4.02 Foundation Preparation

(A) General

In the absence of specific ground improvement requirements in the Plans, special provisions and Geotechnical Report, the following applies:

(1) The foundation for the reinforced and retained wall fill shall be graded level for the entire area of the base of such backfills, plus an additional 12 inches on all sides, or to the limits shown in the Plans.

(2) If soil reinforcement components are to be positioned on native soil, the top 1 foot of native soil shall meet the requirements of the reinforced backfill material specified in Subsection 929-3.05 of this TPA 600-2.

(3) If soil reinforcement components are to be positioned on native rock mass, the rock mass shall be classified as at least Class II rock mass in accordance with Subsection 10.4.6.4 of the AASHTO *LRFD Bridge Design Specifications*, 6th edition (2012).

(B) Proof-Rolling

Proof-rolling shall be performed to evaluate the stability and uniformity of the subgrades on which retaining wall structures will be constructed. Proof-rolling shall be performed on the entire areas at the following locations and at other locations shown on the Plans:

(1) At the bottom of the overexcavation and recompaction zones if specified;

(2) At the bottom of the overexcavation and replacement zones if specified;

(3) At the base of all retaining walls;

(4) At the base of all concrete box culverts; and

(5) At the top of native soil layers that have been scarified, moisture conditioned and recompacted (if different from the bottom of the overexcavation and recompaction or overexcavation and replacement zones).

The proof-rolling shall be done immediately after subgrade compaction while the moisture content of the subgrade soil is near optimum or at the moisture content that achieved the required compaction.

If proof-rolling is performed after installation of pipe underdrains, do not use the proof-roller within a vertical distance of 1.5 feet of the underdrains. Proof-rolling shall be performed with a pneumatic tired tandem axle roller with at least 3 wheels on each axle, a gross weight of 25 tons (50 kips) (this weight shall be determined on a project-by-project basis, depending on the soils and purpose of the proof-rolling), a minimum tire pressure of 75 psi and a minimum rolling width of 75 inches. A Caterpillar PS-300B (or PF-300B), Ingersoll-Rand PT-240R, BOMAG BW24R, Dynapac CP271 or equipment with equivalent capabilities shall be used for proof-rolling. The use of water trucks, scrapers, or other equipment for proof-rolling of the subgrades is not allowed.

Proof-rolling equipment shall be operated at a speed between 1.5 to 3 miles per hour or slower as required by the IQF to permit measurements of ruts and/or pumping deformations.

Proof-rolling shall be carried out in two directions at right angles to each other with no more than 24 inches between tire tracks of adjacent passes. In cases where proof-rolling perpendicular to the wall alignment is not possible due to space constraints, proof-rolling shall be performed parallel to the wall with minimum 6 inches overlap between the tracks of adjacent passes. Design-Builder shall operate the proof-roller in a pattern that readily allows for the recording of deformation data and complete coverage of the subgrade.

The following actions shall be taken based on the results of the proof-rolling activity:

(1) If rutting is less than ¼ inch; the grade is acceptable.

(2) If rutting is greater than ¼ inch and less than 1½ inches; the grade needs to be scarified and re-compacted.

(3) If rutting is greater than 1½ inches; the compacted area shall be removed and reconstructed.

(4) If pumping (deformation which rebounds or materials are squeezed out of wheel's path) is greater than 1 inch; remediate as directed by ADOT.

Design-Builder is responsible for maintaining the condition of the approved proof-rolled soils throughout the duration of the MSE wall construction. Wall construction shall not commence until the subgrade has been accepted by the IQF.

929-4.03 Concrete Leveling Pad

Leveling pads shall be constructed of unreinforced concrete as shown on the Shop Drawings and Working Drawings. Gravel leveling pads shall not be allowed. As a minimum, the concrete for leveling pads shall meet the requirements of Section 922 of the ADOT *Standard Specifications*. The elevation of the top of leveling pad shall be within ⅛ inch from the design elevation when measured by a straightedge over any 10-foot run of the leveling pad.

The minimum width of the leveling pad shall be the width of the facing unit plus 8 inches. The centerline of the leveling pad shall be within ½ inch from design location. When the facing units are centered on the leveling pad, the leveling pad shall extend approximately 4 inches beyond the limits of the facing unit as measured in the direction perpendicular to the face of the wall.

Cast-in-place leveling pads shall be cured for a minimum of 24 hours before placement of wall facing units. A geotextile shall be applied over the back of the area of any openings between the facing units and leveling pad steps. The geotextile shall extend a minimum of 6 inches beyond the edges of the opening. The opening shall be filled with concrete, conforming to Section 1006 of the ADOT *Standard Specifications*, or shall be concurrently backfilled on both sides with soil.

929-4.04 Subsurface Drainage

Prior to wall erection, Design-Builder shall install a subsurface drainage system as shown on the Shop Drawings and Working Drawings.

929-4.05 Wall Erection

(A) General

Walls shall be erected in accordance with the manufacturer's written instructions. Design-Builder shall be responsible for ensuring that a field representative from the manufacturer is available at the site during construction of the initial 10-foot height of the full length of wall, and as called upon thereafter by the IQF or ADOT. Such instances may include, but are not restricted to, when the wall construction crew chief is changed, when construction exhibits continuous deviations from the approved Shop Drawings and Working Drawings, or when other concerns about wall construction are raised. All temporary construction aids (e.g., wedges, clamps, etc.) shall be in accordance with the manufacturer's recommendations.

(B) Placement Tolerances for Walls with Rigid (Precast) Facing

For walls with rigid facing, such as precast concrete panels, the panels shall be placed such that their final position is vertical or battered as shown on the Shop Drawings and Working Drawings. As wall fill material is placed, the panels shall be maintained in the correct vertical alignment by means of temporary wedges, clamps, or bracing as recommended by the manufacturer. A minimum of two, but not more than three, rows of panel wedges shall remain in place at all times during wall erection. Wedges shall be removed from lower rows as panel erection progresses, so as to prevent chipping or cracking of concrete panels. Design-Builder shall repair any damage to erected concrete panels and to the IQF's acceptance. No external wedges in front of the wall shall remain in place when the wall is complete.

Erection of walls with rigid facing shall be in accordance with the following tolerances:

(1) Vertical and horizontal alignment of the wall face shall not vary by more than ¾ inch when measured along a 10-foot straightedge.

(2) The overall vertical tolerance (plumbness) of the finished wall shall not exceed ½ inch per 10 feet of wall height at any point along the wall. Negative (outward leaning) batter is not acceptable.

(3) The maximum permissible out-of-plane offset at any panel joint shall not exceed ⅜ inch.

(4) The final horizontal and vertical joint gaps between adjacent facing panel units shall be within -⅛ inch and ±1/4 inch, respectively, of the design final joint opening per the approved calculations required in Subsection 929-3.01(H) of this TPA 600-2.

Wall sections not conforming to these tolerances shall be reconstructed.

(C) Placement Tolerances for Permanent Walls with Flexible Facing

Erection of permanent walls with flexible facing (such as welded wire mesh) shall be in accordance with the following tolerances:

(1) Vertical and horizontal alignment of the wall face shall not vary by more than 2 inches when measured along a 10-foot straightedge, or as shown in the Plans and Project Special Provisions.

(2) The overall vertical tolerance (plumbness) of the wall shall not exceed 1 inch per 10 feet of wall height. Negative (outward leaning) batter is not acceptable.

(3) The offset limit between consecutive rows of facing shall not exceed 1 inch from planned offset.

Wall sections not conforming to these tolerances shall be reconstructed.

(D) Placement Tolerances for Modular Block Units

Erection of walls with modular block units shall be as per the following requirements:

(1) Vertical and horizontal alignment of the wall face shall not vary by more than ¾ of an inch when measured along a 10-foot straightedge.

(2) Overall vertical tolerance (plumbness) of the wall shall not exceed 1¼ inch per 10 feet of wall height from the final wall batter at any point along the wall. Negative (outward leaning) batter is not acceptable.

(3) The first row of units shall be level from unit to unit and from front to back. Use the tail of the units for alignment and measurement.

(4) All units shall be laid snugly together and parallel to the straight or curved line of the wall face.

(5) Unless otherwise noted, all blocks shall be dry-stacked and placed with each block evenly spanning the joint in the row below (running bond). Shimming or grinding shall control the elevations of any two adjacent blocks within 1/16 of an inch.

(6) The top of blocks shall be checked with a straight edge bubble level that is at least 3 feet long. Any high points identified by the straight edge shall be ground flat. Block front to back tilting shall be checked frequently; however, correction by shimming shall be done no later than 3 completed courses.

Wall sections not conforming to these tolerances shall be reconstructed.

(E) Placement of Metallic Reinforcement Elements

Metallic reinforcement elements shall be placed normal (perpendicular) to the face of the wall, unless otherwise shown on the approved Shop Drawings and Working Drawings. All reinforcement shall be structurally connected to the wall face.

At each level of the soil reinforcement, the reinforced wall fill material shall be roughly leveled and compacted before placing the next layer of reinforcement. The reinforcement shall bear uniformly on the compacted reinforced soil

from the connection to the wall to the free end of the reinforcing elements. The reinforcement placement elevation shall be at the connection elevation to 2 inches higher than the connection elevation.

For geosynthetic reinforcement where overlapping of reinforcing may occur, such as at corners, reinforcing connections to panels shall be adjusted to maintain at least 6 inches of vertical separation between overlapping reinforcement.

(F) Placement of Geotextile Fabric

All joints between precast concrete panels shall be covered with geotextile fabric on the back side of the wall. Adhesive shall be applied to panels only. Adhesive shall not be applied to geotextile fabric or within 2 inches of a joint. Design-Builder shall provide geotextile fabric having a minimum width of 12 inches and shall overlap the fabric a minimum of 4 inches. For modular block walls, the placement of the geotextile fabric shall be in accordance with the approved Shop Drawings and Working Drawings.

(G) Joint Pads and Fillers

Design-Builder shall install joint pads and fillers as shown on the approved Shop Drawings and Working Drawings.

(H) Placement of Geosynthetic Reinforcement

Geosynthetic reinforcement shall be installed in accordance with the manufacturer's site-specific wall erection instructions.

The geosynthetic reinforcement shall be rolled out with the stronger direction perpendicular to the wall face. The reinforcement shall be continuous for their full length. Joints parallel to the wall shall not be permitted, except as shown on the approved Shop Drawings and Working Drawings.

Reinforcement coverage shall be 100% of embedment area unless otherwise shown in the approved Shop Drawings and Working Drawings. Adjacent sections of geosynthetic reinforcement need not be overlapped except when exposed in a wraparound face system, at which time the reinforcement rolls shall be overlapped or mechanically connected per the manufacturer's requirements.

Geosynthetic reinforcement shall be placed to lay flat and pulled tight prior to backfilling. After a layer of geosynthetic reinforcement has been placed, suitable means, such as pins or small piles of soil, shall be used to hold the geosynthetic reinforcement in position until the subsequent soil layer can be placed.

During construction, the surface of the fill shall be kept approximately horizontal. Geosynthetic reinforcement shall be placed directly on the compacted horizontal fill surface.

The reinforcement shall bear uniformly on the compacted reinforced soil from the connection to the wall to the free end of the reinforcing elements. The reinforcement placement elevation shall be at the connection elevation to 2 inches higher than the connection elevation.

929-4.06 Reinforced Wall Fill Placement

(A) General

Reinforced wall fill placement shall closely follow erection of each course of facing panels. Backfill shall be placed in such a manner to avoid damage or disturbance of the wall materials, misalignment of facing panels, or damage to soil reinforcement or facing members. Design-Builder shall place backfill to the level of the connection and in such a manner as to ensure that no voids exist directly beneath reinforcing elements.

For walls with modular block facing units, the backfill shall not be advanced more than the height of a modular block unit until the drainage fill, core fill and all fill in all openings within the blocks at that level have been placed. The filled units shall be swept clean of all debris before installing the next level of units and/or placing the geogrid materials.

For walls with flexible facing with gabion style facing, the rock near the wall face shall be hand-placed in accordance with the recommendations of the wall manufacturer.

The maximum lift thickness before compaction shall not exceed 12 inches.

For geosynthetic reinforcements, the fill shall be spread by moving the machinery parallel to or away from the wall facing and in such a manner that the geogrid remains taut. Construction equipment shall not operate directly on the geogrid. A minimum fill thickness of 6 inches over the geogrid shall be required prior to operation of vehicles. Sudden braking and sharp turning shall be avoided.

For metallic reinforcements, the fill shall be spread by moving the machinery parallel to or away from the wall facing and in such a manner that the steel reinforcement remains normal to the face of the wall. Construction equipment shall not operate directly on the steel reinforcement. A minimum fill thickness of 3 inches over the steel reinforcement shall be required prior to operation of vehicles. Sudden braking and sharp turning shall be avoided.

Wall materials which are damaged during backfill placement shall be removed and replaced by Design-Builder. Design-Builder may submit alternative corrective procedures for consideration. Proposed alternative corrective procedures shall have the approval of the MSE wall supplier and designer, in writing, prior to submission for consideration. Any such changes shall be documented in writing within 24 hours of the approved changes. This written document shall be sealed by the manufacturer's design engineer, who is registered as a Professional Engineer.

(B) Compaction

Reinforced wall fill compaction requires a minimum of 2 roller passes of a vibratory roller having a minimum dynamic force of 6,000 pounds impact per vibration, and a minimum frequency of 1,000 vibrations per minute.

The vibratory roller shall be operated at speeds less than 3 feet per second.

Backfill within 3 feet of the wall face shall be compacted utilizing a hand operated vibratory plate.

Retained backfill shall be compacted and tested per Section 203-10.03 (Embankment Construction Requirements) of the ADOT *Standard Specifications* which require compaction to a minimum of 100% of the maximum dry density for an additional 50 feet beyond the limits of approach slabs.

(C) Protection of the Work

Design-Builder shall not allow surface runoff from adjacent areas to enter the wall construction site at any time during construction operations. In addition, at the end of each day's operation, Design-Builder shall slope the last lift of backfill away from the wall facing so that runoff is directed away from the structure. If the subgrade is damaged due to water or otherwise, such that it does not meet the requirements of Subsection 929-4.02 of this TPA 600-2, then Design-Builder shall rework and repair the damaged subgrade. The criteria in Subsection 929-4.02 of this TPA 600-2 shall be used to judge the adequacy of the repair. Rework and repair shall extend to a depth where undamaged work is encountered as determined by the IQF and ADOT.

TPA 600-3 Repairs and Modifications to Existing Bridges

The following table identifies the required repairs and modifications to existing bridges as part of this Project.

No.	Item Description	Description of Work
1.	Structure Number (SN) 02612 Wild Horse Pass Blvd/Sundust Rd TI Underpass (UP) • Expansion Joint Replacement	The compression seals have failed, causing debris buildup at the abutments. • Remove and replace existing expansion joint compression seals at both abutments per TPA 600-4. • Clean debris from abutments.
2.	SN 02612 Wild Horse Pass Blvd/Sundust Rd TI UP • Deck Sealing	The existing bridge deck has cracks. Apply methacrylate penetrating crack seal material to existing deck and approach slabs.
3.	SN 02302 SR 347/Queen Creek Rd TI UP • Expansion Joint Replacement	The compression seals have failed, causing debris buildup at the abutments. • Remove and replace existing expansion joint compression seals at both abutments per TPA 600-4. • Clean debris from abutments.

TPA 600-4 Replace Bridge Deck Joint Seal

1.0 Description

The work under this item shall consist of replacing existing bridge deck expansion joint compression seals, including removal and disposal of the existing joint seals and furnishing and installing new joint seals in accordance with this TPA 600-4 and as shown on the Plans and as described in the TPs.

2.0 Materials

The deck joint seal material shall conform to the requirements of Subsection 1011-5 of the ADOT *Standard Specifications*.

3.0 Construction Requirements

Immediately prior to the installation of the new bridge deck expansion joint compression seal, the contact surfaces of the joint opening shall be clean, dry, and free of oil, rust, paint, or foreign material. If any damage to the existing joint opening or joint armor occurs during installation, Design-Builder shall include repair of the damage in the Project cost.

TPA 600-5 Remove Deck Surface (Mechanical Milling)

1.0 Description

The work under this item shall consist of removing the concrete deck surface by mechanical milling at the locations and in accordance with this TPA 600-5 and in accordance with the details shown on the Plans and as described in the TPs.

2.0 Mechanical Milling Equipment

Design-Builder shall use power-driven, self-propelled mechanical milling equipment that is the size and shape that allows traffic to pass safely through areas adjacent to the work. Design-Builder shall also use equipment that is:

1. Equipped with a cutting mandrel with carbide tipped cutting teeth designed for mechanical milling concrete to close tolerances.
2. Equipped with grade and slope controls operating from a string line or ski and based on mechanical or sonic operation.
3. Capable of removing concrete to an accuracy of 1/16 inch.
4. Provided with conveyors capable of rear or front loading to transfer the milled material from the roadway to a truck.

3.0 Construction Requirements

The mechanical milling equipment shall have a complete set of new teeth at the beginning of the job, and the teeth shall be replaced as necessary to perform the work satisfactorily. Design-Builder shall provide personnel on each side of the milling equipment to monitor the operation and they shall maintain radio communication with the operator at all times during the work. Design-Builder shall take every measure necessary to protect the top reinforcement bars from damage If any reinforcement bars are damaged by the milling operation, Design-Builder shall include repair of damaged reinforcement in the Project cost.

The milled surface shall provide a texture suitable for use as a temporary riding surface. Mechanical milling methods shall produce a uniform finished surface and maintain a constant cross slope between extremities in each lane. The surface shall have a transverse pattern of 0.2 inch center to center of each strike area. The difference between the ridge and valley of the mat surface shall not exceed 1/16 inch.

Hydrodemolition will not be considered for removal of the deck surface.

Design-Builder shall provide positive drainage to prevent water accumulation on the milled deck. When removing material at ends of milled sections, Design-Builder shall bevel the transverse edges to produce a smooth surface. Design-Builder shall bevel back the longitudinal vertical edges greater than 2 inches that are produced by the removal process and left exposed to traffic. Bevel them back at least 3 inches for each 2 inches of material removed. Use an attached mold board or other approved method.

The surface of the deck following the milling shall be abrasive blast cleaned. The deck shall be dry when blast cleaning is performed. Design-Builder shall not direct traffic onto the milled surface until removal is complete.

If the milled surface becomes contaminated at any time prior to placement of the overlay, the surface shall be cleaned by abrasive blasting. Where abrasive blasting is being performed within 10 feet of a lane occupied by public traffic, the residue, including dust, shall be removed immediately after contact between the abrasive and the surface being treated. Removal of the residue shall be performed by a vacuum attachment operating concurrently with the abrasive blasting operation.

Equipment shall be fitted with suitable traps, filters, drip pans, or other devices as necessary to prevent oil or other deleterious material from being deposited on the deck. All removed materials shall become the property of Design-Builder.

Any other equipment or method like scarifiers, coldplaners, scabblers, and similar types of equipment or procedures that leave fractured aggregate or otherwise damage the concrete surface to remain shall not be used. Adequate means shall be used to prevent water or dust from flowing across traffic lanes, or into waterways.

4.0 Quality Acceptance

Design-Builder shall ensure that the mechanical milling operation produces a uniform surface texture that is true to line, grade, and cross section. The milled surfaces shall be inspected visually and by straightedge. A 10-foot straightedge shall be kept near the mechanical milling operation to measure surface irregularities of the milled deck surface. Any areas exceeding 1/8 inch between the ridge and valley of the mat surface shall require that the underlying layer be removed and replaced with material as directed by ADOT. Design-Builder shall include this work in the Project cost.

TPA 600-6 Polyester Polymer Concrete Bridge Deck Overlay

1.0 Description

The work under this item shall consist of furnishing and placing a Polyester Polymer Concrete (PPC) overlay system on a prepared surface in accordance with this TPA 600-6 and as shown on the Plans and as described in the TPs. PPC shall be comprised of a polyester resin binder, High Molecular Weight Methacrylate (HMWM) resin primer, and aggregate.

2.0 Materials

Design-Builder shall submit a Certified Test Report for all of the materials associated with the PPC overlay and accompanied by certified test reports from independent accredited laboratories.

The PPC overlay system shall consist of polyester resin binder and aggregate as specified below. It shall also include a compatible primer which when mixed with other specified ingredients and applied as specified herein, is capable of producing a polyester polymer concrete meeting the requirements of this TPA 600-6.

2.1 Polyester Resin Binder

Polyester resin binder shall have the following properties:

1. Be an unsaturated isophthalic polyester-styrene co-polymer. The resin content shall be 12% +/- 1% of the weight of the dry aggregate.
2. Contain at least 1% by weight gamma-methacryloxypropyltrimethoxysilane, an organosilane ester silane coupler.
3. Be used with promoter that is compatible with suitable methyl ethyl ketone peroxide and cumene hydroperoxide initiators.
4. Have the values for the material properties shown in Table 600-1:

Table 600-1: POLYESTER RESIN BINDER PROPERTIES
(Tested Each Lot Sent to the Job)

No.	Property	Test Method	Requirement
	Viscosity *	ASTM D 2196	0.1x10-5 to 2.9x10-5 psi (0.075 to 0.20 Pa) RVT No.1 Spindle, 20 RPM at 77 °F
	Specific Gravity *	ASTM D 1475	1.05 to 1.10 at 77 °F
	Elongation	ASTM D 638	35%, minimum Type I specimen, thickness 0.25 +/- 0.03” at Rate = 0.45 inch/minute
		ASTM D 618	Sample Conditioning: 18/25/50+5/70
	Tensile Strength	ASTM D 638	2,500 psi, minimum Type I specimen, thickness 0.25 +/- 0.03” at Rate = 0.45
		ASTM D 618	Sample Conditioning: 18/25/50+5/70
*Test must be performed before adding initiator			

2.2 HMWM Primer:

Primer for the concrete surface shall be a wax-free low odor, HMWM primer, and consist of a resin, initiator, and promoter. The primer shall conform to Table 600-2 and the promoter shall be as recommended by the PPC overlay system provider.

Initiator for the methacrylate resin shall consist of a metal drier and peroxide. If supplied separately from the resin, the metal drier shall not be mixed directly with the peroxide. The containers shall not be stored in a manner that allows leakage or spilling to contact the containers or materials of the other.

Table 600-2: HIGH MOLECULAR WEIGHT METHACRYLATE RESIN PROPERTIES

No.	Property	Test Method	Requirement
1.	Viscosity *	ASTM D 2196	0.1x10-5 to 2.9x10-5 Pa·s (0.075 to 0.20 Pa) RVT No.1 Spindle, 10 RPM at 77 oF
2.	Volatile Content*	ASTM D 2369	30%, maximum
3.	Specific Gravity *	ASTM D 1475	0.90 minimum at 77 oF
4.	Flash Point	ASTM D 3278	180 oF minimum
5.	Vapor Pressure*	ASTM D 323	0.04 inch Hg, maximum at 77 oF
6.	PCC Saturated Surface –Dry Bond Strength (Adhesive)	**California Test 551, part 5	700 psi, minimum at 24 hours and 70 +/- 1 ^{o}F (with polyester concrete at 12% resin content by weight of the dry aggregate)
*Test must be performed before adding initiator **Copies of California Test 551 are available online			

2.3 Aggregates:

Polyester concrete aggregate shall have the following properties:

1. Have a maximum of 45% crushed particles retaining on the No. 8 sieve when tested in accordance with AASHTO T335.
2. Provide fine aggregate consisting of natural sand.
3. Have a weighted-average aggregate absorption of no more than 1.0% when tested under AASHTO Test Methods T 84 and T 85.
4. At the time of mixing with resin, the aggregate moisture content shall not exceed one half of the weighted-average aggregate absorption when tested under AASHTO T255.
5. Comply with the requirements for the aggregate gradation shown in Table 600-3.

Table 600-3: AGGREGATE GRADATION
(Tested Yearly)

No.	Sieve Size	Percent Passing
1.	3/8”	100
2.	#4	62-85

No.	Sieve Size	Percent Passing
3.	#8	45-67
4.	#16	29-50
5.	#30	16-36
6.	#50	5-20
7.	#100	0 – 7
8.	#200	0 - 3

Sand for Abrasive sand finish shall have the following properties:

1. Be commercial-quality blast sand.
2. Have at least 95% passing the No. 8 sieve and at least 95% retained on the No. 20 sieve when tested under AASHTO T27.
3. Have an average absorption of not more than 1% when tested under AASHTO T85.

2.4 Composite System:

Table 600-4: POLYESTER CONCRETE COMPOSITE PROPERTIES
(Tested Every 2 Years)

No.	Property	Test Method	Requirement
1.	PPC Saturated Surface Dry Bond Strength	CT 551*	500 psi minimum at 24 hrs and 70F (without primer, at 12% resin content by weight of the dry aggregate, on Saturated Surface Dry Specimen)
2.	Abrasion Resistance	CT 550*	<2g weight loss (at 12% resin content by weight of the dry aggregate)
3.	Modulus of Elasticity	ASTM C 469	1,000 ksi to 2,000 ksi (at 12% resin content by weight of the dry aggregate)
*Copies of California Test 550 and 551 are available online			

3.0 Construction Requirements:

3.1 Submittals:

Design-Builder shall submit the following: Overlay System, System Provider Qualifications, Design-Builder Qualifications, System Provider Technical Representative Qualifications, Overlay Placement Plan, Equipment, Certificate of Compliance with laboratory testing for each property, and any other relevant documents for the overlay system at least 15 Days prior to the delivery of any of the overlay materials. These submittals are for approval and shall be directed to the IQF.

A. Overlay System:

Design-Builder shall submit two copies of the PPC overlay system provider's material information, written installation instructions, material safety data sheets, and independent test results for approval.

B. System Provider Qualifications:

Design-Builder shall install an overlay system with all components provided through a single PPC overlay system provider with documented experience successfully supplying 5 projects of similar size and scope within the past 5 years. Design-Builder shall submit documentation of the PPC overlay system provider's project experience.

1. Provide construction date.
2. Overlay quantities.
3. Reference name and contact information of owner representative.

C. Design-Builder Qualifications:

Design-Builder shall submit documentation of successful projects placing structural concrete (bridge decks or concrete pavement) and PPC overlay systems to established grade lines using similar equipment as specified herein with the past 5 years. The documentation of Design-Builder's qualifications shall include the following:

1. Project construction date.
2. Overlay quantities.
3. Reference name and contact information of owner representative.

If Design-Builder does not have 5 years of experience placing structural concrete and PPC overlay systems with at least 10 documented successful projects, Design-Builder shall arrange for a qualified PPC overlay system provider technical representative with 5 years of documented experience with PPC to be on site throughout the duration of the project to ensure proper construction of the polymer concrete.

If Design-Builder has 5 years of experience placing structural concrete and PPC overlay systems with at least 10 documented successful projects, the qualified PPC overlay system provider technical representative with 5 years of documented experience with PPC shall, at a minimum, be on site throughout the placement of the bridge deck overlay placement.

D. System Provider Technical Representative Qualifications:

The PPC overlay system provider technical representative shall have a minimum of 5 years of experience with PPC and be completely competent in all aspects of the work, including all materials to install the overlay system. The technical representative shall have experience on a minimum of 5 successful projects of similar size and scope within the past 5 years. Design-Builder shall submit documentation of the PPC overlay system provider's technical representative's experience including the following:

1. Years of experience with polyester polymer concrete.
2. Project construction date.
3. Overlay quantities.
4. Reference name and contact information for owner representative

The technical representative shall be available on site to facilitate the installation of PPC. This includes, but not limited to, surface preparation, polyester polymer concrete application, and PPC cure.

E. Overlay Placement Plan:

Design-Builder shall submit an Overlay Placement Plan that includes the following:

1. Schedule of overlay work and testing for each bridge.
2. Staging plan described overlay placement sequence including:

a. Design-Builder shall paving from the high side of the bridge to the low side; no gaps between passes will be allowed.

b. Cold joints between passes shall be within 1 foot of the stripe lines or centered within the lane.

c. Staging Plan Sheets shall describe overlay placement sequence including: paving widths, anticipated paving lengths, paving directions, joint locations, and location of proposed trial overlay(s).

3. Description of equipment used for:

a. Surface preparation including grinding and shot blasting.

b. Applying HMWM resin.

c. Measuring, mixing, placing, and finishing the polyester polymer concrete overlay.

d. Applying sand.

e. Method of protecting and finishing inlets and bridge drains.

4. Method for preventing leakage of primer onto areas of deck that have not received surface preparation.

5. Method for isolating expansion joints at the abutment and over the piers.

6. Method for measuring and maintaining overlay thickness and profile.

7. Tining plan showing tining locations and describing methods that will be used for hand tining.

8. Mainline tining shall be automated with the finisher.

9. Cure time for PPC.

10. Storage and handling of HMWM resin and PPC components.

11. Procedure for disposal of excess HMWM resin, PPC, and containers.

12. Procedure for cleanup and mixing and placement equipment

F. Equipment:

Design-Builder shall submit a documented history of the use of the paving machine to successfully place PPC overlays on a major bridge project for review and approval by ADOT.

3.2 Trial Application

Prior to constructing the overlay, one or more trial applications shall be placed on a new or previously constructed concrete base to determine the initial set time, and to demonstrate the effectiveness of the mixing, placing, and finishing equipment proposed.

The location of the trial application shall be predetermined and agreed upon prior to submitting the overlay placement plan, and shall be approved by ADOT. The bridge receiving the PPC overlay and the approach slabs cannot be used as a location for the trial application. Each trial application shall be the planned paving width, at least 6 feet long, and the same thickness as the specified overlay. The trail applications shall be tined as per the tining requirements in this TPA 600-6. The set time can be determined when the in-place PPC cannot be deformed by pressing with a finger, indicating the resin binder is no longer in a liquid state. Conditions during the construction of the trial applications and equipment used shall be similar to those to be used for construction of the overlay. Trial applications shall be properly disposed of off-site by Design-Builder.

The number of the trial applications required shall be as many as necessary for Design-Builder to demonstrate the ability to construct an acceptable overlay section and competency in ability to perform the work.

Overlay pull bond testing shall be performed in accordance with the requirements of ASTM C1583 after 24 hours. The test results shall be the average of three tests, drilled a minimum of 0.25", but not greater than 0.50" below the bond line, with strength greater than 250 psi, and a failure area greater than 50% failure in the substrate concrete of the surface area. Acceptable test results shall be achieved on a trial application before the installation may proceed.

3.3 Equipment

All equipment for cleaning the existing concrete surface and mixing and applying the overlay system shall be in accordance with the PPC overlay system provider's recommendation as approved by ADOT prior to commencement of any work.

A. Mixing Equipment:

A continuous mixer shall be used for all polyester polymer concrete overlay applications. The continuous mixer shall:

1. Employ an auger screw/chute device.
2. Be equipped with an automatic metering device that measures and records aggregate and resin volumes. Record volumes at least every five minutes, including time and date. Submit recorded volumes at the end of the work shift.
3. Have a visible readout gage that displays volumes of aggregate and resin being recorded.
4. Produce a satisfactory mix consistently during the entire placement.

A portable mechanical mixer of appropriate size for proposed batches, as recommended by the PPC overlay system provider and approved by ADOT, may be used for all PPC patching applications.

B. Finishing Equipment:

A self-propelled slip-form paving machine, which is modified or specifically built to effectively place the PPC overlay in a manner that meets the objectives and requirements of the project, shall be used for all PPC overlay applications. The paving machine shall:

1. Employ a vibrating pan to consolidate and finish the PPC.
2. Be fitted with hydraulically controlled grade automation to establish the finished profile. The automation shall be fitted with substrate grade averaging devices on both sides of the new placement; the device shall average 15 ft in front and behind the automation sensors. The sensor shall be constructed to work with string-line control. It is acceptable to match grade when placing lanes adjacent to previously placed PPC.
3. Be equipped with controls capable of maintaining the screed at the specified transverse slope within plus or minus 0.01%.
4. Having sufficient engine power and weight to provide adequate vibration of the finishing pan while maintaining consistent forward placement speed.

Finishing of patches of deck removal areas shall be completed using hand finish tools to make it flush with the top of the deck surface.

3.4 Surface Preparation

Existing bridge decks shall be repaired prior to the application of the PPC overlay as shown on the project plans and as determined in the field.

Voids in the deck surface created by the removal of unsound concrete, unsound epoxy concrete patches and all asphalt concrete patches shall be filled with the same PPC patches. After patches have cured for not less than a minimum time required by the material manufacturer, or as directed by ADOT; the entire deck, including patched areas, shall receive the overlay.

The concrete substrate shall be prepared for application of the overlay by shot-blasting in order to remove all existing grease, slurry, oils, point, dirt, striping, cure compound, membrane, or any other contaminants that could interfere with the proper adhesion of the overlay system.

The final prepared surface shall adhere to the following requirements:

1. The areas to be overlaid shall be cleaned by shot-blasting or abrasive sand-blasted in the event that the shot-blaster cannot access areas to be prepared. Cleaning shall not commence until all work involving the repair of the concrete deck surface has been completed and the deck is dry. All contaminants shall be picked up and stored in the vacuum unit and no dust shall be created during the blasting operation that will obstruct the view of motorists in adjacent roadways. The travel speed and/or number of passes of the shot-blasting unit shall be adjusted so as to result in all weak or loose surface mortar being removed and the aggregates of the concrete being exposed, as well as visible change in the concrete color. Cleaned surfaces shall not be exposed to vehicular traffic unless approved by ADOT. If the deck becomes contaminated before placing the overlay, Design-Builder shall shot-blast or abrasive sand-blast the contaminated areas to the satisfaction of ADOT at no additional cost to ADOT.

2. Any loose particle shall be removed prior to the overlay placement by magnets and compressed air and vacuuming such that no trapped particles remain. Power washing will not be allowed.

3. The areas to be overlaid shall be blown off with compressed air just prior to placement of the primer and shall be completely dry.

4. Surface Preparation Pull Bond Testing shall be performed by Design-Builder and submitted to ADOT for acceptance.

3.5 Application of Overlay

Methods shown in this TPA 600-6 are typical of general installations and may be modified per the PPC overlay system provider's recommendations as approved by ADOT. The application of the overlay shall not begin until the concrete deck is completely surface dry in accordance with ASTM D4263. The concrete surface temperature shall be between 40oF and 100oF. Night work may be required when temperatures cannot be met during the day. Stockpiled materials shall not be stored on the bridge deck.

A. HMWM Primer Application:

Immediately before placing primer, all exposed surfaces shall be completely dry and blown clean with oil-free compressed air. Exposed surfaces shall be protected from precipitation and heavy dew during and after the application of the primer.

After the exposed surfaces have been prepared and allowed to dry, primer shall be applied in accordance with the PPC overlay system provider's recommendations. Primer shall be placed within 5 minutes of mixing at approximately 90sf/gal or the rate recommended by the PPC overlay system provider.

Primer shall be uniformly spread to completely cover surfaces to be overlaid. Care shall be taken to avoid excess application that results in puddling. Excess material shall be removed or distributed to meet the required application rate. Primer shall be reapplied to any areas dry after 15 minutes of absorbing the material.

Primer shall not be allowed to leak onto areas that have not received surface preparation.

B. PPC Application:

The PPC shall be applied after 15 minutes and within 2 hours after the primer has been applied. Accelerators or inhibitor may be required to achieve proper setting time of PPC. They shall be used as recommended by the PPC overlay system provider.

The PPC shall be placed prior to gelling or 15 minutes following addition of initiator, whichever occurs first, or within a more restrictive range if recommended by the PPC overlay system provider.

The polyester resin binder shall be initiated and blended completely. Aggregate shall be added and mixed for at least two minutes when a portable mechanical mixer is used.

C. Curing

The overlay shall be allowed to cure sufficiently before being subjected to loads or traffic of any nature that may damage the overlay. Cure time depends upon the ambient and deck temperatures. The overlay shall be considered cured to a traffic ready state after four hours following final finishing.

D. Correction for Smoothness:

Corrective work shall be performed using a method approved by ADOT for areas of excess localized roughness. The finished surface of the concrete shall be tested in accordance with Section 601-3.05(D) of the ADOT *Standard Specifications*.

All costs associated with corrective work will not be paid for separately but shall be included in the work, including but not limited to, profiling, diamond grinding, and additional polyester polymer concrete if diamond grinding removes more than ¼" of polyester polymer concrete in any location.

E. Replacement of Defective Overlay:

A defective overlay, or portion thereof, resulting in failing overlay pull bond test results (ASTM C1583) shall be removed and replaced at Design-Builder's expense. Design-Builder shall submit a written corrective work proposal to ADOT, which shall include the method commence corrective work until the methods and procedures have been approved by ADOT. ADOT's approval shall not relieve Design-Builder of the responsibility of producing work in conformity with the DBA.

TPA 600-7 Intentionally Left Blank

TPA 600-8 Special Bridge Fence

1.0 Description

The work under this item shall consist of designing, furnishing all materials, equipment, tools, and labor, and constructing Special Bridge Fence in accordance with this TPA 600-8 and as shown on the Plans and as described in the TPs.

2.0 Materials

All material specifications shall conform to the requirements of ADOT *Bridge Group Structure Details SD 1.12* and *1.13*.

3.0 Construction Requirements

The fence shall consist of a single vertical plane and shall be mounted to the top of the ADOT 38" single slope bridge concrete barrier. The height of the fence, extending from the top of the bridge concrete barrier to the top of the expanded metal surface, shall be 7'-6" minimum.

The vertical and horizontal structural members shall consist of structural tubing similar in shape to as shown on ADOT *Bridge Group Structure Details SD 1.13*. Sizes may vary based on the Design-Builder's design calculations.

Vertical structural members may consist of a single constant size over the entire height. The size of all vertical structural members in the fence system shall be the same. The size of the vertical structural members, if different than as shown on ADOT *Bridge Group Structure Details SD 1.13*, shall be based on design calculations. The maximum spacing of vertical members without aesthetics shall be 6'-8". The maximum spacing of vertical members with aesthetics shall be the lesser of either 6'-8" or as specified in TPA 800-1.

The TS 4"x3"x1/4" horizontal railing member may be omitted. The size of all horizontal structural members shall be the same. The maximum spacing of horizontal members shall be 4'-0". The center of the bottom horizontal structural member shall be 4 ½" above the top of the bridge concrete barrier as shown on ADOT *Bridge Group Structure Details SD 1.13*. The top horizontal structural member shall be located along the top of the expanded metal.

The expanded metal shall be mounted to the outside face of the fence. The edges of the expanded metal shall be covered to avoid sharp edges in accordance with ADOT *Bridge Group Structure Details SD 1.13*. The expanded metal shall conform to the requirements of ADOT *Bridge Group Structure Details SD 1.13*.

The base plate and anchor system shall be similar in kind to as shown on ADOT *Bridge Group Structure Details SD 1.13*. Sizes may vary and shall be based on the design calculations.

The miscellaneous details such as tube splices, metal strips, angles, end cover plates, spacer plates, connection hardware, and spacing of connections shall be similar in kind to as shown on ADOT *Bridge Group Structure Details SD 1.13*.

All fence components and hardware shall be galvanized in accordance with ADOT *Bridge Group Structure Details SD 1.13*.

Details of the Special Bridge Fence shall be developed and submitted with supporting calculations signed and sealed by a Professional Engineer. Design-Builder shall submit the Special Bridge Fence calculations and details to ADOT no later than at the same time as the Preliminary Design Submittal of a bridge which specifies such fence.

TPA 700-1 Uninterruptible Power Supply

Specifications for Uninterruptible Power Supply for Traffic Signals

1 General

This TPA 700-1 establishes the minimum requirements for a complete emergency battery back-up system for use at traffic signals utilizing light emitting diodes (LED) signals and pedestrian heads. The battery back-up system (BBS) must include, but not be limited to the following:

(A) Uninterruptible power supply (UPS) with inverter, charger, tap switching transformer and internal power transfer switch;

(B) Automatic/manual bypass transfer switch unit;

(C) Batteries;

(D) Cabinet;

(E) Mounting hardware; and

(F) Wiring.

The BBS must provide reliable emergency power to a traffic signal in the event of a power failure or interruption.

2 Operation

2.1 General

(1) The BBS must provide the following operational modes when operating on battery power:

(2) Full operation of all traffic signal devices;

(3) Flash operation; and

(4) Combination of full and flash operation.

2.2 Run Time

The BBS must provide a minimum of 8.0 hours of full-time operation with a 450-watt load. The minimum battery size requirement is listed in Section 7 of this TPA 700-1, Battery Type.

2.3 Compatibility

The BBS must be compatible with Model 332, 336, and 337 cabinets; the ITS cabinet; model 170 and 2070 controllers and any NEMA style cabinet and enclosures; the advanced transportation controller; and all cabinet components for full time operation.

2.4 Output Capacity

The BBS must provide a minimum of 1100W/1100VA at 25°C active output capacity with 83% minimum inverter efficiency with 30% minimum loading.

2.5 Output Voltage

When operating in backup mode, the BBS output must be 120VAC ± 2%, pure sine wave output, ≤ 3% THD, 60Hz ± 0.3 Hz.

2.6 DC System Voltage

The BBS direct current (DC) system voltage shall be 48VDC nominal.

2.7 Transfer Time

The maximum transfer time allowed, from disruption of normal utility line voltage to stabilized inverter line voltage from batteries, must be 5 milliseconds (ms). The same maximum allowable time must also apply when switching from the inverter line voltage to utility-line voltage. Transfers to and from battery operation must not interfere with the operation of the other equipment in the intersection.

2.8 Operating Temperature

The BBS and all components must operate without performance degradation over a temperature range of -40°C to +74°C with a maximum load of 70% of rated output of the BBS inverter.

2.9 Feedback Level

The BBS must be tested and certified to Electrical Standards Underwriters Laboratories (UL) 1778 and CSA 107.3.

2.10 Surge Protection

The BBS must have surge protection compliant with Institute of Electrical and Electronics Engineers/American National Standards Institute (IEEE/ANSI) C.62.41 Cat. A & B.

2.11 Reliability

The BBS system must have a mean-time-before-failure of 174,955 hours at a temperature of 25 degree C (77-degree F) and 103,030 hours at a temperature of 50 degree C (122-degree F).

2.12 Power and Control Connections

The BBS must be easily installed, replaced, or removed by using easily removable cables for AC input, AC output, DC input, external transfer control/alarm and battery temperature sense.

2.13 AC Connection

The AC input and output must hard wired connections.

2.14 DC Connection

The DC connection must be a recessed one-piece Anderson Style connector rated to handle the maximum DC current required by the inverter while running on batteries.

2.15 Temperature Probe Connections

The battery temperature sense inputs shall be panel-mounted Telco style connector.

2.16 Unit Failure

In the event of inverter/charger failure, battery failure or complete battery discharge, the automatic bypass transfer switch shall revert to normally closed (NC) (de-energized) state, where utility line power is connected to the cabinet.

2.17 Overload

The BBS inverter module must be able to shutdown in order to protect against internal damage in the event of an overload at the output. The inverter must support an overload up to 115% for 2 minutes and then turn off the inverter output. The fault recovers when the overload is removed and line power returns.

2.18 Schedule

The BBS must provide a time-of-day schedule settings programmable by the user. The time-of-day schedule must allow the user to program schedule operational modes as required, per intersection. The BBS time-of-day function, when programmed must automatically change operational modes based on the time-of-day schedule. Operational modes must be red flash or full operation. The BBS must not switch from flash operation to full operation mode when the remaining battery capacity is ≤ 40%.

2.19 AC Feedback

The BBS must prevent malfunction feedback to the cabinet or from feeding back to the utility service.

2.20 BBS Failure Mode

In the event of BBS failure (inverter/charger or battery) or complete battery discharge, the internal power transfer relay must revert to NC (de-energized) state and provide utility power to the intersection when utility line power is available to the cabinet.

2.21 Automatic Shutdown

The BBS must initiate an automatic shutdown when battery output reaches 42.5VDC.

2.22 Destructive Discharge or Overcharge

The BBS must be equipped with an integral system to prevent the battery from destructive discharge or overcharge.

3 Automatic & Manual Bypass Switch

3.1 Rating

The BBS must include an automatic/manual transfer switch rated at 120VAC/30 Amps.

3.2 Automatic & Manual Bypass Switch

The automatic bypass transfer switch must be a combination automatic/manual bypass switch. Placing the bypass switch in the “bypass” mode must transfer the intersection load from the UPS output directly to commercial power. AC commercial power must still be available to the UPS input, allowing the UPS to keep the batteries charged. An inverter input breaker must be provided and located on the bypass switch so to shut off commercial power to the UPS input, allowing safely disconnecting and removing the inverter. With the inverter turned off, the batteries can be safely disconnected from the system.

3.3 Indicator Light

The automatic bypass transfer switch must include a bypass indicator light that automatically notifies the user when the manual bypass switch is in bypass position. The indicator light must be illuminated when in UPS mode.

3.4 Status Relay

The automatic transfer switch must have an optional bypass status relay with normally open, dry contacts that automatically close when the manual bypass switch is in bypass position.

3.5 Integrated Switch

The manual bypass switch and the automatic transfer relay must be integrated together within the automatic bypass transfer switch allowing the manual bypass switch to be rated at 15 Amp and to be integrated with the bypass indicator light.

3.6 Terminal Blocks

The automatic bypass transfer switch must have terminal blocks capable of accepting #6 American Wire Gauge (AWG) wiring for the AC input and output with #10 AWG from the automatic bypass transfer switch to inverter/charger module.

4 Functionality

4.1 Output Voltage Regulation Mode

The BBS must include auto voltage regulation functionality.

4.1.1 AC Input Voltage Range for Output Regulation

The buck/boost mode must have a minimum range of 88 - 175 VAC.

4.1.2 Transfer Set Points

There must not be any user definable transfer set points for the buck boost mode.

4.1.3 Regulated Voltage

Whenever auto voltage regulation mode is selected the output of the system must be regulated between 108-130VAC. When the output of the system can no longer be maintained with this range, the BBS must transfer to backup mode.

4.2 Circuit Breakers

The BBS must be equipped with an AC input circuit breaker that protects both the UPS and the loads connected to the output. Should the AC input breaker on the UPS trip, it must allow the UPS to go to inverter mode to power the intersection off of batteries. Should an overload condition still exist when the inverter is energized the inverter must revert to its internal electronic protection, preventing damage to the inverter due to the overload or short circuit condition, on the output. Once this overload condition is cleared the inverter must energize and power the intersection utilizing the available battery power. If the condition does not clear itself, the inverter must stay in the standby mode until manually cleared by a technician.

The BBS must have a flush mounted battery circuit breaker installed on the front panel of the BBS inverter module.

4.3 Line Qualify Time

The BBS must have a user definable line qualify time. The user must be able to select a minimum of six possible settings. The settings must be 3, 10, 20, 30, 40 and 50 seconds. The default line qualify time must be 3 seconds.

4.4 Battery Charger

The BBS must have an integral charger that is compatible with Gel and absorbed glass mat battery topology. The charger must be an intelligent charger with control systems that automatically incorporates bulk, absorption and float charging modes.

4.4.1 Battery Temperature Compensation

The integral intelligent charger must use temperature compensation. The charging system must compensate over a range of 2.5 - 6.0mV/°C per cell, user adjustable when required.

4.4.2 Battery Temperature Sensor

A temperature probe which plugs into the front panel of the BBS must be used to monitor the internal temperature of the batteries. The temperature sensor must be 2 meter in length, external to the inverter/charger module and taped to the side of a center battery within the battery string.

4.4.3 Battery Temperature Charging

The batteries must not be recharged whenever the battery temperature exceeds 50°C.

4.4.4 Battery Balancing

The BBS must include an external battery balancer to automatically balance the battery charger voltage on all batteries in the string to within +/- 100 mV between any two batteries. The balancer must allow for any single 12V battery within the battery string to be replaced without replacing all batteries in the string during the battery warranty period.

4.4.5 Recharge Time

The recharge time for the batteries from "protective low-cutoff" to 90% or more of full charge capacity must not exceed 12 hours. The BBS charger must be capable of providing 15 Amps at 54VDC.

5 User Interfaces and Displays

5.1 Inverter/Charger Display

The BBS inverter/charger unit must include a backlit liquid-crystal display for viewing all status and configuration information. The screen must be easily viewable in both bright sunlight and in darkness.

5.1.1 Screen Size

The screen must be large enough to display the following information with the use of menu scrolling buttons to read required information. All active readings must be real time.

(i) Operating mode (line, standby, backup, buck / boost);

(ii) Utility input voltage;

(iii) BBS output voltage and current;

(iv) Battery temperature;

(v) Input frequency;

(vi) Output power;

(vii) Battery voltage;

(viii) Charger current;

(ix) Shed timer relays time to activation;

(x) Ethernet media access control (MAC) address and internet protocol (IP) address;

(xi) Accumulated output power in kW hours;

(xii) Battery runtime remaining;

(xiii) Unit serial number;

(xiv) Unit firmware version; and

(xv) Any alarms and faults.

5.1.2 Keypad

The BBS inverter/charger unit must include a keypad for navigating system information.

5.1.3 Web-based Interface

The BBS must be provided with a web-based-interface for user configuration and management through a web browser.

5.1.4 Minimum Capabilities

The BBS must allow the user to do the following through the web browser:

(i) View logs;

(ii) Change modes of operation;

(iii) Configure email alarms;

(iv) Adjust line qualify time;

(v) Program relay contacts;

(vi) Configure network parameters;

(vii) Inverter/charger firmware to be upgradeable remotely via Ethernet; and

(viii) Communication module firmware upgradeable remotely.

5.1.5 Status LEDs

The BBS must have discrete status LED indications on the front of the inverter/charger.

5.1.6 Green Output LED

This LED must be “on” any time that the output of the BBS is in normal mode. When the BBS output is either in backup mode or auto voltage regulation modes the LED must flash “on” and “off”.

5.1.7 Red Fault LED

This LED must be solid “on” any time that there are any faults in the system.

5.1.8 Red Flashing Alarm LED

This LED must flash “on” and “off” any time that there are any alarms in the system.

5.1.9 Event Log

The BBS must maintain an event log containing a minimum of 200 of the most recent events recorded by the BBS. These events must be downloadable remotely via Ethernet and automatically reported to the central monitoring software. The events log must be date and time stamped.

5.1.10 Events, Alarms and Faults

The BBS must display and log the following events, alarms and faults:

(i) Operating mode;

(ii) Weak battery;

(iii) Overload;

(iv) High and low temperatures;

(v) Line frequency out of specifications;

(vi) No temperature probe;

(vii) Low battery;

(viii) Battery breaker open;

(ix) BBS is performing a self-test;

(x) Fan fail;

(xi) Incorrect firmware;

(xii) AC input breaker open;

(xiii) Short circuit;

(xiv) Output voltage high;

(xv) Output voltage low;

(xvi) Battery voltage high;

(xvii) Battery voltage low;

(xviii) Isolation relay fail; and

(xix) Temperature high.

The BBS must keep track of the following:

(i) The number of times that the unit was in backup mode.

(ii) The accumulated number of hours and minutes that the unit has operated in backup mode since the last reset.

5.1.11 Programmable Relay Contacts

The BBS must provide the user six programmable dry relay contacts and one 48VDC relay contact. As a minimum, the programmable options must be on battery, low battery, timer, alarm, fault, and off. The BBS must also have three input dry relay contacts. BBS self test, user alarm, and BBS shutdown.

5.2 Relay Contact Terminals

The relay contacts must be made available on the front panel of the BBS via 6, 3 position plug-in terminal blocks with screw down wiring connections.

5.2.1 Contacts

Each relay, C-1 through C-5 must have their own common and their own set of normally open (NO) and NC terminals. The terminals for each relay must be oriented as NO-C-NC on the terminal block. C-6 must provide continuous 48 VDC voltage for powering of enclosure DC fan.

5.2.2 Labeling

The contacts on the terminal block must be labeled 1-18, left to right. Additionally, each set of contact must be labeled with the NO-C-NC designation, as well as C1…C6 from left to right. Printed labels noting all alarms and faults must be provided with the BBS inverter/charger to be installed when required.

5.2.3 Rating

The relay contacts must be rated at a minimum of 1 Amp at 250 VAC.

5.2.4 On Battery Relay Contact

The dry relay contacts that are configured for “on battery” must only energize when the inverter is operating in backup mode.

5.2.5 Timer Relay Contacts

The BBS must include a timer that must energize the “timer” configured dry relay contact after the user configured time has elapsed. The timer is started when the BBS enters backup mode. The user must be able to configure the timer to the required time. The format must be hours, minutes, seconds.

5.2.6 Low Battery Relay Contact

The BBS must have an adjustable low battery relay setting. This setting must be adjustable so that the user can set the point at which the low battery relay contact is energized.

6 Communications

6.1 Serial Interface

The BBS must be equipped with an industry standard RS-232 serial connection for user configuration and management. The serial port must be an Electronics Industries Alliance (EIA) -232 (DB9-Female) connector.

6.2 Ethernet Interface

The BBS must have an internal Ethernet communication interface for user configuration and management. The Ethernet port must be an RJ-45, EIA 568B pin out connector.

6.3 Remote Monitoring

The BBS must be include remote monitoring & alarms transmission capabilities through the Ethernet RJ-45 IP addressable port, using simple network management protocol.

6.4 Notification

System must have the capability of notifying operations, maintenance or traffic management center via e-mail of any alarms, faults or events, user selectable. E-mail set up must allow for different levels of notifications based on the criticalness of the alarms.

6.5 User Configuration Menus

All BBS configuration and system menus must be accessible and programmable from the RS-232 and Ethernet port.

6.6 Communication Protocols

The BBS must support TCP and user datagram protocol (UDP) over IP protocol communications.

6.7 Application Layer Protocols

The BBS must support file transfer protocol, Telnet, and hypertext transfer protocol (HTTP).

6.8 Simple Network Management Protocol

The BBS must be simple network management protocol compliant.

7 Batteries

7.1 Battery Type

The battery must be comprised of extreme temperature, float cycle, Gel valve regulated lead acid. Individual batteries must meet the following specifications:

(1) Voltage rating: 12V;

(2) Amp-hour rating: 109 AH, at the 20 hour rate, to 1.75 Volts per cell, minimum battery rating. Larger AH batteries are acceptable providing they do not exceed the group size listed below. (Case 31);

(3) Group size: Case 31;

(4) Batteries must be easily replaced and commercially available off the shelf; and

(5) Batteries must provide 100% runtime capacity out-of-box. Each battery must meet its specification without the requirement of cycling upon initial installation and after the initial 24 hour top off charge.

7.2 Battery String

Batteries used for the BBS must consist of a 4 batteries configured for a 48 VDC battery buss system.

7.3 Operating Temperature

The battery system must consist of one or more strings of extreme temperature; float cycle Gel valve regulated lead acid batteries. Batteries must be certified to operate at extreme temperatures from –40°C to +71°C.

7.4 Construction

7.4.1 Terminals

The batteries must have maintenance-free threaded insert terminals eliminating annual torqueing. Battery terminals that require annual torqueing of each post connection must not permitted.

7.4.2 Ability to Function

An integral lifting handle should be provided on the batteries for ease of removal/installation.

8 Cabinet

8.1 General

8.1.1 BBS Cabinet Dimensions

The dimensions for the BBS cabinet must not exceed 50 inches in height, 17 inches in width and 17 inches in depth.

8.1.2 Inverter/Charger Mounting

The inverter/charger unit must be shelf or rack mounted on a standard EIA 19 inch rack.

8.1.3 Automatic Transfer Switch Mounting

The automatic transfer switch must be mounted on EIA 19 inch rail.

8.1.4 Interconnect Wiring

All interconnect wiring must be provided and must be UL Style 1015 CSA TEW.

8.2 BBS Replacement

The BBS equipment and batteries must be easily replaced and must not require any special tools for installation.

8.3 Hot Swappable

The BBS inverter and batteries must be hot swappable. There must be no disruption to the traffic signal when removing the inverter or batteries for maintenance.

8.4 Quick Disconnects

All inverter and battery connections must be of the quick disconnect type for ease of maintenance.

8.5 Ancillary Installation Hardware

All necessary installation hardware (bolts, fasteners, washers, shelves, racks, etc.) must be included.

8.6 Cabinet Sizing

The external cabinet must be capable of housing batteries up to a group 31 size, inverter/charger power module, automatic transfer switch, control panels, wiring, wiring harnesses, and all other, ancillary equipment.

8.7 Cabinet Types

The BBS can be installed either as:

(1) Free-standing base-mounted cabinet with optional 8-inch riser for easy cable entrance; P

(2) Pole-mounted cabinet with optional pole mount bracket kit; or

(3) Side-mounted to a traffic controller cabinet with no mounting brackets required.

8.8 Rating

All external cabinets must be NEMA 3R rated. The enclosure must be made of 0.125 (5052- H32) aluminum.

8.9 Ventilation

The external cabinet must be ventilated through the use of louvered vents, filter, and one thermostatically controlled fan. The filter must be the re-usable type and match the dimensions of the louver with both located on the bottom half of the door.

The cabinet fan must be DC operated for longer reliability.

8.10 Ancillary Hardware

The BBS cabinet must come with all bolts, washers, nuts required to mount it to a controller cabinet.

8.11 Accessibility

All components, terminations, terminal blocks, relays, etc. must be fully accessible.

8.12 Shelves

Battery shelves must be located in the bottom half of the enclosure. All battery shelves must be removable and on ball bearing rollers to slide in and out for easy access for the batteries. Air must be allowed to flow from the bottom of the cabinet and up the back internal wall. Neither the top battery shelf nor the power module shelf must inhibit the airflow to the top of the cabinet.

8.12.1 Locking

The cabinet must include a 3-point locking system, including a Type-2 Corbin lock and utilize a handle with pad locking capability.

8.12.2 Cabinet Options

The following options must be available for the cabinet:

(i) On-battery lamp mounted externally on the top of the cabinet that illuminates when the BBS is operating in inverter mode;

(ii) Battery heater mats to increase battery capacity in cold climates;

(iii) Receptacle plate assembly that mounts on the transfer switch panel to provide utility power to the battery heater mats;

(iv) Automatic generator transfer switch that senses a generator is connected and automatically switches to the generator source;

(v) Internal lamp with door push-button switch to illuminate the interior of the cabinet; and

(vi) Status monitoring dry contacts for the automatic transfer switch and the generator transfer switch.

9 Maintenance

9.1 Probe Jacks

The BBS must provide voltmeter standard probe input-jacks (+) and (-) to read the exact battery voltage drop at the inverter input.

9.2 Self-Testing

The BBS inverter module must be programmable to perform automatic self-testing, programmed in weekly intervals and programmed by the user to meet their specific requirements or manufacturer's recommendation. During self-test, the BBS inverter module must identify a weak battery or multiple batteries in the string that have reached a weak state and notify maintenance by initiating a weak battery alarm.

10 Warranty

10.1 Battery Backup System

The BBS system must include a five-year warranty on parts and labor on the entire BBS system, including batteries, to ADOT when utilizing the BBS Manufacturers own designed enclosure, meeting the above cabinet specifications.

If another enclosure is provided by the BBS manufacturer, the manufacturer must provide a three-year warranty on parts and labor on the BBS inverter module only.

10.2 Batteries

The BBS manufacturer must provide a 5-year unconditional full replacement warranty for every battery with the BBS under this TPA 700-1. Under the warranty time period, the battery must provide a minimum of 70% of its original capacity.

11 Vendor Support

11.1 Technical Support

The BBS manufacturer must provide a toll-free technical support phone number. The toll-free phone number must be included in the BBS manual.

11.2 Documentation

Equipment manuals must be provided for each BBS cabinet. Equipment manuals must include installation, operation, programming, maintenance and troubleshooting.

12 Quality Assurance

12.1 Design and Production

Each BBS must be manufactured in accordance with a written manufacturer's Quality Assurance Program. The QA program must include, as a minimum, specific design and production QA procedures.

12.2 ISO Certified

The BBS power module manufacturer must be ISO 9001 or ISO 9002 certified.

12.3 Design Qualification Testing

The manufacturer must be certified to carry out the CSA and UL standards testing on the BBS system.

TPA 700-2 Pull Box (No. 4B)

Description

The work consists of furnishing and installing locking lid pull boxes for highway lighting, including excavating, backfilling and compacting at the locations designated on the project plans and in accordance with the details shown on the plans and the requirements of this item.

Materials

Pull boxes are to be approximately 13 x 24 x 24 inches and conform to the details on Standard Drawing TS 1-12. They shall meet all requirements in the ADOT *Standard Specifications*.

The boxes shall be made from reinforced concrete. Covers and extensions shall be installed and located as shown on the project plans and shall be the size specified.

Chipped or cracked pull boxes, covers, and extensions will not be accepted.

Portland cement concrete shall conform to the requirements of Section 1006 for Class S concrete (3,000 PSI) of the ADOT *Standard Specifications*. When requested by the ADOT, pull boxes, covers, and extensions shall be furnished for testing at no additional cost to ADOT.

Lids shall be provided with locking devices and the wording “A.D.O.T. ELECTRICAL HIGH VOLTAGE” on the lids. Markings shall be clearly defined and uniform in depth and shall be placed parallel to the long side of the cover. Letters shall be one inch high. The locking mechanism shall consist of a set of jaws which clamp onto the opposing vertical walls of the box and require a deliberately designed tool to engage and disengage. One locking/unlocking tool shall be provided to ADOT after final acceptance. The locking mechanism shall be secured by two ½” – 13 x 1-½” security bolts. These bolts shall be tightened with a torque wrench to the specifications of the manufacturer. The lid shall have a 1-1/2” x ¼” continuous steel band around the perimeter. The lid shall conform to the requirements of ANSI 77-2010.

The box shall be equipped with threaded ferrule loops cast into the base of the box and 12” long galvanized steel arms which attach to the loops.

Construction Requirements

Section 732 of the ADOT *Standard Specifications* shall govern the requirements for installation.

Excavation and backfill shall be in accordance with the requirements of Subsection 203-5 of the ADOT *Standard Specifications*.

Design-Builder shall contact Steve Koebler at (480) 589-8250 prior to ordering pull boxes to determine the pattern used for the security bolts and locking/unlocking tool.

TPA 700-3 Opticom Pre-emption Unit

Description

The Work under this item shall consist of furnishing all materials, equipment and labor, including circuits, wiring, power connection conductors and all miscellaneous equipment required to install a complete and operational Opticom emergency vehicle pre-emption system at each signalized intersection as shown on the Plans, in accordance with the manufacturers requirements and as specified in this TPA 700-3.

Materials

The system at each of the three locations shall include:

(A) 1 Opticom 764, 4-Channel MultiMode Phase Selector;

(B) 4 Opticom 711 One Channel, One Direction Detector;

(C) 4 ATP Pelco Mini Bracket Opticom Detector Mounts; and

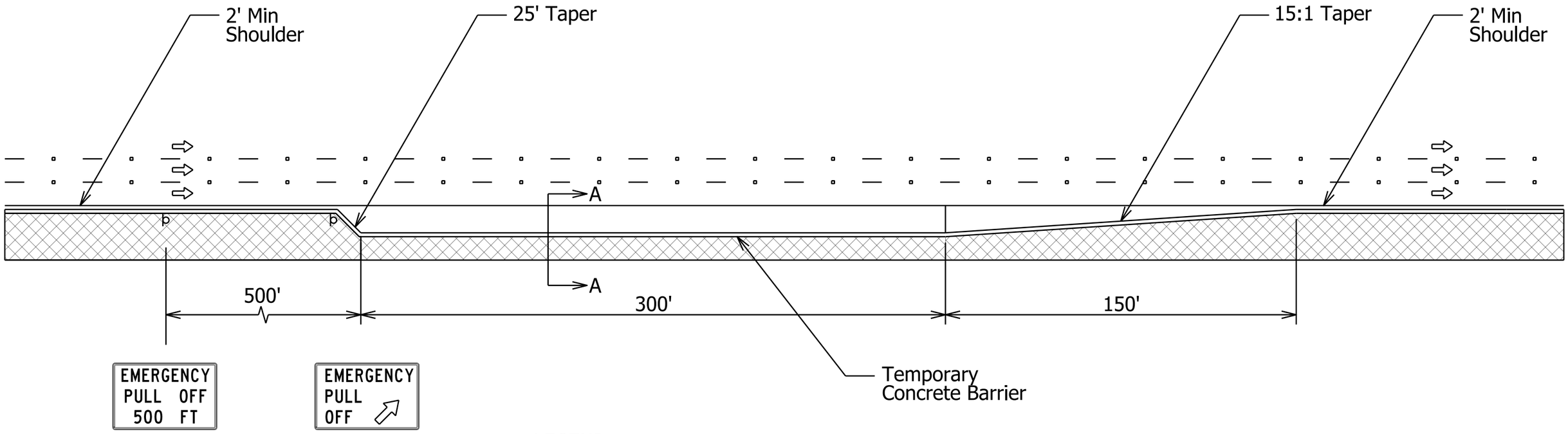
(D) 800’ Opticom 138 Detector Cable.

Construction Requirements

Design-Builder shall be responsible to ensure that all necessary features are included when installing the Opticom emergency vehicle pre-emption system in accordance with the requirements of the system manufacturer and these special provisions. Prior to activation of the signal, the Opticom emergency vehicle pre-emption system shall be fully functional and operational.

TPA 701-1 Temporary Emergency Pull-Off Detail

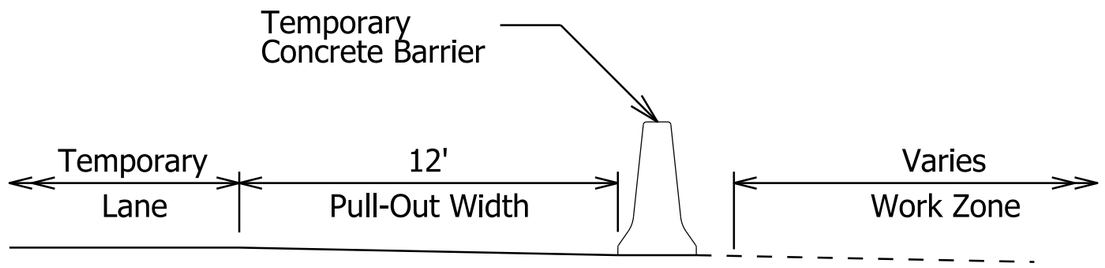
See attached



LEGEND

Work Zone

Sign



SECTION A-A

Notes:

1. Pull-off area shall be comprised of existing pavement, temporary asphalt pavement or millings. Pull-off area may be comprised of different materials.

2. "Shoulder Closed and Emergency Pull-Off Area" signs and plaques shall be mounted on the side of the roadway where the shoulder is affected. Usage of these signs on the opposite side of divided highways is optional. Mount all other signs on both sides of the work-affected roadways on divided highways.

3. Emergency pull-off areas should not be located where adequate sight distances for Acceleration and deceleration maneuvers would not exist. The location of temporary Traffic barrier and construction activities occurring on the inside of horizontal Curves just behind that barrier should be considered when determining whether Motorists will have adequate sight distance through a horizontal curve.

4. Emergency pull-off shall not be used for construction ingress or egress.

TPA 701-1
TEMPORARY EMERGENCY PULL-OFF DETAIL
I-10 GILA RIVER INDIAN COMMUNITY PROJECT

TPA 738-1 ITS Technical Specifications

Section 738 General Requirements

738-1 Description

It is the purpose of this section to provide general information necessary for completion of the work on the elements of Intelligent Transportation Systems (ITS) in accordance with the referenced TPs, ADOT *Standard Drawings*, details shown on the RFC plans and requirements of this TPA 738-1.

ITS generally include; dynamic message sign systems, ramp metering/detection systems, closed circuit television camera systems, electronic communications and network infrastructure dedicated to supporting these systems.

All ITS components and appurtenances shall be complete, functional, have successfully passed any specified testing and training procedures, and in operating condition at the time of acceptance.

(A) ITS Material Submittal

The material submittal shall be clear and contain all items to be supplied on the project by Design-Builder. The material submittal shall contain an index of the items included in the material submittal package. The material submittal shall include adequate details to allow ADOT to procure replacements of materials used on the project. The model, variations, accessories, and options shall be clearly indicated. Material designations used by ADOT shall be noted on the material list. The materials shall be identified by the contract project number, catalog part number, catalog cut, Shop Drawings and Working Drawings for equipment, trade name, and schedules for other pertinent information. The material submittal shall include Certificates of Compliance for all materials conforming to the requirements of TP Section 106.15 (*Domestic Material and Products*).

ADOT approval is required before ordering or installing materials. Design-Builder work schedule shall include at least 10 Days for ADOT inspection and testing.

(B) Access to ADOT Traffic Operations Center

Design-Builder shall do no work within the Traffic Operation Center (TOC). All interface cabling (i.e., video or data) that may be required in the TOC will be furnished and installed by ADOT personnel.

(C) ITS Device Staking

Design-Builder shall survey and stake the locations of the cabinet foundations, DMS structure foundations, CCTV pole, wrong way detection and ramp meter/flasher pole foundations, and on- ramp stop bar locations according to the RFC Plans in the presence ADOT personnel or designated representative. Design-Builder shall give a minimum of 2 Days advanced notice to ADOT prior to staking the locations.

(D) Tracer Wire

Magnetic detection for underground facilities shall meet the requirements of *Stored Specifications 104MAGDET*.

738-2 Abbreviations

The meaning of various abbreviations and acronyms used in this TPA 738-1 are defined below. The meaning of all other abbreviations and acronyms used in this TPA 738-1 but not defined below are defined in DBA Exhibit 1 (*Abbreviations, Acronyms, and Definitions*).

ARP	Address Resolution Protocol
BPL	Broadband over Power Lines
CCTV	Closed circuit television

CIDR	Classless Inter-Domain Routing
dB	Decibels – a logarithmic ratio of input and output power or voltage
DHCP	Dynamic Host Configuration Protocol
DIN	Deutsches Institut für Normung
DMS	Dynamic Message Sign
Dual LAN	Dual Local Area Network
EAP	Extensible Authentication Protocol
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EQPT	Equipment
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
GFCI	Ground Fault Circuit Interrupter
GIS	Geographic Information System
HDMI	High-Definition Multimedia Interface
HDPE	High Density Polyethylene
Hz	Hertz
ICMP	Internet Control Message Protocol
IEEE	Institute of Electrical and Electronics Engineers
IMSA	International Municipal Signal Association
ISO	International Standards Organization
ITS	Intelligent Transportation System
kVA	Kilo-Volt-Amperes
LC	Lucent Connector
LED	Light-emitting diode
mA	Milli-amp, equivalent to 1/1,000 Amp
MJPEG	Motion Joint Photographic Experts Group
MOV	Metal oxide varistor
MPEG4	Moving Picture Experts Group 4
MUTCD	Manual on Uniform Traffic Control Devices
mV	Milli-Volt, equivalent to 1/1,000 of a Volt
NEC	National Electrical Code

NICET	National Institute for Certification in Engineering Technologies
NPN	Negative-Positive-Negative
NSPS	National Society of Professional Surveyors
NTCIP	National Transportation Communications for ITS Protocol
NTP	Network Time Protocol
NTSC	National Television Systems Committee
PDF	Portable Document Format
PIM	Port-1 Interface Module
PPI	Plastic Pipe Institute
OTDR	Optical Time-Domain Reflectometer
Ps	Pico-second, equivalent to 1 trillionth of a second
RAM	Random Access Memory
RGB	Red, Green, and Blue
RMS	Root Mean Square
ROM	Read-Only Memory
SAT	System Acceptance Test
SDLC	Synchronous Data Link Control
SDR	Standard Dimension Ratio
SIG GATES	Signal Gates
SMFO	Single-Mode Fiber-Optic
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
SSPC	Society for Protective Coatings
SST	Subsystem Acceptance Test
STMP	Simple Transportation Management Protocol
TFTP	Trivial File Transfer Protocol
THHN	Thermoplastic High Heat-resistant Nylon-coated
TIA	Telecommunications Industry Association
TOC	Traffic Operations Center
TTL	Transistor-Transistor Logic
Typ.	Typical

USB	Universal Serial Bus
VAC	Volts, Alternating Current
VDC	Volts, Direct Current
VGA	Video Graphics Array
VLAN	Virtual Local Area Network
WWD	Wrong-Way Driving

Section 739 General Requirements

739-1 Description

The work under this item includes removing loop lead-in cables, removing foundations for sign structure, removal of pull boxes, and removal of conduits. Relocation of ITS equipment will not be allowed.

739-2 Construction Requirements

The work shall be in accordance with the requirements of Section 202 of the ADOT *Standard Specifications for Road and Bridge Construction* (*Standard Specifications*) as adapted by the Project Special Provisions for construction with the exception that the concrete foundation shall be removed entirely or to a depth of at least 36 inches below finished subgrade elevation.

Design-Builder shall identify the locations of buried pull boxes. Design-Builder shall remove the pull boxes and replaced with a new No. 9 pull box or connect existing conduit which entered the buried pull box by using new conduit and couplers that match diameter and material of existing conduit. Conduit sweeps into the existing pull box shall be removed. Cables within the affected conduit and pull boxes shall be removed and replaced. Cables which have an existing splice in the pull box being removed shall be replaced with new continuous cables or new splice enclosure in new No. 9 pull box.

Removal of pull boxes with HDPE-to-PVC coupling shall be per Section 741-3.01(D) of this TPA 738-1.

Section 740 Structural Supports and Foundations for ITS Elements

740-1 Description

The work under this item includes furnishing equipment, material, labor and accessories needed to furnish and install structural supports and foundations for ITS elements including CCTV, camera lowering systems, ramp meters/flashers, wrong way detection poles and DMS sign structures.

740-2 Materials

Materials shall be in accordance with the requirements of Subsection 606-2 and Section 609 Drilled Shaft Foundations of the ADOT *Standard Specifications*.

Concrete for the foundations shall conform to the requirements of Section 1006 of the ADOT *Standard Specifications*. Reinforcing steel and wire mesh shall conform to the requirements of Section 1003 of the ADOT *Standard Specifications* and to the requirements of ASTM A 615. Unless otherwise specified, steel bars meeting the requirements of ASTM A 706 may be substituted for ASTM A 615 steel bars. When ASTM A 706 bars are used, tack welding of the reinforcement will not be permitted unless approved in writing by ADOT. Reinforcing steel wire shall conform to the requirements of ASTM A 82.

ITS structural elements and foundations shall conform to the requirements of TP Section 600 (*Structural*).

(A) Shop Drawings and Working Drawings

The Shop Drawings and Working Drawings shall detail connection of the DMS to the support structure and list materials, lengths of support members, flexible conduit routing, catwalk dimensions and connections, handrail, grating, cable connections, and other features required for successful erection, installation, and operation of the DMS. The Shop Drawings and Working Drawings shall specifically identify the bolt torque values. The shop drawing shall show the lane configuration, shoulder width, the location of the DMS and location and elevation of the DMS panel and structural supports in relation to the high point of the roadway including shoulders.

(B) Pole Shafts

Pole shafts shall be constructed of a uniformly tapered, one or two-piece round tubular pole, conforming to the ITS Standard Drawings. CCTV poles shall provide a means of routing the CCTV cables inside the pole. CCTV poles shall be designed to accommodate a CCTV camera assembly, electrical hardware, mounting hardware, lowering device, pole-mounted cabinet, and enclosures. Threaded couplings to support pole-mounted equipment shall be factory-installed. Field-modifications to CCTV poles will not be accepted.

CCTV poles shall be constructed of material conforming to ASTM A595, Grade A or ASTM A572, Grade 55 or better. Drilled shafts shall be used to support CCTV structures. CCTV poles shall be designed for a minimum effective wind area of two square feet for CCTV & Assembly and shall be designed for a one inch maximum deflection at the top of the pole under a 30 mile per hour non-gust wind speed.

The CCTV pole hand hole shall be reinforced with a minimum 2-inch wide hot rolled steel rim. The nominal outside dimension of the hand hole shall be 6 inches x 27 inches. The hand hole shall have a tapped hole for mounting the portable winch for the CCTV lowering system. The hand hole shall be positioned on the CCTV pole so that it is not in conflict with the CCTV pole- mounted cabinet and associated 1-inch mogul elbow. The hand hole shall be positioned so that the CCTV camera is not directly above the user when operating the CCTV lowering system.

Prior to pole fabrication, Design-Builder shall provide the material submittal for each type of pole for approval. The material submittal shall include material specifications and structural calculations showing stresses and deflections in accordance with this TPA 738-1, TP Section 600 (*Structural*), Sections 604 and 731 of the ADOT *Standard Specifications*, the ITS Standard Drawings, and the RFC Plans. Drawings and calculations shall be prepared, signed and sealed by a Civil or Structural Engineer registered in the State of Arizona.

(C) Base Plates

Base plates shall be fabricated from structural steel plates conforming to the minimum strength requirements of ASTM A36. Exposed surfaces shall be finished smooth and exposed edges shall be neatly rounded to a 1/8-inch radius. Pole bases shall be galvanized in accordance with ASTM A123.

(D) Non-shrink Grout

Non-shrink grout shall conform to the requirements of the ADOT Approved Products List.

(E) CCTV Camera Lowering System

The CCTV camera lowering system shall be compatible with Bosch model MIC-7522-Z30W and orientation of camera, resulting in a correctly-orientated camera image. The CCTV camera lowering system shall not obscure the CCTV cameras range of vision. The CCTV camera lowering system shall be designed to support and lower/raise CCTV camera systems weighing up to 100 pounds. External components shall be made of corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment. Moving parts of the CCTV camera lowering system shall be corrosion resistant, self-lubricating and sealed, rated for a minimum of 10,000 lowering and lifting operations. If offered by the manufacturer, the conductor interface mechanism which receives the movable portion of the lowering device shall be the heavy-duty version.

Design-Builder shall supply and install grommets, connectors, nipples, necessary hardware, a cable from the CCTV cabinet to the lowering device, and a cable from the lowering device to the CCTV camera assembly. Cables shall be

outdoor rated, and contain shielded communication conductors and five auxiliary conductors, 14 AWG, or larger. Conductors within the cables shall be stranded.

The CCTV camera lowering system shall be equipped with a self-aligning locking mechanism which securely holds the movable portion of the CCTV camera lowering device when the CCTV camera is in use. When in the locked position, all weight shall be removed from the lowering cable. The locking components shall be made of metal.

The CCTV camera lowering system shall include a junction box between the CCTV camera and the movable portion of the lowering device to facilitate the connection of CCTV camera power, video, and camera control. The junction box shall be water resistant and in accordance with NEMA 3R requirements.

Electrical connections shall be suited for operation at 120 VAC with a current carrying capacity not less than 15 Amperes. The electrical connectors shall contain a minimum of 14 contacts including a ground. Data contacts shall be designed to handle 1V peak to peak NTSC video, RS-232 and RS-485 control, and Ethernet communication signals.

The CCTV camera lowering system shall be operated from the ground by the use of a portable lowering tool. The tool shall consist of a lightweight metal frame and winch assembly operated by a variable speed electric drill motor or hand crank. The CCTV camera lowering system shall include clutches and brakes to prevent the free-fall of the CCTV camera and over tensioning of the lowering device cable. The lowering tool shall have the appropriate gearing to facilitate using a hand crank for lowering and raising the CCTV camera. The CCTV camera lowering system shall incorporate a field adjustable counterweight system to minimize the amount of effort required to raise the CCTV camera. One lowering tool for the project shall be provided to ADOT.

(F) CCTV Pole Foundation

CCTV Pole Foundations shall be drilled shaft in accordance with TP Section 600 (*Structural*). Excavation and backfill shall conform to the requirements of Subsection 203-5.03 of the ADOT *Standard Specifications*.

Anchor bolts shall conform to the requirements of ASTM F1554 Grade 55. The upper 12 inches of the bolts shall be hot dip galvanized in accordance with ASTM A153. The strength of the nuts shall be equal to or exceed the proof load of the bolts.

Concrete for foundations shall be Class S and shall have a required 28-day compressive strength of 3,500 pounds per square inch.

Design-Builder shall provide the material submittal for each type of foundation including material specifications and reinforcing drawings per ADOT ITS Standard Details or RFC Foundation Details.

740-3 Construction Requirements

Prior to fabrication of sign structures, Design-Builder shall perform a field survey of the foundation and roadway elevation to determine support structure dimensions to ensure proper mounting height of the DMS and vertical clearance requirements.

ITS structures shall be constructed in accordance with the requirements of TP Section 600 (*Structural*), Subsection 606-3 of the ADOT *Standard Specifications* and the RFC Plans.

Design-Builder shall form a 1/4-inch weep hole in the grout at the base of the pole which allows drainage of water that may accumulate inside the structure.

(A) Foundations

ITS structure foundations shall be constructed in accordance with the requirements of TP Section 600 (*Structural*), Subsection 606-3 of the ADOT *Standard Specifications* and the RFC Plans.

Design-Builder shall use drilled shaft method per Section 609 of the ADOT *Standard Specifications*.

Excavation shall be performed to avoid damage to pavement, sidewalk, landscaping, irrigation systems, and other improvements. Excavated material shall be placed in a position that will not impact traffic, pedestrians, and drainage. If existing concrete is damaged by Design-Builder, the entire section, between expansion joints, shall be removed and reconstructed.

Surplus excavated material shall be removed and properly disposed of by Design-Builder.

Excavation and backfill shall conform to the requirements of Subsection 203-5 of the ADOT *Standard Specifications*. At the end of each working period, excavations shall be barricaded or covered, or both, to provide safe passage for pedestrian and vehicular traffic.

Concrete shall be placed in holes which have been augured against undisturbed earth. If the material in the bottom of the hole is not firm and stable, it shall be compacted, or treated as directed by Design-Builder's Geotechnical Engineer. The walls and the bottoms of the hole shall be adequately moistened prior to placing the concrete.

If the soil is not stable and a hole cannot be augured, casings shall be used of the proper size and dimensions, and shall be rigid and securely braced. The casing and the bottom of the hole shall be adequately moistened prior to placing the concrete.

Anchor bolts and conduit stubs shall be placed and held in proper alignment, position, and height during the placing and vibrating of concrete. Foundations shall set for 7 Days prior to pole installation.

DMS support structures shall be bonded to form a continuous grounding system in accordance with Subsection 732-3.03 of the ADOT *Standard Specifications*. The coil ground shall be covered with native soil prior to placing concrete. A ground resistance test shall be performed in accordance with the ground rod testing method specified in Subsection 732-3.03 of the ADOT *Standard Specifications*.

Design-Builder shall protect existing lighting poles, conduit, conductors, irrigation, landscape, aesthetic, storm drains, utilities and other elements from damage.

(B) Pole Shafts

Design-Builder shall bond and ground CCTV poles in accordance with Subsection 732-3.03 of the ADOT *Standard Specifications* and as shown in the ITS Standard Drawings. CCTV poles shall be bonded to form a continuous grounding system.

Poles shall be vertically plumb with camera equipment installed. Once the pole installation is complete, the open space between the base plate and foundation shall be grouted. Grout shall be mixed, handled and placed in accordance with the manufacturer's recommendations.

If field-repair of galvanizing is allowed by ADOT, it shall be by the hot-stick method.

Design-Builder shall obtain an FAA determination for any new CCTV pole which meet the requirements for construction or alteration requiring notice (77.13) in the Code of Federal Aviation Regulations, part 77. Design-Builder shall not incorporate such new CCTV poles unless and until approved by the FAA.

CCTV camera pole foundations shall be set flush with the existing or new curb and sidewalk or flush with the finished grade where there is no curb or sidewalk, except in sloped areas.

Section 741 Electrical Underground Equipment for ITS

741-1 Description

The work under these items includes furnishing and installing electrical underground equipment including conduit, innerduct and pull boxes for ITS elements, as shown on the RFC Plans and in this TPA 738-1.

The work under this item shall include replacement or adjustment of pull boxes, extensions, lids, conduit sweeps into pull boxes, conduit orientation, conduit alignment, mitigation of unusable conduit, conduit fittings, and other

work needed to remedy conditions of existing pull boxes and conduit, as requested by ADOT, within the project limits.

741-2 Materials

Polyvinyl Chloride (PVC) conduit, Rigid Metallic Conduit (RMC), and Flexible Metal Conduit shall conform to Subsection 732-2.02 of the ADOT *Standard Specifications*. Intermediate Metal Conduit (IMC) is not allowed for ITS applications. Conduit runs which enter pole and cabinet foundations shall consist of PVC.

Conduit bends, fittings, expansion couplings, sweeps, and other accessories shall be of the same material as the conduit.

Conduit elbows for new or future fiber optic cable shall have a minimum radius of 36 inches. Other conduit elbows shall have a minimum radius of 24 inches.

(A) 7-Way Multi-Duct:

The 7-Way Multi-Duct materials shall be the following with no substitutions allowed:

(1) ADOT 7-Way: Dura Line Corporation FuturePath® Armored with Blue HDPE - 0.110-in Sheath (Armored), 7-way x 18/14 mm Micro-ducts, ADDD2256:

(a) Micro-ducts Colors: Blue, Brown, Green, Grey, Orange, Red & White;

(b) Dura-Line Part Numbers:

(i) 10093781 (2,000’ on a 102” reel);

(ii) 10093782 (2,500’ on a 102” reel); and

(iii) 10093803 (3,300’ on a 102” reel).

(2) GRTI 7-Way: Dura Line Corporation FuturePath® Armored with Orange HDPE - 0.110-in Sheath (Armored), 7-way x 18/14 mm Micro-ducts, ADDD1750:

(a) Micro-ducts Colors: Blue, Brown, Green, Grey, Orange, Red & White;

(b) Dura-Line Part Numbers:

(i) 10093827 (2,000’ on a 102” reel);

(ii) 10093828 (2,500’ on a 102” reel); and

(iii) 10093829 (3,300’ on a 102” reel).

(3) Dura Line Accessory Products:

(a) Dura-Line Part Number 20001518 Micro Coupler 18/14mm;

(b) Dura-Line Part Number 20001485 Micro End Cap 18mm;

(c) Dura-Line Part Number 20005189 Divisible Duct Seal Kit 18mm;

(d) Dura-Line Part Number 20001533 Splice Kit 7-Way18/14mm;

(e) Dura-Line Part Number 20005684 Large Microduct Cutter;

(f) Dura-Line Part Number 20003768 Longitudinal Sheath Slitter; and

(g) Other Dura-Line products needed to fit proposed fiber optic cables.

(4) Sealing Voids in FuturePath® Located Between the MicroDucts and Oversheath:

(a) Per Dura-Line TECHNICAL BULLETIN: DCEB-08008 called FuturePath®-Recommended Void Sealing Methods.

The 7-Way Multi-Duct shall be installed in one continuous length, between No.9 pull boxes, with no couplings or splicing outside the pull boxes, unless approved by ADOT. Couplings and splicing will be allowed at one end of directional drilling locations as shown in the plans. All proposed 7-Way Multi-Duct locations shall be pre-approved by ADOT.

Six of the seven micro-ducts (colors: Blue, Brown, Green, Grey, Red & White) shall be installed in one continuous length through the No.9 pull boxes. A straight coupler for each micro-duct is permitted within the No.9 pull box to achieve the continuous lengths.

The Orange micro-duct shall be cut within each ADOT No.9 pull box, leaving a minimum length of 2 feet inside the pull box with 1 foot or more accessible from each side of the pull box.

Design-Builder shall bond the steel armor strength member of the 7-Way Multi-Duct, at each exposed end within the No.9B pull boxes, to the ground rod within the pull box.

(B) HDPE Conduit

Design-Builder may propose substituting HDPE conduit which meets the requirement in this TPA 738-1 in place of direct-buried PVC conduit.

HDPE conduit and fittings shall comply with ASTM D 2241 and ASTM-F2160-01. HDPE conduit shall have a minimum rating of SDR 11. HDPE innerducts shall have a minimum rating of SDR 13.5. It shall have a cell classification of PE334470C (for black conduit) and PE334470E (for colored conduit) in accordance with ASTM 3350: Standard Specification for Polyethylene Pipe and Fittings Materials. The polyethylene base resin shall meet the density requirement and melt index properties described herein. The density shall not be less than 0.940 and not more than 0.955 g/CM3 in accordance with ASTM D 1505: Standard Test Method for Density of Plastics by the Density-Gradient Technique. The range for the melt index shall be between 0.05 to 0.5g/10 minutes in accordance with ASTM D 1238: Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer. The HDPE conduit shall have a minimum Flexural Modulus, of 80,000 psi, in accordance with ASTM D 790 and a minimum tensile strength at yield of 3,000 psi, in accordance with ASTM D-638. Additives to the base resin shall be included to provide heat stabilization, oxidation prevention and ultraviolet (UV) protection. It shall utilize carbon black in the range of 2 to 3% for long term protection against UV degradation. The minimum protection period shall be one year from date of manufacture in unprotected, outdoor storage in accordance with ASTM D 1603: Standard Test Method for Carbon Black in Olefin Plastics.

Design-Builder shall submit data sheets and a Certificate of Compliance letter from the HDPE conduit manufacturer stating that the product meets these requirements per this TPA 738-1.

(C) Innerduct

Innerduct shall be ribbed HDPE. The number of innerducts per conduit and sizes shall be as called for in the RFC Plans. Innerduct color shall be orange from the factory unless otherwise specified. The innerduct shall be furnished in one continuous length with no factory installed splices or couplings, and of lengths sufficient to complete runs between pull boxes without splicing.

(D) Conduit Warning Tape

Conduit warning tape shall be a minimum four-mil composite reinforced thermoplastic, with a minimum width of 3 inches and minimum length of 5 feet. Warning tape shall be highly resistant to alkalis, acids, and other destructive agents found in the soil.

Warning tape shall have a continuous printed message warning of the location of underground conduits. The message shall be in permanent ink specifically formulated for prolonged underground use and shall bear the words, “CAUTION - ELECTRIC LINE BURIED BELOW” or “CAUTION – COMMUNICATION CABLE BURIED BELOW” in black

letters on a red background for electric conduits or orange background for communication conduits. Where both electric and communications conduits are in a single trench, both warning tapes, as described above, shall be provided.

(E) Detectable Pull Tape

Detectable pull tape shall be constructed of fiber and have an embedded #22 AWG conductor. The tape shall be low-stretch and moisture-resistant. The tape shall have nominal pull strength of 2,500 pounds. The tape shall include distance markings at intervals not to exceed 2 feet.

(F) No. 7 ITS Pull Boxes

No. 7 ITS pull boxes shall be precast, polymer concrete, fiberglass reinforced, with ANSI Tier 22 rating for both the box and lid. Concrete pull boxes and lids shall not be used. Steel pull box lids shall not to be used unless H20 traffic loading is required.

No. 7 ITS pull boxes shall be 24 inches in depth and consist of a single-piece box unit. Stacked units shall not be used unless otherwise specified.

Pull box lids shall bear the words “ADOT FMS” unless otherwise specified. Markings shall be clearly defined and placed parallel to the long side of the cover. No. 7 pull boxes letter height shall be a minimum of 1 inch and recessed into the lid.

Pull box lids shall have a locking mechanism approved by ADOT.

Design-Builder shall provide a Certificate of Compliance that the pull boxes furnished and installed are in conformance with this TPA 738-1.

(G) No. 9 Pull Boxes

No. 9 and No. 9 “split” pull boxes shall be fabricated of concrete and provide conduit access ports on the four sides as shown in the ITS Standard Drawings.

No. 9 pull box lids shall have a square, hinged lid that opens a full 180 degrees. Lid opening shall be spring-assisted from both the open and closed positions using a torsion bar lift system. Lids shall lock down with at least one stainless steel security type penta-head bolt that shall be captive to the lid. Lids shall have padlock cavity with a spring-loaded cover and lock-down bolt that leaves no part of the padlock is exposed.

No. 9 pull boxes shall be furnished with galvanized and slotted C-channel struts embedded in the concrete walls of the pull box, with an 18-hole rack mounted to each slotted C-channel strut, and ½ inch spring nuts and bolts and one cable hook per rack.

Pull box lids shall bear the words “ADOT FMS” and GRTI pull box lids shall bear the words “GRTI COMM” unless otherwise specified. Markings shall be clearly defined and placed parallel to the long side of the cover. Letter height for No. 9 pull boxes shall be 4 inches.

Pull box lids shall have a locking mechanism approved by ADOT, except for those installed for GRTI which shall be approved by GRTI.

Design-Builder shall provide a Certificate of Compliance that the pull boxes furnished and installed are in conformance with this TPA 738-1.

(H) Retrofit Lids for No. 9 Pull Box

New lid assemblies retrofitted onto existing No. 9 pull boxes shall match the width and length of the No. 9 pull box. Existing No. 9 pull boxes that do not have existing grounding shall have new a ground rod, grounding conductor and grounding lugs, furnished and installed.

(I) Metal Junction Boxes

Metal junction boxes and covers installed in concrete structures shall be fabricated from a minimum of 16-gauge type 304 stainless steel. Seams shall be continuously welded and conform to the details in the RFC Submittal and Project Special Provisions.

A neoprene gasket with a thickness of 1/8 inch shall fit between the pull box and cover. The cover shall fit securely and be held in place with a minimum of four stainless steel machine screws.

Design-Builder shall furnish materials that meet the requirements of Section 732-2 of the ADOT *Standard Specifications* for conduit and pull boxes, except as modified by this TPA 738-1.

741-3 Construction Requirements:

Construction Requirements shall conform to Section 732 of the ADOT *Standard Specifications*, unless otherwise specified in the ITS Standard Drawings, on the Plans, or this TPA 738-1.

741-3.01 Conduit

Conduit installation shall conform to Subsection 732-3.01 of the ADOT *Standard Specifications* with the following exceptions.

(A) Conduit Routing

Conduit shown on the plans indicates the intended path and conduit shall be placed in accordance with the lines, grades, details and dimensions shown on the RFC Plans, the ADOT *Standard Specifications* and this TPA 738-1. The conduit path shall be modified as necessary, to avoid obstacles, conflicts and obstructions, to facilitate future maintenance, or to conform to appropriate codes and specifications. Final conduit locations shall be documented in the record drawings.

The contactor shall restore, repair, or replace, damaged or contaminated vegetation, landscaping features, decomposed granite, irrigation facilities, walkways, utilities, and other items resulting from ITS construction activities.

Design-Builder shall take special precautions prior to work in the vicinity of irrigation lines. Small irrigation lines are typically not Blue Staked, but shall be repaired or replaced if damaged during construction by Design-Builder.

Excavations shall be in accordance with the Project Safety Management Plan.

(B) Conduit Size

Conduit sizes shall be as indicated on RFC plans and in conformance with the Technical Provisions.

(C) Conduit Bend Radius and Deflection

Except for factory bends, conduit bends shall have a radius of not less than that specified in the NEC. Conduit shall be bent without crimping or flattening, using the longest radius practicable. Communications conduits shall not deflect more than 1 inch per foot (1:12) vertically or horizontally. This is equivalent to a minimum radius of 6 feet. If the 1:12 requirement cannot be achieved, elbow fittings of 11 1/4, 22 1/2, 30 or 45 degrees, with a minimum radius of 12 times the conduit diameter shall be used. If 90-degree cumulative turns are required, they shall be made of individual elbows with a minimum radius of 36 inches for new or future fiber optic cable.

(D) Conduit Fittings

New runs of conduit shall be continuous from pull box to pull box. HDPE conduit shall not be joined to PVC conduit in the length of the run.

If joining segments of HDPE conduit is called for on the plans, Design-Builder shall utilize non- corrosive, sit-tight, water-tight couplings. Heat fusion, electrofusion fittings and mechanical connections will be permitted if the HDPE

conduit and joining device manufacturer's recommendations are followed and the internal diameter of the HDPE conduit is not reduced. Extrusion welding and hot gas welding to join HDPE conduits is not permitted. Upon completion of joining HDPE conduit sections and setting the pull boxes, Design-Builder shall clean the HDPE conduit with compressed air. Design-Builder shall demonstrate that the conduit was not deformed during installation by pulling a cleaning mandrel or ball mandrel with a diameter of 80% of the HDPE inside diameter. If the mandrel passes through the HDPE, Design-Builder shall install the pull tape in accordance with Section 732 of the ADOT *Standard Specifications*. If the mandrel encounters a deformity in the HDPE conduit, Design-Builder shall replace the entire segment of HDPE between pull boxes with new HDPE.

Conduit plugs, caps, or sealing fittings for sealing empty conduit and occupied conduit shall be durable, easily removable, reusable, and produce a watertight seal. Plugs, caps, and sealing fittings shall be designed for the diameter of the conduit and cable, shall cause no damage to the cable when installed, and shall have a rope tie on the inside end for connection of a pull rope. Plugs that seal conduits containing fiber optic cable shall be of the split design to allow installation and removal around in-place cables.

(E) Conduit Depth

Conduits shall have a minimum cover depth of 30 inches. Backfill compaction shall be in accordance with Subsection 203-5.03(B)(4) of the ADOT *Standard Specifications*. When conduit cannot be installed at the required minimum depths, it shall be encased in Class B concrete, in accordance with Section 1006 of the ADOT *Standard Specifications*.

(F) Conduit in Trenches

Immediately after conduit work including, installation, mandrelling, or cable or pull tape installations, conduit shall be sealed to prevent the intrusion of water, mud, gravel, vermin, etc. Taping the ends of the conduit is not allowed.

Unoccupied conduits on which work is performed, including those extending beyond the end of capped conduit, shall be sealed with a water-tight, corrosion-proof, removable, reusable, and vermin resistant conduit plug or cap.

Occupied conduits on which work is performed shall be sealed with a conduit cap. The conduit cap shall be water-tight, corrosion-proof, removable, and vermin resistant.

Occupied innerduct on which work is performed extending beyond the end of the capped conduit shall be sealed with an innerduct cap. The innerduct cap shall be water-tight, corrosion-proof, removable, and vermin resistant.

New innerducts and existing empty innerducts to be utilized, shall have a plug pulled through to demonstrate that the innerduct integrity and continuity is appropriate for use with no breaks or debris.

New innerducts and existing empty innerducts to be utilized, shall have a means to secure the ends of the innerduct to prevent the innerduct from retracting into the conduit.

A three inch "Y" shall be cut into the face of the curb directly over conduit located under rolled or vertical curbs.

Design-Builder shall place warning tape in trenches in which new PVC or trenched HDPE conduit is placed. Warning tape is not required in conduit segments where trenchless methods are used for installation. Warning tape shall be buried at a depth of 6 to 8 inches below the finished grade. No compensation will be provided to restore landscape or add decomposed granite of disturbed areas.

(G) Conduit by Trenchless Methods

New conduit to be installed under existing pavement, curbs and gutters, sidewalks, established landscaping or decomposed granite not otherwise impacted by construction, and at other locations specifically indicated on the RFC Plans, shall be installed by Horizontal Directional Boring (HDB) or Horizontal Directional Drilling (HDD) methods. Open cutting and trenching existing pavement to remain shall not be allowed.

Prior to beginning trenchless installation methods, Design-Builder shall complete the necessary potholing, and submit the proposed profile to the IQF. The profile if installed conduit shall be such that the allowable bend radiuses are not exceeded. Installation shall be performed in accordance with industry standards.

Design-Builder's installation process shall utilize the "walkover" locating system or other ADOT approved equivalent, for determining the installation profile. The installation equipment shall register the depth, angle, rotation and directional data. At the surface, equipment shall be used to gather the data and relay the information to the equipment operator.

Excavation and backfill of excavated pits shall be in accordance with the requirements of Subsection 203-5.03(A) and (B) of the ADOT *Standard Specifications*.

When enlargement of an installation hole is necessary, the hole shall be at least 25% larger than the conduit to be installed. Pulling equipment such as grips, pulling eyes, and other attachment hardware external to the conduit will be permitted as long as a wooden dowel is placed inside the conduit to prevent it from collapsing at the point of attachment when pull tension is at its peak. A swivel shall be used with pulling hardware when pulling back the conduit into the installation path. Drilling fluid shall be pumped down the hole to provide lubrication for the conduit as it is pulled in. The pulling tension for installing conduit into the installation path shall not exceed 75% of the conduit manufacturer's tensile strength rating in order to prevent the conduit from "necking down" or deforming.

Final installation profiles shall be submitted to ADOT.

(H) Detectable Pull Tape

Design-Builder shall install detectable pull tape in new and existing empty conduits and innerducts. Detectable pull tape in conduits shall terminate at the end of the conduit with a minimum of 2 feet of coiled slack in the pull box. Detectable pull tape traveling through conduit that terminates in a pull box, shall have its wire ends connected together to allow for a continuous locating signal to be used for the entire conduit run.

(I) Conduits Embedded in or Attached to Structures

Attaching or embedding conduit in a structure shall be approved by ADOT and shown on the RFC plans. Conduit within a structural member shall be installed in accordance with the National Electrical Code.

Conduit installed within open bridge cells or attached to structures shall be rigid metal conduit (RMC). RMC shall be painted to match the exterior color of the structure when located on the exterior of the structure. Painting may require pre-treatment of the RMC.

Intermediate junction boxes shall be used in RMC runs over 1,000 feet in length. Intermediate junction boxes shall be evenly spaced at a maximum spacing of 1,000 feet.

Expansion couplings shall be installed in conduit runs which cross an expansion joint in a structure. Expansion couplings shall be as shown in the ITS Standard Drawings or RFC Plans as approved by ADOT. A minimum of 3 feet shall separate a conduit expansion coupling and the pipe sleeve where the conduit enters a structure. Expansion couplings on adjacent conduits shall be staggered to keep conduit runs as straight as possible. Where bonding is not continuous, expansion couplings shall be provided with a #6 AWG bonding jumper conductor with enough slack to accommodate the range of expansion of the coupling.

Where it is not possible to use expansion couplings, sleeves of sufficient size shall be installed to provide a minimum 1/2-inch clearance between the conduit and the inside wall of the sleeve. The sleeve shall be discontinuous at the expansion joints. The coupling sleeve shall not be exposed to the elements and shall be protected by a steel plate recessed within the barrier at the expansion joint.

(J) Conduit Cleaning

Design-Builder shall clean existing conduit, no more than one week prior to installation of cables or conductors. For PVC conduit, a metal-disc mandrel with an outer diameter not less than 90% of the conduit's inside diameter shall

be pulled through the conduit. For HDPE conduit, a ball mandrel with an outer diameter not less than 80% of the conduit's inside diameter shall be pulled through the conduit. Prior to pulling the mandrel through the conduit, the conduit shall be brushed or swabbed.

(K) Utility Conduits

Installation of conduit for underground utility service shall conform to the utility company requirements, local codes and this TPA 738-1.

(L) Conduit Entering Pull Boxes

Conduit entering pull boxes shall be installed in accordance with the ITS Standard Drawings. Conduit ends shall be capped with conduit end cap or plug fittings until wiring or cabling is installed. When end caps or plugs are removed, Design-Builder shall install bell end fittings or bell end shape integral to the conduit as approved by ADOT. Bell ends shall be installed prior to the installation of the conductors or cables. Insulated grounding bushings shall be used on steel conduit ends as approved by ADOT.

RMC conduits terminating in a No. 7 ITS pull box shall have a coupling to convert to PVC prior to the underground elbow.

New HDPE conduits terminating in a No. 9 pull box shall run directly into the conduit port hole of the pull box wall and be cut flush with the inside face of the pull box. The void between the outside of the conduit and inside of conduit port hole shall be sealed with a sealant as approved by ADOT.

(M) Innerduct

Innerduct shall be installed in conduit as shown on the plans. Innerduct shall not be pulled dragged on the ground or pavement. Design-Builder shall ensure that the tensile load on the innerduct does not exceed the allowed maximum by using a break-away technique and/or a pulley system with numeric readout which includes a means of alerting the installer when the pulling tension approaches the manufacturer's maximum pulling tension.

Design-Builder shall ensure that the innerduct is protected from sharp edges and excessive bends. Design-Builder shall not cause the innerduct to violate the minimum bending radius for which the

innerduct was designed. Design-Builder shall be responsible for damage of innerduct and shall remove and install new innerduct.

During pulling, the innerduct shall be continuously lubricated as it enters the conduit. Pre- lubrication may be necessary per manufacturers requirements. The lubricant used shall be compatible with the innerduct material. The manufacturer's recommended pulling speed and pulling tension shall not be exceeded.

Innerduct shall be anchored at pull boxes to keep innerduct from retracting into the conduits, beyond the exposed conduit end, in a manner approved by ADOT.

Newly-installed empty innerduct shall contain detectable pull tape from pull box to pull box. Each pull tape shall terminate at the end of the innerduct with a minimum of 2 feet of coiled slack in each pull box.

(N) Cathodic Protection

Prior to trenching, Design-Builder shall verify the existence of cathodic protection in existing utilities and shall maintain existing cathodic protection and test stations.

(O) Conduit at Removed Pull Boxes

At pull boxes to be removed, where existing HDPE conduit has a HDPE-to-PVC coupling, a new No. 9 pull box shall be installed in place of the coupling or the coupling and PVC components shall be removed and the conduit shall be spliced with matching HDPE conduit and HDPE-to- HDPE coupling as approved by ADOT, resulting in a continuous all-HDPE segment.

(P) Conduit Reconditioning

Design-Builder shall not recondition existing conduit. Existing damaged conduit intended to remain shall be replaced with new conduit of the same material as the entire conduit run from pull box to pull box.

741-3.02 Pull Boxes

Prior to installation, pull boxes shall be field-located, to avoid drainage swales, slopes steeper than 2:1, maintenance vehicle pathways, utility easements, and other areas of conflict.

Design-Builder shall be responsible for restoring the surrounding surface conditions back to their original condition if not intended to be modified by the Project.

When a new pull box occupies the same location as an existing pull box, the existing bricks, stone sump and felt paper shall be replaced with new. In instances where an existing 12-inch depth pull box is replaced by a 24-inch depth pull box, Design-Builder shall adjust the existing conduits, as necessary, to allow the conduit to enter the bottom of the box in conformance with the ITS Standard Drawings, the Plans, and Project Special Provisions.

Existing flexible delineators for ITS pull boxes within the project limits shall be removed and disposed of by Design-Builder, including delineators for ITS pull boxes that have no other work associated with them.

Compaction around pull boxes shall not cause the sides to deflect or the box or lid to crack or become dented. Design-Builder shall replace cracked, broken, chipped or damaged pull boxes and lids.

Removable caps shall be placed on unused conduits within pull boxes.

(A) No. 9 Pull Boxes

When installing a No. 9 pull box, Design-Builder shall only lift the pull box and covers using the lifting hardware installed for that purpose. The lid shall be oriented such that the lid hinge lies along the side of the pull box farthest from the roadway.

For “Split No. 9” pull boxes, Design-Builder shall pour the concrete floor of the pull box after the pull box is installed. The concrete shall be Class S with 3,000 psi minimum compressive strength with an integrated 8-inch diameter sump hole for drainage and a ground rod.

Existing “Split No. 9” pull boxes for ITS conduits co-located with lighting conduits, shall have the lighting conductors removed, conduit rerouted around the Split No. 9 pull box, and lighting conductors reinstalled and terminated, matching existing. Lighting conductor splicing shall occur only in a new adjacent lighting pull boxes. No lighting conductors or conduits shall pass through a Split No. 9 pull box to remain.

(B) Retrofit Lids for No. 9 Pull Box

New lid assemblies retrofitted onto existing No. 9 pull boxes shall be installed in accordance with the manufacturer’s installation procedure and recommended sealant material between the body of the remaining No. 9 pull box and new lid assembly. New lid assemblies retrofitted onto existing No. 9 pull boxes shall be grounded to a ground rod driven into the sump of the pull box. Grounding shall meet the requirements of Subsection 732-3.03 of the ADOT *Standard Specifications*.

(C) Pull Box Reconditioning

Design-Builder shall not recondition existing pull boxes. Existing damaged pull boxes intended to remain shall be replaced with new pull boxes.

Existing No. 9 pull boxes that do not have existing grounding shall have new a ground rod, grounding lugs, and grounding conductor furnished and installed in accordance with the Standard Drawings. Grounding shall meet the requirements of Subsection 732-3.03 of the ADOT *Standard Specifications*.

Pull box work identified as part of the facilities inventory shall be completed prior to work on fiber optic cable or conductor installation.

Section 742 Fiber Optic Cable and Equipment

742-1 Description

The work under these items includes furnishing and installing fiber optic cables, fiber optic splice closures, Small Form-Factor Pluggable (SFP) transceiver modules with a fiber optic patch cable, rack-mounted fiber optic patch panels and Ethernet switches.

742-2 Materials

(A) Fiber Optic Cable

Design-Builder shall furnish and install Single Mode Fiber Optic (SMFO) communication cables to provide a communications subsystem.

Fiber optic cable shall be of loose tube construction, filled with a water-blocking material, and constructed by a certified ISO 9001 or 9002 manufacturer. Fiber optic cable shall be dielectric and comply with the requirements of REA PE-90, except as modified by the following requirements:

No.	Item	Parameters
1.	Cladding diameter:	125 ± 1.0 µm
2.	Core-to-cladding offset:	≤ 0.8 µm
3.	Cladding non-circularity:	≤ 1.0%
4.	Maximum attenuation:	≤ 0.35 dB/km at 1310 nm, ≤ 0.25 dB/km at 1550 nm
5.	Microbend attenuation (1 turn, 1.25-inch dia.):	≤ 0.5 dB at 1550 nm
6.	Microbend attenuation (100 turns, 3’ dia.):	≤ 0.05 dB at 1310 nm
7.	Mode-field diameter (matched cladding):	9.3 ± 0.5 µm at 1310 nm; 10.5 ± 1.0 µm at 1550 nm
8.	Maximum chromatic dispersion:	≤3.2 ps/(nm x km) from 1285 nm to 1330 nm and < 18 ps/(nm x km) at 1550 nm
9.	Fiber polarization mode dispersion:	≤ 0.5 ps/(km) 1/2
10.	Fiber coating:	Dual layered, UV cured acrylate
11.	Coating diameter:	245 µm ± 10 µm
12.	Minimum storage temperature range:	-40 to 158 degrees Fahrenheit
13.	Minimum operating temperature range:	-40 to 158 degrees Fahrenheit

Buffer tubes shall be filled with a dry water-blocking material that provides for an efficient and craft-friendly cable preparation. Buffer tubes shall be stranded around a central member using the reverse oscillation or “S-Z”, stranding process. Filler rods shall be used in the fiber optic cable to lend symmetry to the cable section.

The fiber optic cable shall have a central strength member designed to prevent buckling of the cable.

The fiber optic cable shall utilize a dry water-blocking material to block the migration of moisture in the cable interstices.

The fiber optic cable shall have tensile strength members designed to minimize cable elongation due to installation forces and temperature variation. The fiber optic cable shall withstand a 600 pound-force (lbf) maximum installation tensile load and a long term installed maximum tensile load of 200 lbf.

The fiber optic cable jacket shall be constructed of a high or medium density polyethylene (HDPE or MDPE) jacket that has been applied directly over the tensile strength members and water- blocking material. The jacket shall have at least one ripcord designed for easy sheath removal. The cable shall be wound on the reel in such a manner as to provide access to both ends of the cable to enable testing to be performed while the cable is on the reel.

The cable shall be capable of withstanding total immersion in water with natural mineral and salt contents, and wasp/hornet spray without damage or decrease in function.

Conductor and cable tagging shall conform to the requirements of Subsection 732-2.01(A)(2) of the ADOT *Standard Specifications*, unless otherwise specified. Tags shall have the capability of being moved along the conductor or cable during future alterations.

Design-Builder shall provide a Certificate of Compliance that the fiber optic cables furnished and installed are in conformance with this TPA 738-1. This certification shall be in two parts:

(1) Certificate of Compliance from the fiber optic cable manufacturer that the cable is in conformance with the Rural Electrification Administration (REA) Bulletin PE-90 (where applicable) and this TPA 738-1.

(2) Certificate of Compliance from Design-Builder that the communication cable subsystem has been installed and spliced in accordance with the fiber optic cable and fiber optic splice closure manufacturer's recommendations, and the RFC Plans and Project Special Provisions for construction.

(B) Fiber Optic Splice Closures

Fiber optic splice closures shall be either shell design or cylindrical, butt-end style, corrosion resistant, watertight, and meet the requirements of CR-771-CORE. Underground splice closures shall seal, bond, anchor, and provide efficient routing, storage, organization, and protection for fiber optic cable and splices.

The splice closure shall provide an internal configuration and end cap with a minimum of two express ports for entry and exit of backbone cable and a minimum of four additional ports for distribution and branch cables.

Splice closures shall be designed to accommodate heat-shrink fusion splice trays in sufficient quantities to perform the required number of splices. At a minimum, the splice closure shall accommodate 144 splices, unless otherwise specified. Splice closures shall be supplied with the maximum number of fusion splice trays.

Splice closures shall have a reliable dual-seal design with both the cable jackets and core tubes sealed, without the use of water-blocking material. The splice closures shall be capable of being opened and completely resealed without loss of performance.

The splice closure minimum dimensions shall be at least 29 inches long by 11 inches wide.

(C) Fiber Optic Patch Panel

The patch panels installed in the field shall be factory terminated and have protective covers for all unused connectors. Patch panels shall be manufactured with LC-type connectors required to match pre-installed connectors on jumper fiber optic cables. Branch 12-SMFO cable shall be pre-installed on the patch panel by manufacturer and have the required length including needed slack to reach each splice location. Branch cable shall be supplied with

the splicing end protected by the manufacturer with secure dust-proof cap ready to be spliced into each splice closure.

(D) Fiber Optic Patch and Splice Module

The fiber patch and splice module shall accommodate 12 single-mode fibers with LC type connectors from the patch cables and the branch cable. Patch cables shall be included with the fiber patch panel. The fiber patch panel shall be compatible with plenum-rated loose tube fiber and provide protection of the buffer tube and individual fibers. The panel shall be capable of securing the cable to the housing to prevent any damage due to movement.

(E) SFP Transceiver Module

The SFP transceiver module and fiber optic patch cable shall be from the same manufacturer. Design-Builder shall ensure compatibility of the SFP with the existing switch. The SFP transceiver module and fiber optic patch cable shall meet the following requirements:

(1) The characteristics are performed in accordance with Telcordia Specification GR 468-CORE;

(2) Single + 3.3V Power Supply;

(3) RoHS Compliant and Lead-free;

(4) AC/AC Differential Electrical Interface;

(5) Eye Safety Designed to meet Laser Class 1 compliant with EN60825-1;

(6) Compliant with Multi-Source Agreement (MSA) Small Form Factor Pluggable (SFP);

(7) EMC requirement meets FCC in the United States and CENELEC EN55022 (CISPR 22) in Europe;

(8) Operating Temperature: -40 to 85 degrees Celsius / -40 to 185 degrees Fahrenheit;

(9) Distance: as specified in design plans;

(10) Cable Type: 9/125µm/single mode;

(11) Connector Type: Duplex LC;

(12) Wavelength: 1310nm;

(13) Link Budget: 20 dBm; and

(14) Sensitivity: -23 dBm.

(F) Ethernet Switches

Ethernet switches shall meet the following requirements:

(1) Supported Standards

(i) IEEE 802.1d – Spanning Tree Protocol;

(ii) IEEE 802.1d – MAC Bridges;

(iii) IEEE 802.1p – Class of Service;

(iv) IEEE 802.1q – VLAN Tagging;

(v) IEEE 802.1w – Rapid Spanning Tree Protocol;

(vi) IEEE 802.1x – Port Based Network Access Control;

(vii) IEEE 802.3 – 10BaseT;

(viii) IEEE 802.3u – 100BaseTX, 100BaseFX;

(ix) IEEE 802.3x – Flow Control;

(x) IEEE 802.3z – 1000BaseLX;

(xi) IEEE 802.3ab – 1000BaseTX;

(xii) IEEE 802.3ab – Link Aggregation;

(xiii) IEEE 802.3af – Power over Ethernet (PoE);

(xiv) RFC768 – UDP;

(xv) RFC783 – TFTP;

(xvi) RFC791 – IP;

(xvii) RFC792 – ICMP;

(xviii) RFC793 – TCP;

(xix) RFC826 – ARP;

(xx) RFC854 – Telnet;

(xxi) RFC894 – IP over Ethernet;

(xxii) RFC1112 – IGMP v1;

(xxiii) RFC1519 – CIDR;

(xxiv) RFC1541 – DHCP (client);

(xxv) RFC2030 – SNTP;

(xxvi) RFC2068 – HTTP;

(xxvii) RFC2236 – IGMP v2;

(xxviii) RFC2284 – EAP;

(xxix) RFC2475 – Differentiated Services;

(xxx) RFC2865 – Radius;

(xxxi) RFC3414 – SNMPv3-USM; and

(xxxii) RFC3415 – SNMPv3-VACM.

(2) Packet Processing

(i) Processing type: store and forward;

(ii) Priority Queues: 4;

(iii) Minimum number of VLANS: 64;

(iv) VLAN ID Range: 1 TO 4094;

(v) Internet Group Management Protocol (IGMP) multicast groups: 256;

(vi) MAC table size: 8192; and

(vii) Packet Buffer size: 1 Mbit.

(3) Network

(i) Support Open System Interconnection (OSI) Layer 2 functionality;

(ii) Point-to-point, daisy-chain, ring, and mesh topologies for connectivity into new and existing fiber optic and copper based Ethernet networks; and

(iii) Broadcast storm frame filtering with user-defined thresholds.

(4) Port Performance

(i) 4 SFP ports;

(ii) SFP duplex single-mode fiber that operates at 1,000 Mbps rated for 10 Km or greater as needed;

(iii) Minimum of 12 RJ-45 copper ports with auto-negotiate operation at 10 Mbps, 100 Mbps, and 1,000 Mbps;

(iv) Port security to prevent unknown devices from gaining access to the network. Unauthorized attempts to access the network shall result in the port being shut down for a definable period of time along with Simple Network Management Protocol (SNMP) trap and alarm generation;

(v) Ports individually configurable for port mirroring, speed, duplex, auto-negotiation, and flow control; and

(vi) Individual port statistics and full support of Remote Monitoring (RMON) statistics, history, alarms, and event groups.

(5) Electrical Service

(i) 120 VAC ± 10%, 60 ± 3 Hz or 12/24/48/-48 VDC power supply.

(6) Enclosure

(i) DIN mounting;

(ii) Permanently labeled with name, model, serial number, and other information required for maintenance; and

(iii) Operating environmental range of - 40 to + 74 degrees C without fans.

742-3 Construction Requirements

Construction shall conform to Section 732 of the ADOT *Standard Specifications*, the ITS Standard Drawings, on the RFC Plans, and this TPA 738-1.

(A) Conduit Cleaning

Design-Builder shall clean new and existing conduits, no more than one week prior to installation of fiber optic cable. Conduit cleaning is not required where existing cables, conductors, or innerducts within a conduit will not be removed.

For PVC conduit, a metal-disc mandrel with an outer diameter not less than 90% of the conduit's inside diameter shall be pulled through the conduit. For HDPE conduit, a ball mandrel with an outer diameter not less than 80% of

the conduit's inside diameter shall be pulled through the conduit. Prior to pulling the mandrel through the conduit, the conduit shall be brushed or swabbed.

(B) Fiber Optic Cable Installation

Design-Builder shall visually inspect fiber optic cable upon delivery and prior to installation. Prior to installation, damaged cable shall successfully pass OTDR testing, as specified herein. Damaged cable shall be replaced by Design-Builder.

No fiber optic cable shall be installed until the conduit, pull boxes, and cabinets through which fiber optic cables will pass or terminate have been approved for fiber optic cable installation.

Design-Builder shall not cause the cable to violate the minimum bending radius specified by the cable manufacturer. In the event Design-Builder violates the minimum bending radius, the entire length of cable from the previous splice point shall be removed from the project and a new cable shall be installed.

Design-Builder shall ensure that the cable is protected from dragging or scraping. Cable shall not drag on the ground or pavement and shall be guided into conduits or innerduct to avoid contact with sharp edges. Fiber optic cables shall be pulled through conduit or innerduct with a device designed to provide a firm hold on the exterior covering and the central strength member of the cable.

Design-Builder shall supply documentation identifying the manufacturer's recommendation for maximum pulling tension and speed, and these values shall not be exceeded. Design-Builder shall have this documentation on site during each fiber optic cable installation pull. Design-Builder shall use a break-away tension limiter set below the tensile load limit of the cable and a system that provides a means of alerting the installer when the tension approaches the tensile load limit.

During pulling, the cable shall be lubricated at each pull box. The lubricant used shall be compatible with the cable jacket and meet the cable manufacturer's recommendations. Liquid detergent shall not be used. Design-Builder shall use a pre-lubrication or continuous lubrication method. Lubricant quantity for each pull shall be as follows:

$$Q = 0.0008 \times D \times L$$

Where:

Q = is the lubricant quantity, in gallons
D = is the conduit diameter, in inches
L = is the length of the pull, in feet

Design-Builder shall record the "foot marking" of installed fiber optic cable at the entrance and exit point of No. 9 pull boxes in a Fiber-Optic Cable Installation Sequential Report. The report shall be provided to ADOT in electronic spreadsheet format prior to final acceptance.

(C) Fiber Optic Patch Panel

The factory terminated patch panels shall be mounted on the cabinet walls. They will be secured to controller cabinets so as to avoid water, dust entry or accidental damage to the branch fiber optic cable. Branch fiber optic cable shall directly connect into patch panels inside controller cabinets, and shall be factory installed on the patch panel. Patch panel shall be installed first in controller cabinet followed by pulling and splicing of the branch fiber optic cable. All connectors on patch panels shall be factory tested and labeled to insure proper installation. All unused connectors shall be sealed by the manufacturer supplied plugs. Pulling of the cable shall comply with general requirements for pulling fiber optic cable in conduits according to this TPA 738-1.

Cables shall be routed to the panel to prevent damage. Design-Builder shall install ultra-polished LC connectors with metal inserts in a composite housing on each branch cable fiber and connect fibers to the panel in the fiber order. The LC connectors for the cable may be fusion pre-polished pigtails or hot melt field-polished connectors. No dry crimp connectors will be acceptable.

(D) Fiber Optic Patch and Splice Module

The fiber optic patch and splice module shall be mounted vertically on the DIN rail, near the right end. Space for air circulation shall be provided for adjacent equipment also mounted on the DIN rail. Cables shall be routed to the panel to prevent damage. Design-Builder shall install ultra-polished LC connectors with metal inserts in a composite housing on each branch cable fiber and connect fibers to the panel in the fiber order. The LC connectors for the cable may be fusion pre-polished pigtails or hot melt field-polished connectors. No dry crimp connectors will be acceptable.

(E) Occupied Conduit

Where fiber optic cables are installed in conduit with existing cables or conductors, Design-Builder shall not damage the existing cables or conductors.

Where fiber optic cables are to be installed within a conduit or innerduct containing existing loop lead-in cables, Design-Builder shall disconnect, remove, reinstall, and test the loop lead-in cables. Design-Builder shall be responsible for damage to existing loop lead-in cables caused by this operation.

Existing fiber optic cables that are required to be removed shall be disconnected, removed, and re-pulled at the same time as the new fiber optic cable and other cables and conductors. The existing fiber optic cable shall be reconnected in the same manner as it was in its original condition and tested in accordance with the requirements in this TPA 738-1.

At least 10 Days prior to disconnecting existing conductors or cables, Design-Builder shall submit a schedule for disconnection and reconnection of existing cables for the ADOT TOC for approval. Additionally, Design-Builder shall contact MAG for identification of RCN fibers along the ADOT trunk line 10 Days prior to disconnecting existing RCN fibers.

(F) Cable Slack & Coiling

Unless a greater distance is specified, No. 9 pull boxes with splice closures shall have 50 feet of cable slack provided between the splice closure and the wall of the pull box where the cable enters/exits the pull box, allowing the splice closure to be removed up to 50 feet from the pull box. No. 9 pull boxes without splice closures shall provide a minimum of 100 feet of slack in each cable passing through the pull box, unless otherwise specified.

Cable slack shall be loosely coiled into a circular shape and attached to the rack and hook system integral to the wall of the No. 9 pull box with industry standard nylon cable ties. Cables shall be coiled independently from one another and secured with separate cable ties for each coil. Cable ties shall be tightened to prevent cable slippage, but shall not deform or damage the cable sheath.

(G) Splices

Design-Builder shall perform fusion splicing of fiber optic cable at the locations shown in the project plans. Splices shall be prepared in accordance with the manufacturer's recommendations. Splicing shall be conducted only at node buildings, specified pull boxes, and connector housing units as shown on the RFC Plans and described in the Project Special Provisions for construction. Fiber optic cable shall be continuous between splice points.

Design-Builder shall install splice closures in a manner such that trunk line cable entries on the same side of the end cap allowing future branch fiber optic cables to be installed without disturbing the trunk line seals.

Where Design-Builder is splicing to existing fiber optic cable, Design-Builder shall take care not to disturb existing splices. Existing splices that are damaged shall be repaired immediately by Design-Builder.

(H) Connectors

Branch fiber optic cables, typically between a cabinet and a splice closure on the trunk line, shall be connectorized in accordance with the manufacturer's recommendations. Connectors shall be installed to meet requirements of the ITS Design Guide, ITS Standard Drawings, as indicated on the RFC Plans, and this TPA 738-1.

Trunk line fiber optic cables shall not be connectorized.

(I) Tagging

Tags shall be installed on conductors and cables inside pull boxes near the pull box entrance and exit, and inside cabinets. Tags shall be labeled with the following fields, as applicable:

Field 1: Responsible Agency (applicable only if agency is other than ADOT)

No.	Example Legends	Application
1.	MCDOT	Maricopa County Department of Transportation
2.	Tempe	City of Tempe

Field 2: Description

No.	Example Legends	Application
1.	SMFO144	144-strand single mode fiber optic cable
2.	SMFO12	12-strand single mode fiber optic cable
3.	AWG6	American Wire Gauge 6
4.	IMSA7	IMSA 19-1, 7-Conductor
5.	LOOP 1U	lane 1 upstream loop detector (other loop designations per Standard Drawing FM-5.01)
6.	CCTV	CCTV device cable
7.	DMS	DMS device cable

Field 3: Termination

No.	Example Legends	Application
1.	TO NODE 12	fiber optic trunk line or power to a node
2.	TO EB TRUNK LINE	fiber optic branch to Eastbound trunk line
3.	TO CAB 3118253	fiber optic or power to a cabinet
4.	TO LC 3118256	power to a load center
5.	TO SIGNAL	fiber optic or power to a signal cabinet
6.	TO EB DMS	Power or control cable to eastbound DMS

A continuous cable passing through a pull box shall have two tags which will be the same except with different termination descriptions. A pull box with a trunk line fiber optic cable spliced with a branch fiber optic cable shall have three tags, two on the trunk line fiber optic cable and one on the branch fiber optic cable. Multiple power conductors that go to one load center shall be bundled together and have one tag that indicates the load center cabinet number in the termination field. Multiple power conductors that go to different cabinets shall be bundled and tagged in conductor pairs according to the cabinet they go to.

Tagging shall be recorded by Design-Builder in a Record Drawing Cable Schedule and include the distance marking on the fiber optic cable at the entrance to a pull box, cabinet, or other termination point. The as-built Cable Schedules within the ITS Plans shall be provided to ADOT with the Final Complied Documentation.

(J) Test Requirements

Fiber optic cable shall successfully pass the following tests, demonstrating acceptable attenuation and connectivity. Design-Builder shall make corrective actions for unacceptable. Failed splices and connections shall be remade and re-tested for compliance. Design-Builder shall replace cable in its entirety that is not compliant with this TPA 738-1.

Each fiber optic strand shall introduce less than 0.35 dB/km of attenuation at 1310 nm and 0.25 dB/km of attenuation at 1550 nm.

Each splice between two new fibers shall introduce less than 0.1 dB of attenuation. Each splice between one new and one existing, or two existing fibers, shall introduce less than 0.3 dB of attenuation.

Each fiber connector shall introduce less than 0.5 dB of attenuation. Connectors exceeding this limit shall be replaced until this requirement is met.

(1) Power Meter Test

Power meter tests shall be conducted by Design-Builder after installation of the fiber optic cable, splicing, and installation of fiber optic pigtails and break-outs.

Power Meter Tests shall be performed on each fiber strand terminated with connectors utilized in circuits, in accordance with Method A.3 of TIA/EIA-526-7 – “Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant.” Testing shall be conducted at the cable ends in one direction using 1310 nm wave length.

Design-Builder shall use the Power Meter Test Form provided at:

https://azdot.gov/business/engineering-and-construction/its-references and submit a complete and organized set of forms in electronic PDF format to ADOT.

(2) OTDR Test

OTDR testing shall be conducted by Design-Builder after successful completion of the power meter test.

OTDR tests shall be performed in accordance with EIA/TIA-455-8 for all fibers, including new fibers, dark fibers, and existing fibers in splice enclosures that Design-Builder works in. Design-Builder shall test each fiber in both directions at 1310 nm and 1550 nm using a launch cable of a length recommended by the OTDR manufacturer.

Design-Builder shall use the OTDR Test Form provided at:

https://azdot.gov/business/engineering-and-construction/its-references and submit a complete and organized set of forms in electronic PDF format to ADOT.

Design-Builder shall submit OTDR traces which clearly annotate the location of each loss event and identify the allowable loss and measured loss.

Design-Builder shall coordinate with ADOT to install the SFP module and fiber optic patch cable and reconfigure the existing switches to accommodate the new fiber optic communications channels being established for this Project.

The fiber patch panel shall be rack mounted at a location designated ADOT. Cables shall be routed to the panel to prevent damage. Design-Builder shall install ultra-polished LC connectors with metal inserts in a composite housing on all 144 fibers and connect fibers to the panel in the fiber order. The LC connectors for the cable may be fusion pre-polished pigtails or hot melt field- polished connectors. No dry crimp connectors will be accepted.

Minimum qualifications for Design-Builder personnel performing installation and testing of the Ethernet Switches shall be:

(i) Three years' experience in installation, testing and maintenance of Ethernet network equipment.

(ii) Performed two installations where Ethernet Switches were deployed and the network has remained in continuous satisfactory operation for at least two years.

Design-Builder shall provide documentation indicating the names of the individuals performing the work, company they work for, contact information, relevant experience and the amount of time spent on each project, and any other supporting information to ADOT for approval at least 60 Days prior to the start of Ethernet switch installation.

Design-Builder shall request the IP address, VLANs, host name, and other configuration settings from ADOT at least 30 Days prior to installing the Ethernet Switches. The host name shall include the cabinet ID number, device type (DMS, CCTV, Ramp Meter), and location description.

Ethernet switches shall be physically labeled with the IP address, device type (DMS, CCTV, Ramp Meter), and location description.

Ethernet switches shall be mounted vertically, in the middle of the DIN rail. The power supply shall be mounted to the left of the Ethernet switch leaving space for air circulation.

Wires and cables shall be neatly installed and secured using common practices and standards. Design-Builder shall provide service loops at connection points. Components shall be installed in a manner where parts are readily accessible for inspection and maintenance.

Section 743 Control Cabinet Assemblies and Foundation

743-1 Description

The work under this item includes furnishing and installing control cabinets, as shown on the Plans and in the requirements in this TPA 738-1.

The work under these items includes furnishing and installing control cabinet foundations, as shown on the plans and in this TPA 738-1.

The work under this item includes furnishing and installing transformer cabinet foundations, as shown on the plans and in this TPA 738-1.

743-2 Materials

The ITS cabinets shall be the type indicated on the RFC Plans. Overall appearance and dimensions shall be as shown in the ITS Standard Drawings unless otherwise specified.

Design-Builder shall provide complete wiring diagrams and schematics for ITS cabinet assemblies for ADOT testing. The diagram shall show the specific loop detector field wire terminals for each loop detector. An electronic copy and one set of 11" x 17" prints shall be provided with each ITS cabinet assembly. The wiring diagram shall illustrate circuits and components in detail. Components shall be identified by name or number so as to be clearly noted in the drawings. Material submittals shall conform to the general requirements of this TPA 738-1 and TP Section 113 (*Submittal Management*).

743-2.01 Standard Equipment

ITS Cabinets Assemblies shall be furnished with the following items.

(A) General

Bolts, nuts, washers, screws, hinges, and hinge pins shall be stainless steel, unless otherwise specified.

Units of equipment shall be enclosed in a sheet metal case with a protective finish. The case shall be designed to provide convenient access to the entire interior assembly and permit the removal of printed circuit boards or modules without the use of special tools.

Module and printed circuit assemblies shall incorporate plug-in techniques and be easily replaceable. A guide or track shall be provided for each module and assembly. Assemblies shall be mechanically secured so as to retain the assemblies in their proper position under conditions of shock and vibration when the unit is mounted in a roadside cabinet.

Assemblies shall be provided with two guides for each plug-in printed circuit board. The guides shall extend to within 0.75 inch from the face of either the socket or connector. Connectors and printed circuit cards shall be keyed to prevent accidental insertion of the wrong connector or card.

The manufacturer's model number, serial number, functional variation circuit issue or revision number, and date of shipment (month and year) shall appear in an easily visible location on each equipment unit and module supplied.

Units having the same model number shall be electrically and mechanically interchangeable.

(B) Cabinet Housing

Cabinet housings shall be ventilated NEMA 3 weather resistant with the top of the enclosure crowned, to prevent standing water. Overall appearance and dimensions shall be as shown on the RFC Plans and conform to the ITS Standard Drawings. The outside surface of the cabinet shall have a smooth, uniform, natural, unpainted aluminum finish.

The enclosure, doors, two lifting eyes, gasket channels and supports welded to the enclosure and doors shall be fabricated of 0.125-inch minimum thickness 5052-H32 sheet aluminum. Bolted-on supports shall be either the same material and thickness as the enclosure, or shall be 0.105-inch thick (minimum) steel. The side panels and filter shell shall be fabricated of 0.080- inch minimum thickness sheet aluminum.

Each cabinet shall be provided with two lifting eyes. Each lifting eye opening shall have a minimum diameter of 0.75 inch. Each lifting eye shall be able to support a load of 1,000 pounds.

Exterior seams for the enclosure and doors shall be continuously welded. Welds shall be neatly formed and free of cracks, blow holes, and other irregularities. Edges shall be filed to a minimum radius of 0.03125 inch. Exterior cabinet welds shall be accomplished by the gas Tungsten arc Tungsten Inert Gas (TIG) process only. For the TIG process, the ER5356 (AIMg-5) 5% Magnesium, Aluminum alloy welding rod, conforming to AWS A5.10 requirements shall be used for welding on aluminum. Procedures, welders, and welding operators shall conform to the requirements and practices in AWS B3.0 and C5.6 for aluminum. Internal cabinet welds shall be done by either the gas metal arc Metal Inert Gas MIG (also known as Gas Metal Arc Welding (GMAW) or the gas tungsten arc TIG process.

An anodic coating shall be applied to aluminum surfaces after the surface has been cleaned and etched. The cleaning and etching procedure shall be to immerse in inhibited alkaline cleaner at 159.8 degrees Fahrenheit for 5 minutes (in a mix of 6 to 8 ounces per gallon to distilled water) then rinsed in cold water and etched in a sodium solution at 150.8 degrees Fahrenheit for 5 minutes (0.5 ounce sodium fluoride, plus five ounces of sodium hydroxide mix per gallon to distilled water). The surface shall again be rinsed in cold water and then degreased in a 50%, by volume, nitric acid solution at 68 degrees Fahrenheit for 2 minutes. Finally, the surface shall be rinsed in cold water.

The anodic coating shall conform to MIL-A-8625F (Anodic Coatings for Aluminum and Aluminum Alloys) for Type II, Class I Coating except the outer housing surface coating shall have a 0.0007- inch minimum thickness and a 0.952 ounces per square inch minimum coating weight. The anodic coating shall be sealed in a 5% aqueous solution of nickel acetate (pH 5.0 to 6.5) for 15 minutes at 210.2 degrees Fahrenheit.

The enclosure door frames shall be double-flanged on all four sides, and shall have strikers to hold tension on and form a firm seal between the door gasket and the frame. The dimension between the door edge and the enclosure external surface when the door is closed and locked shall be 0.156 + 0.08 inch.

Gaskets shall be provided on door openings and shall be dust-tight. Gaskets shall be 0.25-inch minimum thickness, closed-cell neoprene or silicone, and shall be permanently bonded to the metal. If neoprene is used, the mating surface of the gasket shall be covered with a silicone lubricant to prevent sticking to the mating metal surface. A gasket top channel shall be provided to support the top gasket on the door to prevent gasket gravitational fatigue.

No bolts shall protrude through the cabinet top or walls. Inside and outside edges of the cabinet shall be free of burrs.

Cabinet housing shall have single front and rear doors, each equipped with a lock. The handles shall have provisions for padlocking in the closed position. Each handle shall be 0.75-inch minimum diameter stainless steel with a minimum 0.50-inch shank. The padlocking attachment shall be placed at 4 inches from the handle shank center to clear the lock and key. An additional 4-inch minimum gripping length shall be provided.

The latching mechanism shall be a 3-point draw-roller type. The center catches and push-rods shall be cadmium plated, Type II Class 1. Rollers shall have a minimum diameter of 0.75 inch with nylon wheels and steel ball bearings. The push rods shall be turned edgewise at the outward supports and have a cross-section of 0.25-inch thick by 0.75 inch wide, minimum. The center catch shall be fabricated from 0.140-inch steel, minimum.

When the door is closed and latched, the door shall be locked. The lock and lock support shall be rigidly mounted on the door. In the locked position, the bolt throw shall extend a minimum of 0.25 inch into the latch-cam area. A seal shall be provided to prevent dust or water entry through the lock opening.

Locks shall be consistent and compatible with current ADOT ITS cabinet maintenance keys. The key shall be removable only in the locked position. One key shall be furnished with each lock. All parts of the locking mechanism shall be stainless steel. Locks shall have rectangular spring- loaded bolts. Bolts shall have a 0.281-inch throw and shall be 0.75 inches wide by 0.75 inches thick (tolerance is +/- 0.035 inches).

The rear door shall be provided with louvered vents. The louvered vent depth shall be a maximum of 0.25 inch. A removable, reusable air filter shall be housed behind the door vents. The filter shall cover the vent opening area. A filter shell that fits over the filter and provides mechanical support for the filter shall be furnished. The shell shall be louvered to direct the incoming air downward. The shell sides and top shall be bent a minimum of 0.25 inch to contain the filter. The filter resident in its shell shall be held firmly in place with a bottom bracket and a spring loaded upper clamp. No incoming air shall bypass the filter. The bottom filter bracket shall be formed into a waterproof sump with drain holes to the outside of the housing. The filter shall be 16 inches wide x 12 inches high x 0.875-inch thick, and compatible with the cabinet the filter is serving. The intake (including filter with shell) and exhaust areas shall pass a minimum of 100 cubic feet of air per minute.

Two-bolts per leaf hinge shall be provided to bolt the enclosure to the door. The housing shall have 4 hinges. Each hinge shall be 3.5-inch minimum length and have a fixed pin. The pin ends shall be welded to the hinge and ground smooth. The pins and bolts shall be covered by the door edge and not accessible when the door is closed. Front and rear doors shall be provided with catches to hold the doors open at both 90 and 180 ± 10 degrees. The catch minimum diameter shall be either 0.375 inch for plated steel or aluminum rods or 0.25 inch for stainless steel. The catches shall hold the door open at 90 degrees in a 60 mile per hour wind acting at an angle perpendicular to the plane of the door.

Design-Builder shall furnish and install pressure-sensitive, permanent identification decals on load center cabinets, as shown in the ITS Standard Drawings. The decals shall be 3- inch tall, Series C, Gothic letters and shall be top-grade, glass-beaded, reflective black letters on a silver or chrome background.

(C) Cage Support Assembly

A standard EIA 19-inch rack cage shall be installed inside the housing for mounting of the controller unit and cabinet accessories.

The EIA rack portion of the cage shall consist of two pairs of continuous, adjustable equipment mounting angles. The angle nominal thickness shall be either 0.1345-inch plated steel or 0.105 stainless steel. The angles shall be tapped with holes having 10-32 threads with EIA universal spacing.

The angle shall comply with standard EIA RS-310-D and shall be supported at the top and bottom by either welded or bolted support angles to form a cage.

The cage bottom support mounting angles shall be provided on either side, level with the bottom edge of the door opening for horizontal support and bolt attachment. Side cage supports shall be provided for the upper cage bolt attachments. Spacer brackets between the side cage supports and the cage shall be either 0.188-inch aluminum or 0.105-inch steel.

Clearance between angles for mounting assemblies shall be 17.75 inches.

Two steel supporting angles extending from the front to the back rails shall be supplied to support the controller unit. The angles shall be designed to support a minimum of 50 pounds each. The horizontal side of each angle shall be a minimum 3 inches wide. The angles shall be vertically adjustable.

As part of the controller support brackets, a 1.5-inch rack mounted drawer shall be provided within a 1.75-inch space. The rack mounted drawer shall have a hinged top cover. The drawer shall store documents and miscellaneous equipment up to 50 pounds in weight when extended out from the cage. When fully extended, the drawer shall lock in place and shall require manual release of spring pins on each of two sides to allow the drawer to be retracted into the cage.

The cage shall be bolted to the cabinet at four points on both top and bottom, using the housing cage supports and associated spacer brackets, and shall be centered within the cabinet.

Aluminum side panels shall be provided in the cabinet as shown in the ADOT ITS Standard Drawings. They shall be bolted to the support cage.

(D) Electrical Requirements

Circuits shall be functionally operational with regard to the following parameters:

Power source frequency:	60 ± 3 Hz
Applied Line Voltage:	90 to 135 VAC, single-phase
Ambient temperature:	-35 to +165 degrees Fahrenheit
Humidity:	5 to 95%, non-condensing

The surfaces of circuit boards shall be sealed to protect against moisture.

Circuits shall commence operation at or below 90 VAC, as the applied voltage is increased at a rate of 2 ± 0.5 VAC per second.

Equipment shall be unaffected by transient voltages normally experienced in commercial power lines.

Equipment shall be capable of normal operation following opening and closing of contacts in series with the applied voltage at a rate of 30 openings and closings per minute for a period of 2 minutes.

Live electrical circuitry shall be isolated by a dead front panel fabricated from 14-gage sheet steel. The dead front panels shall be hinged on one side and securely fastened on the other with bolts. Switches, breakers and other components shall have openings to operate from the front of the panel.

(E) Cabinet Wiring

Conductors used in cabinet wiring shall terminate with properly sized non-insulated (if used for DC logic only) or clear insulated spring-spade type terminals except when soldered to a through- panel solder lug on the rear side of the terminal block or as specified otherwise. Crimp-style connectors shall be applied with a power tool that prevents opening of the handles until the crimp is completed.

Cable connectors shall have cable hoods or shields and strain relief clamps.

Pin and socket connectors shall use identical contact insertion tools, contact extraction tools, and contact crimping tools. Pin diameter shall be 0.062 inches.

Conductors between the service terminal AC- and equipment ground, and their associated bus, the equipment ground bus conductor to Power Distribution Assembly, and cage rail, AC- Bus to Power Distribution Assembly shall be 8 AWG or larger.

Conductors, unless otherwise specified, shall be 22 AWG or larger, with a minimum of 19 copper strands. Conductors shall conform to Military Specification MIL-W-16878D, Type B, or better. The insulation shall have a minimum thickness of 10 mils and shall be nylon jacketed polyvinyl chloride, except that conductors 14 AWG and larger may have Type THHN insulation (without nylon jacket), and shall be stranded with minimum of seven copper strands.

Field conductors shall be tagged in the control cabinet in accordance with this TPA 738-1. Conductors shall conform to the following color-code requirements:

(1) The grounded conductors of AC circuits shall be identified by a solid white or solid gray color;

(2) The equipment grounding conductors shall be identified by a solid green color or by a continuous green color with one or more yellow stripes;

(3) The DC logic ground conductors shall be identified by a continuous white color with a red stripe;

(4) The ungrounded AC+ conductors shall be identified by a solid black or continuous black with colored stripe; and

(5) The logic ungrounded conductors shall be identified by a color not specified above.

Wiring harnesses shall be routed to minimize crosstalk and electrical interference.

The C1 connector wire harness shall be a minimum of 4 feet in length and shall have adequate length to allow the C1P connector to properly connect the controller unit to the cabinet while the unit is mounted in the cabinet and while the unit is sitting on the cabinet drawer.

Wiring containing AC shall be routed and bundled separately or shielded separately from logic voltage control circuits.

Cabling shall be routed to prevent conductors from being in contact with metal edges.

Cabling shall be arranged so that removable assemblies can be removed without disturbing conductors not associated with that assembly.

The DC logic ground shall be electrically isolated within the cabinet from the AC neutral and the equipment ground by at least 500 Megohms at 250 VDC.

The cabinet power supply DC ground shall be connected to the DC logic ground bus using a No. 14 AWG or larger stranded copper wire.

With the power line surge protector disconnected, the AC neutral and the equipment ground shall be electrically isolated by at least 500 Megohms at 250 VDC.

(F) Circuit Breakers

Circuit breakers shall be trip-free type with medium trip delay characteristics. Multi-pole circuit breakers shall be the common-trip type. Circuit breakers shall be UL 489 approved. The trip and frame size shall be plainly marked on the breaker by the manufacturer, and the Amperes rating shall be marked and visible from the front of the breaker. Breakers shall be quick-make, quick-break on either manual or automatic operation. Contacts shall be silver alloy enclosed in an arc quenching chamber. Overload tripping shall not be influenced by an ambient temperature range of from 0.4 to 122 degrees Fahrenheit. Minimum interrupting capacity shall be 5,000 Amperes RMS when the breaker is secondary to a UL approved fuse or primary circuit breaker, and both breakers in concert provide the rated capacity. For circuit breakers 80 Amperes and above, the minimum interrupting capacity shall be 10,000 Amperes RMS.

(G) Fuses

Fuses shall be 3AG Slow Blow type, and reside in a fuse holder. Fuse size rating shall be labeled on the chassis or beside the holder. Fuses shall be easily accessible and removable without the use of tools.

(H) Power Line Surge Protector

A power line surge protector shall be furnished and installed as part of the cabinet. The power line surge protector shall consist of a hardware base and replaceable protection module with LED failure indicators, conforming to the following requirements:

No.	Item	Requirement
1.	Operating Voltage	120 VAC
2.	Clamping Voltage	340 VAC
3.	Operating Current	15 Amps
4.	Peak Surge Current	32.5 kA/Phase, 45.5 kA/Total
5.	Operating Frequency	60 ± 3 Hz
6.	EMI Attenuation	50 dB Typ.
7.	Modes of Protection Status Indicators Temperature Range Maximum Dimensions	L-N, L-G, N-G Power On, MOVs Functional -40 to + 185 degrees Fahrenheit 3.125 inches wide x 7.125 inches long x 3.5 inches high

Typical radio interference noise suppression shall be 10 dB at 10kHz, 50 dB at 100kHz, and 90 dB at 1 MHz.

Power line surge protection shall be provided to enable equipment to withstand (non-disruptive) and operate normally following the discharge of a 25 microfarad capacitor charged to ± 2,000 Volts, applied directly across the

incoming AC line at a rate of once every 10 seconds, for a maximum of 50 occurrences, with the equipment operating between 27 to 109 degrees Fahrenheit and at 108 to 132 VAC.

Equipment shall withstand (non-disruptive) and operate normally when one discharge pulse of ± 300 Volts is synchronously added to its incoming AC power line and moved uniformly over the full wave across 360 degrees or stay at any point of line cycle once every second, with the equipment operating between 27 to 109 degrees Fahrenheit and at 108 to 132 VAC. Peak noise power shall be 5 kilowatts with a pulse rise time of 500 nanoseconds.

(I) DIN Rail Shelf

A 4U DIN rail shelf shall be included and capable of supporting power supplies, an Ethernet Switch, a patch and splice module, power supplies, and other cabinet accessories.

(J) Ventilation Fan

Cabinets shall be equipped with two electric fans with ball or roller bearings and each with capacity of 100 cubic feet of free air flow per minute. Fans shall be mounted within the interior of the cabinet and vented.

Fans shall be thermostatically controlled and shall be manually adjustable to turn on between 32- and 140-degrees Fahrenheit, with a differential between automatic turn on and off of not more than 20 degrees Fahrenheit. It shall be possible to manually adjust the on/off temperature set point in 20-degree Fahrenheit increments. Each fan circuit shall be protected at 125% of the fan motor current rating.

(K) Lighting

The cabinets shall contain two LED light fixtures. The fixtures shall be mounted on the inside top of the cabinet near the front edge and rear edge of the roof so that the front or rear of the control equipment will be illuminated when the corresponding door is open. A door-actuated, refrigerator-type, normally-closed, durable push-button type switch shall automatically turn the appropriate light fixture on and off when the front or rear door is opened and closed.

743-2.02 Cabinet Accessories

ITS cabinet assemblies shall be provided with the cabinet accessories as required.

(A) Model 2070 Controllers

Controllers shall be Intelight model 2070LC, model number INT YCT-2070LC(S), and shall include Intelight Maxtime ramp metering software and licensing, model INT YSW-RAMPMT, factory-loaded onto the controller. Each controller shall also be provided with one Intelight Maxview central system license, model number INT YSW-MV-LICENSE. The Maxview licenses shall be provided to ADOT in the form of one license key from Intelight for the project by email to systemstechnologygroup@azdot.gov. Design-Builder shall submit the Purchase Order (PO) to ADOT indication the location for each Intelight controller.

(B) Inductive Loop Detector Cards

Detector cards shall provide two inductive loop detector channels for detecting vehicles and actuating Model 2070 controllers. Control buttons and channel indicators shall be mounted on the front panel. Detector cards shall have a front panel indicator to provide visual indication of detection strength for each channel. The detector card front panel shall be provided with a handle to facilitate insertion and removal. Detector cards of the same type shall be interchangeable. Detector cards shall be in full compliance with the environmental requirements of the most current NEMA standard.

Indicator lights and character displays shall have a 45-degree cone of visibility from an axis perpendicular to the front panel. They shall be readily visible at a radius of up to 4 feet within the cone of visibility when they are subjected to 9,000 foot-candles of white light (equivalent to bright sunlight) at 45 degrees to the front panel. The front panel shall provide a separate indicator for Detect and Fault for each channel.

Detector cards shall mate and be fully functional with the input file via a 44 terminal, double row, edge connector having terminal spacing of 0.156 inch.

Detector cards shall draw no more than 100 mA from the + 24 ± 6 VDC cabinet power supply and shall be insensitive to 700 mV RMS ripple on the incoming + 24 VDC line.

Detector card outputs shall be opto-isolated, open collector, NPN transistor and shall sink up to 50 mA at 30 VDC. The output shall be compatible with the controller unit's inputs.

Component parts and test points shall be clearly identified by permanent marking of circuit references on the printed circuit board.

Each loop input channel shall be galvanically isolated, through the use of separate isolation- transformers, from each other and the internal circuitry of the detector.

Detector channels shall function properly with an external surge protector installed on the loop circuit.

Internal surge protection, provided on loop detector input terminals, shall enable the detector to withstand a discharge of a 10 microfarad capacitor charged to ± 1,000 Volts directly across the loop detector input pins with no loop load present and enable the detector to withstand a discharge of a 10 microfarad capacitor charged to ± 2,000 Volts directly across either the detector input pins or from loop input pins to equipment ground. The detector input pins shall have a dummy resistive load attached equal to 5.0 Ohms for test purposes.

Optically-isolated solid state output devices shall be rated to hold off 50 VDC at 20 mA ON current with a maximum 1.5-Volt drop across the output terminals. Isolation shall be at least 1,000 VAC RMS.

Detector cards shall have a remote reset circuit which, when activated by an external ground level signal greater than 15 microseconds, shall cause presence detections to be reset.

Detector channels shall be sequentially scanned to eliminate crosstalk between loops connected to the same unit.

Detector channels shall automatically self-tune to any loop system inductance from 20 to 500 microhenries within 1 second after application or interruption of voltage.

At a minimum, each channel shall include the modes "PRESENCE," "PULSE," and "OFF". "OFF" shall disable the output and indicator, and shall disable the channel excitation circuit to assist in determining the offending channel when crosstalk is present.

"PULSE" shall provide a single 125 ± 25 ms output pulse in response to all types of licensed motor vehicles when traveling over a 6 x 6-foot rectangular loop at 10 miles per hour and shall detect successive vehicles traveling over the same rectangular loop at speeds of 10 to 60 miles per hour with a minimum 1-second headway. Selection of pulse mode shall clear the presence indication on the associated channel.

"PRESENSE" shall output a pulse that is directly related to the duration that a vehicle is detected by the loop system. In presence mode, the detector channel shall be capable of detecting a motorcycle and hold the output for at least 4 minutes when the motorcycle is stopped over one loop of a series-connected loop system having four 6 x 6-foot loops with 1,000 feet of lead-in and a Q factor greater than 5. The detector channel shall hold the output for at least 15 minutes when the test is repeated using a standard automobile on the same loop system configuration.

The time delay between a vehicle entering the detection zone and the occurrence of the detection output shall be 10 ms or less at the midpoint sensitivity setting. The time delay between a vehicle leaving the detection zone and the detection output turning off shall be 10 ms or less at the midpoint sensitivity setting.

For test purposes, a negative inductance change shall be applied for a minimum of 100 ms and a maximum of 600 ms. When the difference in the durations of the inductance change and the corresponding ground true output are averaged over 10 trials, the average difference (algebraic) shall not exceed the specified threshold.

To test for vehicle presence, the delay time between when an inductance change is applied and the time it takes for the output to respond, averaged over 10 trials, shall not exceed the specified threshold.

To test for vehicle absence, the delay time between when an inductance change is removed and the time it takes for the output to respond, averaged over 10 trials, shall not exceed the specified threshold.

To test recovery time, the above two tests shall be repeated in sequence 10 times with a delay of not more than 100 ms between the beginning of each two-stage sequence.

Detector channels shall have a range of selectable sensitivities that ensures detection of all types of licensed motor vehicles (including motorcycles) without detecting moving or stopped vehicles further than 36 inches away from a three-turn, 6 x 6-foot loop with 50 feet, 500 feet, and 1,000 feet of lead-in cable.

Detector channels shall be continuously monitored for open circuit, short circuit, and changes in inductance indicating a loop fault condition. A loop fault of one channel shall have no adverse effect on the operation of the other channel. Specific fault conditions shall be indicated by a unique sequence of flashes by the fault indicator light. The fault indicator light shall display a previous fault condition. Detector channels shall re-tune instantly and resume detection following a momentary open circuit condition. During an open circuit condition, the channel shall provide a continuous output that is not resettable as long as the open circuit exists, except when the channel is off.

(C) Loop Detector Surge Protectors

Loop detector surge protectors shall be provided in existing and new cabinets with new loop terminations. Loop detector surge protectors shall have three spade lugs for connection to a terminal strip, with 7/16-inch spacing, and conform to the following minimum performance requirements:

(1) Peak Surge Current:

(i) 8 x 20 µsec Differential Mode: 400 A

(ii) 8 x 20 µsec Common Mode: 1,000 A

(2) Life Expectancy (Occurrences):

(i) 8 x 20 µsec (200A): 500

(ii) 10 x 700 µsec (100A): 100

(3) Response Time: Less than 5 ns

(4) Input Capacitance: 35 pF

(5) Clamping Voltage (After Breakover): 150 V

(6) Operating Temperature: Up to 185 degrees Fahrenheit

(D) Power Distribution Assembly No.

The Power Distribution Assembly No. 4 (PDA4) shall perform the following functions:

(1) Receive the 120 VAC power source and distribute it to the various cabinet functions through separate circuit breakers.

(2) Provide, via the Model 206 Power Supply Module, a + 24 VDC power source for the operation of various cabinet accessories.

(3) Provide, via a Model 204 flasher unit, a means of flashing external signal indications. Provide a switch pack load bay with inputs from the controller and outputs to field circuits.

The PDA4 shall include four 15 Amp circuit breakers. The rating of each breaker shall be shown on the face of the breaker or handle. Breaker function (EQPT, CCTV, SIG GATES, REC) shall be labeled on the front panel as shown on the ITS Standard Drawings.

The PDA4 shall have three duplex receptacles. Each receptacle shall accept both standard two- prong non-grounded and standard three-prong grounded plugs.

Receptacle No. 1 (REC1) and receptacle No. 2 (REC2) shall have ground-fault circuit interruption, as defined in the NEC. Circuit interruption shall occur in the presence of 6 mA or more ground-fault current and shall not occur on less than 4 mA ground-fault current.

The 120 VAC supplies to the two outlets of receptacle No. 3 (REC3A and REC3B) shall be separate. The rear panel of the PDA shall be etched to label REC3A as “CONTROLLER” and REC3B as “AUX”.

Terminal blocks shall have 10-32 thread terminal screws.

The PDA4 shall provide for the mounting and connection of four Model 200 Switch Packs. The PDA4 shall have a maximum depth of 10.5-inches.

(E) Model 206 Power Supply Module

The Model 206 Power Supply Module shall supply + 24 VDC to the input files and other devices in the cabinet. It shall be furnished as a part of the PDA4.

The power supply shall be of ferro-resonant design, having no active components, and conforming to the following requirements:

(1) Line regulation shall be 2% from 90 to 135 VAC at 60 Hz, plus an additional 1.6% for each 1.0% of frequency deviation.

(2) Load regulation shall be 5% from 1 to 5 Amperes, with a maximum temperature rise of 86 degrees Fahrenheit, above ambient.

(3) Design voltage shall be + 24 ± 0.5 VDC at full load, 86 degrees Fahrenheit, 115 VAC incoming voltage.

(4) Full load current shall be 5 Amperes, minimum.

(5) Ripple noise shall be no greater than 2 Volts peak-to-peak and 500 mV RMS at full load. Power source shall be 90 to 135 VAC.

(6) Efficiency, at full load, shall be 80%, minimum. Circuit capacitors shall be rated for 40 Volts, minimum.

The front panel shall include AC and DC fuses, power ON light, and test points for monitoring the output voltages.

The assembly, including terminals, shall be protected to prevent accidental contact with energized parts.

The module chassis shall be vented. Its top and sides shall be open. When resident in the Power Distribution Assembly, the module shall be held firmly in place by a stud screw, an assembly connector support panel, and a wing-nut.

Two 0.5 Ohm, 10-Watt (minimum) wire-wound power resistors, each with a 0.2 microhenry maximum inductance, shall be provided; one on the AC+ power line and one on the AC- line.

Three MOV surge arrestors rated for 20 Joules minimum, shall be supplied between AC+ and equipment ground, AC- and equipment ground, and between AC+ and AC-. A 0.68-microFarad capacitor shall be placed across AC+ and AC- between the two power resistors and the MOVs.

(F) Input File

Design-Builder shall furnish and install input files for cabinets used for detection applications, as shown in the ADOT ITS Standard Drawings. The input file racks shall provide card slots for the loop detector cards. Each input file rack shall have a maximum depth of 8.5 inches and shall mate with and support up to 14 two-channel detector sensor or isolator cards. The file shall provide a PCB 22/44S connector centered vertically for each two-channel card slot. The input file shall be provided with labels identifying the detectors associated with each slot. Terminal blocks shall be provided with a terminal screw size of 8-32 with locking star washers.

(G) Switch Packs & Flasher Units

The unit chassis shall be made of metal suitable to meet rigid support and meet the ambient temperature and humidity requirements in Section 743-2.01(D) of this TPA 738-1.

The unit control circuitry and switches shall be readily accessible using either a screwdriver or wrench. Only one type of screw head end (Slotted or Phillips) shall be used.

The unit shall be constructed so no live voltage is exposed. A handle shall be attached to the front panel for insertion or removal from the unit mating connector.

The unit shall be constructed so its lower surface is no more than 2.06 inches below the centerline of the connector and no part shall extend more than 0.9 inches to the left or 1.1 inches to the right of the connector centerline.

Continuous edge guides shall be provided on the unit.

Each switch shall be capable of switching any current from 0.050 to 10.0 Amperes (AC) load with a power factor of 0.85 or higher.

Each switch shall be designed for a minimum of 300 Million operations while switching a tungsten load of 1,000 Watts at 158 degrees Fahrenheit. Switch isolation between DC input and AC output circuit shall be at least 10,000 Mega Ohms at 2,000 VDC.

Each switch shall turn ON within ± 5 degrees of the zero-voltage point of the AC sinusoidal line, and shall turn OFF within ± 5 degrees of the zero-current point of the alternating current sinusoidal line. After power restoration, the zero voltage turn ON may be within ± 10 degrees of the zero voltage point only during the first half cycle of line voltage during which an input signal is applied. Turn ON and OFF shall be within 8.33 ms following application or removal of the logic signal, respectively.

(1) Model 200 Switch Packs

The Model 200 Switch Pack unit shall be a modular plug-in device containing three solid-state switches. Each switch shall open or close a connection between applied power and external load.

A Ground True Controller Unit Input (0 to 6 VDC) shall cause the switch to energize and a Ground False (16 VDC or more) shall cause it to de-energize. State transition shall occur between 6 and 16 VDC. The input shall not sink more than 20 milliamps or be subjected to more than 30 VDC. The input shall have reverse polarity protection.

With all switches on, the unit shall not draw more than 60 milliamps at +16 VDC or more from the +24 VDC cabinet supply.

Each switch shall have an OFF state dV/dt rating of at least 100 Volts per microsecond. Each switch shall be isolated so that line transients or switch failure shall not alter the controller unit.

The unit front panel shall have an indicator on the input to each switch. The indicator shall be labeled or color-coded “Red”-top switch, “Yellow”-middle switch, and “Green”-bottom switch. The middle switch indicator shall be vertically centered on the unit front panel with the other indicators positioned 1 inch above and below.

The resistance between the AC+ input terminal and the AC+ output terminal of each switch shall be a minimum of 15 kiloohms when the switch is in the open state. When the switch is in off state, the output current through the load shall not exceed 10 milliamps, peak.

(2) Model 204 Flasher Unit

The Model 204 Flasher Unit shall be a modular plug-in device containing a flasher control circuit and two solid-state switches. The unit's function is to alternatively open and close connections between applied power and external load.

The unit shall generate its own internal DC power from the AC line.

The unit shall commence flashing operation when AC power is applied providing 50 to 60 flashes per minute, per switch, with a 50% duty cycle.

Each switch shall have an OFF state dV/dt rating of at least 200 Volts per microsecond.

An indicator showing the switch's output state shall be provided. The two indicators shall be centered with 1 inch minimum spacing.

Each circuit shall be designed to operate in an open-circuit condition without load for 10 years minimum.

A surge arrestor shall be provided between AC (pin 11) and Flasher Output (pins 7 & 8). The arrestor shall meet the following requirements:

Recurrent Peak Voltage	212 Volts
Maximum Energy Rating	50 Joules
Average Power Dissipation	0.85 Watts

(H) Remote Management Power Strip

A remote management power strip shall be included in the cabinets.

The remote management power strip shall be a non-surge protected power strip rated for an operating temperature range of -34 to 74 degrees Celsius (-30 to165 degrees Fahrenheit) and an operating current of 15 Amps. The power strip shall have a minimum of 4 NEMA 5-20R power outlets, and be rack-mounted with a recess for plug and cord clearance. The power strip shall provide IP network accessibility and support NTP, SNMP, and SMTP protocols. A web interface shall provide status and control of each of the receptacles separately. The system shall be capable of providing email alerts, event log, and scheduling with momentary power cycling.

(I) Detection & Ramp Meter Cabinets

The Detection & Ramp Meter Cabinets shall be furnished and installed in accordance with the ITS Standard Drawings and this TPA 738-1. At location where the number of lanes exceed that as shown in the ITS Standard Drawings, Design-Builder shall coordinate with the cabinet manufacturer to ensure the cabinets are pre-wired to accommodate loops and detectors for all lanes of traffic.

Detection and Ramp Meter Cabinets shall be provided with the following cabinet accessories:

(1) Model 2070 Controller;

(2) Inductive Loop Detector Cards Loop Detector Surge Protector;

(3) Power Distribution Assembly (PDA) No. 4;

(4) Model 206 Power Supply Module;

(5) Input Files "I" and "J" Model 200 Switch Packs; and

(6) Model 204 Flasher Units.

Additional cabinet accessories shall be furnished and installed when specified on the project plans which include a remote management power strip.

Detection and Ramp Meter Cabinets shall be capable of operating without a conflict monitor.

Locking star washers shall be included on each terminal block mounting screw. Each terminal of each double-sided terminal block shall contain two terminal screws with a removable shorting bar between the terminal screws. The shorting bar shall be suitable for 22 AWG through 14 AWG wire, and PV 18-6F-M lugs. A removable shorting bar shall be installed between the terminal screws. The terminal number assigned to each terminal shall be clearly and permanently indicated on a marking strip placed on or adjacent to the terminal block.

The main circuit breaker box shall contain the following:

(1) 120 VAC, 30 Ampere, socket-mounted, double-pole, single-throw heavy duty relay and socket to serve as the signal power interrupt relay;

(2) 30 Ampere single-pole breaker; and

(3) Power line surge protection device.

The circuit breaker box shall have nominal dimensions of 10 inches high x 8 inches wide x 4 inches deep. The main circuit breaker shall accommodate service wire as large as No. 2 AWG. The electrical service conductors shall be contained in a flexible conduit as described in the NEC. This conduit shall enclose the service from the entrance conduit to the circuit breaker box. It shall be long enough to be dressed neatly and attached to the side panel.

The flexible conduit shall be equipped with a coupling and a reducer, if necessary, to enable its attachment to the service entrance conduit. Conduit shall extend approximately 6 inches into the service entrance conduit.

(J) CCTV Cabinets

CCTV Cabinets shall be furnished with pole-mounting hardware. CCTV cabinets shall be provided with one exhaust fan. CCTV Cabinet shall be provided with a power distribution panel including the following:

(1) 30 Ampere main circuit breaker;

(2) 20 Ampere circuit breaker for the cabinet equipment receptacle;

(3) 20 Ampere circuit breakers for GFCI convenience receptacle;

(4) One standard three-wire 20 Ampere duplex outlet;

(5) One GFCI three-wire 20 Ampere duplex outlet; and

(6) Power line surge protection device.

Additional cabinet accessories shall be furnished and installed when specified on the project plans which include a remote management power strip.

743-3 Construction Requirements

Design-Builder shall install wire, cable, connectors, and other incidental materials necessary to connect equipment to be incorporated in, or connected to the work through the foundation, to the cabinet, to form a fully functional system which meets the requirements of Subsection 731-3.01 of the ADOT *Standard Specifications*. Installation shall include:

(1) Grounding the cabinet to the ground system, using bare, solid 8 AWG soft-drawn copper wire;

(2) Grounding the transformer, if it is on the same foundation as the control cabinet; Connecting the cabinet to the power source;

(3) Completing fiber optic splices and terminations within the cabinet, as required; and

(4) Furnishing and installing necessary mounting hardware (pole-mount, if applicable to specific cabinet type and location).

Design-Builder shall supply Certificates of Compliance for each ITS cabinet and each accessory within a control cabinet at the time of delivery of the ITS cabinet assembly for the following:

(1) Acceptance testing of each supplied component;

(2) Physical and functional testing of each module;

(3) A minimum of 100-hour burn-in of each module; and

(4) A minimum of 24 hours of operation of each cabinet.

743-3.01 Cabinet Foundations

Foundations shall conform to the requirements of Subsection 731-3.01 of the ADOT *Standard Specifications*. Foundations shall include conduit, conduit fittings and elbows, anchor bolts, conductors, connectors, ground rods, grounding conductors, grounding lugs, and other incidental materials necessary to connect equipment incorporated in, or connected through the foundation, to the cabinet, to form a fully functional system.

If the cabinet will be located on a slope steeper than 3:1, the foundation shall be offset from the pull box along the mainline conduit or other structure so that their locations do not lie on a line perpendicular to the roadway.

Foundations shall be monolithic with the exposed surfaces formed and finished to present a neat, smooth appearance. The bottom of each foundation shall rest on undisturbed earth and the top shall be level. Adjacent concrete maintenance pads shall also meet these requirements.

Forms for the concrete shall be rigid and securely braced in place. Templates shall be used to properly position and hold in place conduit, anchor bolts, and the ground rod. Immediately prior to pouring the concrete, both forms and the earth shall be thoroughly moistened. The concrete shall be allowed to cure at least 12 hours and shall be hardened sufficiently to prevent damage before the forms are removed. Design-Builder shall backfill and build slope in accordance with the RFC Plans and restore the landscaping in areas with no new landscaping.

Grounding shall meet the requirements of Subsection 732-3.03 of the ADOT *Standard Specifications*. Cabinet foundations shall have a copper clad steel ground rod with a minimum diameter of 5/8 inch. The ground rod shall be driven into place through a sleeve in the foundation. The ground rod shall be installed so that it extends into the surrounding undisturbed earth a minimum of 9 feet. The ground rod shall extend approximately 3 inches above the foundation. The ground rod shall be connected to the grounding system using ground clamps on the rod and an approved lug connector in the cabinet. The cabinet shall be grounded with an 8 AWG solid copper wire.

If Design-Builder prefers to use an electrolytic grounding system, it shall be 100% self- activating, sealed, and maintenance free. The electrolytic grounding system shall be UL listed with a minimum life rating of 30 years. The electrolytic grounding system shall hygroscopically extract moisture from the air to activate the electrolytic process without additions of chemicals or water. The electrolytic grounding system shall not use Hazardous Material.

Concrete shall be 3,000 pound per square inch Class S concrete conforming to the requirements of Section 1006 of the ADOT *Standard Specifications*. Anchor bolts shall conform to the requirements of Section 606-2.05 and 1004-4 of the ADOT *Standard Specifications*. Grounding conductors shall conform to the requirements of Subsection 732-2.01.

743-3.02 Cabinets

Field wires and power service cables shall be wired to the cabinets as shown in the ITS Standard Drawings and on the RFC Plans. Design-Builder shall connect the cabinet and its accessories to the various field devices to be controlled, to form a fully functional system.

Removable caps shall be placed on unused conduits within the cabinet.

Wire and cable terminations shall only be made at recessed-screw barrier type terminal blocks, unless otherwise specifically noted. No in-line or butt splices shall be made other than at terminal blocks.

Control cabinet equipment shall be mounted on the cage mounting rails as shown in the ITS Standard Drawings, unless otherwise specified.

Equipment, housings, metal conduit, and cabinets (exposed metal, non-current carrying parts) shall be grounded and bonded in accordance with Subsection 732-3.03 of the ADOT *Standard Specifications* and NEC Article 250. The cabinet's ground resistance shall be 25 Ohms or less.

Grounding conductors and bonding jumpers shall be connected by exothermic welding, UL listed pressure connectors, UL listed clamps, or other approved UL listed means. Connection devices or fittings that depend solely on soldering shall not be used. Sheet metal screws shall not be used to connect grounding conductors to enclosures.

On two-door cabinets, the DIN rail shall be attached to the vertical rails serving the "back side" of the cabinet. The "front side" of the cabinet is the side from which controller face and keyboard are viewed. On single-door cabinets, the location for mounting the DIN rail shelf will be as specified by ADOT, to meet specific site equipment space requirements.

Design-Builder shall furnish and install silicone caulking, or other sealant as approved by ADOT, around the base of the cabinet to form a watertight and dust-proof seal.

743-3.03 Cabinet Accessories

Detector cards and switch packs shall be installed in the appropriate slots in the control cabinet.

(A) Model 2070 Controllers

Design-Builder shall securely mount the controller unit in the cabinet by firmly attaching it to the cabinet rack with screws. After Design-Builder establishes communications to the controller, ADOT will configure the controller software settings. Design-Builder shall allow a minimum of 10 Days for ADOT to configure the controller software settings.

Ramp meter controllers shall be delivered to ADOT TSMO YM PM02 Basement at 2302 W Durango Street, Phoenix, Arizona 85009 for programming and testing of controllers. Design-Builder shall notify ADOT TSMO at least 2 Business Days prior to the scheduled delivery of the controllers.

(B) Inductive Loop Detector Cards

Design-Builder shall set the loop detector card to the following parameters:

Mainline Channels:

Mode: Short Presence

Frequency Level (levels 1, 2, 3, and 4 correspond to low, medium low, medium high, and high, respectively):

U:1	2U: 3	3U: 2	4U: 4	5U: 1	6U: 3	7U: 2	8U: 4
1D: 2	2D: 4	3D: 1	4D: 3	5D: 2	6D: 4	7D: 1	8D: 3

Sensitivity (set to provide the following call strengths observed under normal traffic):

No vehicle: 0

High Vehicles (Semi-truck, 4x4): 4

Mid-sized Vehicles (car, SUV, small pick-up truck): 5

Low Vehicles (sports car): 6

Entrance Ramp Channels:

Mode: Long Presence

Frequency Level (levels 1, 2, 3, and 4 correspond to low, medium low, medium high, and high, respectively):

ELI:1	ELQ: 1	ERO: 4
ELO: 2	ERI: 3	ERQ: 2

Sensitivity (set to provide the following call strengths observed under normal traffic):

No vehicle: 0

High Vehicles (Semi-truck, 4x4): 4

Mid-sized Vehicles (car, SUV, small pick-up truck): 5

Low Vehicles (sports car): 6

(C) Remote Management Power Strip

Remote management power strips shall be horizontally rack mounted below the DIN rail shelf, leaving a single space gap between the DIN rail shelf and the remote management power strip.

743-3.04 ITS Cabinet Assembly Testing Requirements

ITS cabinet assemblies shall successfully pass the following tests, demonstrating that they operate properly when assembled and connected to the equipment they serve. Design-Builder shall make corrective actions for equipment failing a test.

(A) Stand-Alone Test

Design-Builder shall perform the stand-alone test under normal traffic conditions and after the ITS cabinet assembly is complete and loop lead-in cables have been connected to the loop detector card.

(1) ITS Cabinet Assembly Test

Design-Builder shall use the ITS Cabinet Assembly Test Form provided at:

https://azdot.gov/business/engineering-and-construction/its-references and submit a complete and organized set of forms in electronic PDF format to ADOT.

(2) Traffic Volume and Speed Test

Design-Builder shall test the accuracy of the volume data collected by the controller for each loop detector. The controller shall provide volumes accurate between 95 to 105%. Accuracy shall be evaluated comparing 20-second volume data reported by the controller to a manual vehicle count during a 15-minute period, or 100 vehicles passing over the loop, whichever comes first. Design-Builder shall record 20-second controller volume and 1-minute manual count volume on the Traffic Volume and Speed Test Form provided at:

https://azdot.gov/business/engineering-and-construction/its-references and submit a complete and organized set of forms in electronic PDF format to ADOT. ADOT will add Intelight menu commands to see line speeds.

Design-Builder shall perform the following loop detector speed calibration and test for each mainline lane:

(i) Set the trap distance to 18 feet in the controller.

(ii) Determine the actual speed using a certified radar gun or a vehicle with a calibrated speedometer. If using a vehicle, drive the vehicle past the detector station at a constant maximum safe and legal speed and record the Actual Speed. If using radar, collect radar speeds as vehicles pass over the loops. The person collecting the speeds shall be positioned to collect radar speeds as near to head-on as possible, speeds shall not be collected at an angle exceeding 15 degrees from the line of travel of the vehicle.

(iii) Record the actual speed.

(iv) Record the speed measured by the controller.

(v) Perform the following calculation:

New Trap Distance (ft) = Current Trap Distance (ft) X Controller Speed (mph) / Actual Speed (mph)

(vi) Set the trap distance in the controller to the New Trap Distance.

(vii) Repeat the previous steps as necessary until the controller indicates accurate speeds to ADOT's satisfaction.

(viii) Record the final calibrated speed trap distance on the Traffic Volume and Speed Test Form provided at:

https://azdot.gov/business/engineering-and-construction/its-references and submit a complete and organized set of forms in electronic PDF format to ADOT.

(3) Ethernet Switch Test

Design-Builder shall use the Ethernet Switch Test Form provided at:

https://azdot.gov/business/engineering-and-construction/its-references and submit a complete and organized set of forms in electronic PDF format to ADOT.

(B) Subsystem Test (SST)

ADOT, with the support of Design-Builder, will conduct the subsystem test on the ITS cabinets and communications system to verify that communications circuits (Design-Builder-installed and existing equipment and connections) are properly configured and operate without failure and without adversely affecting the existing system. The SST shall start on a Monday, Tuesday, or Wednesday and shall be conducted for 3 consecutive Days.

A communication failure to detection or ramp meter cabinet shall include receiving traffic data for less than 4,104 of the 4,320 (95%) 20-second intervals in a day.

Design-Builder shall repair or replace components that fail the SST and the test shall be restarted on a Monday, Tuesday, or Wednesday and be conducted for 3 consecutive Days. Design-Builder shall supply test equipment requested by ADOT to troubleshoot the system.

(C) System Acceptance Test (SAT)

Upon successful completion of subsystem testing, the SAT shall be started. The SAT shall consist of a 30 consecutive Day period of operation without failure of all Design-Builder-supplied and approved relocated equipment. Design-Builder shall ensure that all equipment is ready for testing prior to submission for ADOT's testing and acceptance.

The SAT shall not start without providing the required ITS documentation and delivering red lines identified in Section 751 of this TPA 738-1to ADOT. GPS data shall be submitted and approved by ADOT prior to beginning the SAT for the periods specified in the ITS Record Documentation item.

The purpose of the SAT is to demonstrate that the total system, consisting of hardware, software, communications, materials and construction, is properly installed, is free from Defects and problems, exhibits stable and reliable performance, and complies with Contract Documents.

During the SAT, Design-Builder shall maintain equipment in an operable condition and ADOT personnel shall be provided access to the equipment. Design-Builder shall identify, isolate, diagnose, and troubleshoot system problems and inconsistencies. Design-Builder shall provide test equipment and labor needed to test, isolate and correct equipment deficiencies found during the SAT. Design-Builder technical personnel having industry standard certification in the field of the design and construction of each system component shall be available on site within 48 hours of notification of a problem. Design-Builder, in conjunction with ADOT, shall formulate possible solutions and shall implement corrections required in Design-Builder-supplied equipment.

During the SAT, Design-Builder shall record test failures on the System Acceptance Test Failure Log provided at:

https://azdot.gov/business/engineering-and-construction/its-references and immediately submit the form to ADOT. After the repair has been completed, an updated form shall be submitted to ADOT. Documentation errors, omissions, and changes occurring prior to, and during, the SAT shall be corrected and resubmitted before the SAT is completed.

(1) SAT Minor Failure

In the event of a minor failure during the SAT, the test clock shall stop until the system is repaired. Upon completion of the repair, testing shall resume with 24 hours added to the remaining test time of the system. The following constitutes a minor failure:

(i) Failure to communicate to a controller.

(ii) Failure to receive traffic data for less than 4,104 of the 4,320 (95%) 20-second intervals in a day.

(2) SAT Major Failure

In the event of a major failure during the SAT, the test clock shall stop until the system is repaired. Upon completion of the repair, testing shall resume with the test clock reset to day zero. The following constitute a major failure:

(i) Third failure to communicate to an individual controller.

(ii) Third failure to receive traffic data from an individual controller for less than 4,104 of the 4,320 (95%) 20-second intervals in a day.

(iii) Failure to correct an issue within 4 hours of being notified by ADOT.

Equipment lists and equipment submittals shall conform to the general requirements of this TPA 738-1.

Section 744 Load Centers, Transformers and Foundation

744-1 Description

The work under this item includes furnishing and installing load center cabinets, load center cabinet foundations and modifying existing load center cabinets for ITS applications.

744-2 Materials

Load center cabinets shall meet the requirements of Subsection 736-2.03 of the ADOT *Standard Specifications* as modified by this TPA 738-1. Electrical service risers, riser strapping, meter socket and service-side enclosure shall meet the requirements of the electrical service provider. Electrical components shall be UL listed.

Type II load center cabinets shall conform with ADOT Standard Drawings T.S. 3-1 and FM-3.18. Type IV load center cabinets shall conform with ADOT Standard Drawings FM-3.19 and FM- 3.20.

Load center cabinets shall include circuit breakers, internal wiring, meter socket, electrical service riser, transformer, and other incidental materials. Photoelectric lighting controls shall be omitted. There shall be no shelves in the interior of the cabinet.

The cabinet and door shall be constructed from 5052-H32 sheet aluminum alloy with a thickness of 0.125-inches. Welds shall be neatly formed and free of cracks, blow holes, and other irregularities. Inside and outside edges of the cabinet shall be free of burrs. The cabinet shall have a sloped top to prevent the accumulation of water. The outside surface of the cabinet shall have a smooth, uniform, natural, aluminum finish. The doors shall have signs stating "Danger High Voltage".

The door opening(s) shall be double flanged on all four sides to increase strength around openings and keep dirt and liquids from entering the enclosure when the door is opened. A two- position door restraint on each door shall be provided, to hold the door open at 90 degrees in a 60-mph wind acting at an angle perpendicular to the plane of the door. The restraint shall hold the door open at 90 ±10 degrees and at 180 ±10 degrees. The door shall be furnished with a gasket that satisfies the physical properties as found in UL508 Table 21.1 and shall form a weather tight seal between the cabinet and door.

Door hinges shall be continuous and welded to the inside of the door and cabinet and bolted to the outside of the cabinet and door using twenty 0.125-inch stainless steel carriage bolts and nylon insert lock nuts. The hinges shall be made of 0.093-inch thick aluminum and shall have a 3-inch open width with a 0.25-inch diameter stainless steel hinge pin. The hinge pin shall be capped top and bottom by weld to render it tamper proof.

The latching mechanism shall be a 3-point draw roller type. The center catch and push- rods shall be cadmium plated, Type II Class 1. Push-rods shall be turned edgewise at the outward supports and shall be 0.25-inch by 0.75-inch steel, minimum. Rollers shall have a minimum diameter of 0.75-inches and shall be made of nylon. The center catch shall be fabricated from 0.140-inch steel, minimum.

A stainless-steel handle with a 0.75-inch diameter shank shall be furnished. The latching handle shall have a provision for padlocking in the closed position. The lock shall be consistent and compatible with current ADOT maintenance keys. The key shall be removable only in the locked position. One key shall be furnished with each lock. All parts of the locking mechanism shall be stainless steel. The locks shall have rectangular spring-loaded bolts.

A cabinet exhaust fan meeting the requirements of Subsection 734-2.03(D) of the ADOT *Standard Specifications* shall be mounted on top.

Load center cabinets shall have a dead front panel to isolate all live electrical circuitry. The panel shall be fabricated from 14-gage sheet steel. The dead front panels shall be hinged on one side and securely fastened on the other with bolts. Switches, breakers and other components shall have openings to operate from the front panel.

All electrical components in the load center assembly shall be UL listed.

Switches, breakers and other components shall have openings to operate from the front panel.

Foundations shall conform to the requirements of Subsection 731-3.01 of the ADOT *Standard Specifications* and this TPA 738-1. Foundations shall include conduit, conduit fittings and elbows, anchor bolts, conductors, connectors, ground rods, grounding conductors, grounding lugs, and other incidental materials necessary to connect equipment incorporated in, or connected through the foundation, to the cabinet, to form a fully functional system.

Concrete shall be 3,000 pound per square inch Class S concrete conforming to the requirements of Section 1006 of the ADOT *Standard Specifications*. Anchor bolts shall conform to the requirements of Section 606-2.05 and 1004-4 of the ADOT *Standard Specifications*. Grounding conductors shall conform to the requirements of Subsection 734-3.03 of the ADOT *Standard Specifications*.

(A) Cabinets

The enclosure shall be a NEMA 3 single door ventilated cabinet. Overall appearance and dimensions shall be as shown in the ITS Standard Drawings.

Cabinets shall be designed for mounting on a concrete foundation using anchor bolts of size and placement as shown in the ITS Standard Drawings.

The cabinet and door shall be constructed from 5052-H32 sheet aluminum alloy with a thickness of 0.125-inches. All welds shall be neatly formed and free of cracks, blow holes, and other irregularities. All inside and outside edges of the cabinet shall be free of burrs. The cabinet shall be designed with a sloped top to prevent the accumulation of water on its top surface. The outside surface of the cabinet shall have a smooth, uniform, natural, aluminum finish. The doors shall have signs stating “Danger High Voltage”.

The door opening shall be double flanged on all four sides to increase strength around openings and keep dirt and liquids from entering the enclosure when the door is opened. A two-position door restraint on each door shall be provided, to hold the door open at 90 degrees in a 60-mph wind acting at an angle perpendicular to the plane of the door. The restraint shall hold the door open at 90 ± 10 degrees and at 180 ± 10 degrees. The door shall be furnished with a gasket that satisfies the physical properties as found in UL508 Table 21.1 and shall form a weather tight seal between the cabinet and door.

Door hinges shall be continuous and welded to the inside of the door and cabinet and bolted to the outside of the cabinet and door using twenty 0.125-inch stainless steel carriage bolts and nylon insert lock nuts. The hinges shall be made of 0.093-inch thick aluminum and shall have a 3-inch open width with a 0.25-inch diameter stainless steel hinge pin. The hinge pin shall be capped top and bottom by weld to render it tamper proof.

The latching mechanism shall be a 3-point draw roller type. The center catch and push- rods shall be cadmium plated, Type II Class 1. Push-rods shall be turned edgewise at the outward supports and shall be 0.25-inch by 0.75-inch steel, minimum. Rollers shall have a minimum diameter of 0.75-inches and shall be made of nylon. The center catch shall be fabricated from 0.140-inch steel, minimum.

A stainless-steel handle with a 0.75-inch diameter shank shall be furnished. The latching handle shall have a provision for padlocking in the closed position. The lock shall be consistent and compatible with current ADOT maintenance keys. The key shall be removable only in the locked position. One key shall be furnished with each lock. All parts of the locking mechanism shall be stainless steel. The locks shall have rectangular spring-loaded bolts.

Cabinet ventilation shall be provided by louvered vents in the front door with a removable pleated paper air filter. The filter shall cover the vents and shall be held firmly in place with bottom and top brackets and a spring-loaded upper clamp. Exhaust air shall be vented out between the top of the cabinet and the door. The exhaust area shall be screened with a material having a maximum hole diameter of 0.125 inches.

A 12-gauge steel plate or panel board shall be attached with six 3/8-inch mounting studs welded to the back wall of the cabinet for mounting the transformer. Appropriately sized carriage or lag bolts shall be used to attach the

transformer at the top and bottom. The transformer shall be mounted 4 inches from the top of the plate and centered from side to side.

(B) Transformer

Transformers shall be new. Transformers shall conform to paragraphs 2.1.3 and 2.1.5 in Section 2 of the current NEMA Standards Publication TR-1-2013, and to other applicable NEMA standards (i.e., NEMA ST 20), UL (i.e., UL-506), EIA, and ts.

Transformers of the same type shall be identical and interchangeable. The transformer overall dimensions, physical outlines, and mounting hole dimensions shall be shown on the RFC Plans as approved by ADOT. Transformers shall be single-phase, dry type units. The transformer primary and secondary voltages shall be as shown on the project plans. The mass of the transformer shall not exceed 250 pounds and shall be wall mounted. The transformer shall be labeled either “step-up” or “step-down” and the incoming (primary winding) and outgoing (secondary winding) voltages shall be clearly identified on the exterior. Transformers shall be of low-noise and sound levels shall not exceed 40 dB for transformers rated below 10 kVA, and shall not exceed 45 dB for transformers rated 10 kVA and higher. Transformers shall be provided with two 2.5% taps above nominal voltage (Full Capacity Above Nominal - FCAN) and four 2.5% taps below (Full Capacity Below Nominal - FCBN).

The core volume shall allow operation at 10% above rated primary voltage at no load, without exceeding a temperature rise of 207 degrees Fahrenheit. All core laminations shall be oxide or varnish coated, annealed, free of burrs, and properly assembled to reduce noise and ensure efficient operation of the transformer.

Coil conductors shall be continuous with terminations brazed or welded without auxiliary flux material. The entire core and coil assembly shall be impregnated with varnish and cured to seal out moisture. Coils shall be protected with an outer layer of glass tape or similar quality insulation. Coils shall incorporate an electrostatic shield located between primary and secondary windings.

744-3 Construction Requirements

Design-Builder shall coordinate with the electrical service provider, local Governmental Entity and ADOT to identify service locations, determine electrical service addresses, comply with electrical service provider requirements, and verify electrical service provider approval of the load center cabinet equipment and installation methods proposed.

The load center cabinet shall be installed at locations as shown on the RFC Plans. Removable caps shall be placed on unused conduits within the cabinet.

Design-Builder shall furnish and install silicone caulking, or other approved sealant around the base of the cabinet to form a watertight and dust-proof seal.

Design-Builder shall furnish and install pressure-sensitive, permanent identification decals on load center cabinets, as shown in the ITS Standard Drawings. The decals shall be 3- inch tall, Series C, Gothic letters and shall be engineer-grade, glass-beaded, reflective black letters on a silver or chrome background.

Existing load center cabinets to remain shall remain in service for items and devices served in the existing condition.

Design-Builder shall install wire, cable, connectors, and other incidental materials necessary to connect equipment to be incorporated in, or connected to the work through the foundation, to the cabinet, to form a fully functional system.

If the cabinet will be located on a slope steeper than 3:1, the foundation shall be offset a minimum of 5 feet from the pull box along the mainline conduit or other structure so that their locations do not lie on a line perpendicular to the roadway.

Foundations shall be monolithic with the exposed surfaces formed and finished to present a neat, smooth appearance. The bottom of each foundation shall rest on undisturbed earth and the top shall be level. Adjacent concrete maintenance pads as shown on the ITS Standard Drawings shall also meet these requirements.

Forms for the concrete shall be rigid and securely braced in place. Templates shall be used to properly position and hold in place conduit, anchor bolts, and the ground rod. Immediately prior to pouring the concrete, both forms and the earth shall be thoroughly moistened. The concrete shall be allowed to cure at least 12 hours or as specified for class provided, whichever is longer, to prevent damage before the forms are removed. Design-Builder shall backfill and build slope in accordance with the plans and restore the landscaping.

Grounding shall meet the requirements of Subsection 734-3.03 of the ADOT *Standard Specifications*. Cabinet foundations shall have a copper clad steel ground rod with a minimum diameter of 5/8 inch. The ground rod shall be driven into place through a sleeve in the foundation. The ground rod shall be installed so that it extends into the surrounding undisturbed earth a minimum of 9 feet. The ground rod shall extend approximately 3 inches above the foundation. The ground rod shall be connected to the grounding system using ground clamps on the rod and an approved lug connector in the cabinet. The cabinet shall be grounded with a 8 AWG solid copper wire.

If Design-Builder prefers to use an electrolytic grounding system, it shall be 100% self- activating, sealed, and maintenance free. The electrolytic grounding system shall be UL listed with a minimum life rating of 30 years. The electrolytic grounding system shall hygroscopically extract moisture from the air to activate the electrolytic process without additions of chemicals or water. The electrolytic grounding system shall not use Hazardous Material.

The transformer cabinet assembly shall be installed at design locations as shown on the RFC Plans, and as approved by ADOT.

Design-Builder shall measure the secondary voltage after installation. If the secondary voltage is found to be more than 3% above or under nominal operating voltage during loaded and unloaded conditions, Design-Builder shall connect to the appropriate taps on the transformer to supply output voltage within 3% of nominal voltage under loaded and unloaded conditions.

Removable caps shall be placed on unused conduits within the cabinet.

Design-Builder shall furnish and install silicone caulking, or other approved sealant around the base of the cabinet to form a watertight and dust-proof seal.

Section 745 Electrical Conductors for ITS

745-1 Description

The work under these items shall consist of furnishing and installing electrical conductors for ITS elements at the locations designated on the RFC Plans and in accordance with the details shown on the RFC Plans and the requirements of this TPA 738-1.

745-2 Materials

Electrical conductors shall conform to Section 732 of the ADOT *Standard Specifications*, unless otherwise specified. Conductors shall conform to the requirements of the following table, unless otherwise specified.

Conductor Table

No.	Circuit	Function	Insulation		Conductor		
			Color	Type	Minimum Thickness (MILS	Minimum Gauge (AWG)	Type
1.	Ramp Meter Signals	Red Green Common Spare	Red Green White Black			#14	IMSA 19-1

No.	Circuit	Function	Insulation		Conductor		
			Color	Type	Minimum Thickness (MILS	Minimum Gauge (AWG)	Type
2.	Ramp Meter Flashers	Beacon Common Spare Spare	Red White Green Black			#14	IMSA 19-1
3.	Common	Common Lead	White	THW	45/60	AS	AS
4.	Spares	Unused Leads	Varies	Varies		AS	AS
5.	Detection	Detector Roadway Loops, Saw Cut	Black, in Orange Tubing	PE in PVC or PE Tubing	15 31	#14 Stranded	IMSA 51-7
6.	Detection	Detector Roadway Loops, Pre-formed	Black, in Orange Tubing	TFFN in PVC or PP Tubing	AS	#16 Stranded	
7.	Detection	Loop Detector Lead-in Cable	Black/ Natural	PE Alum/ Mylar Tape Shield		#14	IMSA 50-2
8.		Service Service Common Bond	Black White Green or Bare	THW THW THW	AS AS AS	AS AS AS	
Legend: AS = As Specified; PP = Polypropylene; STP = Stranded Twisted Pair; S4C = Stranded 4 Conductor							

In ramp meter conduits, the bond conductor shall have green insulation with the insulation removed within pull boxes from the point where it leaves the bell end of the conduit.

Conductor and cable tagging shall conform to the requirements of Subsection 732-2.01(A)(2) of the ADOT *Standard Specifications*, unless otherwise specified. Tags shall have the capability of being moved along the conductor or cable during future alterations.

745-3 Construction Requirements

Wiring procedures for conductors and cables shall conform to the requirements of Subsection 732-3.02 of the ADOT *Standard Specifications*, unless otherwise specified.

Electrical conductors that are left un-terminated shall be made waterproof.

Bonding and grounding shall conform to Subsection 734-3.03 of the ADOT *Standard Specifications* and the requirements of the Plans and this TPA 738-1.

Metal enclosures, cabinets, pedestals, poles, metal pull box lids, metal conduit, and metal cable sheaths shall be bonded to form a continuously grounded system. Non-metal portions of the system such as PVC or HDPE conduit

shall have a bare copper bond wire or a green insulated copper bond wire installed with suitable connections to form a continuously grounded system.

Cables, conductors, pull tape, and innerducts within the same conduit or innerduct shall be installed at the same time.

Where cables or conductors are to be installed in conduit with existing cables or conductors that will remain, Design-Builder shall disconnect, remove, reinstall, reconnect and test the existing cables and conductors in accordance with the testing requirements of the applicable device being connected or as determined by ADOT. Design-Builder shall be responsible for damage to existing cables or conductors caused by this operation. Existing cables or conductors shall be considered in good condition unless Design-Builder demonstrates otherwise to ADOT as part of the ITS Inventory and prior to ITS Work.

Excess cable length within No. 9 pull boxes shall be loosely coiled into a circular shape and attached to the rack and hook system integral to the wall of the No. 9 pull box with industry standard nylon cable ties. Cables shall be coiled independently from one another and secured with separate cable ties for each coil. Cable ties shall be tightened to prevent cable slippage, but shall not deform or damage the cable sheath.

Tags shall be installed on conductors and cables inside pull boxes near the pull box entrance and exit, inside cabinets and enclosures. Tags shall be labeled with the following fields, as applicable:

Tag Field 1: Responsible Agency (use only if agency is not ADOT)

No.	Examples	Applications
1.	MCDOT	Maricopa County Department of Transportation
2.	Tempe	City of Tempe

Tag Field 2: Description

No.	Examples	Applications
1.	SMFO144	144-strand single mode fiber optic cable
2.	SMFO12	12-strand single mode fiber optic cable
3.	AWG6	American Wire Gauge 6
4.	IMSA7	IMSA 19-1, 7-Conductor
5.	LOOP 1U	lane 1 upstream loop detector (other loop designations per Standard Drawing FM-5.01)
6.	CCTV	CCTV device cable
7.	DMS	DMS device cable

Tag Field 3: Termination

No.	Examples	Applications
1.	TO NODE 12	fiber optic trunk line or power to a node
2.	TO EB TRUNK LINE	fiber optic branch to Eastbound trunk line

No.	Examples	Applications
3.	CAB 3118253	fiber optic or power to a cabinet
4.	LC 3118256	power to a load center
5.	SIGNAL	fiber optic or power to a signal cabinet
6.	EB DMS	Power or control cable to eastbound DMS
7.	LEFT RM	To left side ramp meter pole
8.	WB WW SIGN	To wrong way sign on westbound exit

A continuous cable passing through a pull box shall have two tags which will be the same except with different termination descriptions. Multiple power conductors that go to one load center shall be bundled together and have one tag that indicates the load center cabinet number in the termination field. Multiple power conductors that go to different cabinets shall be bundled and tagged in conductor pairs according to the cabinet they go to.

Tagging shall be recorded by Design-Builder in a Record Drawing Cable Schedule and include the distance marking on the cable at the entrance to a pull box, cabinet, or other termination point. The Record Drawing Cable Schedule shall be provided to ADOT with the ITS Final Compiled Documentation.

Cables and conductors to be removed shall be identified and marked at intermediate pull boxes for ADOT approval prior to removal. After ADOT approval, cables and conductors to be removed shall be cut at intermediate pull boxes prior to removal. Conduits to remain empty for future use shall have detectable pull tape installed.

At least 10 Business Days prior to disconnecting existing conductors or cables, Design-Builder shall submit a schedule for disconnection, removal, reinstallation, reconnection, and testing for ADOT approval.

Section 746 Loop Detection

746-1 Description

The work under these items includes furnishing, installing and testing loop detectors and loop detector lead in cables, as shown on the RFC Plans and in this TPA 738-1.

746-2 Materials

All work shall conform to Section 735 of the ADOT *Standard Specifications*, the ITS Standard Drawings, the RFC Plans, and this TPA 738-1.

Design-Builder shall furnish Certificates of Compliance for loop detector materials which shall include certification that the batches furnished were manufactured under the same conditions as the batches tested.

(A) Loop Wire

Loop detector lead-in cable shall be 14 AWG conforming to IMSA 50-2. Loop detector wire shall be 14 AWG HDPE polyethylene insulated conductors conforming to IMSA 51-7.

(B) High Temperature Backer Rod

High Temperature backer rod shall be a round foam material rated to withstand a minimum temperature of 400 degrees Fahrenheit. The diameter of the backer rod shall be sized according to the width of the saw cut as follows:

No.	Saw Cut Width (inches)	Backer Rod Diameter (inches)
1.	1/4	3/8
2.	3/8	1/2
3.	1/2	5/8
4.	3/4	7/8
5.	7/8	1
6.	1	1 1/4
7.	1 1/8	1 1/2
8.	1 5/8	2

(C) Loop Slot Sealant

Design-Builder shall furnish and install loop slot sealant, depending on the pavement surface to be sealed, to seal the loop slots and surface hole of the home run conduit. Loop slot sealants shall be a flexible encapsulant designed for sealing and protecting loop detector wires installed in saw cuts. Design-Builder shall provide the expiration date of the sealant with the material submittal.

(1) Two-Part Epoxy Filler Sealant

Two-part epoxy joint filler sealant shall be a 100-percent solids, flexible, two-component, solvent free, epoxy resin/hardener system for use as a saw cut sealant in asphaltic concrete pavements and Portland cement concrete pavements.

Materials shall comply with the requirements of Subsection 1015-1 of the ADOT *Standard Specifications*.

The epoxy system shall be specifically designed for the intended application according to the product literature provided by the manufacturer.

The epoxy system shall be of sufficient strength and hardness to withstand stress and abrasion from vehicular traffic, while remaining flexible enough to provide stress relief under thermal movement and protect the loop wire from moisture penetration. It shall also be moisture insensitive to allow effective application to damp pavements. No standing water is permitted on the surfaces to which the epoxy system is to be applied.

The epoxy system shall be designed to enable vehicular traffic to pass over properly filled saw cuts immediately after installation without tracking or stringing of the material.

Properly installed and cured epoxy systems shall exhibit resistance to the effects of weather, motor oils, gasoline, anti-freeze solution, brake fluid, deicing chemicals, and salt in such a manner that the performance of the loop detector wire is not adversely affected.

The epoxy system shall be designed for roadway installation when the surface temperature is a minimum of 40 degrees F and rising. The cured epoxy system shall be temperature stable and exhibit no degradation in performance throughout the ambient pavement temperature ranges experienced within the State of Arizona.

The components of the epoxy system shall have a minimum shelf life of 12 months in original unopened, undamaged containers, when stored in a cool dry environment, as recommended by the manufacturer.

The epoxy system shall meet the following requirements:

No.	Property	Test Method	Requirements
1.	Mixing Ratio; Part A to Part B	-	1 to 1 by volume
2.	Viscosity, centipoises	ASTM D 2393-86	4000 to 8000
3.	Pot Life, minutes	ASTM C 881	12 to 20
4.	Cure Time, minutes	ASTM C 679	60 maximum, Tack Free
5.	Hardness (Shore D)	ASTM D 2240	35 to 65
6.	Tensile Elongation, percent	ASTM D 638	50 minimum
7.	Water Absorption, percent (24 hrs.)	ASTM D 570	1 maximum
8.	3% Salt Water Absorption, percent (24 hrs.)	-	0.03 to 0.20
9.	Oil Absorption, percent (24 hrs.)	ASTM D 471	0.01 to 0.02
10.	Gasoline Absorption, percent (24 hrs.)	-	0.05 to 0.90

(2) One-Part Elastomeric Sealant

One-part elastomeric sealant may be used to seal saw cuts in Portland cement concrete pavement and lean concrete base.

The sealant shall provide compressive yield strength to withstand normal vehicular traffic as well as sufficient flexibility to withstand normal movement in concrete pavements, while protecting the loop wire from moisture penetration.

The encapsulant shall be a one-part elastomeric compound requiring no mixing, measuring or application of heat prior to or during its installation.

The encapsulant shall, within its stated shelf life in original undamaged packaging, cure only in the presence of moisture. The rate of cure will, therefore, depend upon temperature and relative humidity at the time of installation. Cool dry weather will slow curing whereas warm, humid weather will accelerate curing. The encapsulant shall have a minimum 12-month shelf life in undamaged original containers when stored in a cool, dry environment.

The encapsulant shall form a surface skin allowing exposure to vehicular traffic within 30 minutes at 75 degrees F without tracking or stringing of the material, and completely cure to a tough, rubber-like consistency within 2 to 7 Days after installation.

Properly installed and cured encapsulant shall exhibit resistance to effects of weather, vehicular abrasion, motor oils, gasoline, anti-freeze solution, brake fluid, deicing chemicals and salt normally encountered, in such a manner that the performance of the loop detector wire is not adversely affected.

The cured encapsulant shall be temperature stable and exhibit no degradation in performance throughout the ambient pavement temperature ranges experienced within the State of Arizona.

The encapsulant shall exhibit minimal shrinkage during or after its installation, and in no manner affect the performance characteristics of the material.

The encapsulant shall be designed to permit clean-up of material and application equipment, prior to curing of the encapsulant, with a suitable non-flammable solvent. Should encapsulant material be allowed to cure in the application nozzle, it shall be able to be pulled out as a solid plug.

The encapsulant shall be designed for roadway installation when the surface temperature is between 40 and 140 degrees F.

The encapsulant shall have the following physical properties in its uncured and cured states.

Uncured (Wet) Encapsulant

No.	Property	Requirement	Test Procedure
1.	Weight	10.1 ± 0.3 pounds/gallon	A. Weight/Gallon
2.	Total Solids by Weight	75 – 85%	B. Determination of Non-Volatile Content
3.	Viscosity	10,000 – 85,000 centipoise	C. Dynamic Viscosity
4.	Drying Time	Touch: 24 hrs. maximum Complete: 30 hrs. maximum	D. Tack-Free Time

Cured Encapsulant

No.	Property	Test Method	Requirements
1.	Hardness (Indentation)	65 – 85	E. Rex Hardness
2.	Tensile Strength	500 psi minimum	F. Tensile & Elongation
3.	Elongation	300% minimum	

(3) Hot Applied Rubberized Sealant

Hot applied rubberized sealant may be used to seal saw cuts in asphaltic concrete and in lean concrete base. It shall be suitable for use as a sealant for loop detector saw cuts and be non- tracking under traffic. At application temperatures, the sealant shall be a thin, free flowing fluid which penetrates saw cuts and self-levels permitting uniform application. The sealant shall be melted and applied to pavements using a pressure feed melter unit. Pour pot application is not acceptable. The sealant shall be a relatively stiff sealant but shall remain flexible at low pavement surface temperatures. The test results shall conform to the following specifications for the loop detector sealant.

No.	Test	Specification
1.	Penetration: 125 degrees Fahrenheit, 50g, 5s	50 maximum
2.	Penetration: 77 degrees Fahrenheit, 100g, 5s	10 – 25
3.	Softening Point:	210 degrees
4.	Ductility: 77 degrees Fahrenheit	15 cm minimum
5.	Mandrel Bend: 0 degrees Fahrenheit, 90 degrees Arc, 10s, 3/4-inch diameter	Pass 2 of 3
6.	Recommended Pour Temp:	380 degrees Fahrenheit

No.	Test	Specification
7.	Safe Heating Temp:	420 degrees Fahrenheit
8.	Brookfield Viscosity: 400 degrees Fahrenheit	7,500 centipoise max.
9.	Unit Weight:	8.5 pounds per gallon
10.	Coverage; 1/2 by 1/2-inch crack	11.0 pounds per 100 feet

Materials shall conform to ADOT Standard Drawings T.S. 6-3 and T.S. 6-4.

746-3 Construction Requirements

Construction of loop detectors shall conform to the ITS Standard Drawings and project plans. Loop detectors shall not be placed within 6 feet of an adjacent operational loop. The installation of the detectors shall be such that the operation shall not be affected by temperature changes, water, ice, rain, snow, chemicals, or electromagnetic noise. Loop detectors shall be installed prior to chip seal or friction course for asphaltic concrete pavements or Portland cement concrete pavements.

(A) Saw Cut Loops

Prior to installing the loop wire or lead-in cable, Design-Builder shall saw cut the slots and install associated conduit and pull boxes. New loop detectors shall not be cut in the exact same location as an existing loop detector. Design-Builder shall use clean water to prevent blowing dust while cutting the slots. Design-Builder shall flush the slots, vacuum water out of the slots and from the roadway, and then blow the loop slots with oil free compressed air to dry them and free them from debris, taking necessary safety precautions to avoid flying debris from coming into contact with personnel or vehicles. Debris shall be disposed of in accordance with Section 107.11 of the ADOT *Standard Specifications*. Design-Builder shall take precautions to keep materials from entering the storm drains. The slots shall be thoroughly cleaned to allow sealant to adhere to the sides of the slot.

Design-Builder shall install the loop wire in the slots without damage to the insulation. Turns of loop wire shall be installed in the same slot. The loop detector wire shall consist of one continuous wire from the pull box, through the loop, and back to the pull box. The top of the upper loop detector wire shall be a minimum of 1 ½ inches below the top of PCCP or asphalt. Friction course, if present, is not included in the measurement. If the loop detector is installed in reinforced concrete, or is at least 2-inches below the roadway surface, Design-Builder shall install four turns of the loop. The loop detector wire pair shall be twisted together 3 times per foot from the corner of the loop in the roadway to the pull box.

After the loop wire is installed, Design-Builder shall install high temperature backer rod in the saw cut. The backer rod shall be continuous and completely shield the entire length of the loop detector wire from the loop slot sealant.

Design-Builder shall seal the slots with loop slot sealant. Design-Builder shall ensure that the slots are clean and dry with no residue remaining at the time of sealing. Design-Builder shall seal the home run conduit stub out with loop slot sealant. During the sealing operation, the ambient air temperature shall be within the application range specified by the sealant manufacturer. The sealant shall be installed in accordance with the ITS Standard Drawings and in a manner that will fill the slot to its full depth. Design-Builder shall strike off and remove excess sealant and remove it from the site.

(B) Pre-Formed Loops

Pre-formed loops shall be installed in accordance with the ITS Standard Drawings, the RFC Plans and this TPA 738-1.

(C) Lead-in Cable

Design-Builder shall install lead-in cable between the control cabinet and the nearest pull box adjacent to the loop detector. Design-Builder shall leave 5 feet of coiled slack in the pull box. Lead-in cables shall be unspliced from the loop detector wire to the control cabinet. One lead-in cable shall be provided, per loop, unless otherwise specified. Lead-in cables shall be tagged in the control cabinet and in pull boxes in accordance with this TPA 738-1.

Design-Builder shall solder splice the loop wire to its associated lead-in cable and provide a watertight seal in the pull box. Design-Builder shall connect the lead-in cable to the appropriate loop detector channel in the control cabinet. Spade lugs installed on the loop lead-in cable in the control cabinet shall be crimped and soldered. Solder shall be resin core solder with 60% tin and 40% lead. Lead-in cables that are not terminated within 1 Day of installation shall have unterminated ends waterproofed.

(D) Loop Detector Test Requirements

The following tests shall be performed by Design-Builder in the presence of IQF personnel. Design-Builder shall provide traffic control for testing of loop detectors. Design-Builder shall use the Loop Detector Test Form provided at:

https://azdot.gov/business/engineering-and-construction/its-references and submit a complete and organized set of forms in electronic PDF format to the IQF. The IQF will review the test results and submit the form to ADOT for approval. Design-Builder shall not proceed with other loop detector work until ADOT approves the loop test forms.

(1) Loop Detector Wires Only

The following tests shall be performed at the pull box on loop detector wire that is disconnected from the loop lead-in cable.

(a) Existing Loop Detectors

The following tests shall be performed during the facilities inventory on existing loop detectors to be utilized by the project. Testing of existing loop detectors shall be completed prior to other construction activities requiring traffic control. Testing of existing loop detectors shall be accomplished by cutting off the existing lead-in cable splice or waterproofed ends of the loop wire, testing, and resplicing to the existing loop lead-in cable or waterproofing the ends of loop wire of successfully tested loop detectors. Loop detector wire shall not be tested by skinning the insulation. Design-Builder shall install new loop lead-in cable tags where existing tags are missing or do not meet the requirements of this TPA 738-1. Design-Builder shall replace loop detectors and lead-in cables damaged during testing.

Design-Builder shall install new saw cut loop detectors where existing loop detectors to be utilized by the project do not exist or do not pass testing. If a single loop detector within a pair of existing loop detectors (trap) does not pass testing, Design-Builder shall replace both loop detectors.

(b) New Loop Detectors

The following tests shall be performed twice for each new loop detector, before the loop slot sealant has been poured and after the loop slot sealant has hardened. Design-Builder shall replace or repair loop detector components until the loop detection successfully passes testing.

(i) Resistance to Ground Test

The resistance to ground shall be measured with a Megohmmeter (Megger) connected between the loop wire and the nearest reliable electrical ground, such as a meter, metal pole, fire hydrant, or to a metal rod driven 3 feet into the ground. The resistance to ground shall be at least 100 megohms at 500 VDC.

(ii) Series Resistance Test

The series resistance, measured by an ohmmeter, shall be between 0.1 and 0.8 Ohms for a 6 x 6-foot loop, and less than 10 Ohms for other sizes of loops.

(iii) Inductance Test

The inductance of a loop, measured with an inductance tester, shall be between the following limits:

No.	Loop Type	Inductance Test Limits
1.	6’ X 6’ loop, 3 turns	50 to 100 µH
2.	6’ X 6’ loop, 4 turns	100 to 155 µH
3.	6’ X 6’ loop, 5 turns	200 to 260 µH
4.	6’ X 20’ loop, 2 turns	55 to 105 µH
5.	6’ X 20’ loop, 3 turns	125 to 180 µH

(2) Loop Detectors Spliced to Lead-in Cable

After the preceding tests have been passed, the following tests shall be performed at the control cabinet on the loop lead-in cables. The tests shall be performed with the loop lead-in cable spliced to the loop detector wire and with the with loop lead-in cable disconnected from the loop detector card. The tests shall be performed twice for each loop, once with the splice between the loop detector wire and the loop lead-in cable dry, and once with the splice submerged in water, and has been submerged for at least 1 minute.

(a) Resistance to Ground Test

Utilizing a Megger, Design-Builder shall verify that the insulation resistance to ground of each lead-in conductor is at least 10 megohms at 500 VDC.

(b) Inductance Test

The inductance of a loop detector plus the lead-in cable, measured with an inductance tester, shall be between 50 to 490 µH.

Active loop detection within the project limits shall be tested after work is complete which may damage loop detection, such as milling of pavement. Design-Builder shall provide traffic control for testing of loop detectors. Design-Builder shall submit a Loop Detection Test Plan including traffic control plans for review and approval by ADOT. If active loop detection is not shown on the plans, Design-Builder shall coordinate with ADOT to identify active loop detection locations. The test plan shall list active loops to be tested which may include loop detection at entrance ramps, freeway mainline, and in freeway-to-freeway ramps. Inactive loop detection shall not be tested.

Design-Builder shall be accompanied by ADOT personnel during testing.

(3) Loop Detectors Spliced to Lead-in Cable

The following tests shall be performed by Design-Builder at the control cabinet on the loop lead-in cables in the presence of ADOT personnel. The tests shall be performed with the loop lead-in cable spliced to the loop detector wire and with the with loop lead-in cable disconnected from the loop detector card. After the test is complete, Design-Builder shall reconnect the lead-in cable to return the loop detection system to its previous state.

(a) Inductance Test

Utilizing a Megger, Design-Builder shall verify that the insulation resistance to ground of each lead-in conductor is at least 10 megohms at 500 VDC.

The inductance of a loop detector plus the lead-in cable, measured with an inductance tester, shall be between 50 to 490 µH.

(4) Loop Detector Wires Only

The following tests shall be performed if the preceding test failed in order to isolate whether the loop detector or lead-in cable caused the test to fail. The following tests shall be performed at the pull box on loop detector wire that is disconnected from the loop lead-in cable. After the test is complete, Design-Builder shall solder splice the loop wire to its associated lead-in cable and provide a watertight seal using a factory-filled silicon wire nut in the pull box to return the loop detection system to its previous state.

(a) Resistance to Ground Test

The resistance to ground shall be measured with a Megohmmeter (Megger) connected between the loop wire and the nearest reliable electrical ground, such as a metal pole, fire hydrant, or to a metal rod driven 3 feet into the ground. The resistance to ground shall be at least 100 megohms at 500 VDC.

(b) Series Resistance Test

The series resistance, measured by an ohmmeter, shall be between 0.1 and 0.8 ohms for a 6’ x 6’ loop, and less than 10 ohms for other sizes of loops.

(c) Inductance Test

The inductance of a loop, measured with an inductance tester, shall be between the following limits:

No.	Loop Type	Inductance Test Limits
1.	6’ X 6’ loop, 3 turns	50 to 100 µH
2.	6’ X 6’ loop, 4 turns	100 to 155 µH
3.	6’ X 6’ loop, 5 turns	200 to 260 µH
4.	6’ X 20’ loop, 2 turns	55 to 105 µH
5.	6’ X 20’ loop, 3 turns	125 to 180 µH

Design-Builder shall prepare a written report detailing the results of the loop detector testing for review by the IQF. The IQF will review the test results and submit the report to ADOT for approval. Design-Builder shall use the Loop Detector Test Form provided at:

https://azdot.gov/business/engineering-and-construction/its-references and submit a complete and organized set of forms in electronic PDF format to the IQF. Design-Builder shall identify loop detectors failing to pass and the component causing the failure which typically will be the loop detector, splice, or lead-in cable. Repairs identified by Design-Builder are subject to approval by the IQF.

Damage to loop detection during construction activities which could have been reasonably avoided by Design-Builder shall be replaced. Design-Builder shall replace loop detectors and lead-in cables damaged during testing.

Design-Builder shall install new loop lead-in cable tags where existing tags are missing or do not meet the requirements of this TPA 738-1.

Design-Builder shall install new saw cut loop detectors where existing loop detectors do not pass testing. If a single loop detector within a pair of existing loop detectors (trap) does not pass testing, Design-Builder shall replace both loop detectors. New loop detection shall be tested in accordance with the loop detection specifications.

Design-Builder shall install the new loop at locations designated on the RFC plans. Design-Builder shall maintain a distance of at least 5 feet offset for the new loop from the existing non-functional loop.

Section 747 Warning Flasher Assemblies

747-1 Description

The work under this item shall include furnishing and installing warning flasher assemblies, as shown on the plans and in this TPA 738-1.

747-2 Materials

Materials shall comply with Standard Drawing FM 6.01. Materials shall be warranted against all Defects in materials and workmanship in accordance with the Contract Documents. Signs shall meet the requirements of Section 608 of the ADOT *Standard Specifications*. Pole foundations shall meet the requirements Section 609 of the ADOT *Standard Specifications*. Poles shall meet the requirements of Section 731 of the ADOT *Standard Specifications*.

Signal indications and mounting assemblies shall meet the requirements of Section 733 of the ADOT *Standard Specifications*. Signal indications shall be LED modules and meet the requirements of the Institute of Transportation Engineers (ITE), Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement, 2005. The light output of the LED modules shall meet the requirements of Section 4 of the ITE Specification, the 44-point test identified in paragraph 6.4.2.1, and the single point test identified in paragraph 6.4.2.2. LED modules shall include the option listed in Section 5.8 of the ITE Specification and meet the requirements of Technical Note No. 2 of the ITE Specification. LED signal modules shall be a single, self-contained device with integral power supply and shall be weather tight and fit securely in the housing. LED modules shall not include dimming circuitry. LED modules shall be compatible with ADOT load switches and conflict monitors. LED signal modules shall be rated for use in the ambient operating temperature range of –40 to +74 degrees C. LED signal modules shall use two color-coded 20 AWG copper wires with 30 mil jacketed insulation rated for 600 Volts AC and 105 degrees C. The wires shall be a minimum of 36-inches long with crimped spade terminal connectors.

The signal indication shall be flashed by the flasher unit supplied in the control cabinet.

747-3 Construction Requirements

Design-Builder shall connect the warning flasher assembly to the control cabinet in conformance with the RFC Plans to provide a complete and functional ramp meter system. Components shall be supported and installed in accordance with TP Section 600 (*Structural*).

Design-Builder shall test each signal head for accuracy with a IMSA Level II Traffic Signal Field Technician to verify operation before the system is turned over to ADOT for further testing and acceptance. The signal heads shall be bagged until placed into operation.

Section 748 Ramp Meter Signal Assemblies

748-1 Description

The work under this item shall include furnishing and installing ramp meter signal assemblies, as shown on the plans and in this TPA 738-1.

748-2 Materials

Materials shall comply with Standard Drawing FM 6.01. Materials shall be warranted against all Defects in materials and workmanship in accordance with Contract Documents. Signs shall meet the requirements of Section 608 of the

ADOT *Standard Specifications*. Pole foundations shall meet the requirements Section 609 of the ADOT Specifications. Poles shall meet the requirements of Section 731 of the ADOT *Standard Specifications*.

Signal indications and mounting assemblies shall meet the requirements of Section 733 of the ADOT *Standard Specifications*. Signal indications shall be LED modules and meet the requirements of the Institute of Transportation Engineers (ITE), Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement, 2005. The light output of the LED modules shall meet the requirements of Section 4 of the ITE Specification, the 44-point test identified in paragraph 6.4.2.1, and the single point test identified in paragraph 6.4.2.2. LED modules shall include the option listed in Section 5.8 of the ITE Specification and meet the requirements of Technical Note No. 2 of the ITE Specification. LED signal modules shall be a single, self-contained device with integral power supply and shall be weather tight and fit securely in the housing. LED modules shall not include dimming circuitry. LED modules shall be compatible with ADOT load switches and conflict monitors. LED signal modules shall be rated for use in the ambient operating temperature range of –40 to +74 degrees C. LED signal modules shall use two color-coded 20 AWG copper wires with 30 mil jacketed insulation rated for 600 Volts AC and 105 degrees C. The wires shall be a minimum of 36-inches long with crimped spade terminal connectors.

748-3 Construction Requirements

Design-Builder shall connect the ramp meter signal assembly to the control cabinet in conformance with the ITS Standard Drawings, ITS Design Guide and RFC Plans to provide a complete and functional ramp meter system. Components shall be supported and installed to TP Section 600 (*Structural*).

The lower ramp meter head shall be aimed at the location of a driver stopped at the stop bar.

Design-Builder shall test each signal head for accuracy with a IMSA Level II Traffic Signal Field Technician to verify operation before the system is turned over to ADOT for further testing and acceptance. The signal heads shall be bagged until placed into operation.

Section 750 CCTV Field Equipment

750-1 Description

The work under this item shall include furnishing and installing closed circuit television (CCTV) cameras.

750-2 Materials

CCTV cameras shall be Bosch model MIC-7502-Z30W.

750-3 Construction Requirements

Design-Builder shall mount the CCTV Camera to the CCTV lowering device in accordance with the requirements of the CCTV camera manufacturer, lowering device manufacturer.

Conductors and cables shall be routed inside the CCTV pole. No cables or conductors shall be exposed, including at the base of the tilt/pan drive and at the entrance to the CCTV cabinet.

Design-Builder shall program the camera with camera ID information, and preset positions. Design-Builder shall coordinate with ADOT to obtain information for programming of the CCTV cameras prior to testing.

750-4 Test Requirements

CCTV camera components will be subject to testing and monitoring to determine conformance with this TPA 738-1 and to ensure proper operation of the equipment and system.

Design-Builder shall provide traffic control for the CCTV testing.

(A) Stand-Alone Tests

Design-Builder shall test the following stand-alone (non-network) functional operations of the CCTV system:

(1) Control of focus, optical zoom, digital zoom, iris, pan, and tilt

(2) Response to automatic preset positioning commands

(3) Display of Camera ID information

(4) Presence and quality of video signal during bright sunlight and night conditions

(5) Lowering device functions properly

For testing purposes, “bright sunlight” conditions shall be defined as occurring between 10:00 AM and 2:00 PM, on a cloudless day. “Night” conditions shall be defined as occurring between one hour after sundown and one hour before sunrise with the moon no more than one-quarter full.

Design-Builder shall use the CCTV Test Form provided at:

https://azdot.gov/business/engineering-and-construction/its-references and submit a complete and organized set of forms in electronic PDF format to ADOT.

(B) Subsystem Test (SST)

ADOT, with the support of Design-Builder, shall conduct the subsystem test on the CCTV and communications system to verify that communications circuits (Design-Builder installed equipment as well as connections to existing) have been properly configured and operate without failure and without adversely affecting the existing system. The SST shall start on a Monday, Tuesday, or Wednesday and be conducted for 3 consecutive Days.

Design-Builder shall replace components that fail the SST and the test shall be restarted on a Monday, Tuesday, or Wednesday and be conducted for 3 consecutive Days. Design-Builder shall supply test equipment requested by ADOT for troubleshooting the system.

The CCTV SST test shall verify the following:

(1) Transmission of high-quality video images to the TOC

(2) Transmission of control signals to camera

(3) Positioning of camera from the TOC control panels

(4) Response to automatic preset positioning commands from the TOC

(5) Priority and partitioning of commands

(6) Generation of text, date, and time on monitors

If the video is does not meet the requirements of the test, Design-Builder shall perform video resolution and signal-to-noise ratio testing, in which case Design-Builder shall submit a test procedure to ADOT for approval, prior to the testing.

(C) System Acceptance Test (SAT)

Upon successful completion of the subsystem test, the SAT shall be started. The SAT shall consist of a 30 consecutive Day period of operation by ADOT without failure of all Design-Builder-supplied and approved relocated equipment. GPS data shall be submitted and approved prior to beginning the SAT for the periods specified in the ITS Record Documentation item.

The purpose of the SAT is to demonstrate that the total system, consisting of hardware, software, communications, materials and construction, is properly installed, is free from Defects and identified problems, exhibits stable and reliable performance, and completely complies with Contract Documents.

During the SAT, Design-Builder shall ensure that equipment is maintained in operable condition. ADOT personnel shall be provided access to equipment during this period for purposes of verifying its operation. Design-Builder shall identify, isolate, diagnose and troubleshoot system problems and inconsistencies. Design-Builder, in conjunction with ADOT, shall formulate possible solutions and shall implement corrections required in Design-Builder supplied equipment.

Design-Builder shall provide traffic control, bucket truck, test equipment, and labor needed to test, isolate and correct equipment deficiencies found during the SAT. Design-Builder technical personnel having industry standard certification in the field the design and construction of each system component shall be available on site within 48 hours of notification of a problem.

During the SAT, Design-Builder shall record test failures on the System Acceptance Test Failure Log provided at:

https://azdot.gov/business/engineering-and-construction/its-references and immediately submit the form to the IQF. After the repair has been completed, an updated form shall be submitted to the IQF. The IQF will submit the forms to ADOT for approval. Documentation errors, omissions, and changes occurring prior to, and during, the SAT shall be corrected and resubmitted before the SAT is completed.

System documentation errors, omissions and changes occurring prior to and during the SAT shall be corrected and resubmitted before system acceptance can be completed.

(1) SAT Minor Failure

In the event of a minor failure during the SAT, the test clock shall stop until the system is repaired. At the completion of the repair, the testing shall recommence with 24 hours added to the remaining test time of the system. The following constitute minor failures:

(a) Failure to receive acceptable CCTV video image at TOC or loss of CCTV control.

(2) SAT Major Failure

In the event of a major failure during the SAT, the test clock shall stop until the system is repaired. At the completion of the repair, the testing shall recommence with the test clock reset to day zero. The following constitute major failures:

(a) Third failure of the equipment, if determined that failures were caused by faulty installation by Design-Builder.

(b) Third failure to receive acceptable CCTV video image at TOC or loss of CCTV control of an individual CCTV.

(c) Failure to correct an issue within 4 hours of being notified by ADOT.

Section 751 ITS Record Documentation

751-1 Documentation

The work under this item shall include maintaining a complete set of ITS record documentation for installation of new, or modifications to existing ITS equipment.

751-2 Construction Requirements

751-2.01 In-Progress Documentation

In-progress documentation shall be kept current within 14 Days of ITS Work being performed through Substantial Completion. In-progress documentation shall be provided to ADOT prior to initiation of the required System Acceptance Test (SAT) for that device. In-progress documentation shall include:

(A) Construction Plans;

(B) Operation Manuals;

(C) Maintenance Manuals;

(D) Equipment Assembly Drawings;

(E) Cabinet and Rack Wiring Diagrams;

(F) Electrical Schematics, Wiring and Logic Diagrams;

(G) System Connection Diagrams;

(H) Fiber Optic Assignments;

(I) Splice Closure Diagrams;

(J) Software Documentation;

(K) Fiber Management Recording;

(L) Communications and Operating Protocols;

(M) Shop Drawings;

(N) Certificates of Compliance;

(O) Warranties;

(P) Parts Lists; and

(Q) Bore profile of conduits installed by directional drilling.

Fiber Management Recording shall be in a format compatible with ADOT's fiber management software. Acceptable manuals shall contain technical operations, maintenance, and troubleshooting information. Advertising brochures and catalog cuts are not acceptable for manuals.

751-2.02 ITS Final Compiled Documentation

Final acceptance of work in accordance with Contract Documents will not be made until the ITS Final Compiled Documentation has been submitted and has been approved by ADOT.

Design-Builder shall furnish one copy of the ITS Final Compiled Documentation in electronic PDF format, and one printed copy bound in loose-leaf 3-ring binders, grouped logically with printed label tabs.

Design-Builder shall provide one cabinet wiring diagram and fiber optic splice diagram for each control cabinet, labeled with the location name and cabinet number, provided in a weatherproof holder mounted within each control cabinet.

One print of the fiber optic cable connection and splice diagram shall be provided in a weatherproof holder mounted in the pull box with the splice.

Software source code shall be submitted electronically in a format compatible with ADOT's computer system.

Final documentation shall consist of the following documents.

(A) Record drawings

The record drawings shall include lateral offset dimensions of conduit referenced from back of curb, edge of pavement, barrier, guard rail, bridge wall, or other fixed landmark. The dimensions shall be provided at for new conduit at angle points and tangent sections.

(B) GPS Data

GPS data of new and existing to remain ITS equipment within the project limits shall be collected by an Arizona Registered Land Surveyor, regardless if the equipment was affected by construction. GPS data shall be high-precision corrected, collected with accuracy within 12 inches or less. Design-Builder shall submit a transmittal letter stamped by the surveyor, certifying the accuracy of the GPS survey data. The GPS survey data shall be submitted to ADOT in an Excel spreadsheet with different worksheet tabs for each ITS equipment type listed below.

The GPS survey data for control cabinet foundations for CCTV, DMS, ramp meters, detectors, and traffic signals shall be submitted to ADOT at least 45 Days prior to the start of the system acceptance testing to allow ADOT to integrate the equipment into ADOT's software. The remaining GPS survey data shall be submitted at least 15 Days prior to the start of the system acceptance testing.

The following ITS equipment types and fields shall be collected:

(1) Cabinets:

a. Coordinates at center of front door;

b. FMS Cabinet Identification Number;

c. MU Cabinet number;

d. Type: CCTV, DMS, Ramp meter, Detector, Traffic Signal;

e. Route Number: examples L-202, I-17, SR-51; and

f. Route direction: NB, SB, WB, EB;

(2) Load Center Cabinets:

a. Coordinates at center of front door; and

b. FMS Cabinet Identification Number;

c. MU Cabinet number;

d. Type: FMS Load Center;

e. Route Number: examples L-202, I-17, SR-51;

f. Route direction: NB, SB, WB, EB;

g. Street Address; and

h. Utility Name: APS, SRP, etc.;

(3) Node Buildings:

a. Coordinates at center of front door;

b. Node Number;

c. Route Number: examples L-202, I-17, SR-51; and

d. Route direction: NB, SB, WB, EB;

(4) Dynamic Message Signs:

a. Coordinates of support foundation on the right side;

b. DMS ID;

c. DMS Manufacturer;

d. Vertical clearance above the roadway measured at the left edge of the catwalk, catwalk at the right edge line, and center of DMS sign;

e. Route Number: examples L-202, I-17, SR-51; and

f. Route direction: NB, SB, WB, EB;

(5) Ramp Meter Signals and Ramp Meter Flashers:

a. Coordinates of pole foundation (one point for each pole);

b. Route Number: examples L-202, I-17, SR-51; and

c. Route direction: NB, SB, WB, EB;

(6) Entrance Ramp Queue Loop:

a. Coordinates in the center of each loop (one point per loop);

b. Loop Size: 6x6;

c. Route Number: examples L-202, I-17, SR-51; and

d. Route direction: NB, SB, WB, EB;

(7) Mainline Detection:

a. Coordinates in the center of the mainline, centered between loop pairs (one point for all loops);

b. Station ID;

c. Loop Size: 6x6;

d. Route Number: examples L-202, I-17, SR-51; and

e. Route direction: NB, SB, WB, EB;

(8) CCTV Poles:

a. Coordinates of pole foundation;

b. CCTV ID;

c. Route Number: examples L-202, I-17, SR-51; and

d. Route direction: NB, SB, WB, EB;

(9) Pull Boxes:

a. Coordinates in the center of pull box;

b. Pull box ID;

c. Type: 7, 7X, 9;

d. Route Number: examples L-202, I-17, SR-51; and

e. Route direction: NB, SB, WB, EB.

(C) Operation Manuals

Manuals containing a general description and detailed operation and installation instructions shall be provided for each type and model of ITS equipment.

(D) Maintenance Manuals

Manual containing detailed preventive maintenance and troubleshooting procedures shall be provided for each type or model of ITS equipment. Step-by-step field and bench trouble-shooting procedures shall be included, including normative waveforms and test wattages as applicable. A detailed parts list shall be included. For each part, its circuit or pictorial identification shall be shown, as well as rating information and a manufacturer and associated model or part number.

The list shall include cross-references to part numbers of other manufacturers who make the same replacement part.

(E) Equipment Assembly Drawings

A drawing showing the physical location and identification shall be for each different electronic unit and each different subassembly of electronic units. Equipment assembly drawings shall be included in the maintenance manual.

(F) Cabinet and Rack Wiring Diagrams

In addition to the diagram stored in the field cabinet, a wiring diagram shall be provided for each type of cabinet, equipment rack, and junction box containing wire terminals identified by location. The wiring diagram shall depict actual, installed conditions.

(G) System Connection Diagrams

Connection diagrams for the entire ITS system, including block diagrams, terminal numbers, IP addresses, and conductor color codes shall be cross-referenced to correlate with plan's wiring diagrams. The diagram shall include conduits, pull boxes, detectors, etc.

(H) Fiber Optic Splices and Splice Closures

Design-Builder shall provide documentation identifying the location and fiber color codes for each field splice performed by Design-Builder. In addition to storing a drawing in each control cabinet, a fiber assignment drawing shall be provided to ADOT for each splice closure throughout the project.

(I) Configuration Information

Design-Builder shall provide final configuration information for Design-Builder-installed equipment. Configuration information shall include configuration parameters, location, make and model number, serial number, date of installation, vendor, vendor contact information, and warranty expiration date.

Section 752 Wrong-Way Detection

752-1 Description

The work under this item shall include furnishing and installing a wrong-way detection system including thermal cameras, pole mounted NEMA 3R cabinets, illuminated wrong-way sign assemblies, cabling, connectors, mounting hardware, and accessories required to provide a complete and fully functioning wrong-way detection system integrated with software and equipment used by ADOT. The thermal cameras and pole mounted NEMA 3R cabinets shall be installed on ADOT Type 'G' poles unless alternative placement is allowed per the Technical Provisions.

752-2 Functional Requirements

The WWD system shall be capable of:

(A) Real time detection of wrong way vehicles and bicycles using the ramp. Wrong way bicycles using the ramp can be detected regardless of which lane they are using even if vehicle traffic is present in the correct or wrong way direction of travel.

(B) Displaying detection zones on the thermal image with associated outputs. Outputs/Inputs status will be indicated on the screen. Parameters will also include the ability to view raw video without any verbiage and/or detectors for surveillance purposes.

(C) Detecting within its view the presence of vehicles or bicycles in user defined zones. Type of detection capability shall be presence, count, delay, extension, or pulse mode for either arrival or departure of vehicles. Each sensor shall also detect and collect traffic data of passing vehicles in user-defined zones.

(D) Being programmed remotely with a network connection.

(E) Storing detector configurations offline.

(F) Being directionally sensitive. The system shall be omni directional or a sensor that only detects movement: from right to left, left to right, up to down or down to up as seen on the screen.

(G) Containing a minimum of 8 detection zones per sensor.

(H) Exporting data to a spreadsheet format, downloadable from a PC.

752-2.01 Event Log Database

The WWD system shall store an onboard database capable of time stamping and storing 500 events. The Event Log Database can be viewed or downloaded as a comma separated value (csv) file and Extensible Markup Language (xml) file. Erasure of the Event Log Database shall not alter programmed configurations. As a minimum, the WWD system shall be capable of logging and time stamping the following events at user selectable intervals between 1 to 60 minutes:

(A) Firmware upgrade;

(B) Loss of signal;

(C) Resumption of signal;

(D) Configuration change;

(E) Bad thermal quality;

(F) Loss of power to sensor;

(G) Resumption of power to sensor; and

(H) Recall activated.

752-3 Materials

All items and materials furnished shall be new, unused, current production models and shall be currently in distribution unless modified by the Technical Provisions. The manufacturer of the detection products shall have a proven track record of traffic detection equipment for more than 20 years.

The wrong-way detection system shall include the following components:

(A) Detection Module (Thermal Camera)

(B) Interface Module

(C) ADOT Type ‘G’ Poles.

(D) Pole Mounting Brackets

(E) BPL Power and Communication Cable

(F) NEMA 3R Cabinet

Where fiber optic connectivity is required, the system shall also include:

(A) Fiber Optic Cable;

(B) Patch Panel;

(C) Media Converter;

(D) Switch;

(E) Power Component; and

(F) Ethernet Card.

752-3.01 Detection Module (Thermal Camera)

The detection module shall be FLIR TrafiSense AI 645 Thermal Camera with sunshield.

The sensor shall not depend on any visible or invisible (infrared) illumination or image intensifier to “see” i.e., produce images. The sensor shall be totally passive and not produce any energy or emit light in any bandwidth. The sensor shall allow the user to clearly identify images in the total absence of light.

The sensor shall utilize a Vanadium Oxide (VOx) uncooled microbolometer sensor responding in the LWIR (Long Wave Infrared) spectral range of 7 - 14 ~m, which is beyond what is visible to the human eye.

The sensor shall be based on Vanadium Oxide (VOx) microbolometer detector technology and shall not be susceptible to permanent damage after imaging the sun.

The sensor shall not utilize shutters to prevent damage from the sun, but rather the sensor shall provide uninterrupted video which shall be required for wrong-way detection.

The sensor shall not utilize dynamic apertures to protect the image sensor.

The sensor shall provide a thermal optics that automatically adjust to background thermal changes, and therefore do not require re-adjustment and/or thermal refocusing.

The sensor shall not be susceptible to “image blooming” caused by bright lights as are image intensifiers and visible spectrum cameras.

The sensor shall be factory configured with the following fixed anti-reflection coated Germanium lenses with the Field of View (FOV) and resolutions as indicated:

No.	Device	Resolution (Pixels)	FOV	Detection Distance
1.	TrafiSense AI 645	640 x 480	45° H x 35° V	30-260 ft.
2.	TrafiSense AI 632	640 x 480	32° H x 26° V	80-300 ft.

The sensor shall provide a Noise Equivalent Temperature Difference (NETD) of <50mK f/1.0 or lower.

The sensor shall include Auto Digital Detail Enhancement (Auto DDE), which is an advanced non-linear image processing algorithm to enhance the image detail to match the total dynamic range of the original image allowing details to be visible to the user even in scenes with low or high therma,1 contrast.

The sensor shall utilize Non-Uniformity Correction (NUC) with the following features and benefits:

(A) Eliminate the need for FPA (Focal Plane Array) temperature stabilization.

(B) Allow for near instantaneous camera turn-on.

(C) Reduced system complexity and power consumption.

(D) Allow for a wider operating temperature range.

The sensor shall include Automatic Gain Control (AGC) circuitry to compensate for scene variations, improve image quality by avoiding saturation and distortion, and to balance signal levels prior to display to maximize image quality.

The Thermal Traffic Camera shall feature both White-Hot and Black-Hot operating modes. In the White-Hot (default) mode warmer objects will be displayed in white and lighter shades than cooler or background areas. In the Black-Hot mode warmer images will be displayed as black or dark grey as compared to cooler background objects.

The sensor shall be furnished in an IP-67 rated outdoor enclosure with mounting bracket. The mounting bracket shall be provided with holes for mounting to a pole, pedestal, or wall mount. All cable connections shall be quick connect. No tools shall be required to connect the sensor once the original adapter has been installed on the wire.

The sensor shall contain a ground conductor which is run as part of the power cable bundle. This ground shall be terminated in the cabinet.

The sensor shall operate on 12-60 VDC.

The sensor shall include a 10-year warranty on the sensor. The sensor shall meet the following minimum requirements:

No.	Sensor Type	Long-life VOx Uncooled Microbolometer *w/10-year warranty*
1.	Spectral Response	7 to 14IJm
2.	Sensitivity (Thermal Camera sensor)	<50mK f/1.0
3.	Pixel Resolution I Pitch	640x480 I 17 microns
4.	Output	(< 1,000 feet) (>1,000 feet)
5.	User Interface	Web Interface
6.	Input Voltage	12-60V DC
7.	Power Consumption	max 9.6W, 400mA@24 VDC
8.	Operating Temperature Range	-34°C to +74°C I -29.2°F to +165.2°F (Continuous Operation)
9.	NEMA TS 2	Shall meet requirements of Section 2.1 of NEMA TS 2-2003
10.	Weight	Shall not exceed 1.5kg/3.3lbs (bracket, sunshield, housing sensor and video detection module)

No.	Sensor Type	Long-life VOx Uncooled Microbolometer *w/10-year warranty*
11.	Dimensions	9.8” x 6.3” x 4.7” (nominal, w/ mounting bracket)

752-3.02 EDGE Interface Card

The EDGE interface card and other wrong-way detection equipment shall be housed in a pole mounted NEMA 3R enclosure attached to the ADOT Type ‘G’ pole containing the wrong-way detection camera. The EDGE interface card shall be modular by design and housed in either a self-contained stand-alone unit or fit directly into NEMA TS1 &TS2 type racks or Type 170/2070 input files in the NEMA 3R cabinet. The EDGE card shall be interchangeable between a shelf or rack mount installation without replacing or modifying existing units.

A single EDGE card shall communicate with 1 to 8 sensors and include interface to the agencies existing IP network. Only a single IP address shall be necessary for all sensors and allow for independent streaming of video.

The system shall be designed to operate reliably in the adverse environment of roadside cabinets and shall meet or exceed all NEMA TS1 and TS2, as well as Type 170/2070 environmental specifications.

Ambient operating temperature shall be from -34 to +74 degrees Centigrade (-29.2 to +165.2 degrees Fahrenheit) at 0 to 95% relative humidity non-condensing.

The EDGE interface card shall be connected via RJ45 cable. The system shall be powered by 12-60 VDC or 12-42 VAC.

Surge ratings shall be set forth in the NEMA TS1 and TS2 specifications.

The EDGE interface board shall have 4 opto-isolated open collector outputs. Twenty-four (24) additional outputs shall be available via the USB expansion port and up to five (5) 4 I/O USB expansion modules.

Must be able to provide loop emulation for presence, bike presence, counting and data collection.

Presence hold time must have parameters that range from 10 to 600 seconds.

Each TI BPL2 EDGE card shall allow for up to 24 digital inputs into the traffic controller via the 4 I/O USB Expansion boards or up to 64 digital inputs into the traffic controller via the PIM Module using an SDLC interface.

Each TI BPL2 EDGE card shall have error detection. Outputs will be turned “ON” if the video signal is bad or the card is not functioning properly. A user defined quality level will automatically put selected outputs to recall in cases of severe degraded visibility such as fog or blizzard. Normal detection shall resume when visibility improves above the user defined thermal quality level.

Using an agencies network, the TI BPL2 Edge card shall be capable of streaming all connected sensors video streams simultaneously via MPEG4/ H.264/MJPEG. These streams shall be available with or without detection overlay.

The n BPL2 EDGE board shall have a reset button on the front panel to reset the thermal sensors to “learn” the roadway image. During “learn”, selectable recall shall be capable of being enabled or disabled for immediate operation. Learning time of video detectors shall be less than 6 minutes.

The TrafiSense2 Sensor and TI BPL2 EDGE card shall have internal surge suppression. The BPL2 EDGE board shall have separate light emitting diodes (LEDs) that indicate:

No.	Item	Light
1.	POWER	LED to verify power and reboot TI board
2.	POWER	LED to verify sensor power and reboot sensors

No.	Item	Light
3.	PIM	Dual color status LED for PIM Connection
4.	OUTPUT Status	LED if the corresponding detection group is active
5.	INPUT Status	LED if the corresponding detection group is active
6.	8 BPL Sensors	Dual color LED Status
7.	RJ45	The TI BPL2 EDGE card has 2 RJ45 connectors
8.	USB	(10/100Mbit/s auto switching)

The 4 I/O USB Expansion board shall also have separate LEDs that indicate:

No.	Item	Light
1.	POWER	Power LED
2.	OUTPUT	LED to indicate Output Status
3.	INPUT	LED to indicate Input Status
4.	Rotary	Rotary Switch that defines output numbers

752-3.03 Video System Communication Module

The Communication board shall be integral with the TI BPL2 EDGE card and fit directly into NEMA TS1 & TS2 type racks or Type 170/2070 input files in the NEMA 3R cabinet.

752-3.04 Image Sensor Mounting Brackets

The mounting brackets shall be capable of mounting the thermal image sensor on ADOT Type ‘G’ poles.

752-3.05 Image Sensor Cable

Power cable shall be installed in conduits or overhead as indicated in the plans. Power cable shall be suitable for exterior use and in direct sunlight. Power cable shall have a minimum of 3 conductors.

The cable shall meet the following requirements:

No.	Cable	Requirement
1.	Conductors/pair count:	3 conductors
2.	Gauge & stranding:	18 AWG minimum, 7-strand, gauge to be determined by distance
3.	Primary insulation type:	Polyvinyl chloride
4.	Insulation thickness:	0.015-inch
5.	Color code:	Blue, white, green
6.	Jacket type:	Sunlight resistant direct burial polyvinyl chloride

No.	Cable	Requirement
7.	Jacket color:	Black
8.	Jacket thickness:	0.045-inch
9.	Nominal OD:	0.280-inch
10.	Ripcord:	Yes
11.	Voltage rating:	600V
12.	Temp. Rating:	-39°C to 90°C (-38.2°F to 194°F)
13.	Ul type or style:	Type TC or TC-ER
14.	Packaging:	500 feet spools

752-3.06 NEMA 3R Enclosure

NEMA Type 3R Enclosure to be installed on the new ADOT Type 'G' pole shall include a padlock with ADOT masterlock key.

752-3.07 Media Converter

A Media Converter, installed in the NEMA Type 3R Enclosure, shall be provided wherever the camera is connected via fiber optic cable.

752-3.08 Illuminated Wrong-way Sign Assembly

The sign assembly shall include an internally illuminated LED WRONG-WAY sign, flashing LED lights on the border of the sign, sign mounting hardware, electronic components, materials, tools, and labor necessary to provide a complete and fully operational system.

The assembly shall include one 36" x 48 inch" R5-1a "Wrong-way" internally illuminated wrong- way sign. The sign shall include a minimum of 70 red LEDs which illuminate the border of the sign. The sign dimension references the visibly-illuminated portion of the sign panel, and the structural frame of the sign is not included in the dimensions. The LEDs internally illuminating sign panel shall turn on without flashing when the sign is activated. The LED's on the border shall flash at a rate of approximately 60 flashes per minute when the sign is activated. The sign assembly shall be activated for a user-adjustable duration up to 10 minutes triggered by a short pulse contact closure output from the thermal camera system. The sign shall only be activated when a wrong-way vehicle is detected by the system. Design-Builder shall furnish electronic components required for the sign including relays, transformers, and flasher.

Components shall be able to withstand and operate at temperature extremes of -22 to +140 degrees F.

All exterior surfaces of the internally illuminated sign shall be powder-coat painted in accordance with Military Standard MIL-C-24712. Finish shall meet the requirements of ASTM D3359, ASTM D3363, and ASTM D552. The internally illuminated sign enclosure shall have a weatherproof design that ensures water does not reach internal components, and shall be able to do so in its design, without the use of silicone. The sign shall have a 3mm or 4mm acrylic front panel that is UV, weather, abrasion and impact resistant. The acrylic panel shall be cyro-acrylite. The front panel shall be replaceable if required. The sign shall be designed and constructed to withstand 150 mph wind loads in conformance with the requirements of the AASHTO publication, "Standard Specifications for Structural Supports of Highway Signs, Luminaries and Traffic Signals," 6th Edition 2013, with 2015 Interim Revisions. Signs shall be tested and certified for the following environmental conditions: Exclusion of Water Test, Strain Relief Test, Temperature Test, Dielectric Voltage-Withstand Test.

The entire surface of the sign panel shall be evenly illuminated with a minimum average brightness reading at the letters of 580 Lux and a variation of no more than 15% for any reading from the average (minimum of 50 readings). Each background reading measured shall not vary by more than 10% (minimum of 50 readings) from the average of the background brightness readings. The light transmission factor of the sign panel shall provide a letter to a minimum background ratio of 4:1.

The light source for the sign shall be LEDs (light emitting diodes). The LEDs shall evenly illuminate a light panel that is the same dimensions of the sign face. The LEDs shall have a minimum rated lumen maintenance of 70% at 60,000 hours (an L70 of 60,000 hours).

Electrical conductors shall enter the sign housing on the side of the sign that is away from traffic lanes or the bottom of the sign. LED single output switching power supply shall be a fully encapsulated, constant- current design built to withstand 300 VAC surge input for 5 seconds, with inherent short circuit/over current/over voltage protection. The power supply shall be a UL 1310 Class 2 power unit and shall be housed in a fully isolated plastic case to prevent water intrusion. The sign's LED single output switching power supply shall be rated for a 1450 mA rated current, a DC voltage range of 9-34 VDC, a power rating of 59.5 Watts, a voltage tolerance of +/- 5.0%percent, an AC current of 0.7 Amps at 230VAC, and voltage range of 127 to -370 VDC with 87%percent operating efficiency rating, plus a working temperature of -30 to +70 degrees Celsius. Safety standards shall meet the following criteria: UL1310 Class 2, CAN/CSA C22.2 No. 223-M91 (for LPC-60-1750 only), IP67 approved; design refer to TUV EN60950-1, EN61347-2-13.

The sign manufacturer shall have a demonstrable Quality Assurance Program in place, with proof of regular re-certification by an independent auditing agency. Reports shall be made available upon request.

The sign shall be listed and approved to UL 48 Standards by a Nationally Recognized Testing Laboratory. The outside of the sign shall be marked with a certification mark for Electric Signs UL 48.

The sign sheeting shall have anti-graffiti film applied per the requirements of the sign sheeting manufacturer.

Sign shall have a warranty for a minimum of 5 years.

The sign support hardware shall be certified by the hardware manufacturer that it is structurally adequate and compatible to support the sign assembly considering wind and other loads specified in this TPA 738-1. Manufacturers of sign components shall certify that the components are MUTCD compliant.

ADOT may request one sign assembly to be provided for evaluation and testing for a period of one week prior to approving the material submittal for items related to the sign assembly.

752-4 Construction Requirements

752-4.01 Thermal Cameras

Cable from the BPL cameras to the cabinet shall be continuous without splices. The terminal block for the BPL cameras shall be mounted to the side of the NEMA 3R cabinet.

Design-Builder shall be responsible for ensuring that all necessary features are included when installing the thermal camera detection system as shown on the project plans and in accordance with the requirements of the system manufacturer and this TPA 738-1.

Design-Builder shall install thermal cameras on new Type G poles or as allowed by the Technical Provisions. Minimum installation height of the camera is 27 feet above the pavement where the detection zone is and shall be confirmed with the thermal camera vendor to achieve optimum viewing angles. Thermal cameras for wrong-way detection shall not be mounted on traffic signal mast arms nor luminaire mast arms.

Design-Builder shall install the TI BPL2 Edge Interface card and three 4I/O USB expansion cards in the NEMA 3R cabinet housing. The NEMA 3R cabinet shall also include a new 60 VDC power supply and 120 VAC, 15 Amp circuit breakers, a 242L DC Isolator, an Ethernet media converter and fiber termination unit.

A space shall be provided between equipment installed on DIN rail for air circulation.

Design-Builder shall install power and communication cables through the FMS conduits as shown on the plans. BPL cables shall run in continuous unspliced lengths between the new thermal cameras and the cabinet.

Design-Builder shall install cables in the conduit as designated on the approved plans. If Design-Builder desires to modify which conduits the various cables are installed in, Design-Builder shall submit their request to ADOT and receive approval prior to installing the cables.

Design-Builder shall conduct the stand-alone test, subsystem test, and system acceptance test. Design-Builder shall develop the testing plan and pass/fail requirements and submit to ADOT for approval.

752-4.02 Illuminated Wrong-way Sign Assembly

The illuminated wrong-way sign assembly shall be installed with the bottom of the internally illuminated wrong-way sign 3 feet above the roadway elevation.

Ground for the sign housing and posts shall be provided by a 25-foot coil of # 4 AWG bare copper conductor, or a 14-inch square copper ground plate, installed at the bottom of the foundation for the Type A pole. Electronic components shall be installed in the NEMA 3R cabinet, within the internally illuminated sign housing, or within an enclosure attached to the sign.

Design-Builder shall perform a field visit together with ADOT or ADOT's designee to precisely locate and stake the sign assemblies considering visibility and site details.

752-4.03 Power Supply Arrangements

Design-Builder shall obtain power for wrong-way detection including the illuminated wrong-way sign assembly from the nearest load center.

Section 753 Dynamic Message Signs

753-1 Description

The work under this item shall consist of furnishing and installing full-color, front-access, Dynamic Message Signs (DMS) capable of displaying three lines of 18 characters (MUTCD Series E Modified font) at 18" letter height which corresponds to a sign nominally 31' x 8', in compliance with these Technical Provisions.

753-2 Materials

The DMS shall be a fully-programmable, electronic, full-matrix, full-color, LED-based front-access Dynamic Message Sign (DMS). The DMS shall be a complete assembly and include the sign housing, operational software, sign controller unit (SCU), communication unit, controller cabinet, power supplies, grounding and surge protection, and all other hardware associated with a complete installation as described herein.

All DMS shall be manufactured to allow for mounting to the supporting structures of the type designated in the Technical Provisions. Each DMS shall be capable of operating as a stand-alone unit or integrated into ADOT's Traffic Operations Center (TOC) and DMS control software. The DMS shall be a free-programmable type, capable of graphical full-color (graphics and/or pictogram) and/or a message display (text), used singularly or in combination.

The DMS shall meet the criteria of the most recent approved versions of the codes and standards shown below.

Governing Body	Applicable Standard(s)	
NTCIP (Base Standards)	NTCIP 1101, Simple Transportation Management Framework (STMF)	
	NTCIP 1102	Base Standard Octet Encoding Rules

	NTCIP 1103 Transportation Management Protocols (STMP with SNMP subset) NTCIP 8004 Structure & Identification of Management Information (SMI) NTCIP 8007 Testing and Conformity Assessment Documentation
NTCIP (Data Dictionary)	NTCIP 1201, Global Object Definitions NTCIP 1203 Object Definition for DMS, Part 1 and Part 2 (Testing)
NTCIP (Communications Profiles)	NTCIP 2101, Subnet Profile for Point to Multipoint Protocol via RS-232 NTCIP 2104, Subnetwork Profile for Ethernet NTCIP 2201, Transportation Transport Profile NTCIP 2202, Internet (TCP/IP and UDP/IP) Transport Profile NTCIP 2301, STMF Application Profile (SNMP subset)
UL	UL 48, Standard for Safety for Electric Signs, 15th Ed. dated 09/02/11 Rev. 10/02/12 UL 8750, Standard for Safety for Light Emitting Diode (LED) Equipment for Use in Lighting Products, 1st Ed. Dated 11/18/2009 Rev. 09/19/13 UL 50E, Standard for Safety for Enclosures of Electrical Equipment, Environmental Considerations, 1st Ed. dated 09/04/07 Rev. 04/27/12
NEMA TS 4	NEMA TS 4-2023, Hardware Standards for Dynamic Message Signs (DMS) with NTCIP Requirements, Section 2, Environmental Requirements NEMA TS 4-2023, Hardware Standards for Dynamic Message Signs (DMS) with NTCIP Requirements, Section 5, Display Requirements
FCC	EMC Testing/Evaluation to Standard(s): U.S./FCC 47CFR Part 15, Subpart B EMC Testing/Evaluation to Standard(s): Canada/ICES-003

The DMS manufacturer shall provide self-certification, including a statement of conformance and copies of test reports, indicating that the following tests have been performed and passed.

Product test reports must be submitted for testing of the following National Transportation Communication for ITS Protocol (NTCIP) standards, as applicable:

(A) NTCIP 1201: NTCIP Global Object Definitions.

(B) NTCIP 2101: Point to Multipoint Protocol Using RS-232 Subnetwork Profile.

(C) NTCIP 2104, Subnetwork Profile for Ethernet

(D) NTCIP 2201, Transportation Transport Profile

(E) NTCIP 2202, Internet (TCP/IP and UDP/IP) Transport Profile

The NTCIP testing must have been completed using industry accepted test tools such as the NTCIP Exerciser, Trevilon's NTester, Intelligent Devices' Device Tester, and/or Frontline's FTS for NTCIP. The NTCIP test report(s) must include testing of sub-network communications functionality, all mandatory objects in all mandatory conformance groups, and a subset of the remaining objects.

753-3 General Requirements:

All signs furnished, assembled, and fabricated shall be new, corrosion-resistant, and in strict accordance with the details of this TPA 738-1. All details and functionality listed in this TPA 738-1 will be thoroughly inspected and tested

by the manufacturer prior to delivery. Failure to meet all details and functionality detailed in this TPA 738-1 shall be grounds for rejection of the signs.

The sign design and construction shall utilize the latest available techniques. The signs shall be designed for ease of maintenance. All component parts shall be readily accessible for inspection and maintenance. Test points shall be provided for checking essential voltages.

The complete sign assembly shall be designed fit for purpose (i.e., fulfilling the initial requirements for luminance, contrast and color) for a minimum of 10 years.

The signs shall be designed and constructed to present a clean and neat appearance. Poor workmanship shall be cause for rejection of the sign.

All cables shall be securely clamped and/or tied in the sign housing. No adhesive attachments will be allowed. All exposed cabling external to the sign housing shall be installed in metal conduit in accordance with local codes and requirements.

The performance of the signs shall not be impaired due to continuous vibration caused by wind, traffic, or other factors. This includes the visibility and legibility of the display.

The DMS hardware, along with the sign controller hardware, software, and firmware, shall support all DMS functionality described throughout the remaining specification sections.

DMS and sign controller components shall be 100% solid-state, except for the environmental control fans and thermostats.

All electronic components, except printed circuit boards, shall be commercially available, easily accessible, replaceable, and individually removable using conventional electronics repair methods. All signs shall use the same type and manufacturer of LED boards, drivers, power supplies, and electronic boards.

All electronic equipment shall be of solid-state design and modular construction. Individual electronic modules shall provide easy service access and shall be field replaceable. The design shall be such as to prevent incorrect assembly or installation of connectors, fasteners, etc., where possible malfunction or personnel hazards might occur. Each item of equipment shall be designed to protect personnel from exposure to high voltage during equipment operation, adjustments, and maintenance.

753-4 Mechanical Components:

External DMS component hardware (nuts, bolts, screws, standoffs, rivets, fasteners, etc.) shall be fabricated from hot dipped or mechanically galvanized steel, stainless steel, aluminum, nylon, or other durable corrosion-resistant materials suitable for the roadway signage application. No self-tapping external screws shall be used. All parts shall be made of corrosion resistant materials, such as plastic, stainless steel or aluminum and shall be resistant to fungus growth and moisture deterioration. Dissimilar metals shall be separated by an inert dielectric material.

753-5 Communications Network:

The sign and central control computer will communicate with each other over an Ethernet TCP/IP standard network. All Ethernet cabling, fiber optic cable, and Ethernet-to-fiber converters necessary to allow the signs and control computer(s) to communicate will be provided to the DMS location.

Each sign shall have a local RS232 or Ethernet port which can be used to locally maintain, program, or control the sign via a laptop computer using communications standards outlined herein.

753-6 Sign Control, Monitoring, and Programming:

A single computer will be used to program, monitor, and control all the signs using the same version of sign control programming software. The signs and control computer will communicate using standard Ethernet TCP/IP standards.

Software will be provided for installation on a department supplied computer. Sign control software will conform to the Sign Control Software section of this TPA 738-1.

753-7 Software:

The DMS supplier shall provide a DMS software system shall that contains the following software components described herein:

(A) Communication Software

(B) Control Software

(C) Character Set Software

(D) Message Capabilities

The DMS supplier's signs shall integrate and be controlled by ADOT's central control software, which is FLIR Cameleon ITS v2020.1.60, or latest version, which is used to operate Dynamic Message Signs, closed circuit television cameras, wrong-way detection stations, variable speed limit signs, and dust detection.

753-8 DMS Housing:

An enclosed metal housing shall be used for structurally mounted sign installations in accordance with the Plans and Project Special Provisions. Unless otherwise specified, house all electronics in the sign housing, including, but not limited to, display, control, communications, and power equipment such as modems, transceivers, routers, network switches, controllers, power subsystems, outlets, circuit switches and other required equipment.

The DMS housing shall include the following general characteristics:

Housing Material:

The exterior skin aluminum sheet (ISO AlMg2.5), 1/8" min. thickness. Interior housing structural members, if necessary, conforming to aluminum alloy as required per AASHTO specifications. Mill finish, powder coating or painted finishes or other finishes to be provided as specified.

Equipment shall remain fully functional regardless of temperature, humidity, wind, water, ice and other Arizona environmental factors. The maximum internal DMS air temperatures shall not exceed 165 degrees Fahrenheit (74 degrees Celsius). The equipment shall operate in the following temperatures: -40 to 165 degrees Fahrenheit (-40 to 74 degrees Celsius).

Ingress Protection:

DMS housing shall meet or exceed the requirements of a Type 4 enclosure rating for water ingress, as described in the latest edition of UL50E. Provide at least natural airflow as well as drainage holes to avoid humidity inside the DMS per NEMA TS 4.

Design/Service Loadings:

At a minimum, the DMS housing, structural frame, face matrix and mounting members shall be designed to withstand environmental loadings.

Vibration/Shock:

The performance of the DMS shall not be impaired due to vibration or shock caused by wind, traffic, or any other source.

Mounting Assemblies:

DMS supplier shall coordinate mechanical interfaces for attachment of the DMS housing to its supporting structure with the ADOT standard butterfly sign structure. Supplier shall provide "C" channel or "Z" bar mounting brackets per approved supporting structure designs. DMS supplier shall fabricate all external sign mounting brackets from structural steel (A36), aluminum alloy (6061-T6) or approved alternate. Provide finish as specified with structural steel hot-dipped galvanized after fabrication.

Housing Drainage:

DMS supplier shall provide a minimum of four drain holes on the bottom of the sign housing that are centered from the front to back edges of the bottom housing panel and spaced evenly across the sign's full length. Screen all drain holes to prevent the entrance of small insects and animals. Slope the bottom of the sign housing panel towards the drain holes to prevent the accumulation of water at the bottom of the sign.

Lifting Mechanism:

DMS supplier shall provide multiple steel lifting eye bolts or other equivalent hoisting points to be used during transport and installation, connected directly to the sign housing top internal structure. Lifting eye bolts shall be removable and rated for the application. The hoist points must enable the sign to be lifted evenly during transport and installation. On the top panel of the sign housing, make provisions to prevent the pooling or collecting of water on the top of the sign housing.

The DMS design shall allow unobstructed and convenient access to all non-structural components. Structural components are defined as the metal DMS housing and internal structural framing. All serviceable components shall be modular, interchangeable, and removable from the service access points.

Maximum DMS weight shall be less than 4,200 lbs.

753-9 DMS Front Matrix:

The DMS shall provide panels to prevent moisture, dirt, dust, or other foreign objects to permeate the sign face at the seams. Construct a sign face of aluminum, and coat with a black coating system that will exceed NEMA contrast ratio requirements of 10:1.

The completed exterior face of the front matrix panel shall provide a watertight assembly fulfilling the requirements on water tightness against splash water and high-pressure cleaning during the entire technical lifetime of the DMS.

Multiple LED clusters used to create individual pixels will not be accepted.

Pixels shall have a symmetrical 30-degree cone of vision (±15-degree vertical and horizontal of the pixel) and a refresh rate of at least 200 Hz.

Pixel pitch of 20mm shall be required for the display requirements.

The failure of an LED in one pixel shall not affect the operation of any other pixel.

The manufacturer's Mean Time Before Failure (MTBF) shall be a minimum of 10 years for the operating conditions listed herein. MTBF shall be defined as the point at which an LED's luminance intensity has degraded to 80% or less of its initial level. In other words, after 10 years of operation at least 80% of the initial luminance still must be achieved.

The LEDs shall provide uniformity of luminance and color over the sign's entire face within a minimum 30-degree angle in all directions and lighting conditions. Non-uniformity of brightness or color over the sign's face is justification for rejection of the sign.

753-10 Interior Structure:

DMS Supplier shall construct internal structural members of the DMS housing including the structural frame out of aluminum alloy 6061-T6 or 6063-T5 or approved equivalent. Provide internal structural members to accommodate

all LED mounting, including the rapid removal of individual display modules. Enable the removal of individual display modules without interfering with adjacent or surrounding modules or the use of any tools.

The manufacturer shall provide certification for all coating materials used in the DMS housing.

The DMS shall provide unobstructed access that allows servicing of internal components. Access must not require specialized tools or excessive force.

The DMS shall include a temperature sensor in the sign housing controlled and monitored by the sign controller. Provide the capability for the sign to blank itself when a user-defined critical temperature threshold is exceeded. Provide the capability for the user-defined critical temperature threshold to be changed remotely from the ADOT TOC or other location, using the sign controller.

The DMS shall include sensors with the capability to monitor ambient light levels. Furnish sensors that employ enough photocells in the appropriate locations to measure ambient light conditions.

753-11 DMS Power Supply and Usage:

The DMS supplier shall equip the sign housing with 15A,120-volt rated ground fault interrupter (GFI) outlets that include protected duplex electrical receptacles.

753-12 Display Characteristics for Full Matrix Display Module:

Display Characteristics:

(A) Controller shall support remote uploading of content (images and text).

(B) Display Characters - At a minimum, provide all fonts of a Line Matrix, per NEMA TS 4. Use of other fonts and graphics shall adhere to NTCIP 1203 and applicable MUTCD requirements for Dynamic Message Signs.

(C) Display Memory - Storage of at least 100 predefined messages/pictograms

(D) Dimming - Depending on the ambient light measured by the light sensors (the brighter value of the sensors must be considered), provide capability to automatically adjust at least 100 intensity levels (1-100%). Dimming by pulse wave modulation (PWM) of constant forward LED current, signs using multiplexing technology shall be rejected.

(E) Light sensors - Equip DMS enclosure with a minimum of 2 light sensors positioned on the front and rear side of the housing. DMS supplier shall determine if an optional 3rd sensor at bottom of sign is required for proper operation.

Display Performance:

LED Color – shall be full color RGB.

(A) Active Display Area shall be approximately 8400 mm x 1920 mm based on a 420 column, 96 row pixel configuration.

(B) All symbols and graphics shall meet the visibility and legibility provisions of the MUTCD for Changeable Message Signs.

(C) Text Message length and units of information displayed shall meet the requirements of the MUTCD, Section 2L.05.

Optical Performance:

(A) Chromaticity Classification and Limits - Provide narrow color space chromaticity compliant with chromaticity limits of NEMA TS 4 by color for LED technology, ensuring differentiation between colors

during adverse environmental conditions and allowing best legibility and recognition even for road users with weak color distinction ability.

(B) Luminance Intensity - Guarantee legibility of at least 1000 feet, even during adverse environmental conditions (e.g., low sun height at 5 degrees above horizon) meeting or exceeding NEMA TS 4 for intensity and uniformity.

(C) Contrast Ratio - High luminance (contrast) ratio requirement in combination with improved luminance intensity is most important for good legibility. Meet or exceed contrast ratio requirements of NEMA TS 4 for LED technology by display color.

(D) Text - Provide free positioning vertical and horizontal text, allowing multiple font size display.

753-13 Sign Controller Unit:

The DMS Supplier shall provide a sign controller unit (SCU) to receive sign control commands from both the TOC and a local on-site laptop (portable maintenance computer). Supplier shall program the SCU to transmit responses, as requested, to the TOC and to control sign operation, message displays, and maintenance polls and statuses.

The SCU shall meet the following general requirements:

The SCU shall perform all communication, control, and feedback functions. No intermediate sign controller shall be used between the local sign controller and the TOC.

The SCU shall be installed in a ground mounted cabinet in close proximity to the DMS sign structure.

Center-to-Field (C2F) and Local Communications between the SCU and the sign shall conform to the following:

Communication:	Ethernet (Cat 5e or Cat 6) or Fiber, TCP/I
Communication error:	Supervision of sign to center error: Blank-out
Supervision:	Watchdog function must be implemented to avoid corrupted image message, provide supervision of every single LED, supervision of internal and external communication, supervision of door contacts to report open doors, and other monitoring as required by the sign type
Reporting:	All errors shall be logged and reported to the ADOT TOC

The sign controller shall be programmed to receive NTCIP-compliant sign control commands from the ADOT TOC or laptop computer, transmit NTCIP-compliant responses as requested to the central controller or laptop computer, monitor sign and message status and control sign operation and message displays via the graphics processor.

The sign controller shall utilize the latest NTCIP version (current version: 03.04).

The sign controller must contain enough memory for storing changeable and permanent messages and graphics for controller operation with the ability to store 25 images.

The sign controller must contain DMS-specific control firmware (embedded software) that monitors all external and internal sensors, communication inputs, and controls the display modules, as directed by external control software (central control computer or laptop).

The controller shall have power-up and auto-restart capabilities with a programmable default message (including a blank message) when recovering from a power off condition.

A hardware watchdog circuit shall be utilized to provide automatic reset to the controller.

A controller user interface via a RS232 or Ethernet port shall be provided for a laptop computer to perform the following local functions, at a minimum:

(A) Navigate the controller's menu subsystem.

(B) Display/pixel diagnostics.

(C) Activate messages stored in memory.

(D) Enter message to be displayed and activate that message

(E) Configure display parameters.

(F) Configure communications port settings and NTCIP options.

(G) Provide a subsystem to log and report errors and failures, including data transmission errors, receipt of invalid data, communication failure recoveries, alternating current power failures, power recoveries, pixel status reads, fan status where applicable, temperature status, power supply status, and information on the operational status of the temperature, photocell.

The sign controller unit (SCU) shall meet the following minimum electrical and mechanical requirements:

(A) The SCU shall consist of an embedded, industrial-grade, microprocessor-based unit with multiple digital inputs and outputs as well as analog inputs, designed for extreme temperature applications (-40 to 165 degrees Fahrenheit (-40 to 74 degrees Celsius)).

(B) The SCU shall have power and reset capability locally and through remote operation.

(C) The SCU shall have a mean-time-between-failure (MTBF) of greater than 200,000 hours. For this section, a critical failure shall be any failure which prevents a local or remote authorized user from being able to display a new or previously created message.

(D) The SCU shall be cooled solely through convection (i.e., no fans or filters).

(E) The SCU shall have non-volatile, electronic, changeable memory. This memory shall be formed by flash or battery-backed, static RAM, integrated circuits that retain the data in memory for a minimum of 30 Days following a power loss. The controller memory shall be capable of storing a minimum of 100 changeable messages in non-volatile RAM.

(F) The SCU shall contain a computer-readable clock that has a battery backup circuit. The battery shall keep the clock operating properly for at least 30 Days without external power. The clock shall automatically adjust for Daylight Savings Time and leap year and shall be set electronically by the sign controller microprocessor with accuracy within one (1) minute per month.

The sign controller unit (SCU) shall meet the following minimum operational requirements:

(A) The SCU shall prevent unauthorized users from accessing the sign controller or changing displayed messages without permissions. Protects access to the sign controller using security authentication or login when accessing the sign locally via a laptop computer or a local control panel(s).

(B) The SCU shall include software compatible with the existing software and hardware at the TOC. The software must, at a minimum, provide password protection to restrict access to the program and the sign control functions and be capable of fully controlling all programmable functions of the DMS.

(C) The SCU shall have the ability to play volatile messages.

(D) The SCU shall monitor all external and internal sensors and communications inputs and control the display modules through the graphic processor as directed by external control software.

(E) The SCU shall switch between operating modes (Local/Central) requiring no software or hardware modifications.

(F) Under local control, the SCU shall inhibit communications from the TOC and implement communications to the sign in place of the central communications.

(G) While in local control, the SCU shall 'listen' for a 'Central Override' command which will cause the sign controller to go into a central override mode and allow communications between the sign controller and the TOC.

(H) The SCU shall provide VGA/LVDS/TTL, Dual LAN, USB2.0 and Audio I/O interfaces required by the Plans and Project Special Provisions and the following:

1. The SCU shall contain a minimum of one (1) RS232 communications port.
2. The SCU shall contain a minimum of two (2) Ethernet (Dual 10/100 Mbps) ports with RJ45 connector.
3. The SCU shall provide a HDMI compact audio/video interface.
4. The SCU shall provide the ability to connect to external modems or other communications equipment as may be specified in the Plans (fiber optic modems)
5. The SCU shall provide for Wi-Fi connectivity.

A DMS manufacturer's warranty shall be provided for a period of 5 years starting upon successful completion of the stand-alone test and shall be in accordance with Section 106.13 of the ADOT *Standard Specifications*.

The DMS sign shall include manufacturer-supplied power and control cables between the DMS and sign controller, and a manufacturer-supplied control cabinet including the following accessories:

(A) Sign Controller;

(B) Pullout Drawer;

(C) EIA Equipment Rack;

(D) Ventilation System;

(E) Cabinet lighting;

(F) Main power supply and distribution system; and

(G) Photo Sensor Control.

Design-Builder shall furnish and install UV-rated flexible metal conduit between the DMS support structure and the DMS sign case. Design-Builder shall furnish and install one 8 AWG green bond conductor between the DMS case and control cabinet conforming to Subsection 732-2.01 of the ADOT *Standard Specifications*. Wiring and grounding shall conform to Subsection 732-3.03 of the ADOT *Standard Specifications*.

Design-Builder shall submit Shop Drawings and Working Drawings for each DMS installation conforming to the requirements in the DMS sign structure bid item.

753-14 Construction Requirements

The IQF shall be present at the time of installation.

Design-Builder shall install the control cabinets on foundations. Design-Builder shall furnish and install silicone caulking, or other approved sealant around the base of the cabinet to form a watertight and dust-proof seal.

Design-Builder shall mount communication equipment such as the Ethernet switch, switch power supply, and patch and splice module on the DIN rail shelf leaving space for air circulation between devices. Design-Builder shall integrate the communication equipment and DMS sign controller with ADOT's network.

Design-Builder shall install the control and power cables between the DMS and the sign controller in accordance with the DMS supplier's recommended routing and installation methods. The power cables shall be terminated by Design-Builder and the control cables shall be left disconnected.

Design-Builder shall arrange, coordinate, and provide, under the cost of this item, for a DMS supplier's field technician to be on-site to field-commission the sign, and initial set-up and testing. The DMS supplier's field technician will terminate and connect the control cables between the DMS and the sign controller during the stand-alone test.

Removable caps shall be placed on unused conduits within the cabinet.

Design-Builder shall record on the plans the vertical clearance above the highest point of pavement and the lowest component of the DMS sign, mounting hardware and/or catwalk element.

If the DMS will not be in operation within 14 Days of installation, Design-Builder shall install an ADOT-furnished 36-inch by 36-inch static sign facing traffic with the message "SIGN UNDER TEST". The sign shall be mounted on the vertical member of the DMS support structure with Design-Builder-furnished steel strap or banding. Mounting of the sign by drilling into the support structure is not allowed. Design-Builder shall remove the sign and mounting hardware upon final acceptance. The sign shall be returned to ADOT, after removal. Sign mounting hardware shall become the property of Design-Builder.

Design-Builder shall furnish and install pressure-sensitive, permanent identification decals on the DMS control cabinet, as shown in ITS Standard Drawings FM-3.13. The decals shall be 3-inch tall, Series C, Gothic letters and shall be top-grade, glass-beaded, reflective black letters on a silver or chrome background.

753-15 Testing Requirements

(A) Stand-Alone Test

After Design-Builder has successfully energized all DMS assemblies on the project, the DMS Supplier Testing will be performed by the DMS supplier's field technician. The DMS supplier's field technician will terminate and connect the control cables between the DMS and the sign controller and test functionality of the DMS system.

Design-Builder shall schedule the stand-alone test with ADOT and the DMS supplier at least 4 weeks prior to the desired test date. Design-Builder shall provide the DMS supplier the DMS serial numbers, cabinet serial numbers, and installed locations and mileposts. All DMS assemblies within the project shall be ready for DMS Supplier Testing so Design-Builder's DMS supplier may sequentially perform testing on all DMS assemblies within the project. Design-Builder shall work with the DMS supplier's field technician to troubleshoot and make repairs to the DMS system. Design-Builder shall provide traffic control and a bucket truck with an operator for use by the DMS supplier's field technician during testing. Traffic control will be measured and paid for under their respective traffic control items.

The DMS supplier shall use their standard test form and submit a complete and organized set of forms in electronic PDF format to the IQF. IQF will submit the form to ADOT for approval.

(B) Subsystem Test (SST)

After successful completion of the above tests, ADOT, with the support of Design-Builder, shall conduct the subsystem test verifying that communication to the sign controller is properly configured and operating without failure or adversely affecting the existing system. The SST shall start on a Monday, Tuesday, or Wednesday and be conducted for three consecutive Business Days.

Design-Builder shall repair or replace components that fail the SST at no cost to ADOT and the test shall be restarted on a Monday, Tuesday, or Wednesday and be conducted for three consecutive Business Days. Design-Builder shall supply test equipment requested by ADOT to troubleshoot the system.

Design-Builder shall provide traffic control and a bucket truck with an operator for use by the DMS supplier's field technician during the subsystem test. Traffic control will be measured and paid for under their respective traffic control items.

(C) System Acceptance Test (SAT)

Upon successful completion of the subsystem test, the SAT shall be started. The SAT shall consist of a 30-day period of operation without failure of DMS equipment. GPS data shall be submitted and approved prior to beginning the SAT for the periods specified in the ITS Record Documentation item.

The purpose of the SAT is to demonstrate that the total system, consisting of hardware, software, communications, materials, and construction, is properly installed, is free from Defects and identified problems, exhibits stable and reliable performance, and complies with Contract Documents.

During the SAT, Design-Builder shall ensure that equipment is maintained in operable condition. ADOT shall be provided with access to equipment during the SAT for purposes of verifying operation. Design-Builder shall identify, isolate, diagnose and troubleshoot system problems and inconsistencies. Design-Builder, in conjunction with ADOT, shall formulate possible solutions and shall implement corrections required in Design-Builder -supplied equipment. Design-Builder shall provide test equipment and labor needed to test, isolate, and correct equipment deficiencies found during the SAT. Key Design-Builder technical personnel familiar with the design and construction of each system component shall be available on site within 48 hours of notification of a problem.

During the SAT, Design-Builder shall record test failures on the System Acceptance Test Failure Log provided under "ITS Test Forms" at https://azdot.gov/business/engineering-and-construction/its-references and immediately submit the form to the IQF. After the repair has been completed, an updated form shall be submitted to the IQF. The IQF will submit the forms to ADOT for approval. Documentation errors, omissions, and changes occurring prior to, and during, the SAT shall be corrected and resubmitted before the SAT is completed.

The 30-day SAT is part of the Project Contract Time.

(1) SAT Minor Failure

In the event of a minor failure during the SAT, the test clock shall stop until the system is repaired. At the completion of the repair, the testing shall recommence with 24 hours added to the remaining test time of the system. The following constitute minor failures:

(A) Failure of Design-Builder-furnished equipment;

(B) Failure of an entire communications circuit; and

(C) Failure to communicate to an individual DMS.

(2) SAT Major Failure

In the event of a major failure during the SAT, the test clock shall stop until the system is repaired. At the completion of the repair, the testing shall recommence with the test clock reset to day zero. The following constitute major failures:

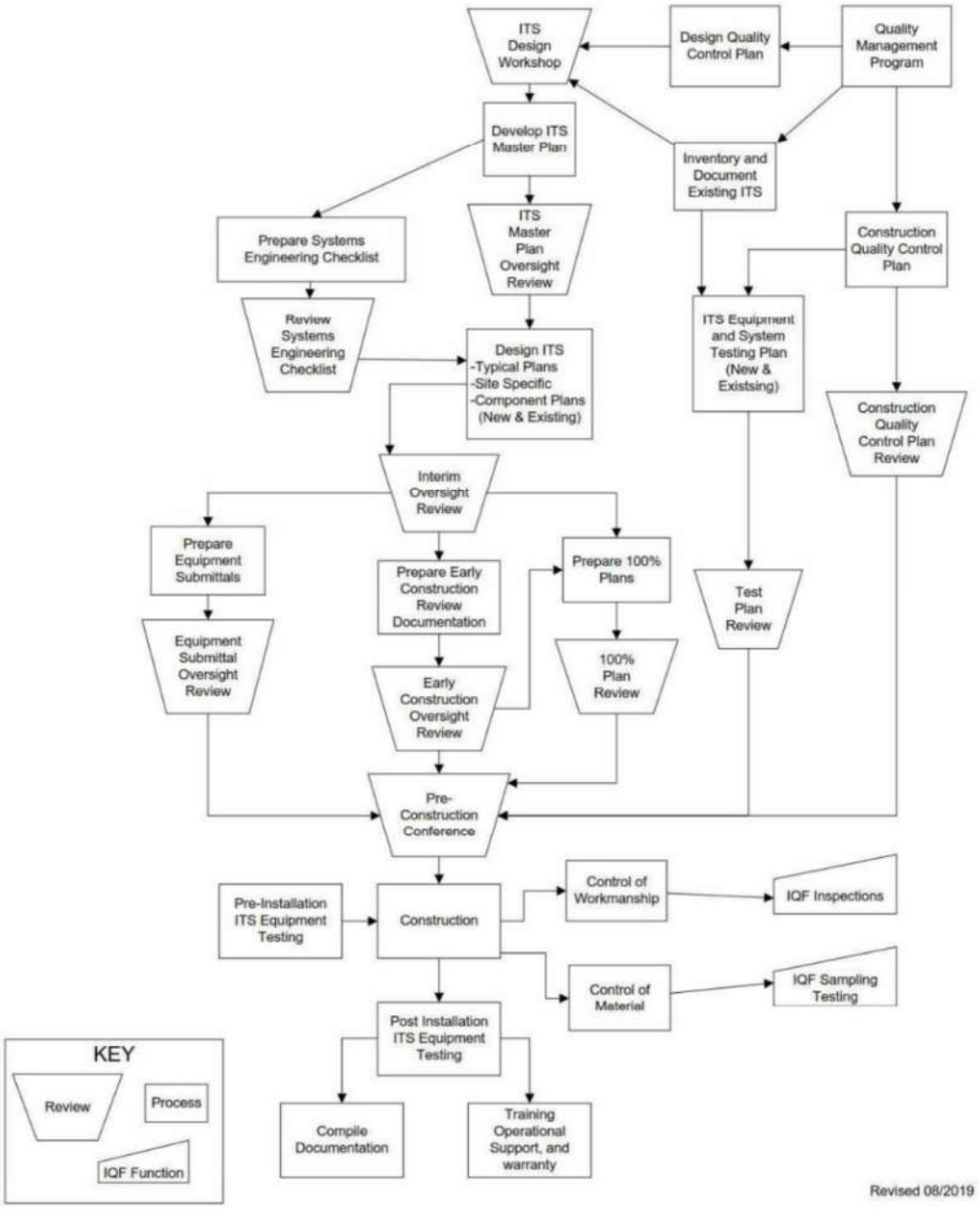
(A) Failure of Design-Builder-furnished equipment, if determined that failures were caused by faulty installation by Design-Builder.

(B) Failure of an entire communications circuit for more than 15 minutes within a 24-hour period.

(C) Failure to communicate to an individual DMS.

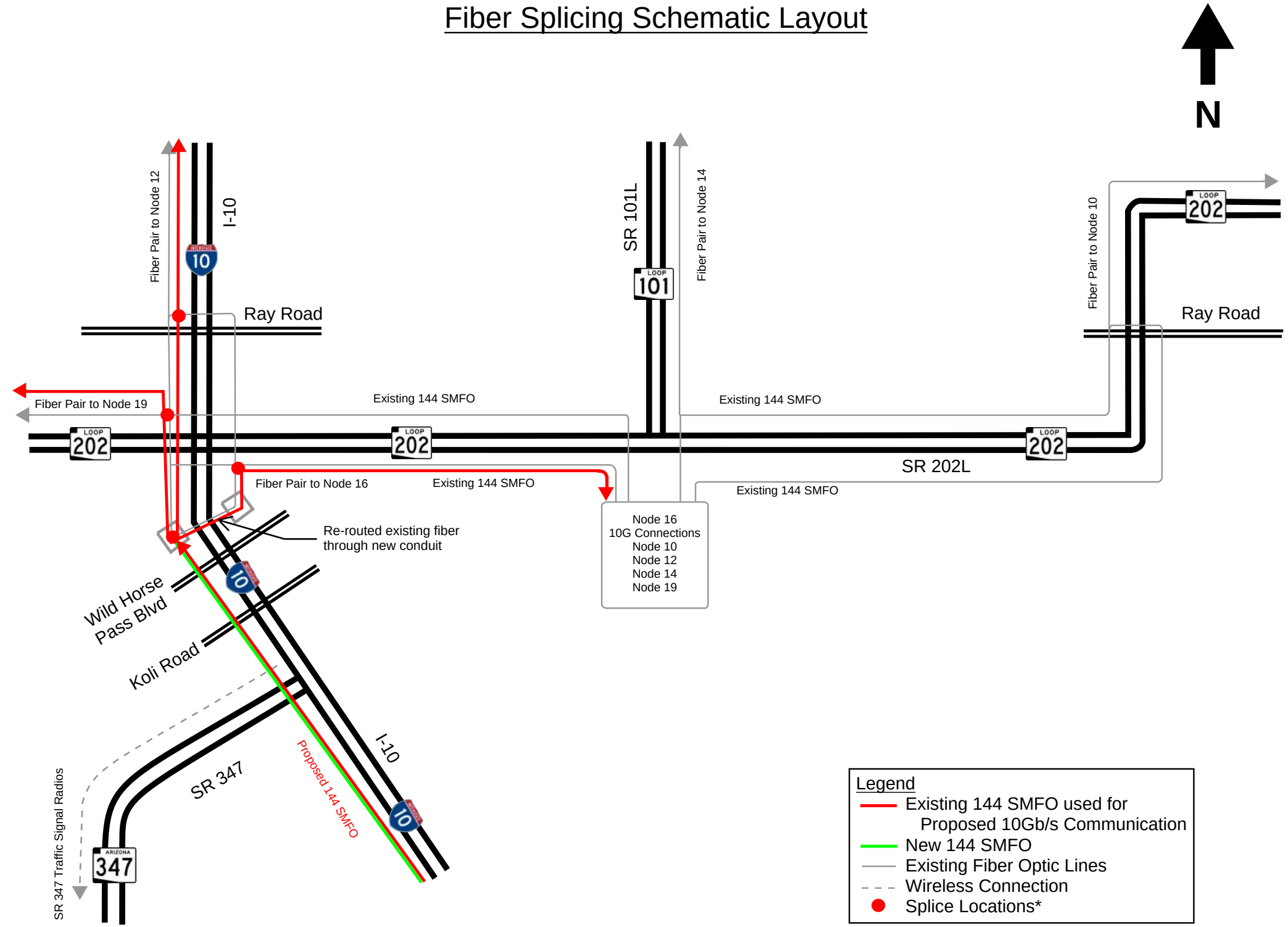
Failure to correct an issue adversely impacting public safety within 4 hours of being notified by ADOT.

TPA 738-2 ITS Workflow Flow Chart



TPA 738-3 Fiber Splicing Schematic Layout

Fiber Splicing Schematic Layout



*Not all splice locations are shown in this layout

TPA 800-1 Structures Aesthetics DCR

See attached



November 2025

TPA 800-1
Structure Aesthetics DCR

010 MA 161 F0721 01C
010-C-NFA

Phoenix – Casa Grande Highway (I-10)
SR 202L (Santan/South Mountain) to Gila River Bridge
Design-Build Capacity Improvements

ARIZONA
DEPARTMENT OF
TRANSPORTATION

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Structure Aesthetic Treatments

ADOT has worked with AZTEC Engineering, HDR, and artist representatives from the Gila River Indian Community (GRIC) on the development of aesthetic treatments for bridge barriers and piers, pedestrian fencing, and MSE walls located in the I-10 corridor between SR202L and the Gila River, **See Exhibit 1**. The aesthetic treatments are derived from images of the Pee-Posh and Akimel O'odham Indian cultures as well as images developed by the GRIC artists.

Objectives for Structure Aesthetic Treatments

The objectives of the Aesthetic Treatment designs are as follows:

- Tie the corridor together into one project.
- Aesthetic images to relate to the surrounding culture and natural environment.
- Be subtle and respectful.
- No grandiose or outlandish design.
- No statues or labels.

There are several elements that have been identified to receive potential aesthetic treatments.

- Bridge Barriers
- Bridge Pedestrian Fencing
- Bridge Piers
- Wing Walls
- Slope Paving
- MSE wall panels.

Structure Aesthetic Area Treatment Concepts

Wildhorse Pass Boulevard / Sundust Road

The existing Wildhorse Pass Boulevard/Sundust Road bridge structure will be widened to the north to incorporate right and left turn lanes, bike lanes, new sidewalks, and barrier/railing. The widened structure, see **Exhibit 14**, will include a Combination Pedestrian Traffic Bridge Railing with Fence (ADOT SD 1.12 & 1.13) on the north side of the bridge structure and the existing Combination Pedestrian Traffic Bridge Railing with fence will remain in place on the south side of the structure. New bladed piers that will match the existing bridge piers.

Bridge Concrete Barriers: The new concrete bridge barriers will have the same "Wave" aesthetic pattern used on the south bridge railing incorporated into the outside face of the barrier. See **Exhibit 2.**

Bridge Piers: The new bladed bridge piers will mimic the existing bridge piers. See **Exhibit 4.**

Metal Icon: The new and existing pedestrian fence will have "Hohokam Dancers" attached to the interior side of the pedestrian fence/posts. See **Exhibit 6.**

Wing Walls: The new wing walls and abutments at each end of the structure will be painted to match the existing walls. In addition, the entire bridge is to be painted Chestnut with barrier aesthetic painted Black Deco and the Hohokam Dancers painted Hohokam Pottery Red.

Koli Road

Two new bridge structures will be constructed at the Koli Road alignment, see **Exhibit 14**. The new structures will include:

Bridge Concrete Barriers:

- 38" Single Slope Bridge Concrete Barrier (ADOT SD 1.10) with vertical fence on the north side of the north bridge and both sides of the south bridge.
- Combination Pedestrian Traffic Bridge Railing with Fence (ADOT SD 1.12 & 1.13) on south side of north bridge.
- "Flowing River" bridge barrier pattern (See **Exhibit 3**) for barriers/railing.

Bridge Piers: The bridge piers located on the outside of the roadway will have a river rock aesthetic pattern at the base of the pier and three triangular flag bands at the top. The bridge piers located in the median will not have the river rock texturing, they will only have the three triangular flag bands located at the top of the pier. See **Exhibit 5.**

Metal Icon: The fence on the most outward fences (south fence of the southern bridge and the northern fence of the northern bridge) will each have four basket pattern icons, approximately 35.5' in length and 9.5' in height, located on the outside of the fence and attached to the fence posts. Two basket patterns will be located over north bound and two over the south bound travel lanes, see **Exhibit 7**.

Retaining Wall: The retaining walls for the bridge structure will be constructed using MSE panels that are 5' vertical and 10' horizontal in size. Some of the panels will have a river rock texture, other panels will have a light sand blast finish with animal graphics incorporated, and the remaining panels will have a light sand blast finish. The MSE panels will be arranged in a pattern that represents basket chording. See **Exhibit 12.**

Painting: New bridge structures are to be painted ADOT Standard Tan with bridge aesthetics painted Hohokam Pottery Red.

Queen Creek Road

The existing structure will remain and be modified to remove the existing bridge barriers and fence and construct new Combination Pedestrian Traffic Bridge Railing and Fence (ADOT SD 1.12 & SD 1.13) on both sides, see **Exhibit 14**. The structure will include:

Bridge Concrete Barriers:

- ADOT SD 1.12 and SD1.13 with fence on both sides
- "Flowing River" pattern incorporated into the outside face of the bridge barrier/railing. (See **Exhibit 3**)

Bridge Piers: The median bridge piers will have three triangular flag bands at the top. See **Exhibit 5.**

Metal Icon: The new fencing will have the "Flying Bird" metal icons attached to the interior side of the fence/posts. See **Exhibit 8.**

Wing Walls: The bridge structure wing walls and abutment will be painted and have a river rock aesthetic pattern finish. See **Exhibit 13.**

Slope Paving: The existing slope paving under the bridge will be removed and replaced with new slope paving and will incorporate a basket pattern graphic. See **Exhibit 11.**

Painting: The existing bridge structure is to be painted ADOT Standard Tan with bridge aesthetics painted Hohokam Pottery Red.

There will also be a new direct-connect ramp constructed for the SR347 EB to I-10 WB. This ramp will utilize steel tub girders. The new structure will include:

Bridge Concrete Barriers:

- ADOT SD-1.10, no fence or icons.
- "Flowing River" pattern incorporated into the outside face of the bridge barrier/railing. (See **Exhibit 3**)

Bridge Piers: The bridge piers will have a river rock aesthetic pattern placed at the bottom of the piers (except those in I-10 median) and three triangular flag bands at the top. See **Exhibit 5A.**

Bridge Abutments: The bridge abutments will be painted and have a river rock aesthetic pattern finish.

Wing Walls: The bridge structure wing walls and abutment will be painted and have a river rock aesthetic pattern finish. See **Exhibit 13**.

Slope Paving: There is no slope paving for this structure.

Painting: The structure is to be painted ADOT Standard Tan with bridge barrier aesthetics painted Hohokam Pottery Red.

Riggs Road

The existing Riggs Road bridge structure will be removed and a new bridge structure will be constructed. The new bridge structure, see **Exhibit 15**, will include:

Bridge Concrete Barriers:

- Combination Pedestrian Traffic Bridge Railing with Fence (ADOT SD 1.12 & 1.13) on the north and south sides of the bridge structure
- "Flowing River" pattern incorporated into the outside face of the bridge barrier/railing. See **Exhibit 3.**

Bridge Piers: The bridge piers located on the outside of the roadway will have a river rock aesthetic pattern at the base of the pier and three triangular flag bands at the top. The bridge piers located in the median will not have the river rock texturing, they will only have the three triangular flag bands located at the top of the pier. See **Exhibit 5.**

Metal Icon: The new pedestrian fences on both sides of the bridge will have the "Roadrunner" metal icons attached to the interior side of the pedestrian fence/posts. See **Exhibit 9.**

Retaining Walls: The retaining walls for the bridge abutments will be constructed using MSE panels that are 5' vertical and 10' horizontal in size. Some of the panels will have a river rock texture, other panels will have a light sand blast finish with animal graphics incorporated, and the remaining panels will have a light sand blast finish. The MSE panels with the river rock texture will be arranged in a pattern that represents basket chords used in Pee-Posh baskets. See **Exhibit 12.**

Painting: New bridge structures are to be painted ADOT Standard Tan with bridge aesthetics painted Hohokam Pottery Red.

Goodyear Road

The existing Goodyear Road bridge structure will be replaced with a new two-span structure which will include new sidewalks, and barriers/railing. The new structure, see **Exhibit 15**, will include:

Bridge Concrete Barriers:

- Combination Pedestrian Traffic Bridge Railing with Fence (ADOT SD 1.12 & 1.13) on the north and south sides of the bridge structure
- "Flowing River" pattern incorporated into the outside face of the bridge barrier/railing. See **Exhibit 3.**

Bridge Piers: The bridge piers located in the median will not have the river rock texturing, they will only have the three triangular flag bands located at the top of the pier. See **Exhibit 5B.**

Metal Icon: The new pedestrian fences on both sides of the bridge will have the "Snake" metal icons attached to the interior side of the pedestrian fence/posts. See **Exhibit 10.**

Full-Height Abutment Walls: The abutment walls will be constructed using MSE panels that are 5' vertical and 10' horizontal in size. Some of the panels will have a river rock texture, other panels will have a light sand blast finish with animal graphics incorporated, and the remaining panels will have a light sand blast

finish. The MSE panels with the river rock texture will be arranged in a pattern that represents basket chords used in Pee-Posh baskets. See **Exhibit 12.**

Slope Paving: The existing slope paving will be removed.

Painting: The new bridge structure is to be painted ADOT Standard Tan with bridge aesthetics painted Hohokam Pottery Red.

Exhibits

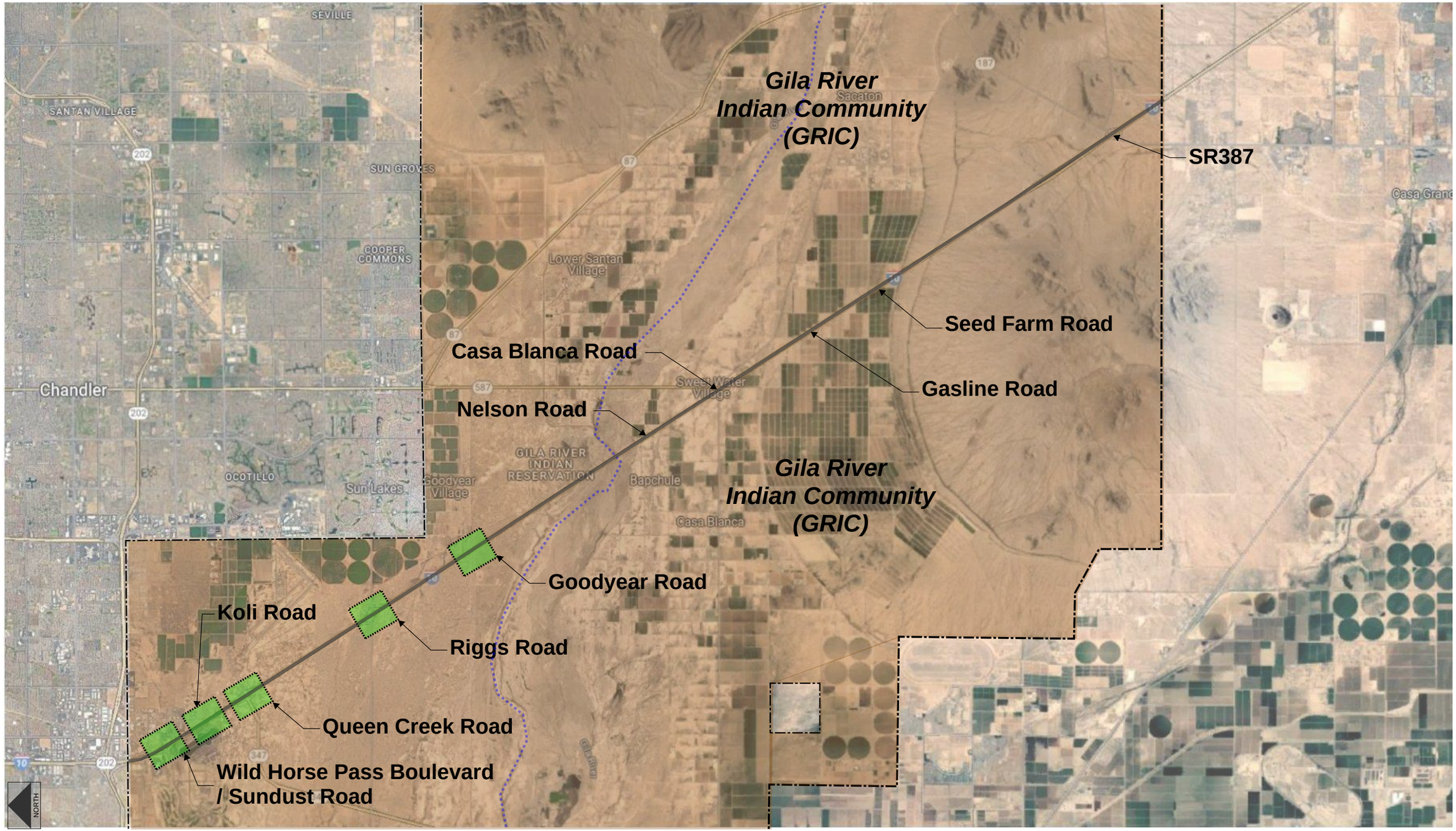


EXHIBIT 1

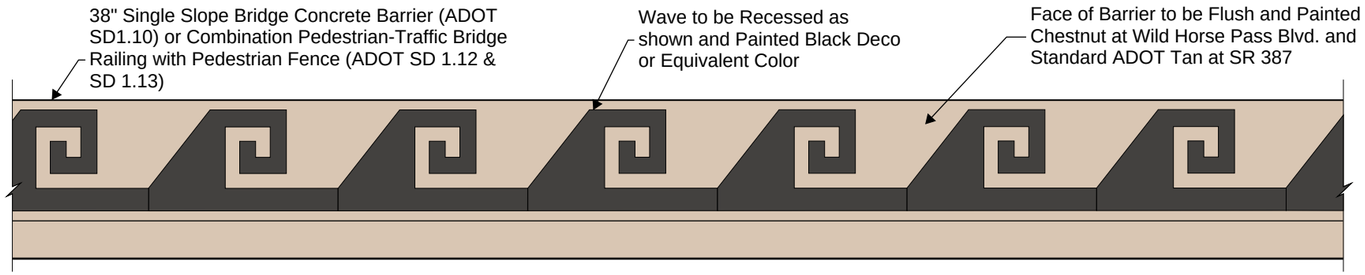
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DESIGN	SEL	6/2025
DRAWN	JKP / KA	6/2025
CHECKED	SEL	6/2025

AZTEC Engineering Group, Inc.
621 N. 44th Street, Suite 300
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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

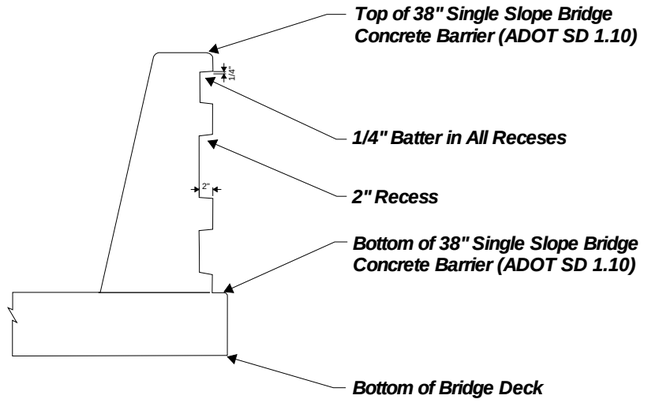
KEY MAP

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STRUCTURE NO.	TRACS NO. F0252 01D						___ OF ___



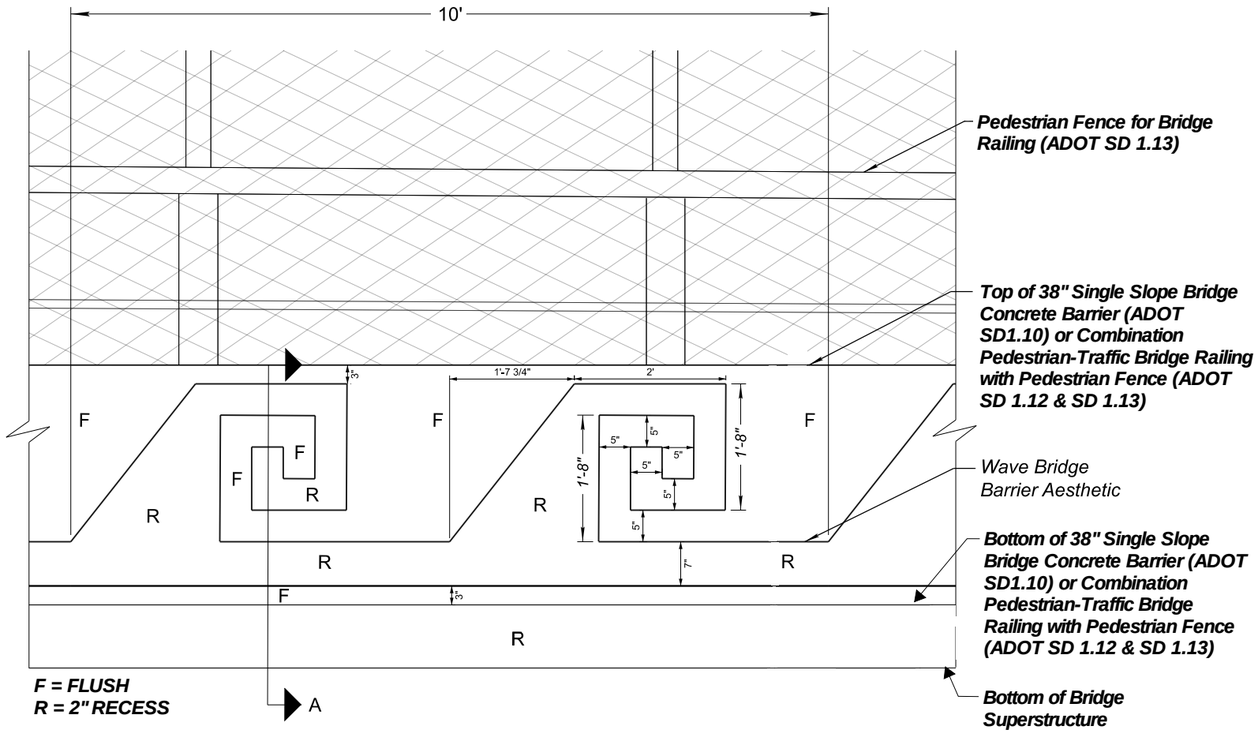
ELEVATION

NTS



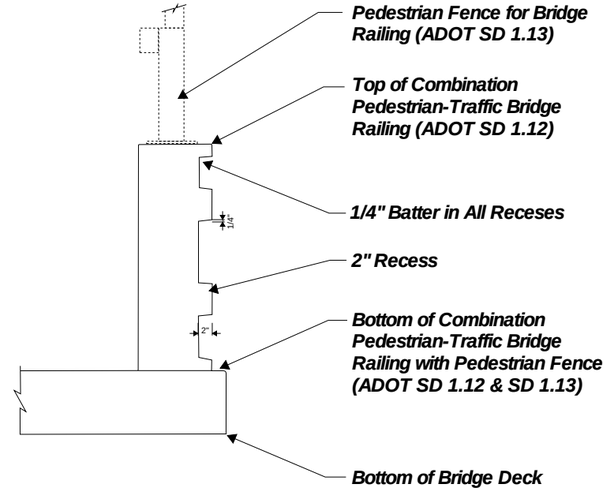
SECTION A-A

(38" Single Slope Bridge Concrete Barrier (ADOT SD1.10) NTS



LAYOUT

NTS



SECTION A-A

(Combination Pedestrian-Traffic Bridge Railing with Pedestrian Fence (ADOT SD1.12 & SD 1.13) NTS

EXHIBIT 2

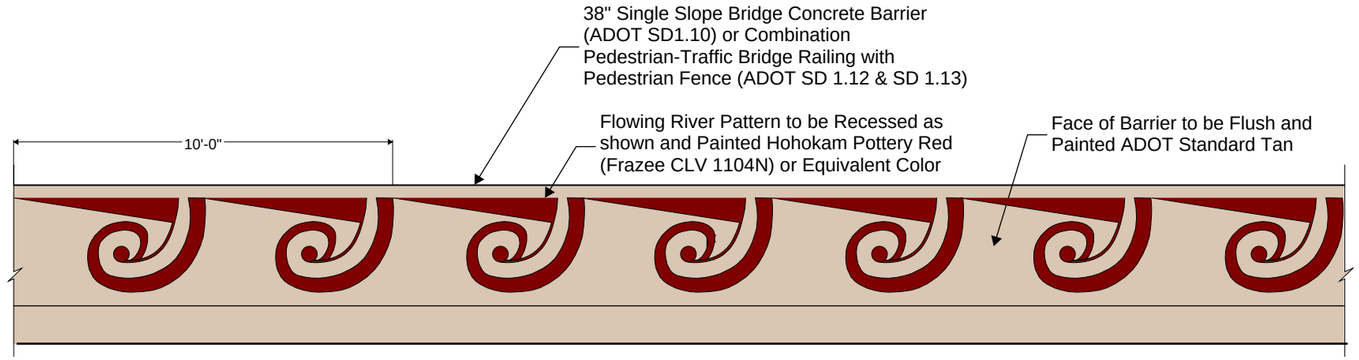
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DESIGN	SEL	6/2025
DRAWN	JKP / KA	6/2025
CHECKED	SEL	6/2025

AZTEC Engineering Group, Inc.
521 N. 44th Street, Suite 300
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FAX: 602.454.0403

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

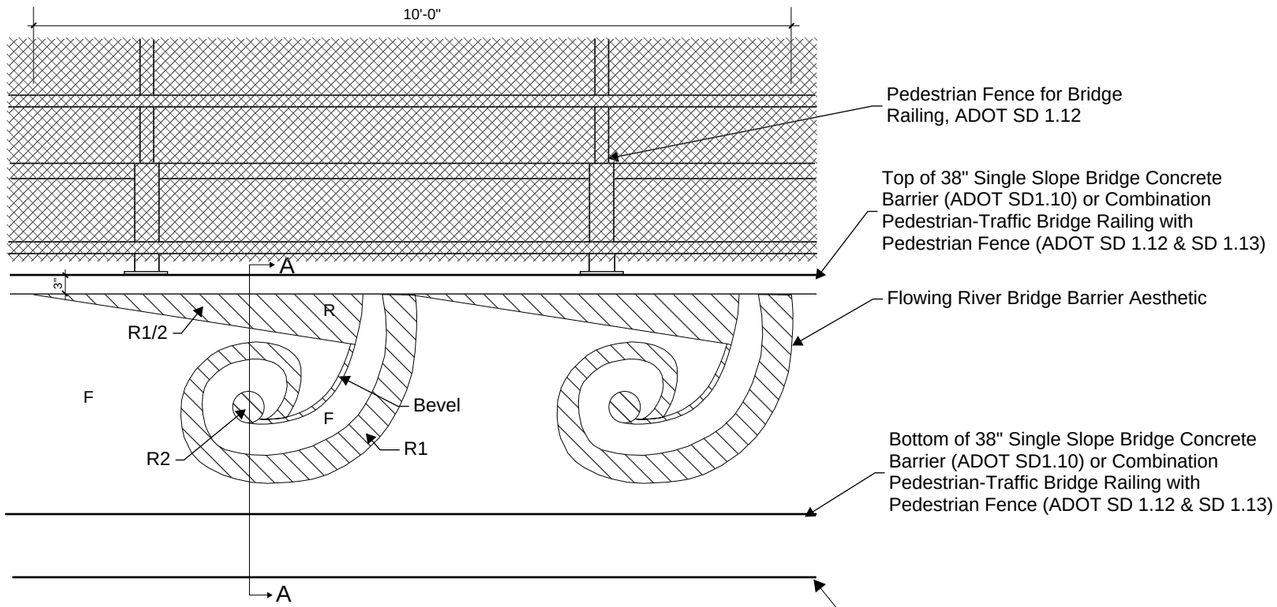
BRIDGE BARRIER
WAVE
WILD HORSE PASS BOULEVARD

ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 C (222)S	010 C (222)S			
MILEPOST	LOCATION I-10 CORRIDOR: 202L TO SR 387						DWG NO.
STRUCTURE NO.	TRACS NO. F0252 01D						____ OF ____



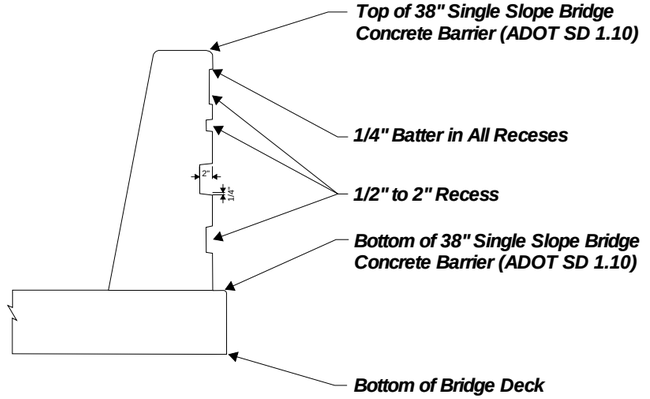
ELEVATION

NTS



LAYOUT

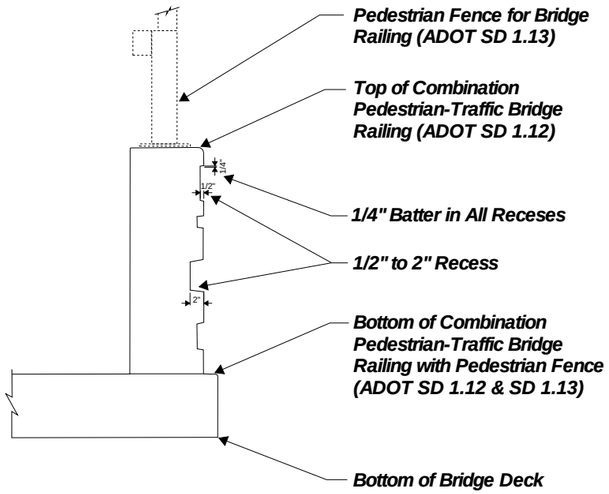
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SECTION A-A

(38" Single Slope Bridge Concrete Barrier (ADOT SD1.10)

NTS



SECTION A-A

(Combination Pedestrian-Traffic Bridge Railing with Pedestrian Fence (ADOT SD1.12 & SD 1.13)

NTS

EXHIBIT 3

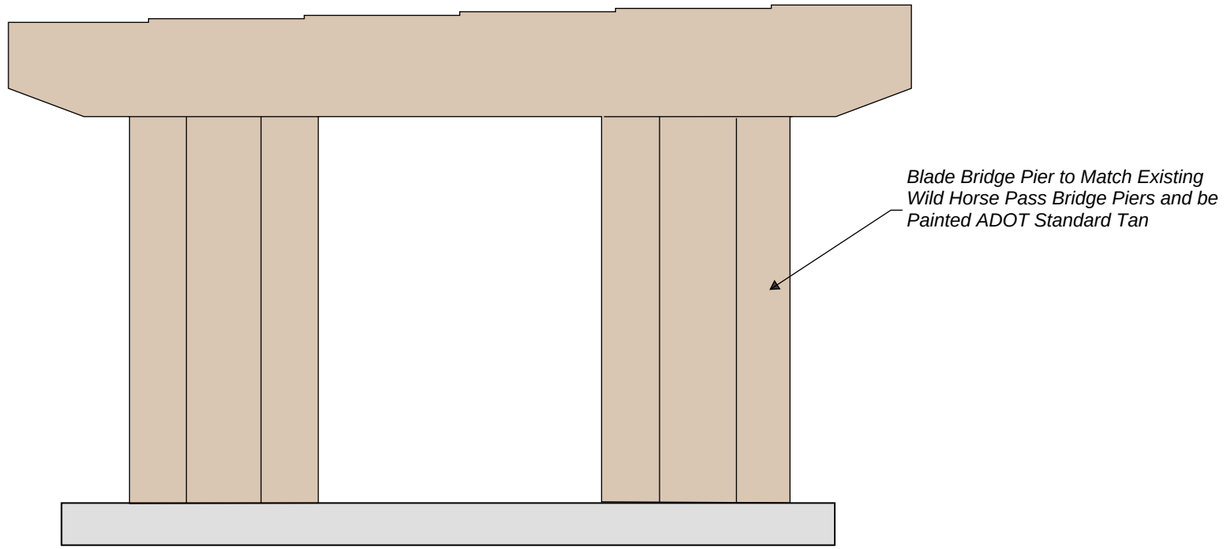
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DESIGN	SEL	6/2025
DRAWN	JKP / KA	6/2025
CHECKED	SEL	6/2025

AZTEC TYPSA
AZTEC Engineering Group, Inc.
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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

BRIDGE BARRIER
FLOWING RIVER
KOLI, QUEEN CREEK, RIGGS, & GOODYEAR ROADS

ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 C (222)S	010 C (222)S			
MILEPOST	LOCATION I-10 CORRIDOR: 202L TO SR 387						DWG NO.
STRUCTURE NO.	TRACS NO. F0252 01D						___ OF___



WILD HORSE PADSS BLADE BRIDGE PIER ELEVATION

NTS

EXHIBIT 4

	NAME	DATE
DESIGN	SEL	6/2025
DRAWN	JKP / KA	6/2025
CHECKED	SEL	6/2025

AZTEC Engineering Group, Inc.
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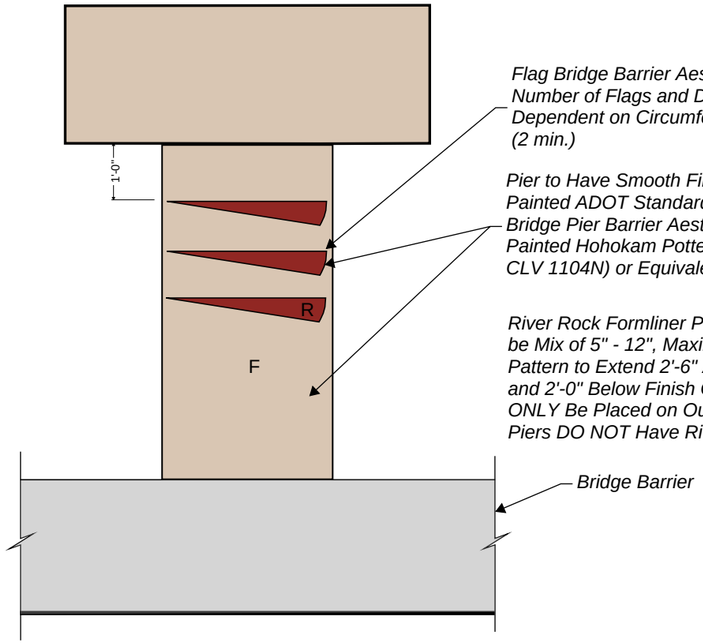
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

BRIDGE PIERS
BLADE
WILD HORSE PASS BLVD. / SUNDUST ROAD

ROUTE	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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MILEPOST	LOCATION I-10 CORRIDOR: 202L TO SR 387					DWG NO.
STRUCTURE NO.	TRACS NO. F0252 01D					___ OF___

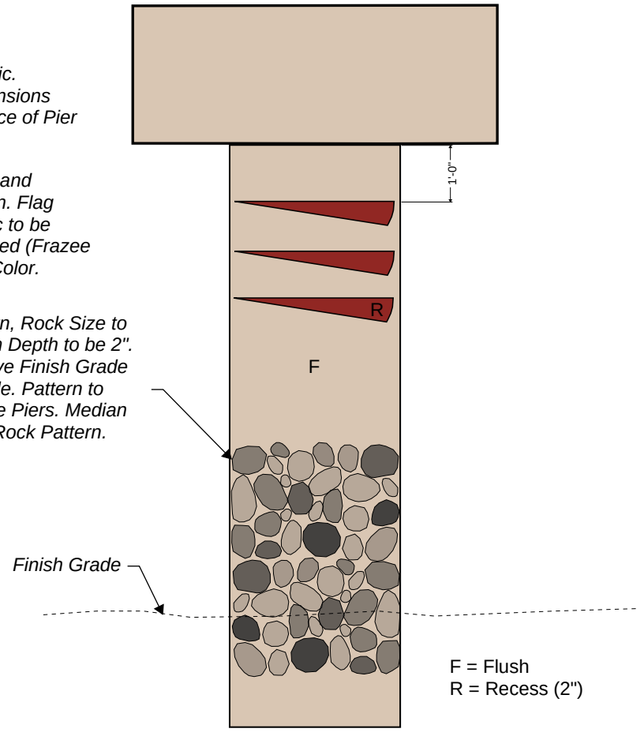
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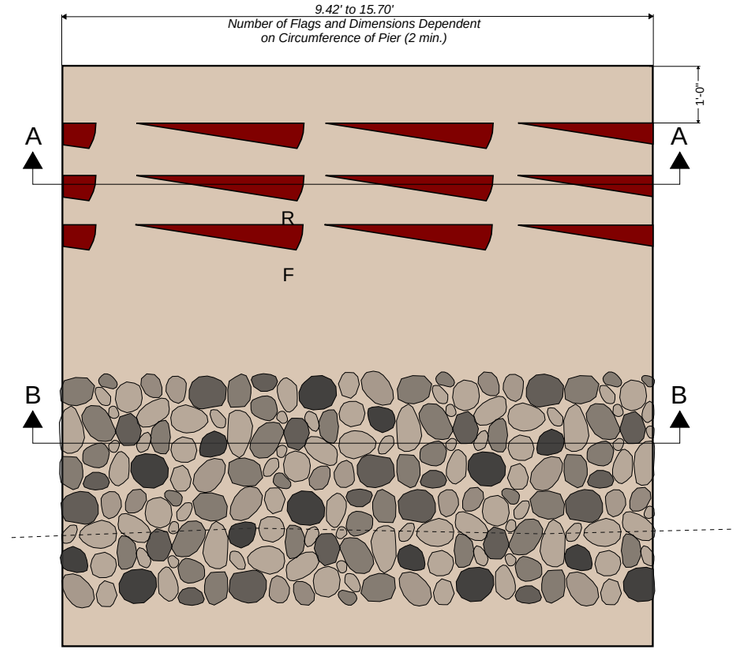
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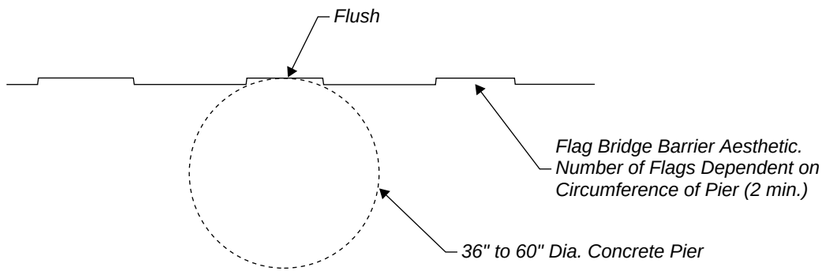
36" TO 60" DIA. BRIDGE PIER ELEVATION (KOLI ROAD, QUEEN CREEK ROAD, AND RIGGS ROAD)

NTS



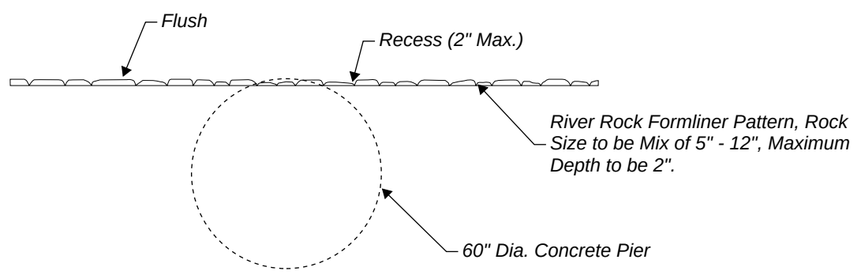


NTS



36" TO 60" DIA. BRIDGE PIER ELEVATION SECTION A-A (MEDIAN PIER)

NTS



36" TO 60" DIA. BRIDGE PIER ELEVATION SECTION B-B (OUTSIDE ROADWAY)

NTS

EXHIBIT 5

	NAME	DATE
DESIGN	SEL	11/2025
DRAWN	JKP / KA	11/2025
CHECKED	SEL	11/2025

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

BRIDGE PIERS
36" TO 60" DIAMETER BRIDGE PIERS
KOLI ROAD, QUEEN CREEK ROAD, & RIGGS ROAD

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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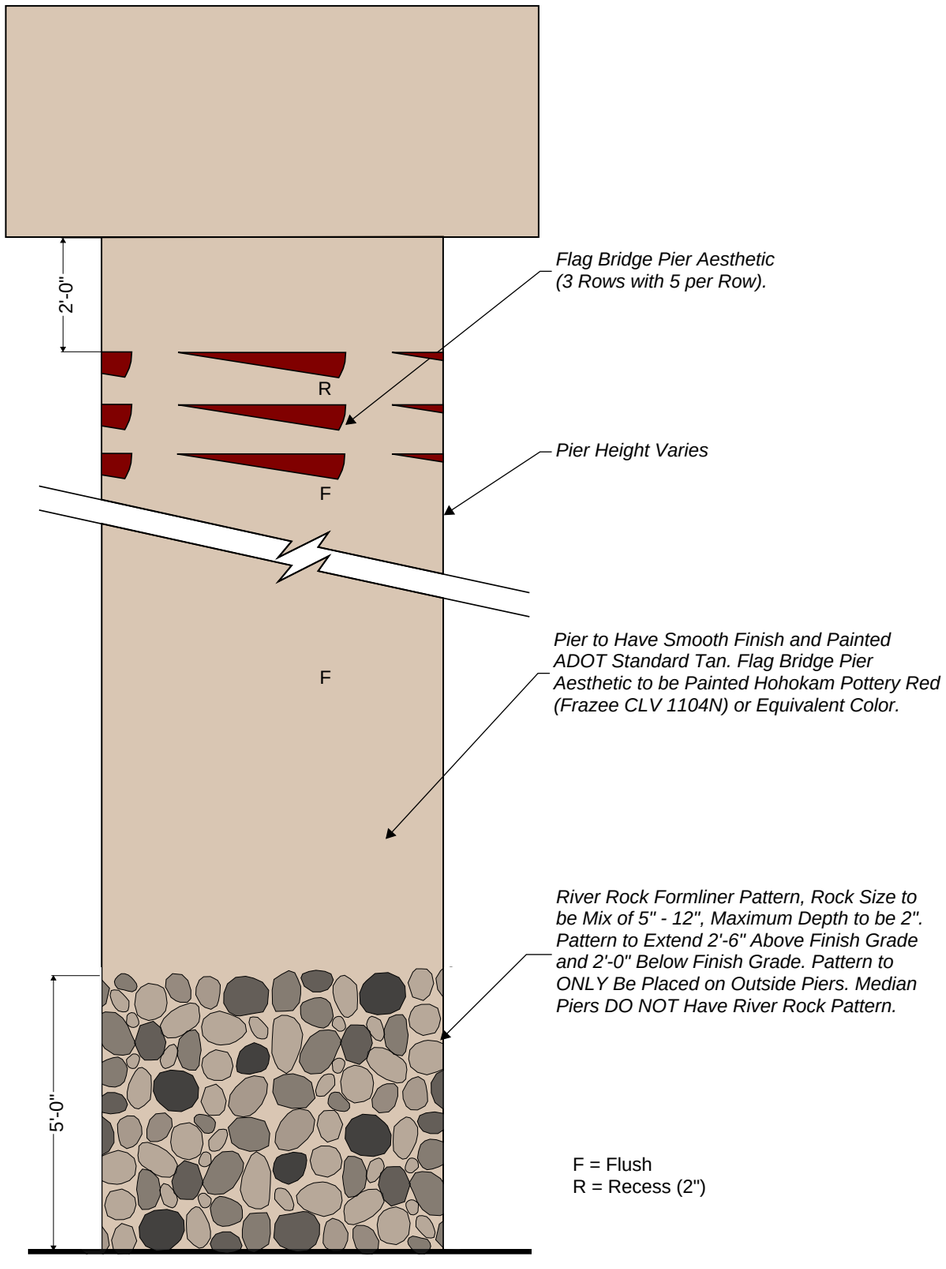
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DWG NO.

TRACS NO. F0252 01D

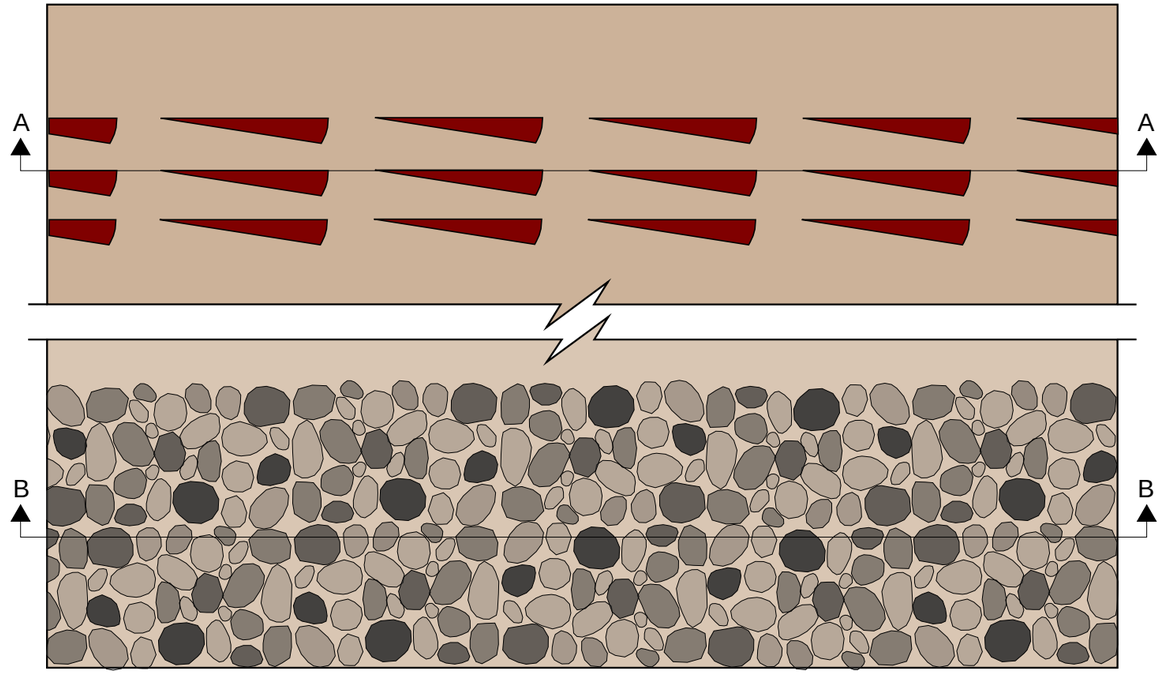
ARIZONA DEPARTMENT OF TRANSPORTATION

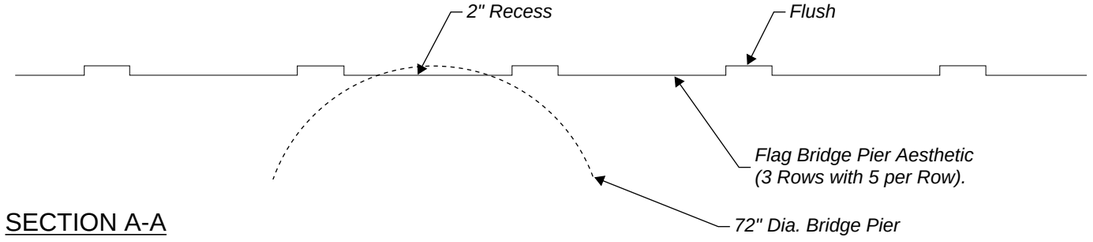
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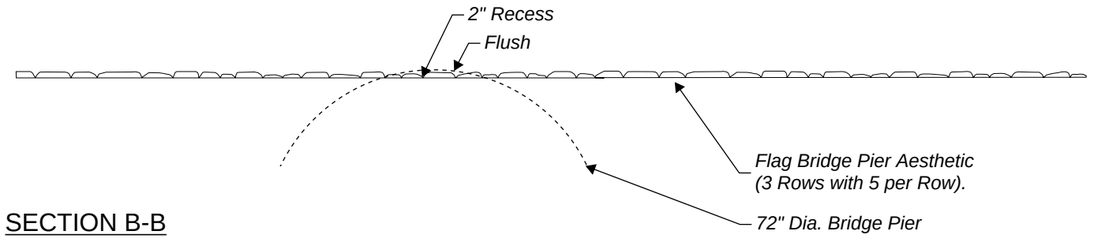
72" DIA. BRIDGE PIER ELEVATION
(FLY-OVER)

NTS





SECTION A-A



SECTION B-B

72" DIA. BRIDGE PIER AESTHETIC LAYOUT / SECTION A-A
(FLY-OVER)

NTS

EXHIBIT 5A

	NAME	DATE
DESIGN	SEL	11/2025
DRAWN	JKP / KA	11/2025
CHECKED	SEL	11/2025

AZTEC Engineering Group, Inc.
921 N. 44th Street, Suite 300
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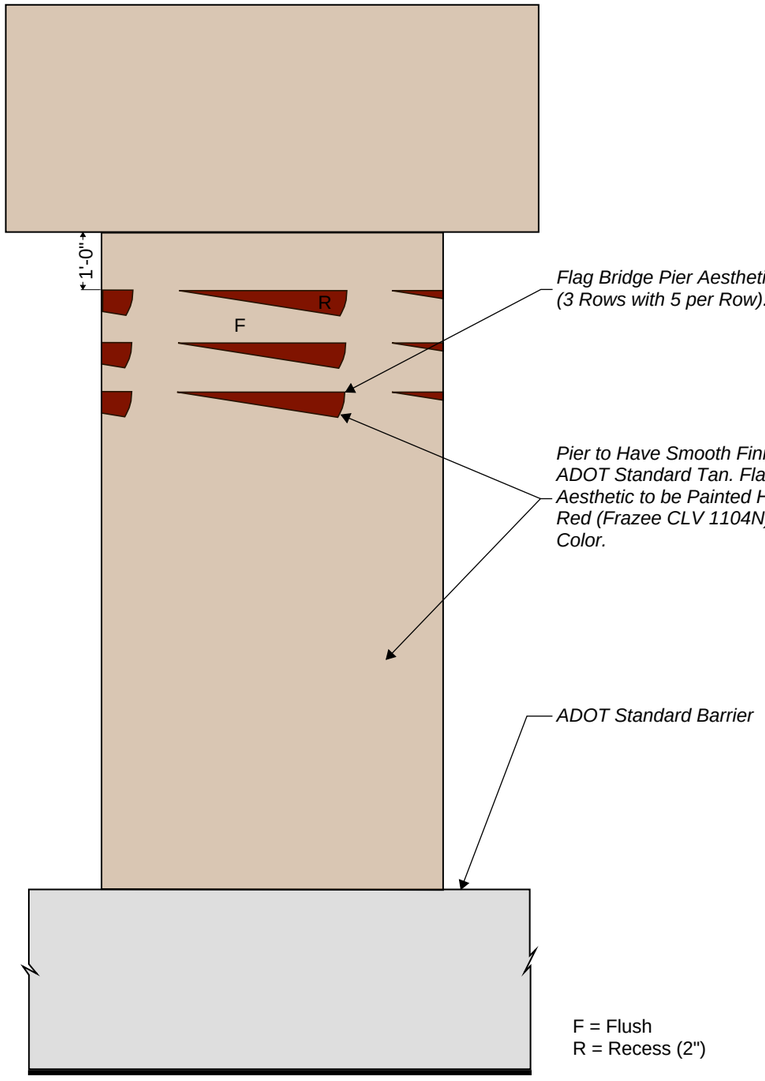
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

BRIDGE PIERS
72" DIAMETER BRIDGE PIERS
FLY-OVER

ROUTE	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10	ARIZ.	010 C (222)S	010 C (222)S			
MILEPOST	LOCATION	I-10 CORRIDOR: 202L TO SR 387				DWG NO.
STRUCTURE NO.	TRACS NO. F0252 01D					___ OF___

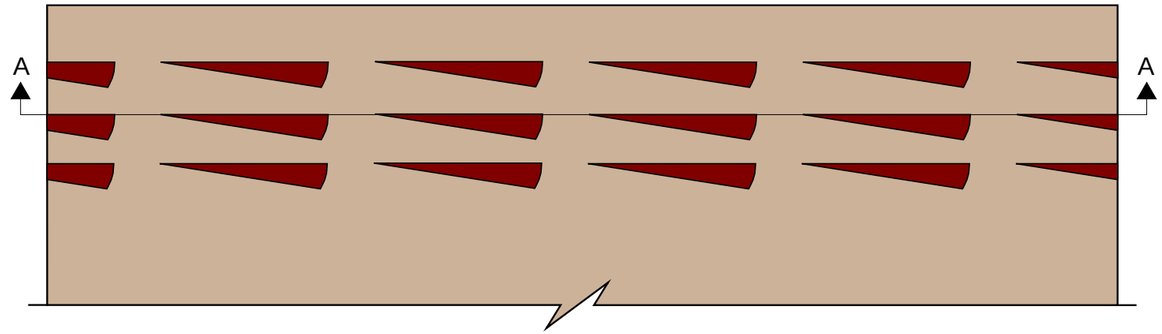
F.H.W.A. Arizona Division

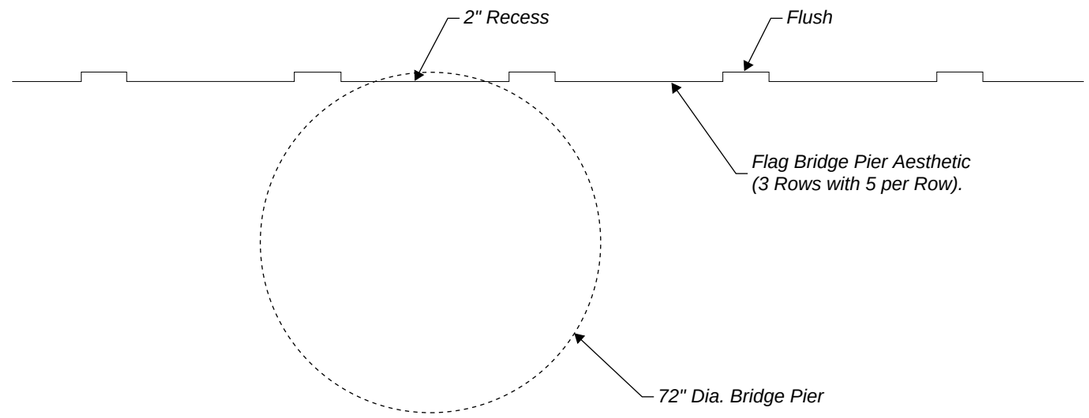
ARIZONA DEPARTMENT OF TRANSPORTATION



72" DIA. BRIDGE PIER ELEVATION (GOODYEAR ROAD)

NTS





72" DIA. BRIDGE PIER AESTHETIC LAYOUT / SECTION A-A (GOODYEAR ROAD)

NTS

EXHIBIT 5B

	NAME	DATE
DESIGN	SEL	11/2025
DRAWN	JKP / KA	11/2025
CHECKED	SEL	11/2025

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

BRIDGE PIERS
72" DIAMETER BRIDGE PIERS
GOODYEAR ROAD

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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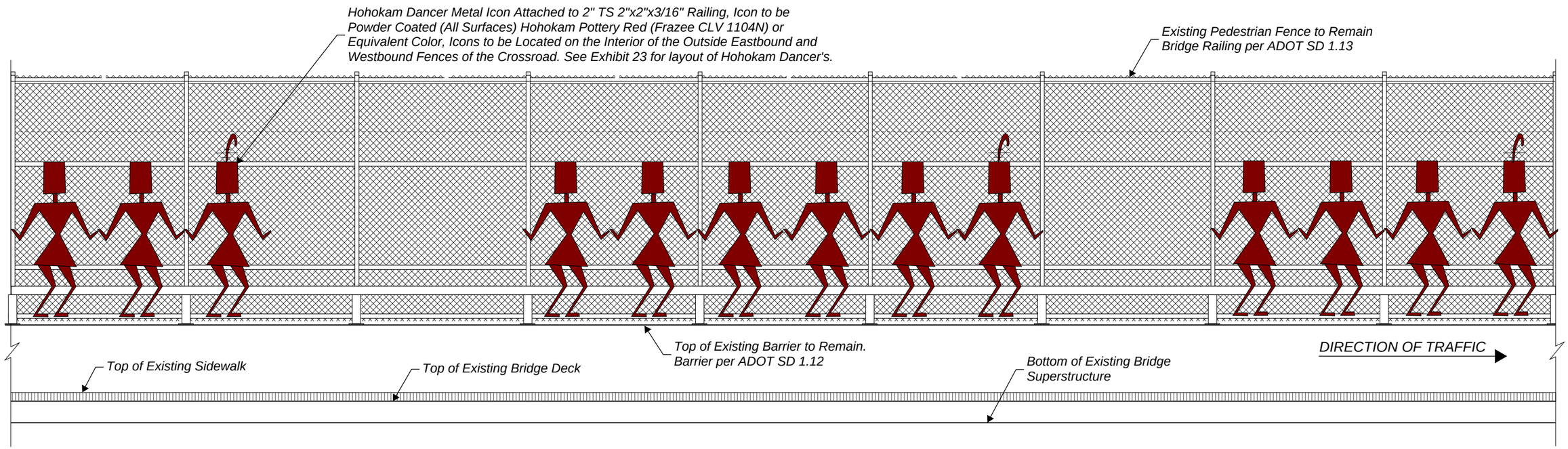
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DWG NO.

TRACS NO. F0252 01D

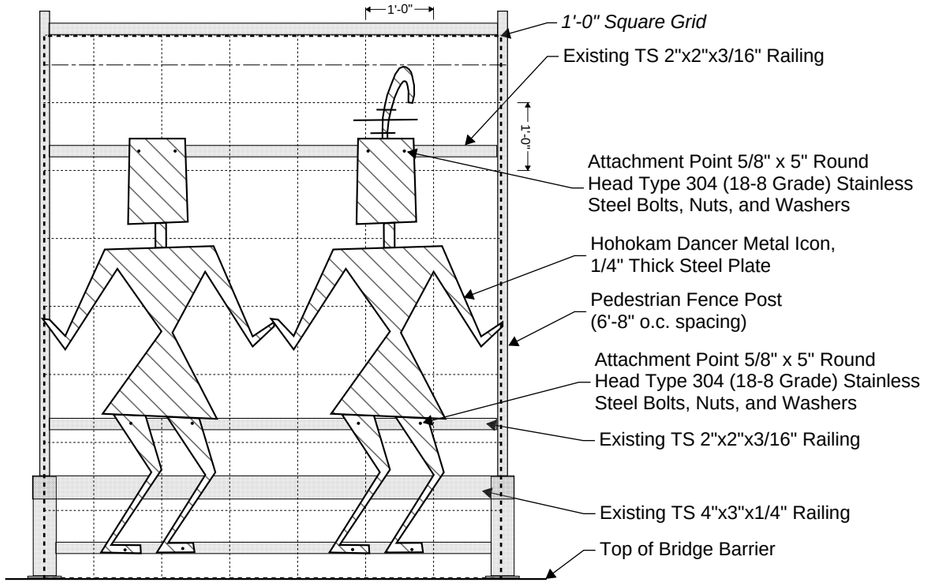
ARIZONA DEPARTMENT OF TRANSPORTATION

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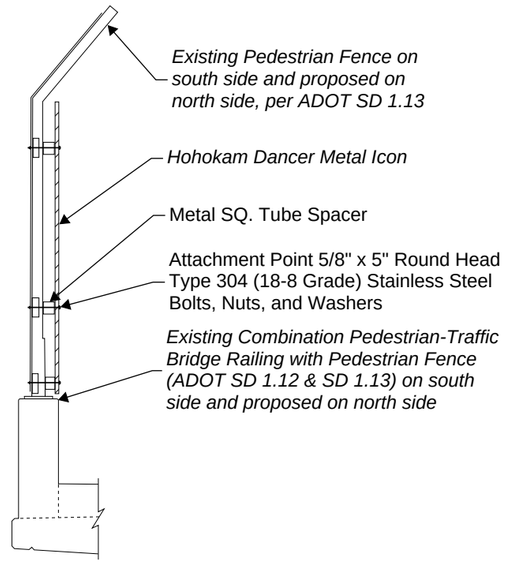
HOHOKAM DANCER ICON ELEVATION (INTERIOR)

NTS



HOHOKAM DANCER ICON LAYOUT

NTS



PEDESTRIAN FENCE SECTION

NTS

EXHIBIT 6

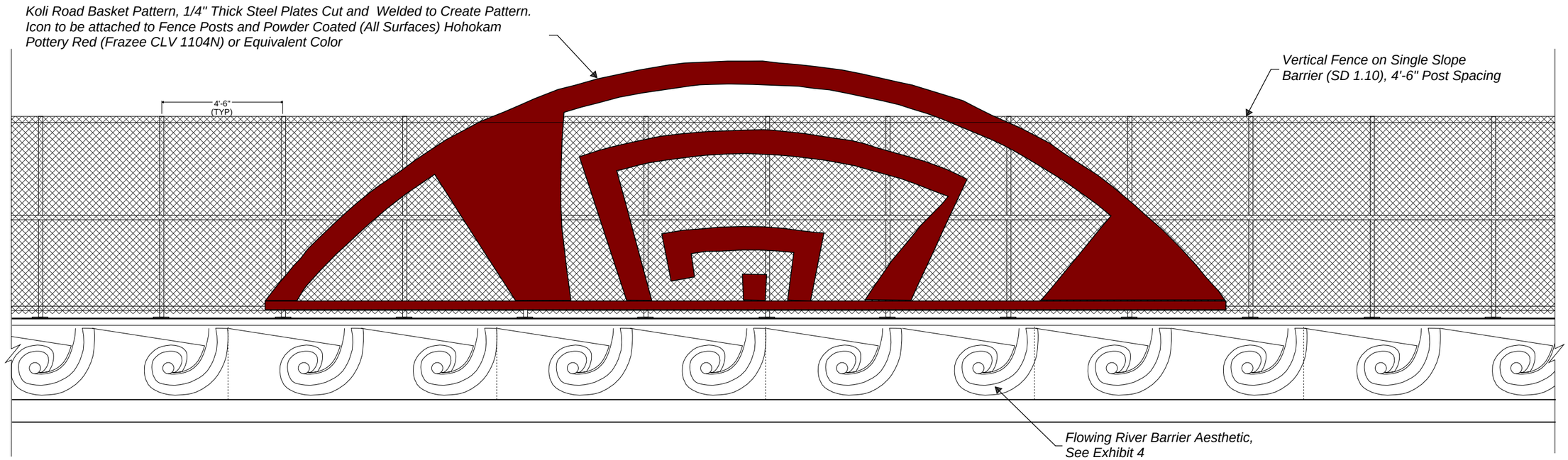
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DESIGN	SEL	6/2025
DRAWN	JKP / KA	6/2025
CHECKED	SEL	6/2025

AZTEC TYPSA — AZTEC Engineering Group, Inc. 501 N. 44th Street, Suite 300 Phoenix, Arizona 85008 TEL: 602.454.0402 FAX: 602.454.0403

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

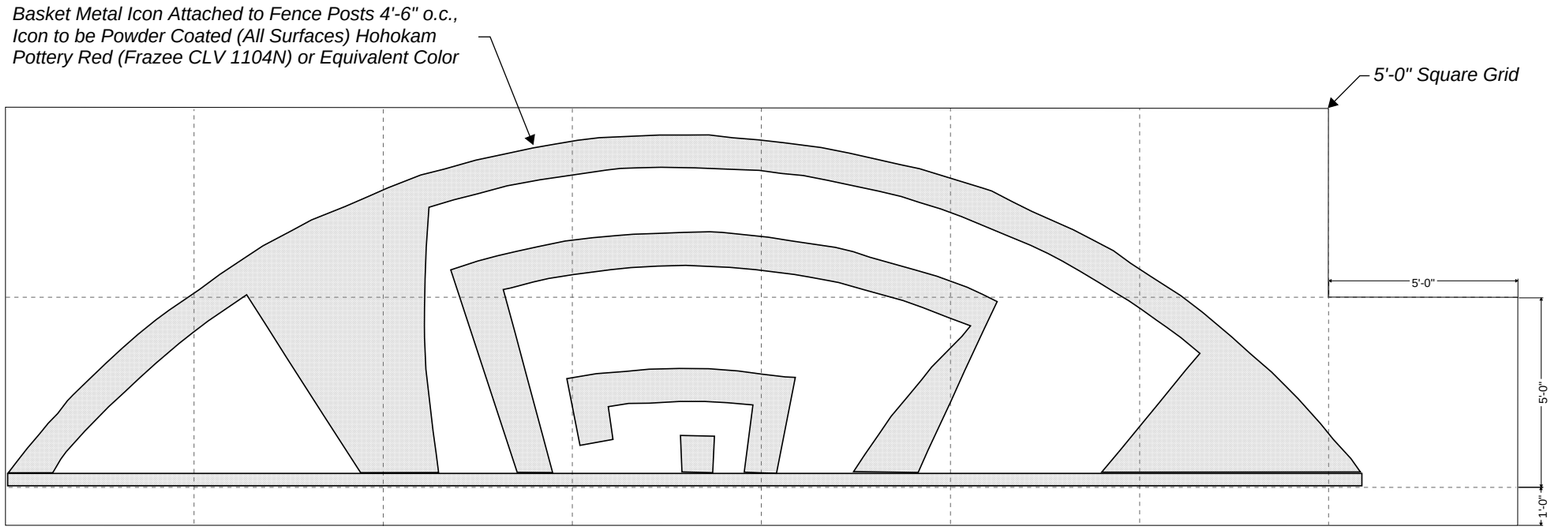
METAL ICONS
HOHOKAM DANCER
WILD HORSE PASS BLVD. / SUNDUST ROAD

ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 C (222)S	010 C (222)S			
MILEPOST	LOCATION I-10 CORRIDOR: 202L TO SR 387						DWG NO.
STRUCTURE NO.	TRACS NO. F0252 01D						___ OF___



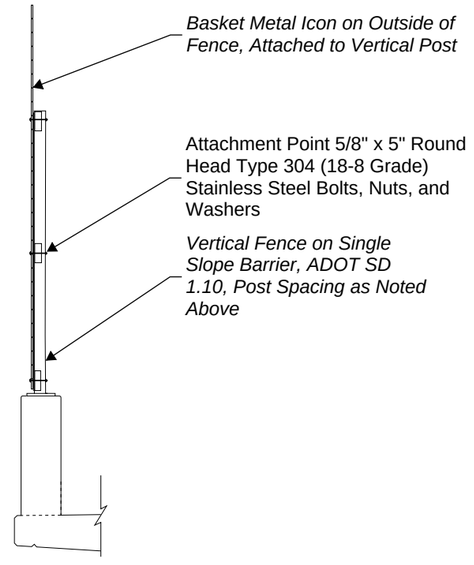
BASKET ICON ELEVATION (EXTERIOR)

NTS



BASKET ICON LAYOUT

NTS



VERTCAL FENCE SECTION

NTS

EXHIBIT 7

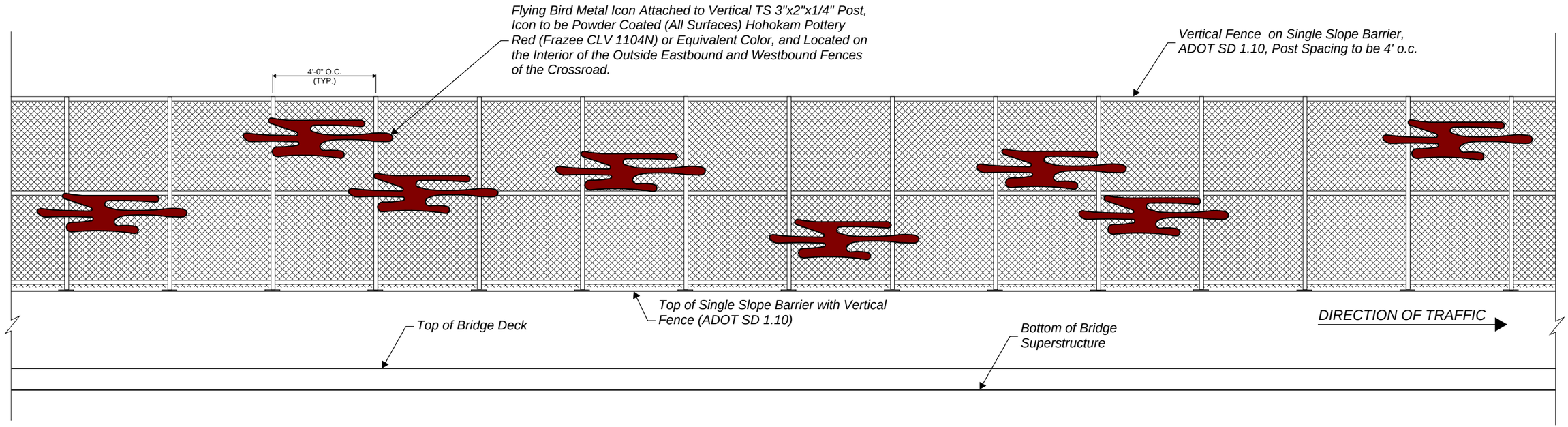
	NAME	DATE
DESIGN	SEL	6/2025
DRAWN	JKP / KA	6/2025
CHECKED	SEL	6/2025

AZTEC Engineering Group, Inc.
501 N. 44th Street, Suite 300
Phoenix, Arizona 85008
TEL: 602 454 0402
FAX: 602 454 0403

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

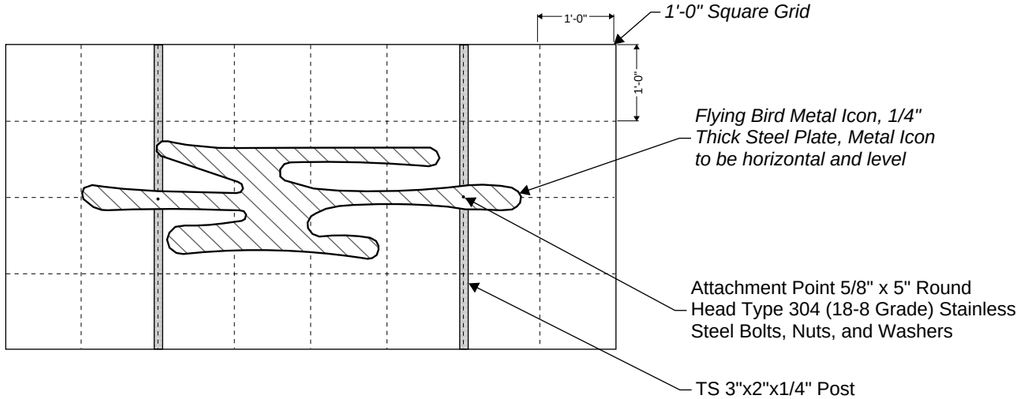
METAL ICONS
BASKET
KOLI ROAD

ROUTE	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10	ARIZ.	010 C (222)S	010 C (222)S			
MILEPOST	F.H.W.A. Arizona Division					
STRUCTURE NO.	LOCATION I-10 CORRIDOR: 202L TO SR 387					DWG NO.
	TRACS NO. F0252 01D					___ OF___



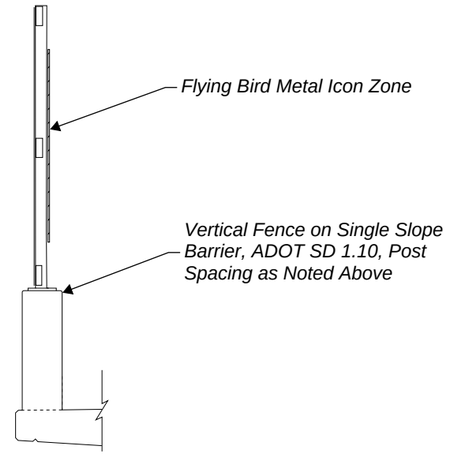
FLYING BIRD ICON ELEVATION (INTERIOR)

NTS



FLYING BIRD ICON LAYOUT

NTS



VERTCAL FENCE SECTION

NTS

EXHIBIT 8

	NAME	DATE
DESIGN	SEL	6/2025
DRAWN	JKP / KA	6/2025
CHECKED	SEL	6/2025

AZTEC Engineering Group, Inc.
521 N. 44th Street, Suite 300
Phoenix, Arizona 85008
TEL: 602.454.0402
FAX: 602.454.0403

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

METAL ICONS
FLYING BIRDS
QUEEN CREEK ROAD

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 C (222)S	010 C (222)S			

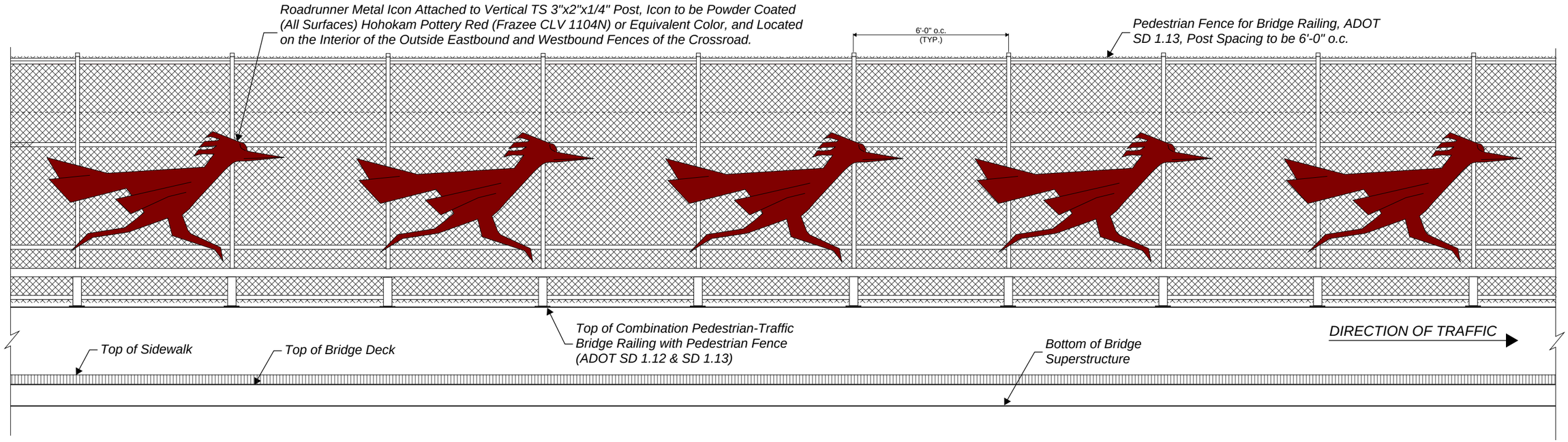
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO.

TRACS NO. F0252 01D

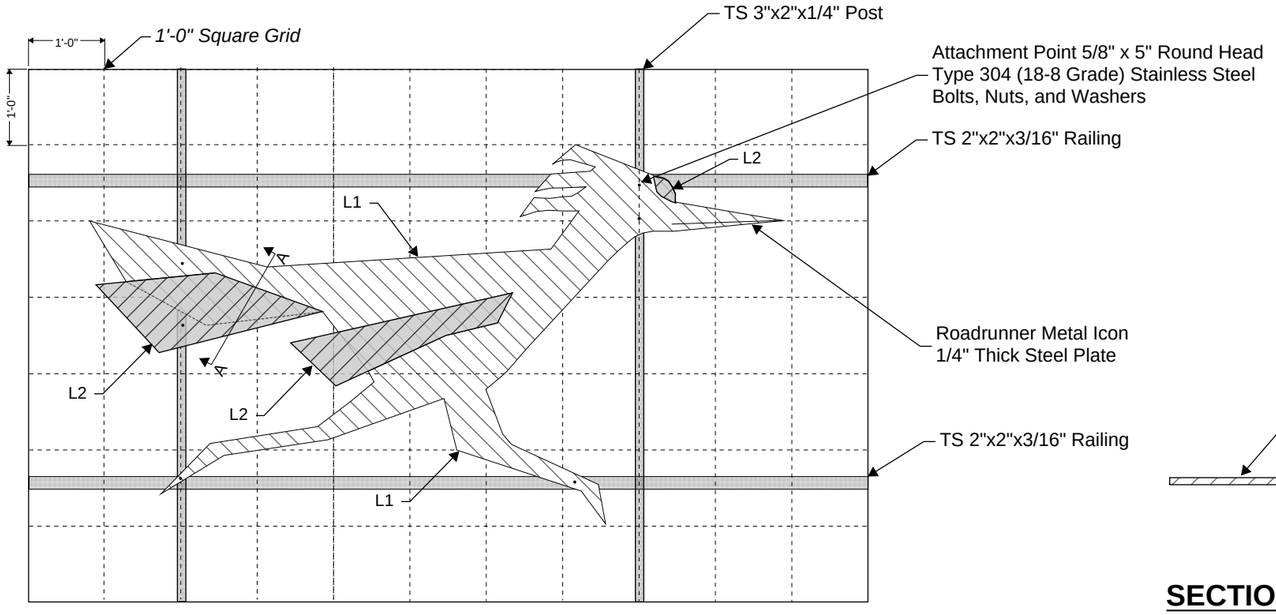
ARIZONA DEPARTMENT OF TRANSPORTATION

____ OF ____



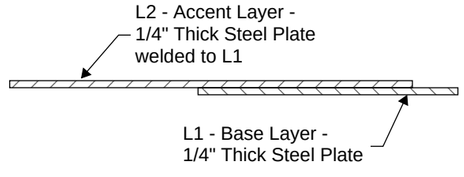
ROADRUNNER ICON ELEVATION (INTERIOR)

NTS

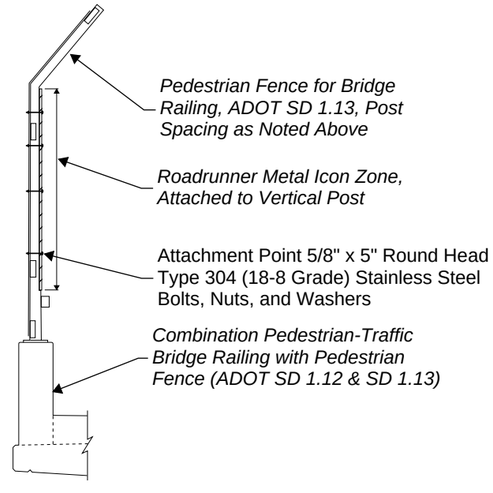


ROADRUNNER ICON LAYOUT

NTS



SECTION A-A



PEDESTRIAN FENCE SECTION

NTS

EXHIBIT 9

	NAME	DATE
DESIGN	SEL	6/2025
DRAWN	JKP / KA	6/2025
CHECKED	SEL	6/2025

AZTEC Engineering Group, Inc.
601 N. 44th Street, Suite 300
Phoenix, Arizona 85008
TEL: 602.454.0402
FAX: 602.454.0403

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

METAL ICONS
ROADRUNNER
RIGGS ROAD

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 C (222)S	010 C (222)S			

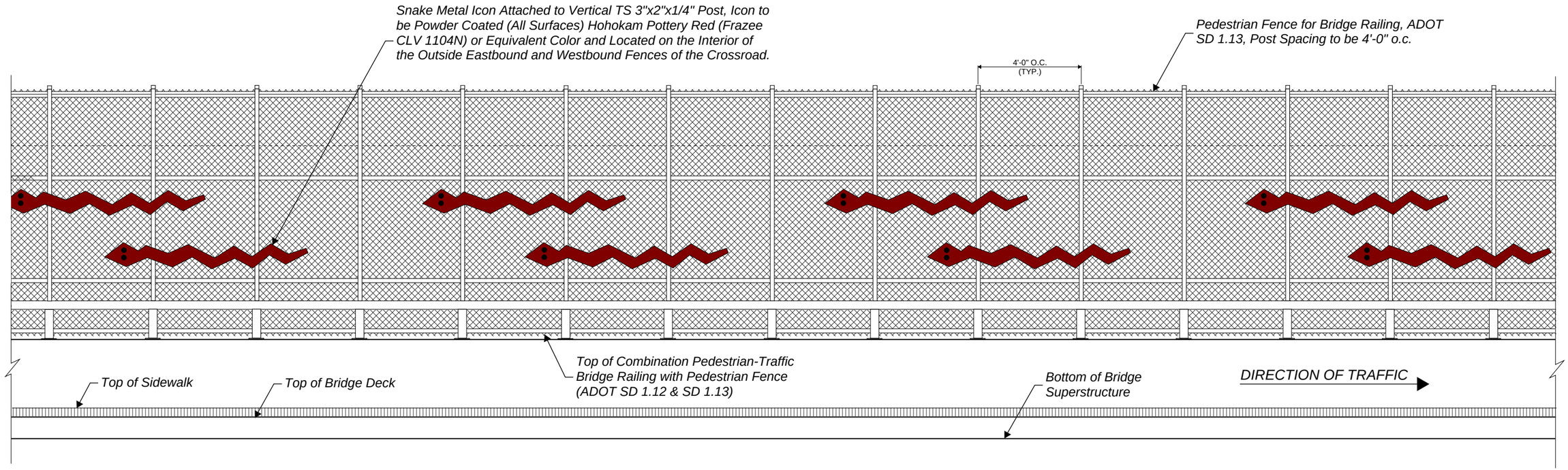
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO.

TRACS NO. F0252 01D

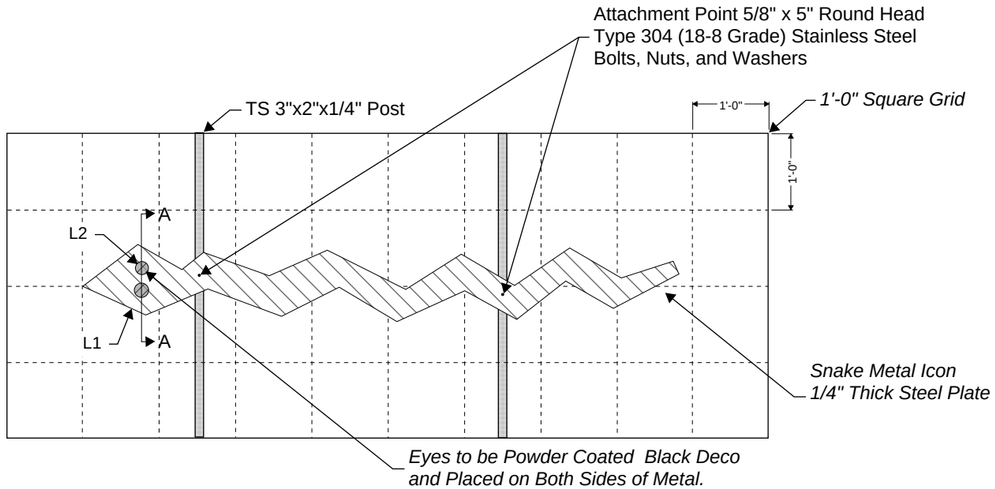
ARIZONA DEPARTMENT OF TRANSPORTATION

____ OF____



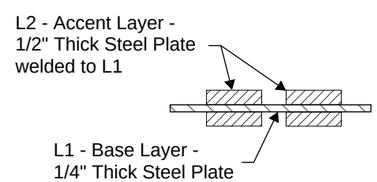
SNAKE ICON ELEVATION (INTERIOR)

NTS

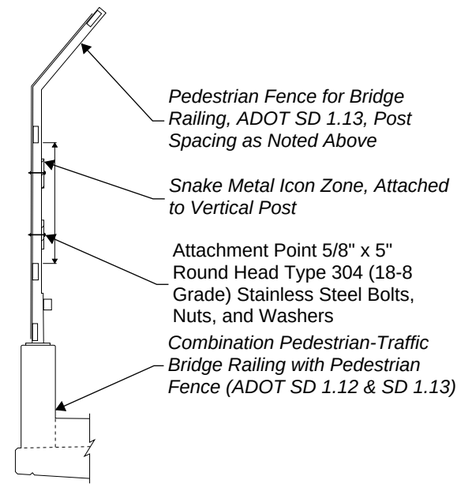


SNAKE ICON LAYOUT

NTS



SECTION A-A



PEDESTRIAN FENCE SECTION

NTS

EXHIBIT 10

	NAME	DATE
DESIGN	SEL	6/2025
DRAWN	JKP / KA	6/2025
CHECKED	SEL	6/2025

AZTEC TYPSA — AZTEC Engineering Group, Inc. 501 N. 44th Street, Suite 300 Phoenix, Arizona 85006 TEL: 602.454.0402 FAX: 602.454.0403

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

METAL ICONS
SNAKE
GOODYEAR ROAD

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 C (222)S	010 C (222)S			

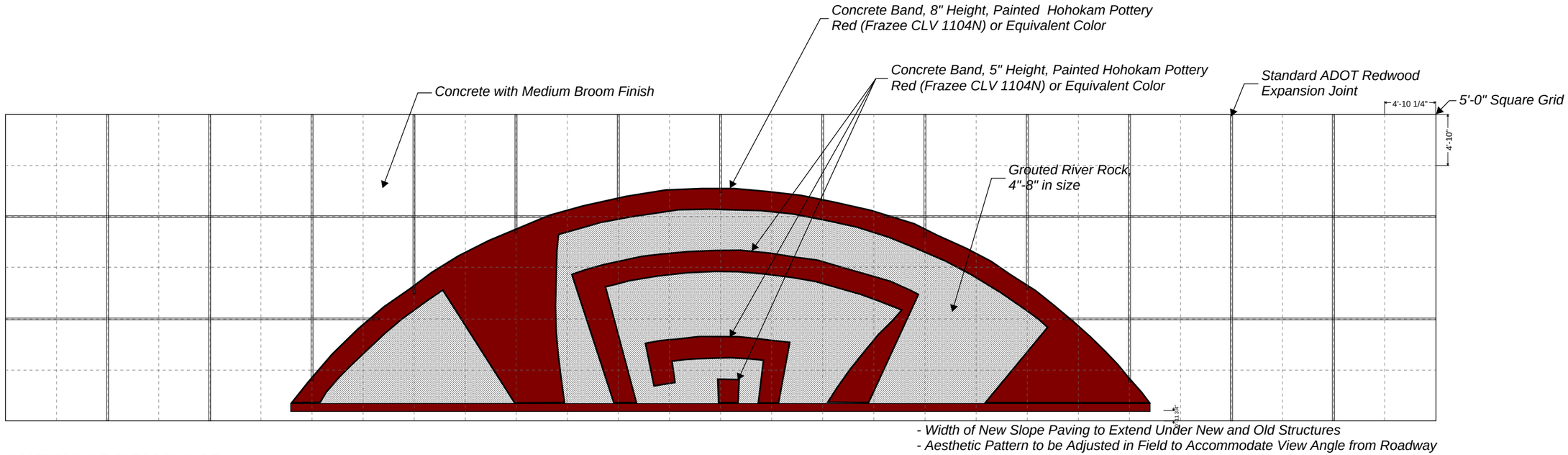
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO.

TRACS NO. F0252 01D

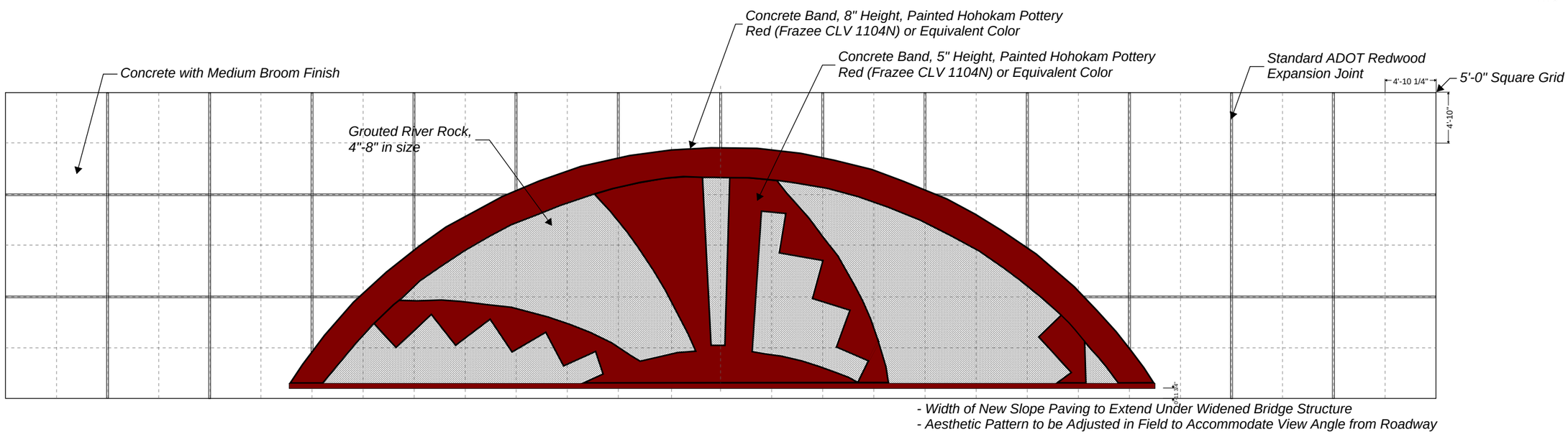
ARIZONA DEPARTMENT OF TRANSPORTATION

____ OF ____



QUEEN CREEK ROAD

NTS



GOODYEAR ROAD

NTS

EXHIBIT 11

	NAME	DATE
DESIGN	SEL	6/2025
DRAWN	JKP / KA	6/2025
CHECKED	SEL	6/2025

AZTEC Engineering Group, Inc.
501 N. 44th Street, Suite 300
Phoenix, Arizona 85008
TEL: 602.454.0402
FAX: 602.454.0403

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

SLOPE PAVING
QUEEN CREEK ROAD & GOODYEAR ROAD

ROUTE	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10	ARIZ.	010 C (222)S	010 C (222)S			

MILEPOST

STRUCTURE NO.

F.H.W.A. Arizona Division

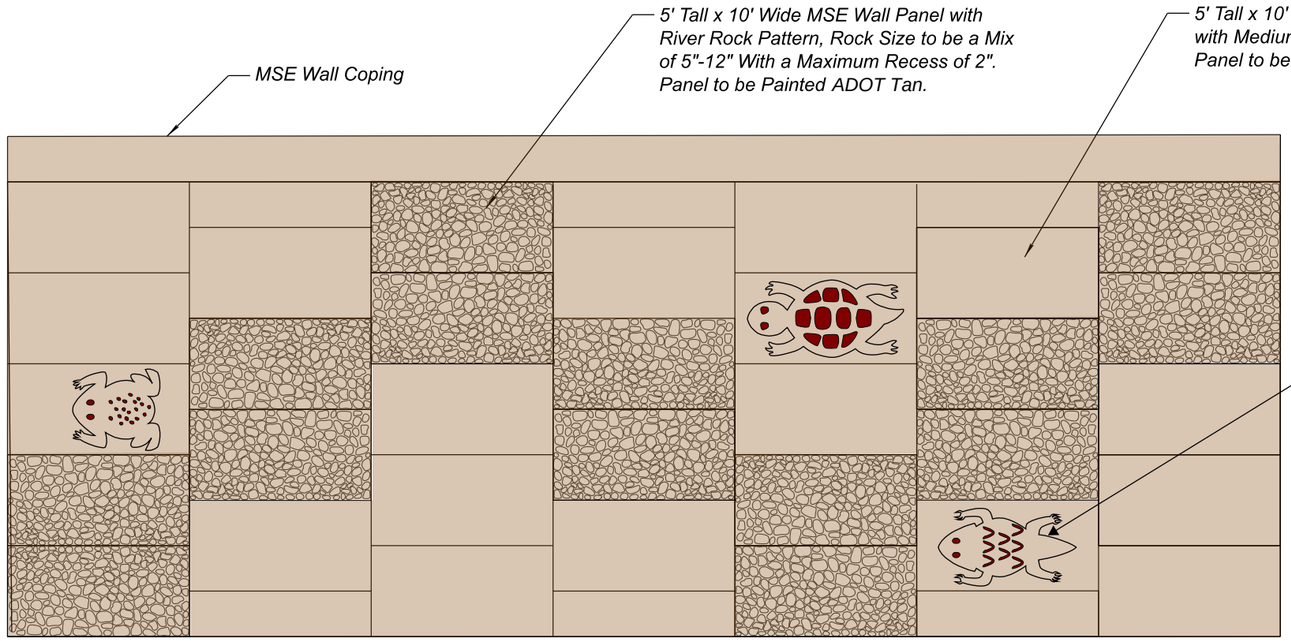
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO.

TRACS NO. F0252 01D

ARIZONA DEPARTMENT OF TRANSPORTATION

____ OF____

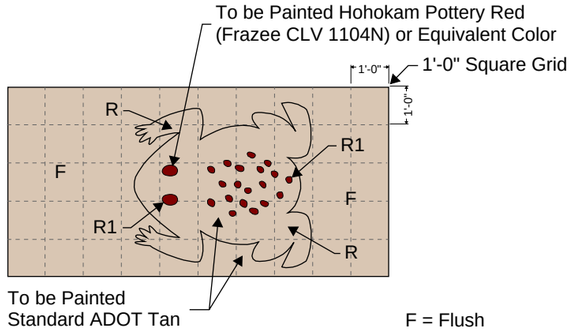


NOTES:

1. The MSE Wall Pattern Shall also be used for the Cast-In-Place Walls.
2. The MSE Wall Coping Shall also be Replicated in the Cast-In-Place Walls.
3. The Full Height Abutments Shall use this Exhibit for the Aesthetic Treatment.

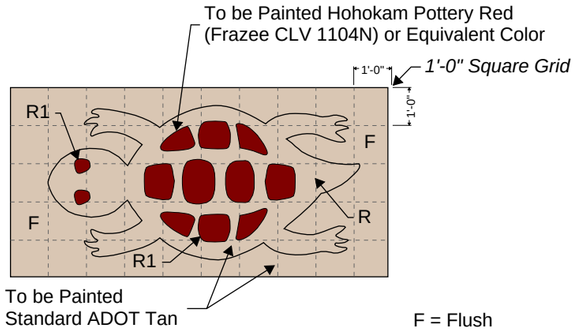
MSE WALL ELEVATION

NTS



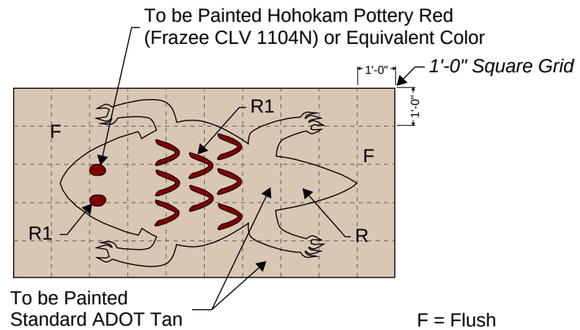
FROG

NTS



TORTOISE

NTS



LIZARD

NTS

EXHIBIT 12

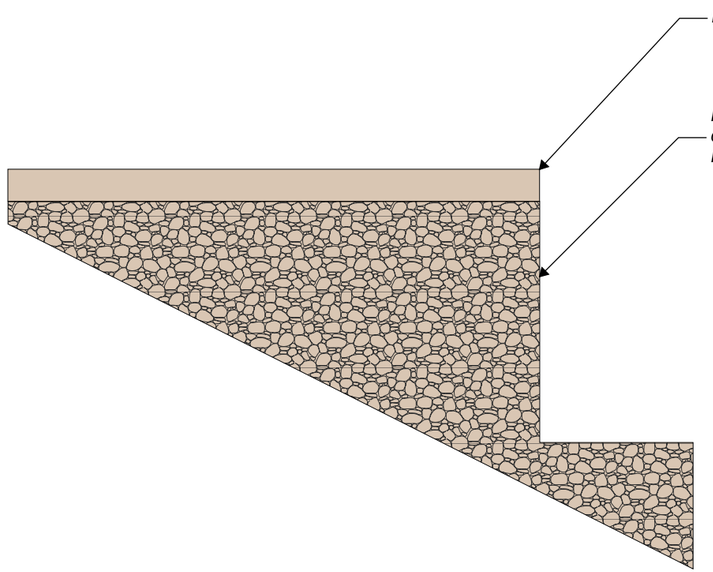
	NAME	DATE
DESIGN	SEL	6/2025
DRAWN	JKP / KA	6/2025
CHECKED	SEL	6/2025

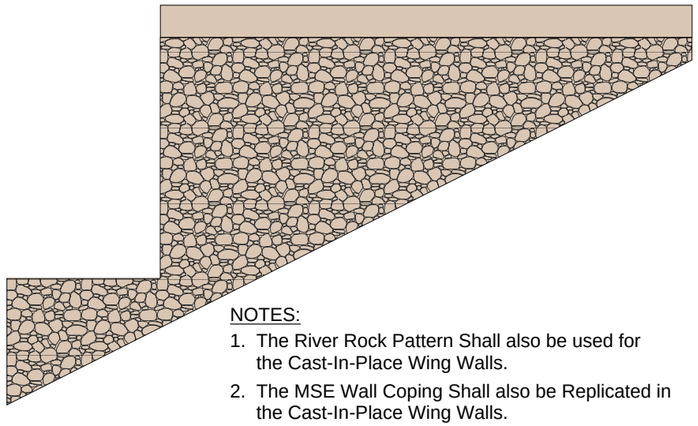
AZTEC Engineering Group, Inc.
301 N. 44th Street, Suite 300
Phoenix, Arizona 85008
TEL. 602.454.0402
FAX. 602.454.0403

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

MSE PANELS

ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 C (222)S	010 C (222)S			
MILEPOST	LOCATION I-10 CORRIDOR: 202L TO SR 387						DWG NO.
STRUCTURE NO.	TRACS NO. F0252 01D						___ OF___





NOTES:

1. The River Rock Pattern Shall also be used for the Cast-In-Place Wing Walls.
2. The MSE Wall Coping Shall also be Replicated in the Cast-In-Place Wing Walls.
3. The Stub Abutments Shall use this Exhibit for the Aesthetic Treatment.

WING WALL ELEVATIONS

NTS

EXHIBIT 13

	NAME	DATE
DESIGN	SEL	6/2025
DRAWN	JKP / KA	6/2025
CHECKED	SEL	6/2025

AZTEC TYPSA
AZTEC Engineering Group, Inc.
301 N. 44th Street, Suite 300
Phoenix, Arizona 85008
TEL: 602.454.0402
FAX: 602.454.0403

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

WING WALL

ROUTE	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10	ARIZ.	010 C (222)S	010 C (222)S			
MILEPOST						
STRUCTURE NO.						

F.H.W.A. Arizona Division

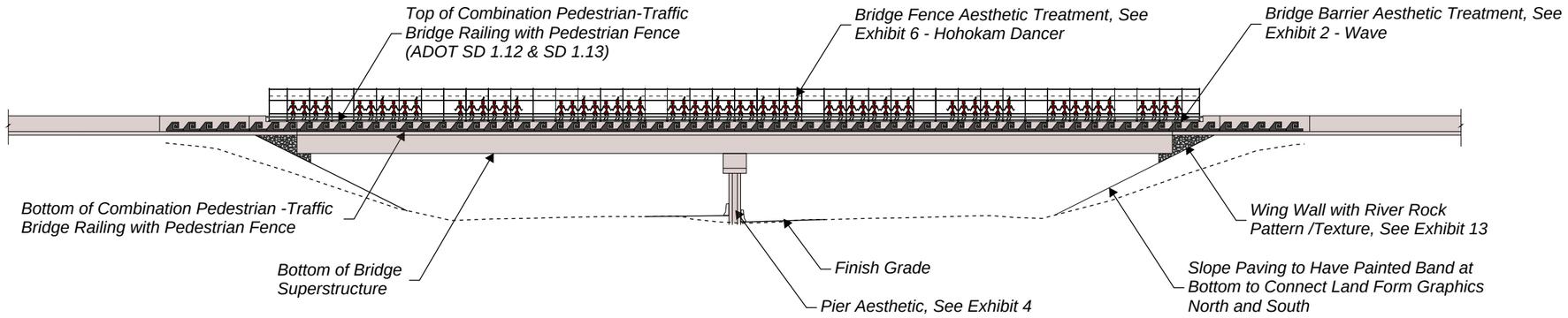
LOCATION I-10 CORRIDOR: 202L TO SR 387

TRACS NO. F0252 01D

ARIZONA DEPARTMENT OF TRANSPORTATION

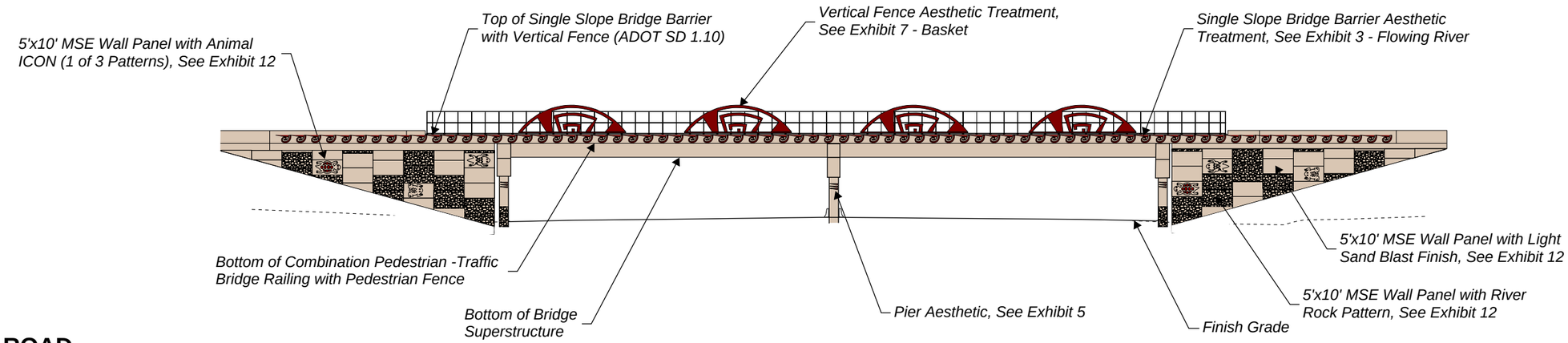
DWG NO.

___ OF___



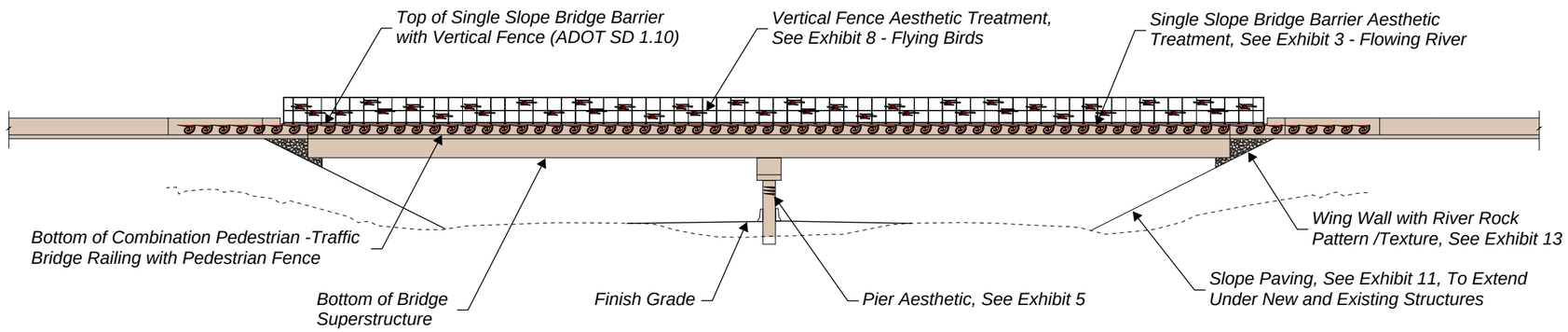
WILDHORSE PASS BOULEVARD / SUNDUST ROAD

NTS



KOLI ROAD

NTS



QUEEN CREEK ROAD

NTS

EXHIBIT 14

	NAME	DATE
DESIGN	SEL	6/2025
DRAWN	JKP / KA	6/2025
CHECKED	SEL	6/2025

AZTEC Engineering Group, Inc.
501 N. 44th Street, Suite 300
Phoenix, Arizona 85008
TEL: 602.454.0402
FAX: 602.454.0403

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES
BRIDGE ELEVATIONS
WILD HORSE PASS BLVD. / QUEEN CREEK ROAD / KOLI ROAD

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 C (222)S	010 C (222)S			

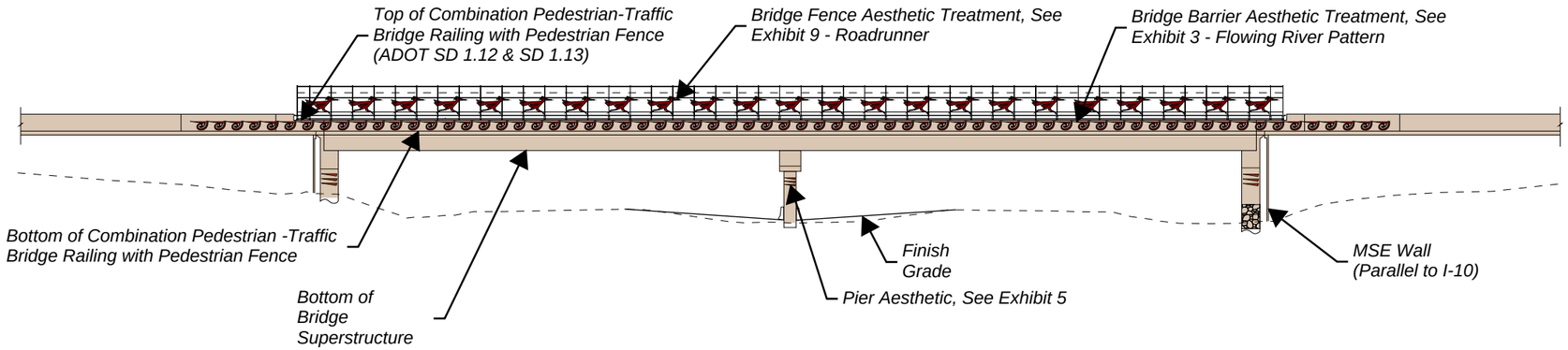
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO.

TRACS NO. F0252 01D

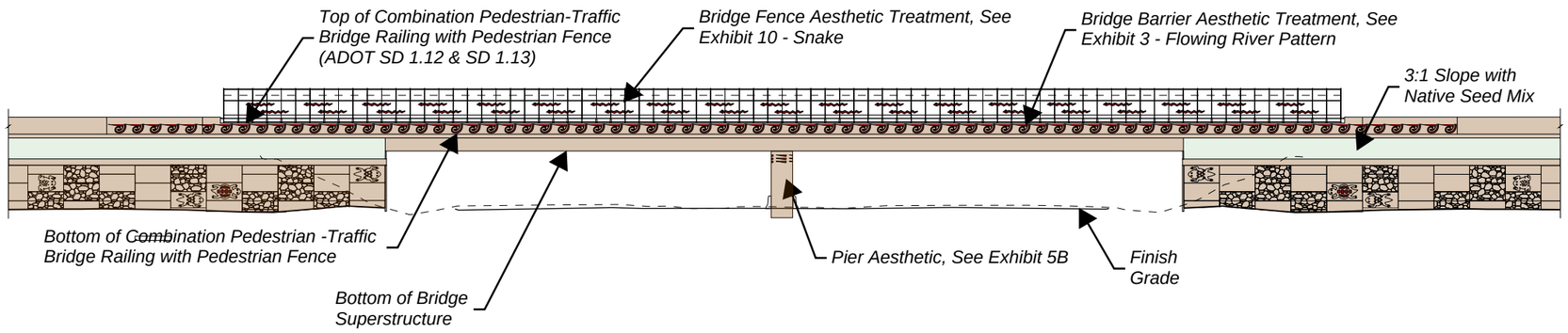
ARIZONA DEPARTMENT OF TRANSPORTATION

____ OF ____



RIGGS ROAD

NTS



GOODYEAR ROAD

NTS

EXHIBIT 15

	NAME	DATE
DESIGN	SEL	11/2025
DRAWN	JKP / KA	11/2025
CHECKED	SEL	11/2025

AZTEC TYPSA — AZTEC Engineering Group, Inc. 501 N. 44th Street, Suite 300 Phoenix, Arizona 85008 TEL: 602 454 0402 FAX: 602 454 0403

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATION DIVISION
ROADSIDE DEVELOPMENT SERVICES

BRIDGE ELEVATIONS
RIGGS ROAD & GOODYEAR ROAD

ROUTE: I-10
MILEPOST:
STRUCTURE NO.:

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 C (222)S	010 C (222)S			

LOCATION: I-10 CORRIDOR: 202L TO SR 387

DWG NO.

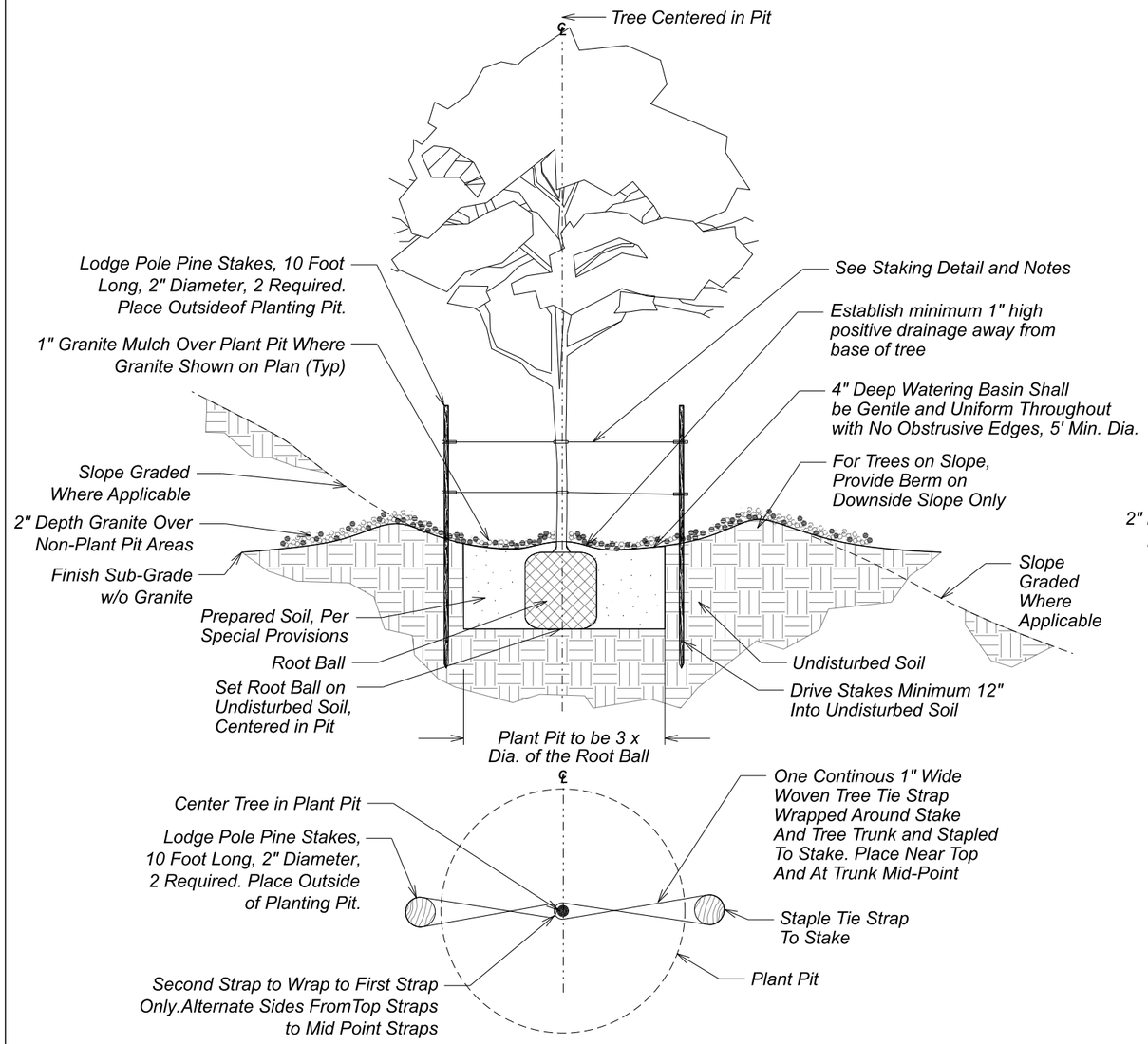
TRACS NO. F0252 01D

ARIZONA DEPARTMENT OF TRANSPORTATION

____ OF____

TPA 800-2 Landscape Details

See attached



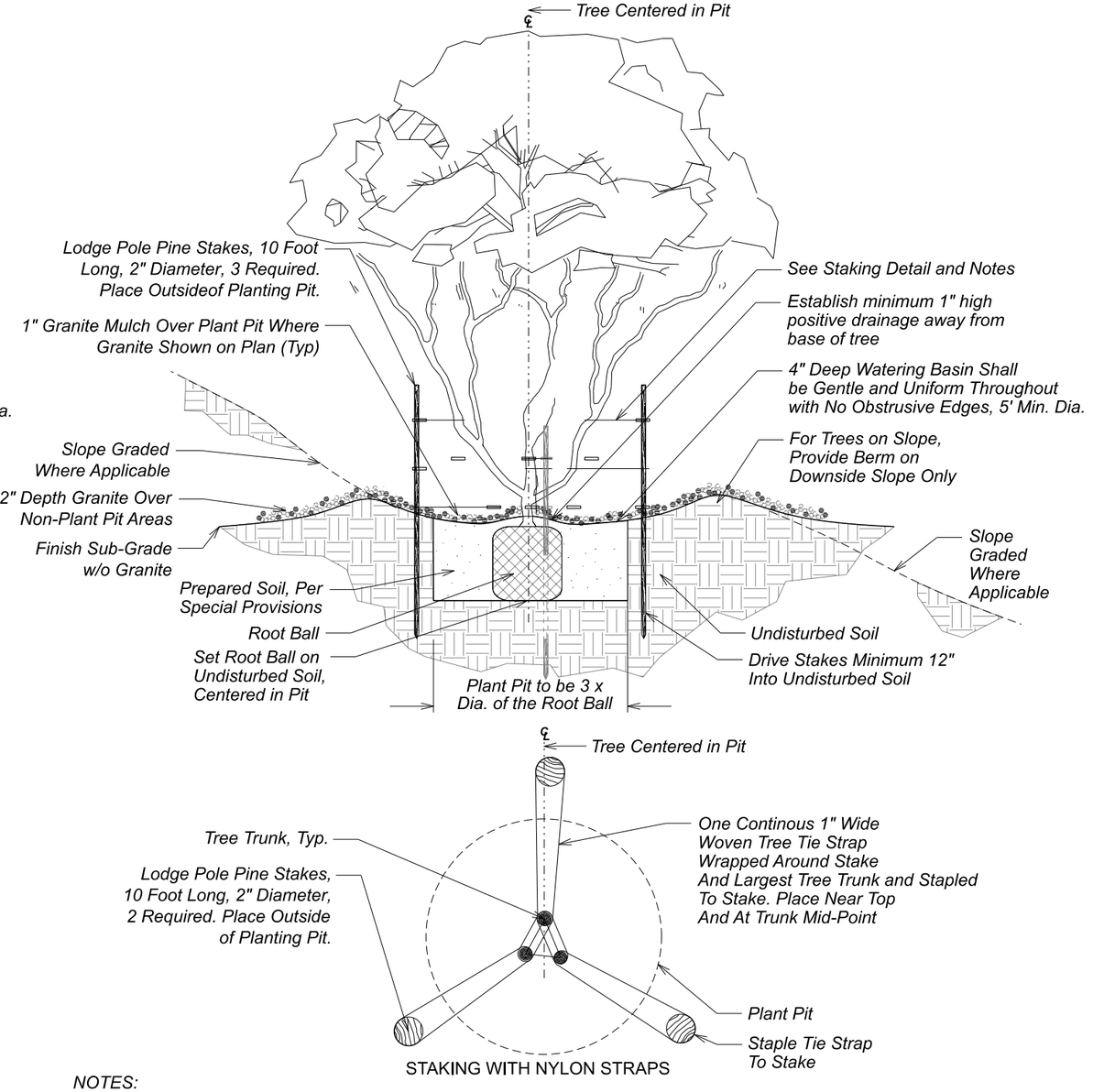
STAKING WITH NYLON STRAPS

NOTES:

1. *Stakes should be installed such that they provide the best protection against prevailing winds.*
2. *Place opposing tree wraps near top and at mid-point of trunk.*
3. *Contractor shall follow the approved submitted pruning, staking/guying, and irrigation plan.*
4. *Roughen bottom and sides of excavated hole prior to setting.*
5. *Staking shall be constructed so that trunks have flexibility.*
6. *Contractor may use Nylon Straps or Steel Wire or equivalent product per approval of the RLA.*

DETAIL L1 NTS

STANDARD TRUNK TREE PLANTING AND STAKING



STAKING WITH NYLON STRAPS

NOTES:

1. *Stakes should be installed such that they provide the best protection against prevailing winds and so that trunks have flexibility.*
2. *Place opposing tree wraps near top and at mid-point of trunk.*
3. *Contractor shall follow the approved submitted pruning, staking/guying, and irrigation plan.*
4. *Roughen bottom and sides of excavated hole prior to setting.*

DETAIL L2 NTS

MULTI-TRUNK TREE PLANTING AND STAKING

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT — CERTIFICATE NO. 27437 — STEVEN E. LOHIDE — Date Signed 07/24/2024 — ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	07/24
DRAWN	JKP	07/24
CHECKED	SEL	07/24

AZTEC TYPSA — 501 N 44th St, Suite 300, Phoenix, AZ 85008-6505, Tel (602) 454-0402, Fax (480) 499-5565, www.aztecus

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

LANDSCAPE DETAILS

ROUTE	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10	ARIZ.	010 MA 161	010-C-NFA			
MILEPOST						
STRUCTURE NO.						

F.H.W.A. Arizona Division

LOCATION I-10, SR 202L (SANTAN/SOUTH MOUNTAIN) TO GILA RIVER BRIDGE

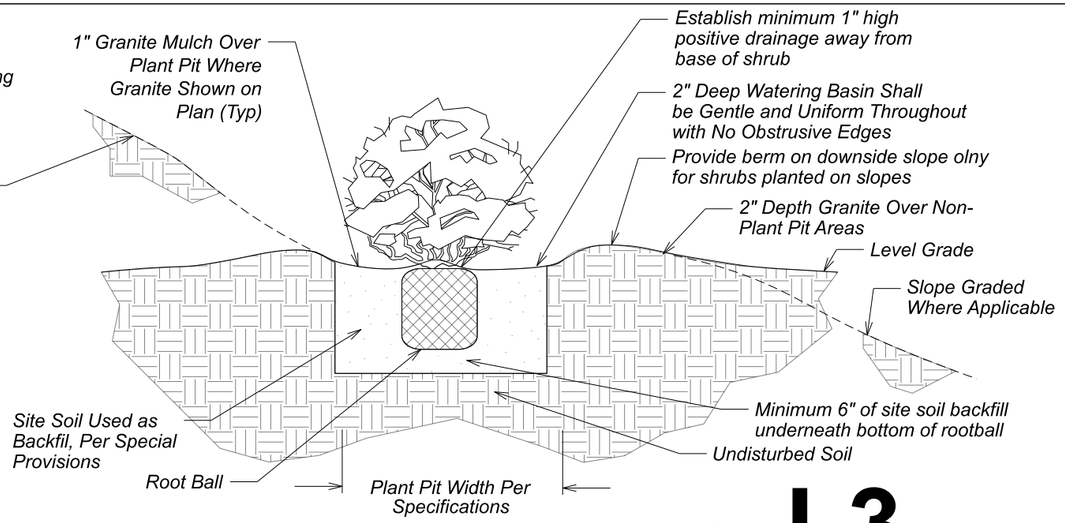
DWG NO. L-01.01

TRACS NO. F0721 01C

ADOT

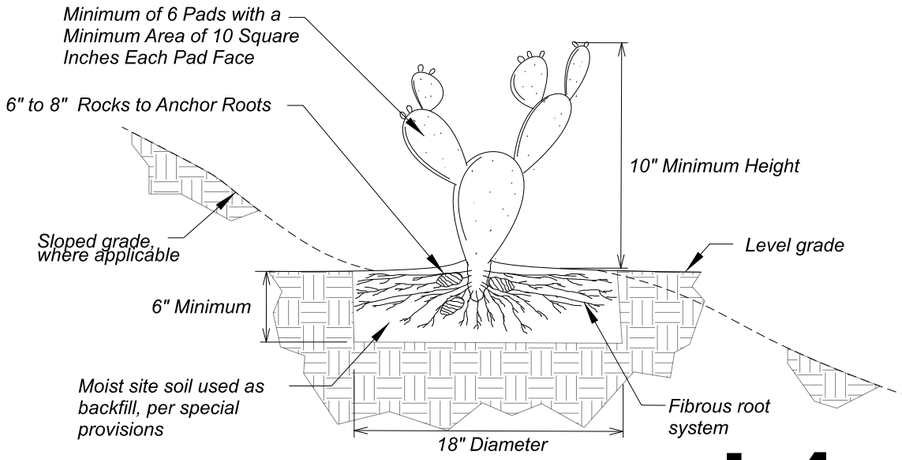
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NOTES:
1. Refer to special provisions for planting pit width and basin diameter.



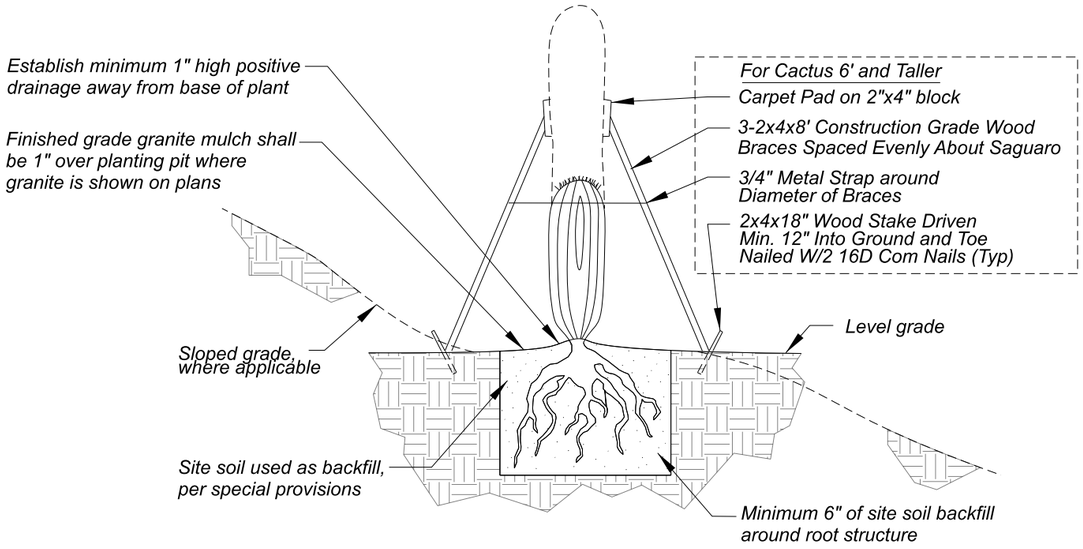
DETAIL L3 NTS

CONTAINER GROWN SHRUB/ACCENT PLANTING DETAIL



DETAIL L4 NTS

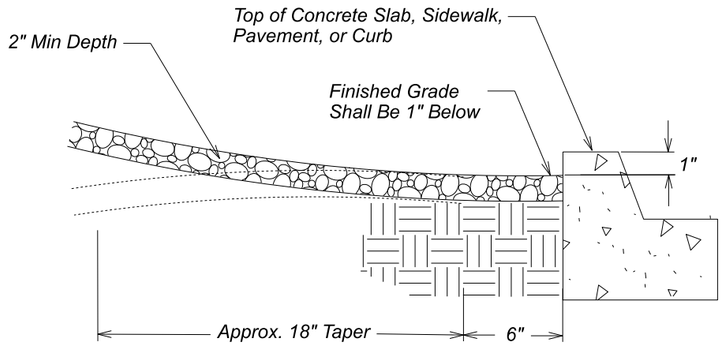
PRICKLY PEAR PLANTING



NOTES:
1.) Plant saguaro in same north orientation as grown.
2.) Root prune all shredded or damaged roots.
3.) Spray with antibiotic, dust all wounds and roots with sulfur powder. Refer to the special provisions.
4.) Bare root saguaros shall not be stored outside of ground longer than five days.
5.) Planting depth shall be at the depth which the plant was grown.
6.) Brace all single spears greater than 6' in height.

DETAIL L5 NTS

SAGAURO PLANTING DETAIL



NOTE:
1. Hold Granite Mulch 1" Below Finish Grade of Adjoining Surface For 6" Min., Then Taper Granite Mulch Bottom For Approx. 18" To Match Finished Grade or as Approved By The Landacape Architect.

DETAIL L6 NTS

GRAINITE MULCH/ROCK MULCH EDGE FINISH

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 07-24-2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	07/24
DRAWN	JKP	07/24
CHECKED	SEL	07/24

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ROADSIDE DEVELOPMENT SERVICES

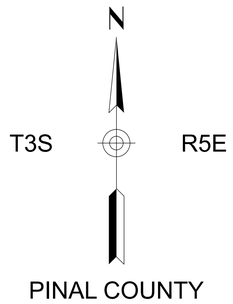
LANDSCAPE DETAILS

ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 MA 161	010-C-NFA			
MILEPOST	LOCATION I-10, SR 202L (SANTAN/SOUTH MOUNTAIN) TO GILA RIVER BRIDGE						DWG NO. L-01.02
STRUCTURE NO.	TRACS NO. F0721 01C	ADOT					____ OF ____

TPA 800-3 Plant Inventory

See attached





PINAL COUNTY

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SECTION

ADOT

PLANT INVENTORY PLANS

STATE HIGHWAY
PHOENIX-CASA GRANDE HIGHWAY
I-10



Project Limits I-10 MP 161.0 to MP 172.75

Constructed by:

Construction Company

Completion Date

Red-Lines by:

Construction Administrator Name & Company

Completion Date

Record Drawings by:

Record Drawings Designer Name & Company

Completion Date

SR 202L (SANTAN/SOUTH MOUNTAIN)
TO GILA RIVER BIRDGE

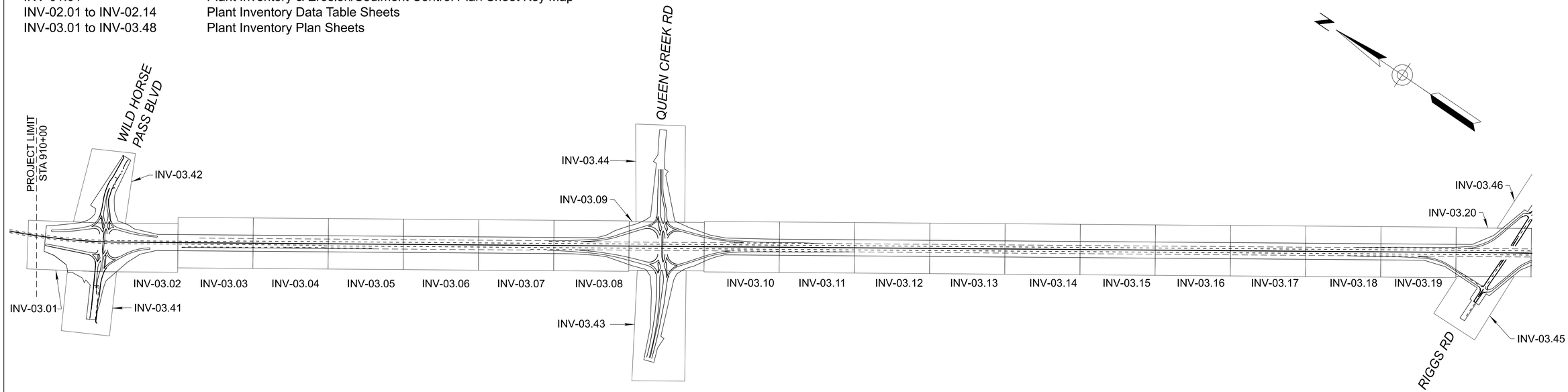
PROJECT NO. 010 MA 161 F0721 01C
FEDERAL AID NO. 010-C(NFA)

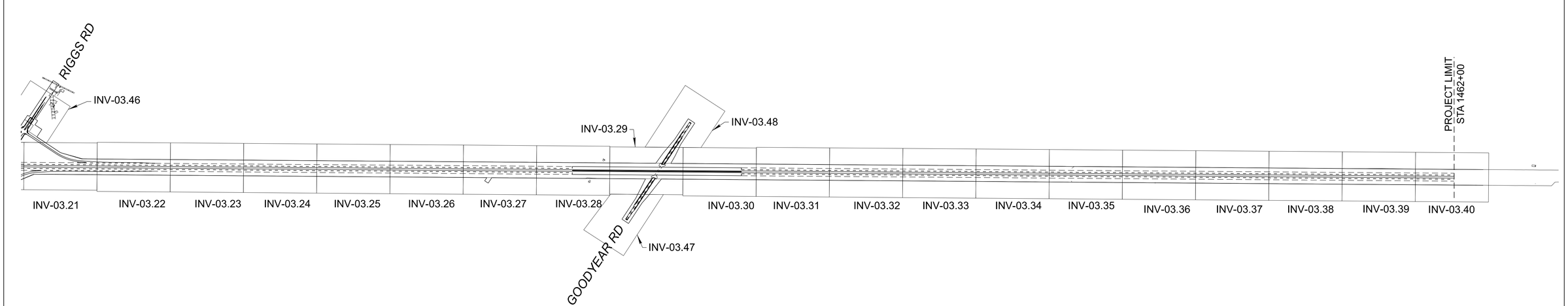
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
GREGORY BYRES, P.E., STATE ENGINEER

REC. DWGS. DATA	REC. DWG. DATE	1 OF 64

SHEET INDEX:

INV-01.01	Plant Inventory & Erosion/Sediment Control Plan Sheet Key Map
INV-02.01 to INV-02.14	Plant Inventory Data Table Sheets
INV-03.01 to INV-03.48	Plant Inventory Plan Sheets





REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
Not Valid Without Signature and Original Seal

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

PLANT INVENTORY KEYMAP

ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 MA 161	010-C(NFA)	2	64	
MILEPOST	LOCATION I-10 CORRIDOR: 202L TO SR 387						DWG NO. INV-01.01
STRUCTURE NO.	TRACS NO. F0721 01C		ADOT				____ OF ____

PLANT INVENTORY DATA TABLES

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
1			Shrub	Larrea tridentata	43	30	-	-	excellent		
2			Shrub	Larrea tridentata	24	41	-	-	excellent		
3			Shrub	Larrea tridentata	5	5	-	-	excellent		
4			Shrub	Larrea tridentata	13	13	-	-	excellent		
5			Shrub	Larrea tridentata	6	6	-	-	excellent		
6			Shrub	Larrea tridentata	7	11	-	-	excellent		
7			Shrub	Larrea tridentata	9	12	-	-	excellent		
8			Shrub	Larrea tridentata	8	6	-	-	excellent		
9			Shrub	Larrea tridentata	9	9	-	-	excellent		
10			Shrub	Larrea tridentata	7	5	-	-	excellent		
11			Shrub	Larrea tridentata	9	9	-	-	excellent		
12	X	12	Cactus	Opuntia spp	148	56	-	4	good	Salvage and Replant	X
13										Number Not Used	
14	X	14	Tree	Prosopis spp.	413	216	> 12	-	good	Salvage for fuel wood	
15			Shrub	Larrea tridentata	8	5	-	-	fair		
16			Shrub	Larrea tridentata	3	2	-	-	fair		
17			Shrub	Larrea tridentata	8	3	-	-	fair		
18			Shrub	Larrea tridentata	6	3	-	-	excellent		
19			Tree	Olneya tesota	288	300	6 to 12	-	excellent		X
20	X	20	Cactus	Carnegiea gigantea	0	240	-	14	excellent	Salvage and Replant	X
21			Shrub	Larrea tridentata	8	8	-	-	excellent		
22	X	22	Cactus	Opuntia spp	102	44	-	1	good	Salvage and Replant	X
23	X	23	Cactus	Carnegiea gigantea	0	112	-	-	excellent	Salvage and Replant	X
24										Number Not Used	
25										Number Not Used	
26	X	26	Tree	Prosopis spp.	254	156	6 to 12	-	excellent	Salvage for fuel wood	
27			Tree	Parkinsonia spp.	384	360	> 12	-	excellent		X
28			Tree	Olneya tesota	372	216	> 12	-	excellent		X
29										Number Not Used	
30										Number Not Used	
31			Shrub	Larrea tridentata	34	31	-	-	excellent		X
32			Shrub	Larrea tridentata	41	33	-	-	good		X
33			Shrub	Baccharis spp.	33	36	-	-	excellent		X
34	X	34	Tree	Prosopis spp.	416	288	6 to 12	-	excellent	Salvage for fuel wood	X
35	X	35	Tree	Prosopis spp.	450	288	> 12	-	excellent	Salvage for fuel wood	X
36			Tree	Parkinsonia spp.	282	180	> 12	-	excellent		
37			Tree	Olneya tesota	384	216	> 12	-	excellent		X
38	X	38	Cactus	Opuntia spp	53	36	-	1	good	Salvage and Replant	X
39	X	39	Tree	Prosopis spp.	414	252	6 to 12	-	excellent	Salvage for fuel wood	
40			Shrub	Larrea tridentata	18	30	-	-	excellent		
41	X	41	Tree	Prosopis spp.	340	264	> 12	-	excellent	Salvage for fuel wood	X
42			Tree	Parkinsonia spp.	324	240	6 to 12	-	good		X
43			Shrub	Baccharis spp.	24	38	-	-	excellent		
44			Tree	Prosopis spp.	20	41	-	-	excellent		
45			Shrub	Larrea tridentata	37	39	-	-	excellent		
46			Shrub	Baccharis spp.	11	19	-	-	excellent		
47	X	47	Tree	Prosopis spp.	344	216	> 12	-	excellent	Salvage for fuel wood	X
48			Tree	Parkinsonia spp.	360	216	6 to 12	-	excellent		
49			Shrub	Larrea tridentata	58	43	-	-	excellent		X
50	X	50	Cactus	Carnegiea gigantea	0	84	-	1	excellent	Salvage and Replant	X
51			Shrub	Larrea tridentata	58	58	-	-	good		
52			Tree	Parkinsonia spp.	23	19	< 3	-	good		
53			Shrub	Larrea tridentata	22	59	-	-	excellent		
54	X	54	Tree	Prosopis spp.	599	300	> 12	-	excellent	Salvage for fuel wood	
55			Shrub	Baccharis spp.	34	48	-	-	excellent		
56			Tree	Parkinsonia spp.	17	15	< 3	-	excellent		
57			Tree	Parkinsonia spp.	211	180	6 to 12	-	excellent		X
58	X	58	Tree	Prosopis spp.	408	360	> 12	-	excellent	Salvage for fuel wood	
59			Shrub	Larrea tridentata	10	10	-	-	excellent		
60			Shrub	Larrea tridentata	24	16	-	-	excellent		
61			Shrub	Larrea tridentata	32	40	-	-	excellent		
62										Number Not Used	
63	X	63	Tree	Prosopis spp.	420	252	> 12	-	excellent	Salvage for fuel wood	
64										Number Not Used	
65	X	65	Cactus	Yucca	52	124	-	2	excellent	Salvage and Replant	X
66	X	66	Cactus	Yucca	72	74	-	4	excellent	Salvage and Replant	X
67			Tree	Parkinsonia spp.	20	15	< 3	-	excellent		
68			Tree	Prosopis spp.	30	14	< 3	-	excellent		
69			Tree	Parkinsonia spp.	32	16	< 3	-	excellent		
70			Tree	Parkinsonia spp.	14	22	< 3	-	excellent		
71										Number Not Used	
72			Tree	Parkinsonia spp.	10	22	< 3	-	poor		
73			Tree	Parkinsonia spp.	16	26	< 3	-	poor		
74			Tree	Parkinsonia spp.	24	28	< 3	-	poor		
75			Tree	Parkinsonia spp.	37	22	< 3	-	fair		
76			Tree	Parkinsonia spp.	21	20	< 3	-	good		
77			Tree	Parkinsonia spp.	16	15	< 3	-	good		
78			Tree	Parkinsonia spp.	23	22	< 3	-	good		
79			Tree	Parkinsonia spp.	30	27	< 3	-	fair		
80	X	80	Tree	Prosopis spp.	125	67	3 to 6	-	excellent	Salvage for fuel wood	
81			Tree	Parkinsonia spp.	16	15	< 3	-	fair		
82			Tree	Parkinsonia spp.	38	16	< 3	-	poor		
83			Tree	Parkinsonia spp.	26	24	< 3	-	good		
84			Tree	Prosopis spp.	22	17	< 3	-	excellent		
85			Tree	Parkinsonia spp.	53	23	< 3	-	excellent		
86			Tree	Parkinsonia spp.	43	24	< 3	-	dead		
87			Tree	Parkinsonia spp.	72	29	< 3	-	excellent		
88			Tree	Parkinsonia spp.	27	16	< 3	-	excellent		
89			Tree	Prosopis spp.	89	60	< 3	-	excellent		
90			Tree	Parkinsonia spp.	41	22	< 3	-	excellent		
91			Tree	Parkinsonia spp.	71	35	< 3	-	excellent		
92										Number Not Used	
93			Tree	Parkinsonia spp.	34	30	< 3	-	fair		

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
94			Tree	Parkinsonia spp.	13	13	< 3	-	excellent		
95			Tree	Parkinsonia spp.	38	23	< 3	-	excellent		
96			Tree	Parkinsonia spp.	28	17	< 3	-	excellent		
97			Tree	Parkinsonia spp.	28	16	< 3	-	excellent		
98			Tree	Parkinsonia spp.	13	14	< 3	-	good		
99			Shrub	Larrea tridentata	40	30	-	-	excellent		
100			Shrub	Larrea tridentata	30	24	-	-	excellent		
101			Shrub	Larrea tridentata	48	33	-	-	excellent		
102			Shrub	Larrea tridentata	28	26	-	-	excellent		
103			Shrub	Larrea tridentata	24	15	-	-	fair		
104			Shrub	Larrea tridentata	17	7	-	-	poor		
105			Tree	Parkinsonia spp.	456	216	> 12	-	excellent		
106			Shrub	Larrea tridentata	48	30	-	-	excellent		
107			Shrub	Larrea tridentata	45	25	-	-	excellent		
108			Tree	Prosopis spp.	35	13	< 3	-	excellent		
109			Tree	Prosopis spp.	57	28	< 3	-	excellent		
110			Tree	Prosopis spp.	65	24	< 3	-	excellent		
111			Tree	Parkinsonia spp.	12	10	< 3	-	excellent		
112	X	112	Tree	Prosopis spp.	348	240	> 12	-	excellent	Salvage for fuel wood	
113			Tree	Olneya tesota	176	180	6 to 12	-	excellent		X
114			Tree	Parkinsonia spp.	360	216	> 12	-	excellent		
115	X	115	Tree	Prosopis spp.	444	288	> 12	-	excellent	Salvage for fuel wood	
116	X	116	Cactus	Carnegiea gigantea	0	70	-	1	excellent	Salvage and Replant	X
117	X	117	Tree	Prosopis spp.	384	180	6 to 12	-	excellent	Salvage for fuel wood	
118			Shrub	Larrea tridentata	103	84	-	-	excellent		X
119			Tree	Parkinsonia spp.	4	6	< 3	-	fair		
120			Tree	Parkinsonia spp.	10	12	< 3	-	good		
121			Tree	Parkinsonia spp.	348	216	> 12	-	excellent		
122			Tree	Parkinsonia spp.	292	288	6 to 12	-	excellent		
123			Shrub	Baccharis spp.	45	47	-	-	fair		
124	X	124	Cactus	Carnegiea gigantea	0	102	-	1	excellent	Salvage and Replant	X
125	X	125	Tree	Prosopis spp.	396	204	> 12	-	excellent	Salvage for fuel wood	
126			Tree	Parkinsonia spp.	24	26	< 3	-	dead		
127			Tree	Parkinsonia spp.	366	288	6 to 12	-	excellent		X
128			Tree	Parkinsonia spp.	217	252	6 to 12	-	excellent		X
129			Shrub	Larrea tridentata	96	84	-	-	excellent		X
130			Tree	Parkinsonia spp.	336	195	6 to 12	-	excellent		
131			Shrub	Larrea tridentata	108	144	-	-	fair		X
132			Shrub	Larrea tridentata	65	57	-	-	excellent		X
133			Shrub	Larrea tridentata	138	84	-	-	excellent		X
134			Shrub	Larrea tridentata	149	96	-	-	excellent		X
135	X	135	Tree	Prosopis spp.	576	324	> 12	-	excellent	Salvage for fuel wood	
136	X	136	Cactus	Carnegiea gigantea	0	108	-	1	good	Salvage and Replant	X
137			Tree	Olneya tesota	276	240	> 12	-	excellent		
138	X	138	Cactus	Carnegiea gigantea	0	180	-	2	fair	Salvage and Replant	X
139			Tree	Parkinsonia spp.	187	216	6 to 12	-	excellent		X
140			Tree	Parkinsonia spp.	324	216	6 to 12	-	excellent		
141			Tree	Olneya tesota	218	216	3 to 6	-	good		X
142	X	142	Cactus	Carnegiea gigantea	0	132	-	5	excellent	Salvage and Replant	X
143			Tree	Parkinsonia spp.	52	35	< 3	-	excellent		
144			Shrub	Larrea tridentata	140	90	-	-	excellent		X
145	X	145	Tree	Prosopis spp.	312	216	6 to 12	-	excellent	Salvage for fuel wood	
146			Shrub	Larrea tridentata	108	72	-	-	excellent		X
147			Tree	Parkinsonia spp.	21	11	< 3	-	poor		
148			Tree	Parkinsonia spp.	23	12	< 3	-	excellent		
149	X	149	Cactus	Carnegiea gigantea	0	96	-	1	excellent	Salvage and Replant	X
150			Tree	Parkinsonia spp.	314	324	6 to 12	-	good		X
151	X	151	Tree	Prosopis spp.	422	288	> 12	-	excellent	Salvage for fuel wood	X
152			Tree	Parkinsonia spp.	264	216	6 to 12	-	excellent		X
153	X	153	Tree	Prosopis spp.	378	240	> 12	-	excellent	Salvage for fuel wood	X
154			Tree	Prosopis spp.	36	27	< 3	-	excellent		
155			Tree	Prosopis spp.	24	10	< 3	-	excellent		
156			Tree	Prosopis spp.	20	9	< 3	-	excellent		
157			Tree	Parkinsonia spp.	24	25	< 3	-	excellent		
158			Shrub	Larrea tridentata	111	78	-	-	dead		
159			Tree	Parkinsonia spp.	90	37	< 3	-	excellent		
160			Shrub	Larrea tridentata	144	78	-	-	poor		
161			Tree	Parkinsonia spp.	80	45	< 3	-	excellent		
162			Shrub	Larrea tridentata	36	14	-	-	excellent		
163			Tree	Parkinsonia spp.	240	192	6 to 12	-	good		
164			Tree	Parkinsonia spp.	271	288	6 to 12	-	excellent		
165	X	165	Tree	Prosopis spp.	324	192	6 to 12	-	good	Salvage for fuel wood	X
166	X	166	Tree	Prosopis spp.	407	240	> 12	-	excellent	Salvage for fuel wood	X
167			Tree	Olneya tesota	240	204	6 to 12	-	excellent		X
168			Shrub	Larrea tridentata	30	19	-	-	excellent		
169			Tree	Prosopis spp.	12	12	< 3	-	excellent		
170			Shrub	Baccharis spp.	24	33	-	-	excellent		
171	X	171	Tree	Prosopis spp.	457	252	6 to 12	-	excellent	Salvage for fuel wood	X
172			Tree	Olneya tesota	264	186	> 12	-	good		X
173			Tree	Prosopis spp.	84	72	< 3	-	excellent		
174	X	174	Tree	Prosopis spp.	372	252	> 12	-	excellent	Salvage for fuel wood	X
175			Shrub	Baccharis spp.	72	68	-	-	excellent		
176			Shrub	Baccharis spp.	72	52	-	-	excellent		
177			Shrub	Baccharis spp.	72	62	-	-	fair		
178	X	178	Tree	Prosopis spp.	228	174	6 to 12	-	excellent	Salvage for fuel wood	X
179			Tree	Parkinsonia spp.	47	26	< 3	-	excellent		
180			Tree	Tamarix ramosissima	96	48	< 3	-	excellent		
181			Tree	Tamarix ramosissima	48	40	< 3	-	excellent		
182	X	182	Tree	Prosopis spp.	336	192	6 to 12	-	excellent	Salvage for fuel wood	X
183			Tree	Prosopis spp.	72	48	< 3	-	excellent		
184			Tree	Prosopis spp.	72	48	< 3	-	excellent		
185	X	185	Tree	Prosopis spp.	324	288	> 12	-	excellent	Salvage for fuel wood	
186			Tree	Prosopis spp.	481	228	6 to 12	-	excellent		X

NOTE:

All plant material noted to be 'Salvage for Fuel Wood' or 'Salvage and Replant', that will not be disturbed by construction, is to be protected-in-place.

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

PLANT INVENTORY DATA TABLES

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	3	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-02.01

TRACS NO. F0721 01C

ADOT

____ OF ____

PLANT INVENTORY DATA TABLES

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
187			Tree	Parkinsonia spp.	264	180	6 to 12	-	excellent		X
188			Tree	Olneya tesota	312	204	6 to 12	-	excellent		X
189			Tree	Parkinsonia spp.	413	216	6 to 12	-	excellent		X
190			Shrub	Baccharis spp.	48	42	-	-	excellent		
191			Shrub	Larrea tridentata	120	60	-	-	excellent		X
192			Shrub	Larrea tridentata	84	72	-	-	excellent		X
193			Shrub	Larrea tridentata	72	60	-	-	excellent		X
194			Tree	Parkinsonia spp.	45	30	< 3	-	excellent		
195	X	195	Tree	Prosopis spp.	408	360	> 12	-	excellent	Salvage for fuel wood	X
196			Shrub	Larrea tridentata	132	84	-	-	excellent		X
197			Tree	Parkinsonia spp.	8	10	< 3	-	excellent		
198			Tree	Parkinsonia spp.	38	42	< 3	-	excellent		
199			Shrub	Larrea tridentata	23	23	-	-	excellent		
200			Shrub	Larrea tridentata	32	24	-	-	excellent		
201	X	201	Cactus	Carnegiea gigantea	0	180	-	4	excellent	Salvage and Replant	X
202			Tree	Parkinsonia spp.	48	22	< 3	-	excellent		
203			Shrub	Larrea tridentata	24	14	-	-	excellent		
204			Tree	Prosopis spp.	30	12	< 3	-	excellent		
205			Shrub	Larrea tridentata	105	74	-	-	excellent		
206			Shrub	Larrea tridentata	96	72	-	-	excellent		
207			Tree	Parkinsonia spp.	18	48	< 3	-	excellent		
208			Tree	Prosopis spp.	5	15	< 3	-	excellent		
209			Tree	Parkinsonia spp.	366	180	6 to 12	-	excellent		X
210			Tree	Prosopis spp.	24	18	< 3	-	excellent		
211			Shrub	Larrea tridentata	132	72	-	-	good		
212			Groupin	Larrea tridentata	48	96	-	-		6 creosote	
213			Tree	Olneya tesota	252	204	6 to 12	-	excellent		X
214			Shrub	Larrea tridentata	120	84	-	-	excellent		
215			Shrub	Larrea tridentata	120	84	-	-	excellent		X
216			Shrub	Larrea tridentata	108	72	-	-	excellent		
217			Shrub	Larrea tridentata	84	60	-	-	excellent		
218			Tree	Parkinsonia spp.	360	192	6 to 12	-	excellent		X
219			Tree	Olneya tesota	288	180	> 12	-	excellent		X
220	X	220	Tree	Prosopis spp.	396	216	6 to 12	-	excellent	Salvage for fuel wood	X
221			Tree	Parkinsonia spp.	334	288	> 12	-	excellent		X
222			Tree	Prosopis spp.	72	39	< 3	-	excellent		
223			Tree	Prosopis spp.	8	4	< 3	-	excellent		
224	X	224	Tree	Prosopis spp.	360	204	6 to 12	-	excellent	Salvage for fuel wood	X
225	X	225	Tree	Prosopis spp.	480	240	> 12	-	excellent	Salvage for fuel wood	X
226			Tree	Parkinsonia spp.	186	216	6 to 12	-	excellent		X
227			Tree	Parkinsonia spp.	260	264	6 to 12	-	excellent		X
228	X	228	Tree	Prosopis spp.	192	180	6 to 12	-	excellent	Salvage for fuel wood	X
229										Number Not Used	
230			Tree	Parkinsonia spp.	326	192	> 12	-	excellent		X
231			Tree	Parkinsonia spp.	290	252	6 to 12	-	excellent		X
232										Number Not Used	
233			Shrub	Larrea tridentata	8	6	-	-	fair		
234			Tree	Olneya tesota	286	288	> 12	-	excellent		X
235			Tree	Parkinsonia spp.	204	216	6 to 12	-	good		X
236			Shrub	Larrea tridentata	152	72	-	-	excellent		X
237	X	237	Tree	Prosopis spp.	506	360	> 12	-	excellent	Salvage for fuel wood	X
238			Shrub	Larrea tridentata	180	132	-	-	excellent		X
239			Tree	Parkinsonia spp.	28	20	< 3	-	excellent		
240			Tree	Parkinsonia spp.	2	8	< 3	-	excellent		
241			Tree	Parkinsonia spp.	48	51	< 3	-	excellent		
242			Tree	Parkinsonia spp.	268	180	6 to 12	-	excellent		X
243			Tree	Olneya tesota	240	192	6 to 12	-	excellent		X
244										Number Not Used	
245			Tree	Parkinsonia spp.	48	48	< 3	-	excellent		
246			Tree	Prosopis spp.	48	60	< 3	-	excellent		
247			Shrub	Larrea tridentata	192	114	-	-	excellent		
248	X	248	Tree	Prosopis spp.	456	252	3 to 6	-	excellent	Salvage for fuel wood	X
249			Tree	Parkinsonia spp.	84	84	< 3	-	excellent		
250			Tree	Parkinsonia spp.	24	12	< 3	-	excellent		
251			Tree	Parkinsonia spp.	12	12	< 3	-	excellent		
252			Tree	Parkinsonia spp.	245	252	6 to 12	-	excellent		
253			Tree	Parkinsonia spp.	324	288	6 to 12	-	excellent		X
254			Groupin	Parkinsonia spp.	0	0	-	-		45 Palo verde	
255	X	255	Tree	Prosopis spp.	252	204	6 to 12	-	excellent	Salvage for fuel wood	X
256			Shrub	Larrea tridentata	144	80	-	-	excellent		
257			Shrub	Larrea tridentata	129	98	-	-	excellent		
258			Tree	Olneya tesota	252	18	6 to 12	-	excellent		X
259			Tree	Parkinsonia spp.	312	216	6 to 12	-	excellent		
260			Shrub	Larrea tridentata	151	46	-	-	excellent		X
261			Shrub	Larrea tridentata	40	28	-	-	excellent		X
262			Shrub	Larrea tridentata	204	108	-	-	excellent		
263			Shrub	Larrea tridentata	240	108	-	-	excellent		
264			Shrub	Larrea tridentata	329	240	-	-	excellent		
265			Shrub	Larrea tridentata	45	35	-	-	excellent		
266			Shrub	Larrea tridentata	36	36	-	-	excellent		
267			Shrub	Larrea tridentata	24	24	-	-	excellent		
268			Shrub	Larrea tridentata	24	24	-	-	excellent		
269			Shrub	Larrea tridentata	36	36	-	-	excellent		
270			Shrub	Larrea tridentata	36	24	-	-	excellent		
271			Tree	Olneya tesota	294	228	6 to 12	-	excellent		X
272			Shrub	Larrea tridentata	36	18	-	-	fair		
273			Shrub	Larrea tridentata	36	24	-	-	excellent		
274			Shrub	Larrea tridentata	42	36	-	-	excellent		
275			Shrub	Larrea tridentata	24	12	-	-	excellent		
276			Shrub	Larrea tridentata	24	18	-	-	excellent		
277			Shrub	Larrea tridentata	15	15	-	-	excellent		
278			Shrub	Larrea tridentata	15	12	-	-	excellent		
279			Tree	Olneya tesota	299	144	6 to 12	-	excellent		X
280										Number Not Used	
281	X	281	Cactus	Carnegiea gigantea	0	112	-	-	excellent	Salvage and Replant	X
282	X	282	Cactus	Carnegiea gigantea	0	156	-	2	excellent	Salvage and Replant	X
283			Shrub	Larrea tridentata	6	6	-	-	excellent		
284			Shrub	Larrea tridentata	175	96	-	-	excellent		X
285	X	285	Cactus	Carnegiea gigantea	0	144	-	1	excellent	Salvage and Replant	X
286			Shrub	Larrea tridentata	174	109	-	-	excellent		X
287										Number Not Used	
288	X	288	Tree	Prosopis spp.	304	192	6 to 12	-	excellent	Salvage for fuel wood	X
289			Shrub	Larrea tridentata	62	50	-	-	excellent		
290			Tree	Parkinsonia spp.	363	234	> 12	-	good		X
291			Shrub	Larrea tridentata	48	36	-	-	excellent		
292			Shrub	Larrea tridentata	61	48	-	-	excellent		X
293			Shrub	Larrea tridentata	24	19	-	-	excellent		X
294			Shrub	Larrea tridentata	108	108	-	-	excellent		
295	X	295	Cactus	Carnegiea gigantea	0	96	-	1	excellent	Salvage and Replant	
296			Shrub	Larrea tridentata	148	108	-	-	excellent		
297			Shrub	Larrea tridentata	13	10	-	-	excellent		X
298			Shrub	Larrea tridentata	10	20	-	-	poor		
299			Shrub	Larrea tridentata	148	111	-	-	excellent		X
300			Shrub	Larrea tridentata	10	8	-	-	excellent		
301			Shrub	Larrea tridentata	180	108	-	-	excellent		X
302	X	302	Cactus	Carnegiea gigantea	0	124	-	-	good	Salvage and Replant	X
303			Shrub	Larrea tridentata	168	108	-	-	excellent		X
304			Tree	Parkinsonia spp.	287	192	6 to 12	-	excellent		X
305			Shrub	Larrea tridentata	191	136	-	-	excellent		X
306	X	306	Tree	Prosopis spp.	238	180	6 to 12	-	excellent	Salvage for fuel wood	X
307	X	307	Cactus	Carnegiea gigantea	0	86	-	-	excellent	Salvage and Replant	X
308			Tree	Parkinsonia spp.	120	120	3 to 6	-	excellent		X
309			Tree	Parkinsonia spp.	233	252	6 to 12	-	good		X
310			Shrub	Larrea tridentata	49	25	-	-	excellent		X
311			Shrub	Larrea tridentata	46	40	-	-	excellent		X
312			Shrub	Larrea tridentata	37	34	-	-	excellent		X
313			Tree	Olneya tesota	216	192	6 to 12	-	excellent		X
314			Shrub	Larrea tridentata	12	8	-	-	poor		
315			Tree	Olneya tesota	276	198	> 12	-	excellent		X
316			Shrub	Larrea tridentata	7	8	-	-	excellent		
317	X	317	Tree	Prosopis spp.	310	216	> 12	-	excellent	Salvage for fuel wood	X
318			Shrub	Larrea tridentata	198	103	-	-	excellent		X
319			Shrub	Larrea tridentata	32	24	-	-	excellent		X
320			Tree	Olneya tesota	244	162	3 to 6	-	excellent		X
321	X	321	Cactus	Carnegiea gigantea	0	175	-	4	excellent	Salvage and Replant	X
322			Shrub	Larrea tridentata	7	15	-	-	excellent		
323			Shrub	Larrea tridentata	7	8	-	-	excellent		
324			Shrub	Larrea tridentata	7	8	-	-	excellent		
325			Shrub	Larrea tridentata	7	4	-	-	excellent		
326			Shrub	Larrea tridentata	120	96	-	-	excellent		
327			Shrub	Larrea tridentata	161	110	-	-	excellent		X
328			Shrub	Larrea tridentata	18	10	-	-	excellent		
329			Shrub	Larrea tridentata	156	74	-	-	fair		X
330			Shrub	Larrea tridentata	120	108	-	-	excellent		X
331			Tree	Parkinsonia spp.	204	216	6 to 12	-	excellent		X
332			Shrub	Baccharis spp.	35	27	-	-	excellent		X
333			Shrub	Larrea tridentata	14	7	-	-	excellent		X
334			Tree	Parkinsonia spp.	203	168	6 to 12	-	excellent		X
335			Tree	Parkinsonia spp.	60	72	< 3	-	excellent		
336			Tree	Parkinsonia spp.	288	177	6 to 12	-	excellent		X
337			Tree	Parkinsonia spp.	288	206	6 to 12	-	good		X
338			Tree	Olneya tesota	150	168	3 to 6	-	excellent		X
339			Shrub	Larrea tridentata	96	36	-	-	excellent		X
340			Tree	Parkinsonia spp.	190	180	3 to 6	-	excellent		X
341	X	341	Tree	Prosopis spp.	507	306	> 12	-	excellent	Salvage for fuel wood	X
342			Shrub	Larrea tridentata	15	8	-	-	excellent		
343			Shrub	Larrea tridentata	10	8	-	-	excellent		
344			Shrub	Larrea tridentata	12	8	-	-	excellent		
345			Shrub	Larrea tridentata	24	8	-	-	excellent		
346	X	346	Tree	Prosopis spp.	516	288	> 12	-	excellent	Salvage for fuel wood	X
347	X	347	Tree	Prosopis spp.	204	180	6 to 12	-	excellent	Salvage for fuel wood	X
348			Shrub	Larrea tridentata	16	12	-	-	excellent		X
349	X	349	Cactus	Carnegiea gigantea	0	146	-	-	excellent	Salvage and Replant	X
350			Tree	Parkinsonia spp.	44	70	< 3	-	excellent		
351			Tree	Parkinsonia spp.	46	62	< 3	-	excellent		
352			Shrub	Larrea tridentata	192	113	-	-	excellent		X
353			Tree	Parkinsonia spp.	48	36	< 3	-	excellent		
354			Tree	Parkinsonia spp.	50	36	< 3	-	excellent		
355			Tree	Parkinsonia spp.	48	60	< 3	-	excellent		
356			Tree	Parkinsonia spp.	252	186	6 to 12	-	good		X
357			Tree	Olneya tesota	257	180	6 to 12	-	excellent		X
358			Shrub	Larrea tridentata	195	128	-	-	excellent		X
359			Tree	Parkinsonia spp.	92	75	< 3	-	excellent		
360			Shrub	Larrea tridentata	152	95	-	-	good		X
361			Tree	Parkinsonia spp.	72	36	< 3	-	excellent		
362			Tree	Parkinsonia spp.	60	36	< 3	-	excellent		
363			Tree	Parkinsonia spp.	84	96	6 to 12	-	excellent		X
364	X	364	Cactus	Carnegiea gigantea	0	117	-	-	excellent	Salvage and Replant	X
365			Tree	Olneya tesota	230	202	6 to 12	-	excellent		X
366			Tree	Parkinsonia spp.	264	180	> 12	-	good		X
367			Tree	Parkinsonia spp.	360	216	6 to 12	-	excellent		
368	X	368	Tree	Prosopis spp.	252	192	6 to 12	-	excellent	Salvage for fuel wood	X
369	X	369	Cactus	Carnegiea gigantea	0	204	-	4	good	Salvage and Replant	
370			Shrub	Larrea tridentata	42	26	-	-	excellent		
371	X	371	Cactus	Fouquieria splendens	0	96	-	30	good	Salvage and Replant	X
372			Tree	Olneya tesota	248	252	6 to 12	-	excellent		X

NOTE:

All plant material noted to be 'Salvage for Fuel Wood' or 'Salvage and Replant', that will not be disturbed by construction, is to be protected-in-place.

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

PLANT INVENTORY DATA TABLES

ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 MA 161	010-C(NFA)	4	64	
MILEPOST	LOCATION I-10 CORRIDOR: 202L TO SR 387						DWG NO. INV-02.02
STRUCTURE NO.	TRACS NO. F0721 01C		ADOT				___ OF___

PLANT INVENTORY DATA TABLES

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
373			Tree	Parkinsonia spp.	63	51	< 3	-	dead		X
374			Tree	Olneya tesota	230	156	6 to 12	-	excellent		X
375			Tree	Parkinsonia spp.	240	144	6 to 12	-	excellent		X
376			Tree	Parkinsonia spp.	336	192	> 12	-	good		X
377	X	377	Tree	Prosopis spp.	206	216	> 12	-	excellent	Salvage for fuel wood	X
378			Tree	Parkinsonia spp.	92	52	< 3	-	poor		X
379			Tree	Parkinsonia spp.	47	20	< 3	-	excellent		X
380			Shrub	Larrea tridentata	43	31	-	-	good		X
381	X	381	Tree	Prosopis spp.	246	174	6 to 12	-	excellent	Salvage for fuel wood	X
382	X	382	Tree	Prosopis spp.	386	240	> 12	-	excellent	Salvage for fuel wood	X
383	X	383	Tree	Prosopis spp.	168	110	3 to 6	-	excellent	Salvage for fuel wood	X
384	X	384	Tree	Prosopis spp.	126	180	6 to 12	-	excellent	Salvage for fuel wood	X
385	X	385	Tree	Prosopis spp.	252	208	6 to 12	-	excellent	Salvage for fuel wood	X
386	X	386	Tree	Prosopis spp.	280	216	> 12	-	excellent	Salvage for fuel wood	X
387			Tree	Parkinsonia spp.	56	54	< 3	-	excellent		X
388	X	388	Tree	Prosopis spp.	288	192	6 to 12	-	excellent	Salvage for fuel wood	X
389			Tree	Parkinsonia spp.	336	255	6 to 12	-	good		X
390	X	390	Cactus	Opuntia spp	65	23	-	1	poor	Salvage and Replant	X
391			Shrub	Larrea tridentata	137	71	-	-	excellent		X
392	X	392	Cactus	Opuntia spp	91	40	-	1	good	Salvage and Replant	X
393			Shrub	Larrea tridentata	119	63	-	-	excellent		X
394	X	394	Cactus	Opuntia spp	82	48	-	1	good	Salvage and Replant	X
395			Shrub	Larrea tridentata	88	73	-	-	excellent		X
396			Shrub	Larrea tridentata	113	70	-	-	excellent		X
397	X	397	Cactus	Opuntia spp	89	34	-	1	fair	Salvage and Replant	X
398	X	398	Cactus	Opuntia spp	69	32	-	1	good	Salvage and Replant	X
399	X	399	Tree	Prosopis spp.	348	271	> 12	-	excellent	Salvage for fuel wood	X
400			Tree	Prosopis spp.	84	52	< 3	-	excellent		
401			Tree	Olneya tesota	246	172	> 12	-	excellent		X
402	X	402	Cactus	Carnegiea gigantea	0	108	-	-	excellent	Salvage and Replant	X
403			Tree	Parkinsonia spp.	372	288	> 12	-	excellent		X
404			Tree	Olneya tesota	299	240	6 to 12	-	excellent		X
405			Shrub	Baccharis spp.	36	30	-	-	excellent		
406			Shrub	Larrea tridentata	36	30	-	-	excellent		
407			Shrub	Larrea tridentata	38	30	-	-	excellent		
408			Shrub	Larrea tridentata	38	30	-	-	excellent		
409	X	409	Tree	Prosopis spp.	384	264	> 12	-	excellent	Salvage for fuel wood	X
410			Tree	Parkinsonia spp.	240	177	> 12	-	excellent		X
411	X	411	Tree	Prosopis spp.	336	168	6 to 12	-	excellent	Salvage for fuel wood	X
412			Shrub	Larrea tridentata	180	84	-	-	excellent		X
413			Tree	Olneya tesota	264	150	6 to 12	-	excellent		X
414	X	414	Cactus	Carnegiea gigantea	0	70	-	1	excellent	Salvage and Replant	X
415			Tree	Olneya tesota	173	216	6 to 12	-	excellent		X
416			Tree	Parkinsonia spp.	366	240	> 12	-	excellent		X
417			Shrub	Baccharis spp.	45	48	-	-	excellent		
418	X	418	Cactus	Carnegiea gigantea	0	90	-	1	excellent	Salvage and Replant	X
419	X	419	Tree	Prosopis spp.	270	180	6 to 12	-	excellent	Salvage for fuel wood	X
420			Tree	Parkinsonia spp.	198	180	> 12	-	excellent		X
421			Tree	Tamarix ramosissima	576	420	> 12	-	excellent		
422			Tree	Olneya tesota	264	216	6 to 12	-	excellent		X
423			Tree	Parkinsonia spp.	168	180	6 to 12	-	excellent		X
424			Tree	Olneya tesota	180	180	6 to 12	-	excellent		X
425			Tree	Olneya tesota	180	120	6 to 12	-	dead		X
426			Tree	Parkinsonia spp.	144	132	6 to 12	-	excellent		X
427			Shrub	Baccharis spp.	24	30	-	-	excellent		
428			Shrub	Baccharis spp.	60	48	-	-	excellent		
429			Groupin	Baccharis spp.	120	96	-	-		25 Desert Broom	
430	X	430	Cactus	Carnegiea gigantea	0	120	-	-	excellent	Salvage and Replant	X
431	X	431	Cactus	Carnegiea gigantea	0	98	-	-	excellent	Salvage and Replant	X
432			Shrub	Larrea tridentata	72	84	-	-	excellent		X
433	X	433	Cactus	Carnegiea gigantea	0	122	-	-	excellent	Salvage and Replant	X
434	X	434	Cactus	Carnegiea gigantea	0	111	-	-	excellent	Salvage and Replant	X
435			Tree	Parkinsonia spp.	30	40	< 3	-	excellent		
436	X	436	Cactus	Carnegiea gigantea	0	165	-	9	excellent	Salvage and Replant	X
437			Tree	Parkinsonia spp.	336	264	> 12	-	excellent		X
438	X	438	Cactus	Carnegiea gigantea	0	156	-	-	excellent	Salvage and Replant	X
439	X	439	Tree	Prosopis spp.	276	240	> 12	-	excellent	Salvage for fuel wood	X
440			Shrub	Larrea tridentata	60	40	-	-	excellent		
441			Shrub	Larrea tridentata	72	84	-	-	excellent		X
442			Shrub	Larrea tridentata	120	96	-	-	excellent		X
443			Shrub	Larrea tridentata	72	80	-	-	excellent		X
444	X	444	Cactus	Carnegiea gigantea	0	168	-	4	excellent	Salvage and Replant	X
445			Shrub	Larrea tridentata	110	108	-	-	excellent		X
446			Shrub	Larrea tridentata	84	60	-	-	excellent		X
447	X	447	Cactus	Carnegiea gigantea	0	122	-	-	good	Salvage and Replant	X
448			Shrub	Larrea tridentata	120	96	-	-	excellent		X
449			Shrub	Larrea tridentata	108	96	-	-	excellent		X
450			Shrub	Larrea tridentata	60	36	-	-	excellent		X
451			Tree	Parkinsonia spp.	33	52	< 3	-	dead		X
452			Tree	Parkinsonia spp.	72	72	< 3	-	dead		X
453			Tree	Parkinsonia spp.	48	72	< 3	-	excellent		
454			Tree	Parkinsonia spp.	60	52	< 3	-	dead		X
455			Tree	Parkinsonia spp.	62	47	< 3	-	dead		X
456			Tree	Parkinsonia spp.	53	58	< 3	-	dead		X
457			Tree	Parkinsonia spp.	60	75	< 3	-	dead		X
458			Tree	Parkinsonia spp.	60	66	< 3	-	dead		X
459			Tree	Parkinsonia spp.	52	59	< 3	-	dead		X
460	X	460	Cactus	Carnegiea gigantea	0	74	-	1	excellent	Salvage and Replant	X
461			Tree	Parkinsonia spp.	50	59	< 3	-	dead		X
462	X	462	Cactus	Carnegiea gigantea	0	150	-	2	excellent	Salvage and Replant	X
463	X	463	Cactus	Carnegiea gigantea	0	125	-	-	excellent	Salvage and Replant	X
464			Tree	Parkinsonia spp.	180	180	6 to 12	-	excellent		
465	X	465	Cactus	Carnegiea gigantea	0	162	-	3	excellent	Salvage and Replant	X
466	X	466	Cactus	Carnegiea gigantea	0	86	-	1	fair	Salvage and Replant	X
467	X	467	Tree	Prosopis spp.	360	208	6 to 12	-	excellent	Salvage for fuel wood	X
468			Shrub	Larrea tridentata	192	108	-	-	excellent		X
469			Shrub	Larrea tridentata	240	168	-	-	excellent		X
470			Tree	Parkinsonia spp.	288	144	6 to 12	-	excellent		X
471			Shrub	Larrea tridentata	108	84	-	-	excellent		X
472			Shrub	Larrea tridentata	168	120	-	-	excellent		X
473			Shrub	Larrea tridentata	192	180	-	-	excellent		X
474			Shrub	Larrea tridentata	216	144	-	-	excellent		X
475			Shrub	Larrea tridentata	144	84	-	-	excellent		X
476			Shrub	Larrea tridentata	204	168	-	-	excellent		
477										Number Not Used	
478	X	478	Cactus	Carnegiea gigantea	0	96	-	1	excellent	Salvage and Replant	X
479	X	479	Cactus	Fouquieria splendens	0	120	-	7	fair	Salvage and Replant	X
480			Shrub	Larrea tridentata	190	108	-	-	excellent		X
481	X	481	Tree	Prosopis spp.	300	264	6 to 12	-	excellent	Salvage for fuel wood	X
482	X	482	Tree	Prosopis spp.	216	240	6 to 12	-	excellent	Salvage for fuel wood	X
483	X	483	Tree	Prosopis spp.	240	192	6 to 12	-	excellent	Salvage for fuel wood	X
484	X	484	Tree	Prosopis spp.	360	384	> 12	-	excellent	Salvage for fuel wood	X
485	X	485	Tree	Prosopis spp.	240	276	6 to 12	-	excellent	Salvage for fuel wood	X
486			Tree	Olneya tesota	180	180	6 to 12	-	excellent		X
487	X	487	Tree	Prosopis spp.	180	228	6 to 12	-	excellent	Salvage for fuel wood	X
488	X	488	Tree	Prosopis spp.	216	180	6 to 12	-	excellent	Salvage for fuel wood	X
489			Tree	Olneya tesota	180	156	6 to 12	-	good		X
490	X	490	Tree	Prosopis spp.	108	132	3 to 6	-	excellent	Salvage for fuel wood	X
491	X	491	Tree	Prosopis spp.	180	192	6 to 12	-	excellent	Salvage for fuel wood	X
492	X	492	Tree	Prosopis spp.	288	240	6 to 12	-	excellent	Salvage for fuel wood	X
493			Tree	Prosopis spp.	180	216	6 to 12	-	good		X
494	X	494	Tree	Prosopis spp.	276	168	6 to 12	-	excellent	Salvage for fuel wood	X
495			Tree	Parkinsonia spp.	192	168	6 to 12	-	good		X
496	X	496	Tree	Prosopis spp.	240	216	6 to 12	-	excellent	Salvage for fuel wood	X
497			Tree	Olneya tesota	180	204	6 to 12	-	excellent		X
498	X	498	Tree	Prosopis spp.	252	216	6 to 12	-	excellent	Salvage for fuel wood	X
499	X	499	Tree	Prosopis spp.	180	204	6 to 12	-	excellent	Salvage for fuel wood	X
500			Shrub	Larrea tridentata	30	28	-	-	excellent		X
501			Shrub	Larrea tridentata	70	53	-	-	excellent		X
502			Shrub	Larrea tridentata	80	52	-	-	excellent		X
503			Shrub	Larrea tridentata	204	156	-	-	excellent		X
504			Shrub	Larrea tridentata	90	84	-	-	excellent		X
505			Shrub	Larrea tridentata	110	120	-	-	excellent		X
506			Shrub	Larrea tridentata	39	50	-	-	excellent		X
507			Shrub	Larrea tridentata	100	70	-	-	excellent		X
508	X	508	Cactus	Fouquieria splendens	0	114	-	5	dead		X
509			Shrub	Larrea tridentata	168	108	-	-	excellent		X
510			Shrub	Larrea tridentata	176	132	-	-	excellent		X
511			Shrub	Larrea tridentata	84	32	-	-	excellent		X
512			Shrub	Larrea tridentata	30	25	-	-	excellent		X
513	X	513	Cactus	Carnegiea gigantea	0	144	-	3	excellent	Salvage and Replant	X
514			Shrub	Larrea tridentata	26	30	-	-	excellent		X
515			Shrub	Larrea tridentata	44	51	-	-	excellent		X
516			Shrub	Larrea tridentata	20	12	-	-	excellent		X
517			Shrub	Larrea tridentata	204	108	-	-	excellent		X
518			Shrub	Larrea tridentata	46	32	-	-	excellent		X
519			Shrub	Larrea tridentata	72	43	-	-	excellent		X
520			Shrub	Larrea tridentata	38	28	-	-	excellent		X
521			Shrub	Larrea tridentata	132	96	-	-	excellent		X
522			Shrub	Larrea tridentata	60	40	-	-	excellent		X
523			Shrub	Larrea tridentata	55	34	-	-	excellent		X
524			Shrub	Larrea tridentata	36	40	-	-	excellent		X
525			Shrub	Larrea tridentata	24	22	-	-	good		X
526			Shrub	Larrea tridentata	39	22	-	-	fair		X
527			Shrub	Larrea tridentata	33	23	-	-	excellent		X
528			Shrub	Larrea tridentata	80	58	-	-	excellent		X
529			Tree	Prosopis spp.	60	72	< 3	-	excellent		X
530			Tree	Prosopis spp.	66	72	< 3	-	excellent		X
531			Shrub	Larrea tridentata	80	74	-	-	excellent		X
532			Shrub	Larrea tridentata	73	62	-	-	excellent		X
533			Shrub	Larrea tridentata	50	62	-	-	excellent		X
534			Cactus	Fouquieria splendens	0	108	-	20	poor	Salvage and Replant	X
535	X	535	Tree	Prosopis spp.	288	216	> 12	-	excellent	Salvage for fuel wood	X
536			Shrub	Larrea tridentata	56	39	-	-	excellent		X
537			Shrub	Larrea tridentata	51	39	-	-	excellent		X
538			Shrub	Larrea tridentata	59	31	-	-	good		X
539			Shrub	Larrea tridentata	84	65	-	-	excellent		X
540	X	540	Cactus	Carnegiea gigantea	0	148	-	1	excellent	Salvage and Replant	X
541			Shrub	Larrea tridentata	82	60	-	-	excellent		X
542			Shrub	Larrea tridentata	63	42	-	-	excellent		X
543			Shrub	Larrea tridentata	38	27	-	-	excellent		X
544			Shrub	Larrea tridentata	61	47	-	-	excellent		X
545			Shrub	Larrea tridentata	40	34	-	-	excellent		X
546			Shrub	Larrea tridentata	50	49	-	-	excellent		X
547			Shrub	Larrea tridentata	42	39	-	-	excellent		X
548			Shrub	Larrea tridentata	74	34	-	-	excellent		X
549			Tree	Prosopis spp.	132	94	< 3	-	excellent		X
550			Shrub	Larrea tridentata	80	59	-	-	excellent		X
551			Shrub	Larrea tridentata	140	84	-	-	excellent		X
552			Shrub	Larrea tridentata	129	102	-	-	good		X
553			Tree	Olneya tesota	165	180	6 to 12	-	fair		X
554			Shrub	Larrea tridentata	112	108	-	-	excellent		X
555			Shrub	Larrea tridentata	175	114	-	-	excellent		
556	X	556	Cactus	Carnegiea gigantea	0	120	-	1	excellent	Salvage and Replant	X
557			Shrub	Larrea tridentata	48	30	-	-	fair		X
558			Shrub	Larrea tridentata	207	132	-	-	excellent		X

NOTE:

All plant material noted to be 'Salvage for Fuel Wood' or 'Salvage and Replant', that will not be disturbed by construction, is to be protected-in-place.

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

PLANT INVENTORY DATA TABLES

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division | STATE ARIZ. | PROJECT NO. 010 MA 161 | FEDERAL ID NO. 010-C(NFA) | SHEET NO. 5 | TOTAL SHEETS 64 | RECORD DRAWING

LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-02.03

TRACS NO. F0721 01C

ADOT

___ OF ___

PLANT INVENTORY DATA TABLES

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
559	X	559	Cactus	Carnegiea gigantea	0	108	-	1	excellent	Salvage and Replant	X
560			Shrub	Larrea tridentata	34	27	-	-	fair		X
561	X	561	Tree	Prosopis spp.	288	180	> 12	-	excellent	Salvage for fuel wood	X
562	X	562	Cactus	Carnegiea gigantea	0	54	-	1	excellent	Salvage and Replant	X
563			Shrub	Larrea tridentata	200	130	-	-	excellent		X
564			Shrub	Larrea tridentata	80	66	-	-	excellent		X
565			Tree	Parkinsonia spp.	288	208	6 to 12	-	excellent		
566			Shrub	Larrea tridentata	73	42	-	-	excellent		X
567			Shrub	Larrea tridentata	57	36	-	-	excellent		X
568			Tree	Prosopis spp.	52	50	< 3	-	excellent		
569			Shrub	Larrea tridentata	70	47	-	-	excellent		X
570			Shrub	Larrea tridentata	70	76	-	-	excellent		X
571			Shrub	Larrea tridentata	168	108	-	-	excellent		X
572			Shrub	Larrea tridentata	40	63	-	-	excellent		X
573	X	573	Cactus	Carnegiea gigantea	0	144	-	1	excellent	Salvage and Replant	X
574			Shrub	Larrea tridentata	90	86	-	-	excellent		X
575			Tree	Olneya tesota	252	216	6 to 12	-	excellent		X
576	X	576	Cactus	Carnegiea gigantea	0	150	-	1	excellent	Salvage and Replant	X
577			Tree	Olneya tesota	180	204	6 to 12	-	excellent		X
578			Shrub	Larrea tridentata	36	31	-	-	good		X
579	X	579	Cactus	Carnegiea gigantea	0	162	-	1	excellent	Salvage and Replant	X
580			Shrub	Larrea tridentata	156	100	-	-	excellent		X
581			Shrub	Larrea tridentata	195	132	-	-	fair		X
582			Shrub	Larrea tridentata	96	80	-	-	excellent		X
583			Shrub	Larrea tridentata	240	150	-	-	excellent		
584			Tree	Olneya tesota	180	264	6 to 12	-	excellent		X
585			Shrub	Larrea tridentata	156	140	-	-	excellent		X
586			Shrub	Larrea tridentata	162	134	-	-	excellent		X
587			Tree	Parkinsonia spp.	336	240	> 12	-	excellent		X
588			Shrub	Larrea tridentata	198	100	-	-	good		X
589			Shrub	Larrea tridentata	198	74	-	-	excellent		X
590			Shrub	Larrea tridentata	170	90	-	-	excellent		X
591	X	591	Cactus	Carnegiea gigantea	0	86	-	3	excellent	Salvage and Replant	X
592			Tree	Olneya tesota	240	216	6 to 12	-	excellent		X
593			Shrub	Larrea tridentata	72	48	-	-	excellent		X
594			Shrub	Larrea tridentata	65	48	-	-	excellent		X
595			Shrub	Larrea tridentata	210	92	-	-	excellent		X
596			Shrub	Larrea tridentata	192	112	-	-	excellent		X
597			Tree	Parkinsonia spp.	200	216	6 to 12	-	excellent		X
598			Tree	Olneya tesota	192	180	3 to 6	-	excellent		X
599			Shrub	Larrea tridentata	192	84	-	-	excellent		X
600			Shrub	Larrea tridentata	72	48	-	-	excellent		X
601			Shrub	Larrea tridentata	72	52	-	-	excellent		X
602			Shrub	Larrea tridentata	60	48	-	-	excellent		X
603			Shrub	Larrea tridentata	72	30	-	-	excellent		X
604			Shrub	Larrea tridentata	120	108	-	-	excellent		X
605			Shrub	Larrea tridentata	24	36	-	-	excellent		X
606	X	606	Cactus	Carnegiea gigantea	0	84	-	1	excellent	Salvage and Replant	X
607			Shrub	Larrea tridentata	120	96	-	-	excellent		X
608			Shrub	Larrea tridentata	8	8	-	-	excellent		X
609			Shrub	Larrea tridentata	4	4	-	-	excellent		X
610			Shrub	Larrea tridentata	204	156	-	-	excellent		X
611			Groupin	Larrea tridentata	96	72	-	-		27 creosote	
612			Tree	Parkinsonia spp.	228	180	6 to 12	-	excellent		X
613			Tree	Parkinsonia spp.	216	204	6 to 12	-	excellent		X
614			Shrub	Larrea tridentata	202	69	-	-	good		X
615			Shrub	Larrea tridentata	184	126	-	-	excellent		X
616			Shrub	Larrea tridentata	199	142	-	-	excellent		X
617			Shrub	Larrea tridentata	154	82	-	-	excellent		X
618			Tree	Olneya tesota	180	190	6 to 12	-	excellent		X
619			Tree	Parkinsonia spp.	204	178	6 to 12	-	good		X
620			Shrub	Larrea tridentata	168	66	-	-	excellent		X
621			Tree	Parkinsonia spp.	96	120	< 3	-	excellent		X
622			Shrub	Larrea tridentata	206	144	-	-	excellent		X
623	X	623	Cactus	Carnegiea gigantea	0	132	-	-	excellent	Salvage and Replant	X
624			Tree	Parkinsonia spp.	216	264	> 12	-	excellent		X
625	X	625	Cactus	Carnegiea gigantea	0	138	-	3	excellent	Salvage and Replant	X
626	X	626	Tree	Prosopis spp.	240	228	6 to 12	-	excellent	Salvage for fuel wood	X
627			Tree	Parkinsonia spp.	360	208	> 12	-	excellent		X
628										Number Not Used	
629			Shrub	Larrea tridentata	102	96	-	-	excellent		X
630			Shrub	Larrea tridentata	84	72	-	-	excellent		X
631			Shrub	Larrea tridentata	84	36	-	-	excellent		X
632	X	632	Cactus	Carnegiea gigantea	0	120	-	1	excellent	Salvage and Replant	X
633			Shrub	Larrea tridentata	10	8	-	-	excellent		
634			Shrub	Larrea tridentata	10	8	-	-	excellent		
635			Shrub	Larrea tridentata	10	8	-	-	excellent		
636			Shrub	Larrea tridentata	120	108	-	-	excellent		X
637			Tree	Parkinsonia spp.	250	290	> 12	-	excellent		X
638			Shrub	Larrea tridentata	10	10	-	-	excellent		X
639			Shrub	Larrea tridentata	36	72	-	-	excellent		
640			Shrub	Larrea tridentata	96	108	-	-	excellent		X
641	X	641	Cactus	Carnegiea gigantea	0	144	-	1	excellent	Salvage and Replant	X
642	X	642	Tree	Prosopis spp.	280	288	6 to 12	-	excellent	Salvage for fuel wood	X
643			Shrub	Larrea tridentata	24	12	-	-	excellent		
644			Shrub	Larrea tridentata	50	48	-	-	excellent		
645	X	645	Cactus	Fouquieria splendens	0	60	-	28	excellent	Salvage and Replant	X
646			Tree	Parkinsonia spp.	370	360	> 12	-	excellent		X
647			Shrub	Larrea tridentata	12	8	-	-	excellent		
648	X	648	Cactus	Carnegiea gigantea	0	240	-	1	excellent	Salvage and Replant	X
649			Shrub	Larrea tridentata	5	10	-	-	excellent		
650			Shrub	Larrea tridentata	20	15	-	-	poor		
651			Shrub	Larrea tridentata	15	30	-	-	excellent		
652			Shrub	Larrea tridentata	30	30	-	-	excellent		
653			Shrub	Larrea tridentata	84	94	-	-	excellent		
654			Shrub	Larrea tridentata	46	30	-	-	excellent		
655			Shrub	Larrea tridentata	10	8	-	-	excellent		
656			Shrub	Larrea tridentata	62	39	-	-	excellent		X
657	X	657	Cactus	Carnegiea gigantea	0	96	-	1	excellent	Salvage and Replant	X
658			Shrub	Larrea tridentata	84	36	-	-	excellent		X
659			Shrub	Larrea tridentata	96	84	-	-	excellent		X
660			Shrub	Larrea tridentata	108	60	-	-	excellent		X
661			Shrub	Larrea tridentata	48	30	-	-	excellent		X
662			Cactus	Carnegiea gigantea	0	96	-	1	excellent	Salvage and Replant	X
663			Shrub	Larrea tridentata	58	48	-	-	excellent		X
664			Shrub	Larrea tridentata	48	36	-	-	excellent		X
665			Tree	Prosopis spp.	88	58	< 3	-	excellent		
666			Shrub	Larrea tridentata	72	60	-	-	excellent		X
667			Tree	Parkinsonia spp.	250	180	6 to 12	-	excellent		X
668			Tree	Tamarix ramosissima	84	108	3 to 6	-	excellent		X
669			Tree	Prosopis spp.	140	77	< 3	-	poor		
670			Tree	Prosopis spp.	78	54	< 3	-	good		
671			Shrub	Larrea tridentata	45	40	-	-	excellent		
672			Tree	Prosopis spp.	84	76	< 3	-	excellent		
673			Shrub	Larrea tridentata	84	72	-	-	excellent		
674			Tree	Prosopis spp.	67	48	< 3	-	excellent		
675			Tree	Prosopis spp.	80	53	< 3	-	excellent		
676	X	676	Cactus	Carnegiea gigantea	0	8	-	1	dead		X
677			Tree	Prosopis spp.	115	104	> 12	-	excellent		
678			Shrub	Larrea tridentata	30	24	-	-	excellent		
679			Tree	Prosopis spp.	62	43	< 3	-	excellent		
680			Shrub	Larrea tridentata	24	24	-	-	excellent		
681			Tree	Prosopis spp.	67	48	< 3	-	excellent		
682	X	682	Tree	Prosopis spp.	206	114	6 to 12	-	excellent	Salvage for fuel wood	
683			Tree	Parkinsonia spp.	68	72	< 3	-	excellent		
684			Tree	Prosopis spp.	84	57	< 3	-	excellent		
685			Tree	Prosopis spp.	61	50	< 3	-	excellent		
686			Tree	Prosopis spp.	88	70	< 3	-	excellent		
687	X	687	Tree	Prosopis spp.	192	120	3 to 6	-	excellent	Salvage for fuel wood	
688	X	688	Tree	Prosopis spp.	172	108	3 to 6	-	excellent	Salvage for fuel wood	
689	X	689	Tree	Prosopis spp.	180	108	3 to 6	-	excellent	Salvage for fuel wood	
690			Shrub	Larrea tridentata	55	46	-	-	excellent		
691			Tree	Prosopis spp.	93	67	< 3	-	fair		
692			Tree	Prosopis spp.	84	72	< 3	-	excellent		
693			Tree	Prosopis spp.	92	84	< 3	-	excellent		
694			Tree	Prosopis spp.	84	52	< 3	-	excellent		
695			Tree	Parkinsonia aculeata	175	156	> 12	-	excellent		
696			Tree	Prosopis spp.	130	62	< 3	-	excellent		
697			Shrub	Baccharis spp.	108	80	-	-	fair		
698			Shrub	Baccharis spp.	100	72	-	-	poor		
699			Tree	Prosopis spp.	73	67	< 3	-	excellent		
700	X	700	Tree	Prosopis spp.	156	120	3 to 6	-	good	Salvage for fuel wood	
701	X	701	Tree	Prosopis spp.	192	120	3 to 6	-	excellent	Salvage for fuel wood	
702			Tree	Parkinsonia spp.	180	132	3 to 6	-	excellent		
703			Tree	Prosopis spp.	100	74	< 3	-	excellent		
704			Shrub	Baccharis spp.	88	64	-	-	fair		
705			Tree	Prosopis spp.	130	90	> 12	-	excellent		
706			Tree	Prosopis spp.	100	77	< 3	-	excellent		
707	X	707	Tree	Prosopis spp.	120	96	3 to 6	-	excellent	Salvage for fuel wood	
708			Tree	Prosopis spp.	72	49	< 3	-	excellent		
709			Tree	Prosopis spp.	108	96	< 3	-	excellent		
710	X	710	Tree	Prosopis spp.	240	216	6 to 12	-	excellent	Salvage for fuel wood	
711			Tree	Prosopis spp.	84	68	< 3	-	excellent		
712			Tree	Prosopis spp.	92	75	< 3	-	excellent		
713			Tree	Prosopis spp.	72	60	< 3	-	excellent		
714	X	714	Tree	Prosopis spp.	228	144	> 12	-	excellent	Salvage for fuel wood	
715			Tree	Prosopis spp.	82	60	< 3	-	excellent		
716	X	716	Tree	Prosopis spp.	264	228	> 12	-	excellent	Salvage for fuel wood	
717			Tree	Prosopis spp.	78	55	< 3	-	excellent		
718			Tree	Prosopis spp.	88	65	< 3	-	excellent		
719			Tree	Prosopis spp.	120	84	< 3	-	excellent		
720			Tree	Prosopis spp.	53	57	< 3	-	excellent		
721	X	721	Tree	Prosopis spp.	264	240	> 12	-	excellent	Salvage for fuel wood	
722			Tree	Prosopis spp.	80	53	< 3	-	excellent		
723			Tree	Prosopis spp.	108	69	< 3	-	excellent		
724			Tree	Prosopis spp.	88	74	< 3	-	excellent		
725	X	725	Tree	Prosopis spp.	252	264	> 12	-	excellent	Salvage for fuel wood	
726			Tree	Prosopis spp.	71	59	< 3	-	excellent		
727			Tree	Prosopis spp.	120	108	> 12	-	excellent		
728	X	728	Tree	Prosopis spp.	204	216	> 12	-	excellent	Salvage for fuel wood	
729			Tree	Prosopis spp.	84	120	< 3	-	excellent		
730	X	730	Tree	Prosopis spp.	132	120	3 to 6	-	excellent	Salvage for fuel wood	
731			Shrub	Larrea tridentata	62	40	-	-	excellent		
732			Shrub	Larrea tridentata	108	50	-	-	excellent		
733			Tree	Prosopis spp.	108	88	< 3	-	excellent		
734			Shrub	Larrea tridentata	156	54	-	-	excellent		
735			Tree	Prosopis spp.	96	82	6 to 12	-	excellent		
736	X	736	Tree	Prosopis spp.	172	132	> 12	-	excellent	Salvage for fuel wood	
737			Shrub	Larrea tridentata	55	42	-	-	excellent		
738			Tree	Prosopis spp.	69	50	< 3	-	excellent		
739	X	739	Tree	Prosopis spp.	216	240	> 12	-	excellent	Salvage for fuel wood	
740	X	740	Tree	Prosopis spp.	228	252	> 12	-	excellent	Salvage for fuel wood	
741	X	741	Tree	Prosopis spp.	192	66	6 to 12	-	excellent	Salvage for fuel wood	
742			Shrub	Larrea tridentata	73	36	-	-	excellent		
743			Shrub	Larrea tridentata	90	75	-	-	excellent		
744			Shrub	Larrea tridentata	86	63	-	-	excellent		

NOTE:

All plant material noted to be 'Salvage for Fuel Wood' or 'Salvage and Replant', that will not be disturbed by construction, is to be protected-in-place.

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT — CERTIFICATE NO. 27437 — STEVEN E. LOHIDE — 06/11/2024 — ARIZONA

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

PLANT INVENTORY DATA TABLES

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	6	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-02.04

TRACS NO. F0721 01C

ADOT

____ OF ____

PLANT INVENTORY DATA TABLES

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
745			Shrub	Larrea tridentata	144	108	-	-	excellent		
746			Shrub	Larrea tridentata	120	96	-	-	excellent		
747			Shrub	Larrea tridentata	180	82	-	-	excellent		
748			Shrub	Larrea tridentata	76	55	-	-	excellent		
749			Shrub	Larrea tridentata	76	39	-	-	excellent		
750			Shrub	Larrea tridentata	90	75	-	-	excellent		
751			Shrub	Larrea tridentata	96	70	-	-	excellent		
752			Shrub	Larrea tridentata	89	45	-	-	excellent		
753	X	753	Tree	Prosopis spp.	360	240	> 12	-	excellent	Salvage for fuel wood	X
754			Shrub	Larrea tridentata	60	24	-	-	excellent		
755			Shrub	Larrea tridentata	95	84	-	-	excellent		
756			Shrub	Larrea tridentata	58	33	-	-	excellent		
757			Shrub	Larrea tridentata	59	44	-	-	excellent		
758			Shrub	Larrea tridentata	80	68	-	-	excellent		
759			Shrub	Larrea tridentata	96	57	-	-	excellent		
760			Shrub	Larrea tridentata	101	70	-	-	excellent		
761			Tree	Prosopis spp.	96	70	< 3	-	excellent		
762			Shrub	Larrea tridentata	50	39	-	-	excellent		
763			Shrub	Larrea tridentata	252	144	-	-	excellent		
764	X	764	Tree	Prosopis spp.	348	276	> 12	-	excellent	Salvage for fuel wood	
765			Shrub	Larrea tridentata	216	71	-	-	excellent		
766			Shrub	Larrea tridentata	132	48	-	-	excellent		
767			Shrub	Larrea tridentata	72	39	-	-	excellent		
768			Shrub	Larrea tridentata	108	84	-	-	excellent		X
769			Shrub	Larrea tridentata	180	96	-	-	excellent		
770			Tree	Ebenopsis ebano	300	280	6 to 12	-	excellent	Texas Ebony	X
771			Tree	Olneya tesota	144	168	6 to 12	-	excellent		X
772			Tree	Olneya tesota	300	240	6 to 12	-	excellent		X
773			Tree	Olneya tesota	240	240	> 12	-	excellent		X
774			Tree	Olneya tesota	132	108	6 to 12	-	excellent		X
775			Shrub	Larrea tridentata	93	62	-	-	excellent		X
776			Tree	Parkinsonia spp.	204	204	> 12	-	excellent		X
777	X	777	Cactus	Carnegiea gigantea	0	78	-	-	excellent	Salvage and Replant	X
778	X	778	Cactus	Opuntia spp	196	20	-	-	dead		X
779	X	779	Cactus	Carnegiea gigantea	0	178	-	1	excellent	Salvage and Replant	X
780			Tree	Parkinsonia spp.	84	100	3 to 6	-	excellent		X
781			Shrub	Larrea tridentata	156	108	-	-	excellent		X
782			Tree	Olneya tesota	180	192	6 to 12	-	excellent		X
783	X	783	Cactus	Opuntia spp	96	46	-	1	excellent	Salvage and Replant	X
784	X	784	Cactus	Opuntia spp	50	22	-	1	poor	Salvage and Replant	X
785			Shrub	Larrea tridentata	132	102	-	-	excellent		X
786	X	786	Cactus	Opuntia spp	102	42	-	2	good	Salvage and Replant	X
787			Shrub	Larrea tridentata	120	92	-	-	excellent		X
788	X	788	Cactus	Opuntia spp	120	42	-	3	fair	Salvage and Replant	X
789	X	789	Cactus	Opuntia spp	132	28	-	4	poor	Salvage and Replant	X
790	X	790	Cactus	Opuntia spp	96	35	-	1	good	Salvage and Replant	X
791			Shrub	Larrea tridentata	144	84	-	-	excellent		X
792			Shrub	Larrea tridentata	115	96	-	-	excellent		X
793			Shrub	Larrea tridentata	120	108	-	-	excellent		X
794			Shrub	Larrea tridentata	15	9	-	-	fair		
795			Shrub	Larrea tridentata	108	84	-	-	excellent		X
796			Shrub	Larrea tridentata	96	96	-	-	excellent		X
797	X	797	Tree	Prosopis spp.	288	360	> 12	-	excellent	Salvage for fuel wood	X
798	X	798	Cactus	Fouquieria splendens	0	60	-	17	excellent	Salvage and Replant	X
799			Tree	Parkinsonia spp.	216	216	6 to 12	-	excellent		X
800			Shrub	Larrea tridentata	120	84	-	-	excellent		X
801			Tree	Olneya tesota	186	216	> 12	-	excellent		X
802	X	802	Tree	Prosopis spp.	240	216	> 12	-	excellent	Salvage for fuel wood	X
803			Shrub	Larrea tridentata	12	12	-	-	excellent		
804			Shrub	Larrea tridentata	10	12	-	-	excellent		
805			Shrub	Larrea tridentata	12	10	-	-	excellent		
806			Shrub	Larrea tridentata	10	24	-	-	excellent		
807			Shrub	Larrea tridentata	10	12	-	-	excellent		
808			Shrub	Larrea tridentata	10	10	-	-	excellent		
809			Shrub	Larrea tridentata	18	10	-	-	excellent		
810			Shrub	Larrea tridentata	24	10	-	-	excellent		
811			Shrub	Larrea tridentata	24	10	-	-	excellent		
812			Shrub	Larrea tridentata	120	96	-	-	excellent		X
813			Shrub	Larrea tridentata	168	120	-	-	excellent		X
814			Shrub	Larrea tridentata	120	72	-	-	excellent		X
815	X	815	Tree	Prosopis spp.	340	576	> 12	-	excellent	Salvage for fuel wood	X
816			Tree	Parkinsonia spp.	216	196	> 12	-	excellent		X
817			Shrub	Larrea tridentata	8	12	-	-	excellent		
818			Shrub	Larrea tridentata	8	6	-	-	excellent		
819	X	819	Cactus	Carnegiea gigantea	0	180	-	1	excellent	Salvage and Replant	X
820			Shrub	Larrea tridentata	15	9	-	-	fair		
821			Tree	Parkinsonia spp.	216	180	6 to 12	-	excellent		X
822			Shrub	Larrea tridentata	96	84	-	-	excellent		
823			Shrub	Larrea tridentata	15	20	-	-	excellent		
824			Shrub	Larrea tridentata	108	48	-	-	excellent		X
825			Shrub	Larrea tridentata	228	132	-	-	excellent		X
826	X	826	Cactus	Carnegiea gigantea	0	120	-	1	excellent	Salvage and Replant	X
827			Shrub	Larrea tridentata	40	40	-	-	excellent		
828			Shrub	Larrea tridentata	10	15	-	-	poor		
829			Shrub	Larrea tridentata	10	15	-	-	poor		
830			Shrub	Larrea tridentata	204	96	-	-	excellent		X
831	X	831	Tree	Prosopis spp.	200	180	6 to 12	-	excellent	Salvage for fuel wood	X
832			Tree	Parkinsonia spp.	216	182	6 to 12	-	excellent		X
833			Shrub	Larrea tridentata	175	140	-	-	excellent		X
834	X	834	Cactus	Carnegiea gigantea	0	120	-	-	excellent	Salvage and Replant	X
835			Shrub	Baccharis spp.	20	30	-	-	poor		
836			Shrub	Larrea tridentata	96	86	-	-	excellent		X
837			Shrub	Larrea tridentata	132	130	-	-	excellent		X
838			Shrub	Larrea tridentata	108	84	-	-	excellent		
839			Tree	Olneya tesota	183	210	6 to 12	-	excellent		X
840			Shrub	Larrea tridentata	148	95	-	-	excellent		X
841			Shrub	Larrea tridentata	10	20	-	-	poor		
842	X	842	Cactus	Carnegiea gigantea	0	86	-	1	excellent	Salvage and Replant	X
843			Shrub	Larrea tridentata	10	20	-	-	poor		
844			Shrub	Larrea tridentata	150	105	-	-	excellent		X
845	X	845	Tree	Prosopis spp.	325	288	> 12	-	excellent	Salvage for fuel wood	X
846	X	846	Cactus	Carnegiea gigantea	0	96	-	-	excellent	Salvage and Replant	X
847			Shrub	Larrea tridentata	50	50	-	-	excellent		
848	X	848	Tree	Prosopis spp.	236	210	6 to 12	-	excellent	Salvage for fuel wood	X
849	X	849	Tree	Prosopis spp.	250	288	6 to 12	-	excellent	Salvage for fuel wood	
850	X	850	Cactus	Carnegiea gigantea	0	69	-	-	dead		X
851			Shrub	Larrea tridentata	130	118	-	-	excellent		X
852			Shrub	Larrea tridentata	95	72	-	-	excellent		X
853			Tree	Olneya tesota	180	186	6 to 12	-	excellent		X
854			Shrub	Larrea tridentata	54	32	-	-	excellent		X
855			Shrub	Larrea tridentata	125	60	-	-	excellent		X
856			Shrub	Larrea tridentata	108	84	-	-	excellent		X
857			Shrub	Larrea tridentata	38	42	-	-	excellent		X
858			Shrub	Larrea tridentata	180	140	-	-	excellent		X
859										Number Not Used	
860			Shrub	Larrea tridentata	108	48	-	-	excellent		X
861			Tree	Olneya tesota	192	202	6 to 12	-	excellent		X
862			Tree	Olneya tesota	215	230	> 12	-	excellent		X
863			Shrub	Larrea tridentata	30	27	-	-	excellent		X
864			Shrub	Larrea tridentata	108	96	-	-	excellent		X
865			Shrub	Larrea tridentata	173	140	-	-	excellent		X
866			Shrub	Larrea tridentata	12	24	-	-	excellent		X
867			Shrub	Larrea tridentata	115	82	-	-	excellent		X
868	X	868	Cactus	Carnegiea gigantea	0	144	-	1	excellent	Salvage and Replant	X
869			Shrub	Larrea tridentata	66	65	-	-	excellent		X
870			Shrub	Larrea tridentata	144	180	-	-	excellent		X
871			Shrub	Larrea tridentata	132	108	-	-	excellent		
872			Shrub	Larrea tridentata	144	60	-	-	excellent		X
873			Shrub	Larrea tridentata	132	96	-	-	excellent		X
874			Tree	Parkinsonia aculeata	36	84	< 3	-	excellent		
875			Tree	Parkinsonia spp.	180	168	3 to 6	-	excellent		X
876			Shrub	Larrea tridentata	138	140	-	-	excellent		X
877			Tree	Olneya tesota	192	168	3 to 6	-	excellent		X
878			Tree	Parkinsonia aculeata	108	120	< 3	-	excellent		
879			Shrub	Larrea tridentata	56	45	-	-	excellent		X
880			Tree	Parkinsonia aculeata	108	120	< 3	-	excellent		
881			Shrub	Baccharis spp.	86	50	-	-	excellent		X
882			Shrub	Larrea tridentata	70	42	-	-	excellent		X
883			Tree	Parkinsonia aculeata	144	160	6 to 12	-	excellent		
884			Shrub	Larrea tridentata	194	136	-	-	excellent		X
885			Shrub	Baccharis spp.	48	50	-	-	excellent		
886			Shrub	Baccharis spp.	48	72	-	-	excellent		
887	X	887	Tree	Prosopis spp.	264	235	6 to 12	-	excellent	Salvage for fuel wood	X
888			Tree	Parkinsonia spp.	72	84	< 3	-	excellent		
889	X	889	Tree	Prosopis spp.	210	180	6 to 12	-	excellent	Salvage for fuel wood	X
890			Shrub	Larrea tridentata	36	48	-	-	excellent		
891			Shrub	Larrea tridentata	36	48	-	-	excellent		
892			Tree	Parkinsonia spp.	229	170	6 to 12	-	good		X
893			Shrub	Larrea tridentata	215	118	-	-	excellent		X
894	X	894	Cactus	Carnegiea gigantea	0	78	-	2	excellent	Salvage and Replant	X
895			Shrub	Larrea tridentata	20	12	-	-	excellent		X
896			Shrub	Larrea tridentata	24	10	-	-	excellent		X
897			Shrub	Larrea tridentata	55	59	-	-	excellent		X
898			Shrub	Larrea tridentata	63	47	-	-	excellent		X
899			Tree	Olneya tesota	192	144	6 to 12	-	good		X
900			Shrub	Larrea tridentata	36	18	-	-	excellent		X
901			Shrub	Larrea tridentata	24	12	-	-	excellent		X
902			Shrub	Larrea tridentata	60	34	-	-	excellent		X
903			Tree	Parkinsonia spp.	120	144	6 to 12	-	excellent		X
904			Shrub	Larrea tridentata	52	35	-	-	excellent		X
905			Tree	Prosopis spp.	68	48	< 3	-	excellent		X
906			Shrub	Larrea tridentata	33	21	-	-	excellent		X
907			Tree	Parkinsonia spp.	90	56	< 3	-	excellent		X
908			Tree	Prosopis spp.	60	54	< 3	-	good		X
909	X	909	Cactus	Carnegiea gigantea	0	86	-	1	excellent	Salvage and Replant	X
910			Tree	Olneya tesota	236	172	> 12	-	excellent		X
911			Shrub	Larrea tridentata	20	18	-	-	excellent		X
912			Tree	Olneya tesota	96	120	6 to 12	-	excellent		X
913			Cactus	Carnegiea gigantea	0	130	-	4	excellent	Salvage and Replant	X
914			Tree	Prosopis spp.	72	46	< 3	-	good		X
915			Tree	Parkinsonia spp.	242	220	> 12	-	excellent		X
916			Tree	Prosopis spp.	72	58	< 3	-	fair		X
917	X	917	Tree	Prosopis spp.	216	216	6 to 12	-	excellent	Salvage for fuel wood	X
918	X	918	Tree	Prosopis spp.	238	216	> 12	-	excellent	Salvage for fuel wood	X
919			Shrub	Larrea tridentata	108	84	-	-	excellent		X
920			Shrub	Larrea tridentata	36	30	-	-	excellent		X
921	X	921	Tree	Prosopis spp.	260	210	6 to 12	-	excellent	Salvage for fuel wood	X
922			Cactus	Carnegiea gigantea	0	108	-	1	excellent	Salvage and Replant	X
923	X	923	Tree	Prosopis spp.	177	232	6 to 12	-	excellent	Salvage for fuel wood	X
924	X	924	Tree	Prosopis spp.	221	245	> 12	-	excellent	Salvage for fuel wood	X
925	X	925	Cactus	Carnegiea gigantea	0	120	-	1	excellent	Salvage and Replant	X
926	X	926	Tree	Prosopis spp.	170	210	6 to 12	-	excellent	Salvage for fuel wood	X
927	X	927	Tree	Prosopis spp.	250	228	6 to 12	-	excellent	Salvage for fuel wood	X
928										Number Not Used	
929	X	929	Tree	Prosopis spp.	270	231	> 12	-	excellent	Salvage for fuel wood	X
930	X	930	Tree	Prosopis spp.	215	225	> 12	-	excellent	Salvage for fuel wood	X

NOTE:

All plant material noted to be 'Salvage for Fuel Wood' or 'Salvage and Replant', that will not be disturbed by construction, is to be protected-in-place.

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT — CERTIFICATE NO. 27437 — STEVEN E. LOHIDE — ARIZONA — 06/11/2024

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

PLANT INVENTORY DATA TABLES

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division | STATE ARIZ. | PROJECT NO. 010 MA 161 | FEDERAL ID NO. 010-C(NFA) | SHEET NO. 7 | TOTAL SHEETS 64 | RECORD DRAWING

LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-02.05

TRACS NO. F0721 01C

ADOT

____ OF ____

PLANT INVENTORY DATA TABLES

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
931	X	931	Tree	Prosopis spp.	278	210	> 12	-	excellent	Salvage for fuel wood	X
932			Shrub	Larrea tridentata	36	48	-	-	excellent		
933	X	933	Tree	Prosopis spp.	216	144	6 to 12	-	excellent	Salvage for fuel wood	X
934			Tree	Prosopis spp.	96	84	< 3	-	excellent		
935			Tree	Prosopis spp.	84	72	< 3	-	excellent		
936			Tree	Prosopis spp.	108	84	< 3	-	excellent		
937	X	937	Tree	Prosopis spp.	144	120	6 to 12	-	excellent	Salvage for fuel wood	
938	X	938	Tree	Prosopis spp.	238	140	> 12	-	poor	Salvage for fuel wood	
939	X	939	Tree	Prosopis spp.	162	101	> 12	-	fair	Salvage for fuel wood	X
940			Shrub	Baccharis spp.	24	22	-	-	excellent		
941	X	941	Tree	Prosopis spp.	221	138	> 12	-	excellent	Salvage for fuel wood	X
942	X	942	Tree	Prosopis spp.	108	84	6 to 12	-	excellent	Salvage for fuel wood	
943	X	943	Tree	Prosopis spp.	232	176	> 12	-	excellent	Salvage for fuel wood	X
944	X	944	Tree	Prosopis spp.	180	150	> 12	-	excellent	Salvage for fuel wood	X
945	X	945	Tree	Prosopis spp.	304	210	> 12	-	fair	Salvage for fuel wood	X
946			Tree	Prosopis spp.	36	36	< 3	-	excellent		
947	X	947	Tree	Prosopis spp.	216	190	> 12	-	poor	Salvage for fuel wood	X
948	X	948	Tree	Prosopis spp.	177	128	6 to 12	-	good	Salvage for fuel wood	X
949	X	949	Tree	Prosopis spp.	165	132	6 to 12	-	good	Salvage for fuel wood	X
950	X	950	Tree	Prosopis spp.	84	120	> 12	-	excellent	Salvage for fuel wood	X
951	X	951	Tree	Prosopis spp.	156	138	> 12	-	dead	Salvage for fuel wood	X
952			Tree	Prosopis spp.	100	76	< 3	-	excellent		
953			Tree	Prosopis spp.	68	52	< 3	-	excellent		
954	X	954	Tree	Prosopis spp.	360	180	> 12	-	excellent	Salvage for fuel wood	
955			Tree	Prosopis spp.	72	84	< 3	-	excellent		
956			Tree	Prosopis spp.	84	48	< 3	-	excellent		
957			Tree	Prosopis spp.	74	48	< 3	-	excellent		
958			Tree	Prosopis spp.	108	86	< 3	-	excellent		
959			Tree	Parkinsonia aculeata	131	140	6 to 12	-	good		
960			Tree	Parkinsonia aculeata	152	146	> 12	-	excellent		
961			Tree	Parkinsonia aculeata	155	136	> 12	-	excellent		
962	X	962	Cactus	Carnegiea gigantea	0	216	-	8	excellent	Salvage and Replant	X
963	X	963	Cactus	Carnegiea gigantea	0	120	-	1	excellent	Salvage and Replant	X
964			Tree	Prosopis spp.	48	48	< 3	-	excellent		
965			Tree	Parkinsonia aculeata	119	130	> 12	-	excellent		
966	X	966	Tree	Prosopis spp.	120	120	< 3	-	excellent	Salvage for fuel wood	X
967			Tree	Prosopis spp.	120	120	< 3	-	excellent		X
968			Tree	Prosopis spp.	105	80	< 3	-	excellent		
969			Tree	Prosopis spp.	131	82	< 3	-	excellent		
970	X	970	Cactus	Fouquieria splendens	0	144	-	28	excellent	Salvage and Replant	X
971			Tree	Prosopis spp.	72	60	< 3	-	excellent		
972			Tree	Prosopis spp.	130	90	< 3	-	excellent		
973			Tree	Prosopis spp.	78	67	< 3	-	excellent		
974			Tree	Prosopis spp.	86	80	< 3	-	excellent		
975			Tree	Prosopis spp.	70	67	< 3	-	excellent		
976	X	976	Tree	Prosopis spp.	196	154	> 12	-	excellent	Salvage for fuel wood	
977			Shrub	Baccharis spp.	92	60	-	-	fair		
978	X	978	Tree	Prosopis spp.	72	84	3 to 6	-	excellent	Salvage for fuel wood	
979			Tree	Prosopis spp.	85	69	6 to 12	-	good		
980			Tree	Prosopis spp.	58	46	< 3	-	excellent		
981			Tree	Prosopis spp.	84	60	< 3	-	good		
982			Tree	Prosopis spp.	86	86	< 3	-	excellent		
983			Shrub	Baccharis spp.	98	84	-	-	fair		
984			Tree	Prosopis spp.	92	70	< 3	-	good		
985			Tree	Prosopis spp.	109	58	< 3	-	good		
986			Tree	Prosopis spp.	120	96	< 3	-	excellent		
987			Tree	Prosopis spp.	115	92	< 3	-	good		
988			Tree	Prosopis spp.	108	96	< 3	-	excellent		
989			Tree	Prosopis spp.	84	65	< 3	-	good		
990			Tree	Prosopis spp.	103	65	< 3	-	good		
991	X	991	Tree	Prosopis spp.	120	120	6 to 12	-	excellent	Salvage for fuel wood	
992			Shrub	Baccharis spp.	80	56	-	-	fair		
993			Tree	Prosopis spp.	98	78	< 3	-	good		
994			Tree	Prosopis spp.	72	48	< 3	-	excellent		
995			Tree	Prosopis spp.	171	96	6 to 12	-	good		
996	X	996	Tree	Prosopis spp.	162	128	6 to 12	-	good	Salvage for fuel wood	
997			Tree	Prosopis spp.	48	36	< 3	-	excellent		
998			Tree	Prosopis spp.	176	90	< 3	-	excellent		
999			Tree	Prosopis spp.	172	103	< 3	-	good		
1000	X	1000	Tree	Prosopis spp.	108	81	3 to 6	-	excellent	Salvage for fuel wood	
1001			Tree	Prosopis spp.	91	70	< 3	-	good		
1002	X	1002	Tree	Prosopis spp.	84	92	3 to 6	-	excellent	Salvage for fuel wood	
1003	X	1003	Tree	Prosopis spp.	108	84	3 to 6	-	excellent	Salvage for fuel wood	
1004	X	1004	Tree	Prosopis spp.	108	86	3 to 6	-	excellent	Salvage for fuel wood	
1005	X	1005	Tree	Prosopis spp.	248	186	> 12	-	good	Salvage for fuel wood	
1006	X	1006	Tree	Prosopis spp.	168	132	6 to 12	-	excellent	Salvage for fuel wood	
1007	X	1007	Tree	Prosopis spp.	110	92	3 to 6	-	excellent		
1008			Tree	Prosopis spp.	69	75	< 3	-	excellent		
1009			Tree	Prosopis spp.	48	36	< 3	-	excellent		
1010			Tree	Parkinsonia spp.	84	84	< 3	-	excellent		
1011			Tree	Prosopis spp.	82	60	< 3	-	fair		
1012	X	1012	Tree	Prosopis spp.	122	129	3 to 6	-	good	Salvage for fuel wood	
1013			Tree	Prosopis spp.	108	78	< 3	-	excellent		
1014			Shrub	Baccharis spp.	123	84	-	-	good		
1015	X	1015	Tree	Prosopis spp.	135	80	3 to 6	-	good	Salvage for fuel wood	
1016			Tree	Prosopis spp.	93	75	< 3	-	good		
1017	X	1017	Tree	Prosopis spp.	242	230	> 12	-	excellent	Salvage for fuel wood	
1018			Tree	Parkinsonia spp.	36	60	< 3	-	excellent		
1019			Tree	Prosopis spp.	180	78	< 3	-	good		
1020			Tree	Prosopis spp.	36	24	< 3	-	excellent		
1021			Tree	Prosopis spp.	36	36	< 3	-	excellent		
1022	X	1022	Tree	Prosopis spp.	144	144	6 to 12	-	excellent	Salvage for fuel wood	
1023	X	1023	Tree	Prosopis spp.	324	252	6 to 12	-	excellent	Salvage for fuel wood	X
1024	X	1024	Cactus	Carnegiea gigantea	0	208	-	-	excellent	Salvage and Replant	X
1025	X	1025	Cactus	Carnegiea gigantea	0	85	-	1	excellent	Salvage and Replant	X
1026	X	1026	Tree	Prosopis spp.	120	96	6 to 12	-	excellent	Salvage for fuel wood	
1027	X	1027	Cactus	Carnegiea gigantea	0	72	-	-	dead		X
1028	X	1028	Tree	Prosopis spp.	216	180	6 to 12	-	excellent	Salvage for fuel wood	X
1029	X	1029	Tree	Prosopis spp.	221	210	6 to 12	-	excellent	Salvage for fuel wood	X
1030	X	1030	Tree	Prosopis spp.	120	84	6 to 12	-	excellent	Salvage for fuel wood	
1031	X	1031	Tree	Prosopis spp.	144	108	6 to 12	-	excellent	Salvage for fuel wood	X
1032	X	1032	Tree	Prosopis spp.	120	114	3 to 6	-	excellent	Salvage for fuel wood	
1033			Tree	Prosopis spp.	95	52	< 3	-	excellent		
1034			Tree	Prosopis spp.	108	81	< 3	-	excellent		
1035	X	1035	Cactus	Carnegiea gigantea	0	192	-	5	good	Salvage and Replant	
1036	X	1036	Tree	Prosopis spp.	141	123	3 to 6	-	excellent	Salvage for fuel wood	
1037			Tree	Prosopis spp.	85	89	< 3	-	excellent		
1038	X	1038	Tree	Prosopis spp.	86	96	3 to 6	-	excellent	Salvage for fuel wood	
1039			Tree	Prosopis spp.	48	48	< 3	-	excellent		
1040	X	1040	Cactus	Carnegiea gigantea	0	216	-	1	excellent	Salvage and Replant	
1041			Tree	Prosopis spp.	90	96	< 3	-	excellent		
1042			Tree	Prosopis spp.	123	79	< 3	-	excellent		
1043			Tree	Prosopis spp.	48	36	< 3	-	excellent		
1044	X	1044	Tree	Prosopis spp.	72	90	3 to 6	-	excellent	Salvage for fuel wood	
1045			Tree	Prosopis spp.	48	36	< 3	-	excellent		
1046			Tree	Prosopis spp.	48	50	< 3	-	excellent		
1047			Tree	Prosopis spp.	110	85	< 3	-	excellent		
1048	X	1048	Tree	Prosopis spp.	120	96	3 to 6	-	excellent	Salvage for fuel wood	
1049	X	1049	Tree	Prosopis spp.	280	216	> 12	-	excellent	Salvage for fuel wood	
1050			Tree	Parkinsonia aculeata	96	140	3 to 6	-	excellent		
1051			Tree	Parkinsonia aculeata	84	135	3 to 6	-	excellent		
1052			Tree	Parkinsonia aculeata	105	135	6 to 12	-	excellent		
1053			Tree	Parkinsonia aculeata	182	135	> 12	-	excellent		
1054			Tree	Prosopis spp.	98	69	< 3	-	excellent		
1055			Tree	Prosopis spp.	90	82	< 3	-	excellent		
1056			Tree	Parkinsonia spp.	130	120	3 to 6	-	excellent		
1057			Tree	Prosopis spp.	125	79	< 3	-	excellent		
1058			Tree	Olneya tesota	110	122	3 to 6	-	excellent		
1059	X	1059	Tree	Prosopis spp.	144	120	> 12	-	excellent	Salvage for fuel wood	
1060	X	1060	Tree	Prosopis spp.	140	115	6 to 12	-	excellent	Salvage for fuel wood	
1061	X	1061	Tree	Prosopis spp.	100	144	6 to 12	-	excellent	Salvage for fuel wood	
1062	X	1062	Tree	Prosopis spp.	160	144	> 12	-	excellent	Salvage for fuel wood	
1063	X	1063	Tree	Prosopis spp.	145	80	3 to 6	-	excellent	Salvage for fuel wood	
1064			Tree	Prosopis spp.	48	48	< 3	-	excellent		
1065			Tree	Prosopis spp.	40	48	< 3	-	excellent		
1066										Number Not Used	
1067	X	1067	Tree	Prosopis spp.	148	79	3 to 6	-	excellent	Salvage for fuel wood	
1068	X	1068	Tree	Prosopis spp.	175	120	> 12	-	excellent	Salvage for fuel wood	
1069	X	1069	Tree	Prosopis spp.	175	140	> 12	-	excellent	Salvage for fuel wood	
1070			Tree	Prosopis spp.	75	65	< 3	-	excellent		
1071	X	1071	Tree	Prosopis spp.	94	115	3 to 6	-	excellent	Salvage for fuel wood	
1072	X	1072	Tree	Prosopis spp.	98	96	> 12	-	excellent		
1073	X	1073	Tree	Prosopis spp.	140	128	> 12	-	fair	Salvage for fuel wood	
1074	X	1074	Tree	Prosopis spp.	216	144	> 12	-	excellent	Salvage for fuel wood	
1075			Tree	Prosopis spp.	95	70	< 3	-	excellent		
1076			Tree	Prosopis spp.	82	65	< 3	-	excellent		
1077			Tree	Prosopis spp.	85	68	< 3	-	excellent		
1078			Tree	Prosopis spp.	90	72	< 3	-	excellent		
1079	X	1079	Tree	Prosopis spp.	210	200	> 12	-	excellent	Salvage for fuel wood	
1080			Tree	Parkinsonia aculeata	130	146	> 12	-	excellent		
1081			Shrub	Larrea tridentata	55	50	-	-	excellent		
1082										Number Not Used	
1083	X	1083	Tree	Prosopis spp.	60	72	3 to 6	-	excellent	Salvage for fuel wood	
1084			Tree	Prosopis spp.	74	55	< 3	-	excellent		
1085	X	1085	Tree	Prosopis spp.	230	210	> 12	-	excellent	Salvage for fuel wood	
1086			Tree	Prosopis spp.	50	48	< 3	-	excellent		
1087	X	1087	Tree	Prosopis spp.	85	90	3 to 6	-	excellent	Salvage for fuel wood	
1088	X	1088	Tree	Prosopis spp.	95	100	3 to 6	-	excellent	Salvage for fuel wood	
1089			Tree	Prosopis spp.	128	77	> 12	-	excellent		
1090	X	1090	Tree	Prosopis spp.	120	150	3 to 6	-	excellent	Salvage for fuel wood	
1091	X	1091	Tree	Prosopis spp.	156	150	3 to 6	-	excellent	Salvage for fuel wood	
1092			Tree	Prosopis spp.	115	82	< 3	-	excellent		
1093			Tree	Prosopis spp.	109	63	< 3	-	excellent		
1094	X	1094	Tree	Prosopis spp.	150	180	> 12	-	excellent	Salvage for fuel wood	
1095			Tree	Prosopis spp.	48	48	< 3	-	excellent		
1096	X	1096	Tree	Prosopis spp.	95	112	6 to 12	-	excellent	Salvage for fuel wood	
1097			Tree	Prosopis spp.	94	87	< 3	-	excellent		
1098			Tree	Prosopis spp.	80	72	< 3	-	excellent		
1099			Tree	Prosopis spp.	45	36	< 3	-	excellent		
1100			Tree	Prosopis spp.	124	93	< 3	-	excellent		
1101	X	1101	Tree	Prosopis spp.	88	80	6 to 12	-	excellent	Salvage for fuel wood	
1102	X	1102	Tree	Prosopis spp.	143	112	> 12	-	excellent	Salvage for fuel wood	
1103	X	1103	Tree	Prosopis spp.	84	60	6 to 12	-	excellent	Salvage for fuel wood	
1104			Tree	Prosopis spp.	48	48	< 3	-	excellent		
1105	X	1105	Tree	Prosopis spp.	220	200	> 12	-	excellent	Salvage for fuel wood	
1106	X	1106	Tree	Prosopis spp.	143	89	6 to 12	-	excellent	Salvage for fuel wood	
1107	X	1107	Tree	Prosopis spp.	250	108	> 12	-	excellent	Salvage for fuel wood	
1108			Tree	Prosopis spp.	101	53	< 3	-	excellent		
1109	X	1109	Tree	Prosopis spp.	200	108	6 to 12	-	excellent	Salvage for fuel wood	
1110			Tree	Prosopis spp.	115	58	< 3	-	excellent		
1111			Tree	Prosopis spp.	95	55	< 3	-	excellent		
1112			Tree	Prosopis spp.	149	88	6 to 12	-	excellent		
1113	X	1113	Tree	Prosopis spp.	85	108	3 to 6	-	excellent	Salvage for fuel wood	
1114			Tree	Prosopis spp.	48	48	< 3	-	excellent		
1115			Tree	Parkinsonia spp.	48	60	< 3	-	excellent		
1116			Tree	Parkinsonia aculeata	72	62	< 3	-	excellent		

NOTE:

All plant material noted to be 'Salvage for Fuel Wood' or 'Salvage and Replant', that will not be disturbed by construction, is to be protected-in-place.

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT — CERTIFICATE NO. 27437 — STEVEN E. LOHIDE — Date Signed 06/11/2024 — ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

PLANT INVENTORY DATA TABLES

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	8	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-02.06

TRACS NO. F0721 01C

ADOT

____ OF ____

PLANT INVENTORY DATA TABLES

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
1117	X	1117	Tree	Prosopis spp.	145	102	> 12	-	excellent	Salvage for fuel wood	
1118	X	1118	Tree	Prosopis spp.	90	84	3 to 6	-	excellent	Salvage for fuel wood	
1119	X	1119	Tree	Prosopis spp.	150	144	3 to 6	-	excellent	Salvage for fuel wood	
1120			Tree	Parkinsonia aculeata	46	58	< 3	-	excellent		
1121			Tree	Parkinsonia spp.	50	55	< 3	-	excellent		
1122			Tree	Parkinsonia aculeata	84	120	3 to 6	-	excellent		
1123			Tree	Prosopis spp.	36	48	< 3	-	excellent		
1124	X	1124	Tree	Prosopis spp.	130	128	> 12	-	excellent	Salvage for fuel wood	
1125	X	1125	Tree	Prosopis spp.	200	150	> 12	-	excellent	Salvage for fuel wood	
1126	X	1126	Tree	Prosopis spp.	150	180	> 12	-	excellent	Salvage for fuel wood	
1127			Tree	Prosopis spp.	121	108	< 3	-	excellent		
1128			Tree	Prosopis spp.	75	80	< 3	-	excellent		
1129			Shrub	Larrea tridentata	70	62	-	-	excellent		
1130			Tree	Prosopis spp.	109	81	< 3	-	excellent		
1131	X	1131	Tree	Prosopis spp.	80	100	> 12	-	excellent	Salvage for fuel wood	
1132	X	1132	Tree	Prosopis spp.	200	150	> 12	-	excellent	Salvage for fuel wood	
1133	X	1133	Tree	Prosopis spp.	216	180	> 12	-	excellent	Salvage for fuel wood	
1134	X	1134	Tree	Prosopis spp.	193	165	> 12	-	excellent	Salvage for fuel wood	
1135			Shrub	Baccharis spp.	20	48	-	-	excellent		
1136	X	1136	Tree	Prosopis spp.	211	153	> 12	-	excellent	Salvage for fuel wood	
1137	X	1137	Tree	Prosopis spp.	210	162	> 12	-	excellent	Salvage for fuel wood	
1138	X	1138	Tree	Prosopis spp.	70	85	3 to 6	-	excellent	Salvage for fuel wood	
1139			Shrub	Larrea tridentata	99	49	-	-	excellent		
1140			Shrub	Larrea tridentata	50	48	-	-	excellent		
1141			Shrub	Larrea tridentata	15	85	-	-	excellent		
1142			Shrub	Larrea tridentata	105	81	-	-	excellent		
1143			Shrub	Larrea tridentata	78	81	-	-	excellent		
1144			Shrub	Larrea tridentata	74	65	-	-	excellent		
1145			Shrub	Larrea tridentata	45	37	-	-	excellent		
1146			Shrub	Larrea tridentata	68	45	-	-	excellent		
1147			Shrub	Larrea tridentata	76	59	-	-	good		
1148			Shrub	Larrea tridentata	69	60	-	-	excellent		
1149			Shrub	Larrea tridentata	62	37	-	-	excellent		
1150			Shrub	Larrea tridentata	76	50	-	-	excellent		
1151			Shrub	Larrea tridentata	84	74	-	-	excellent		
1152			Shrub	Larrea tridentata	77	53	-	-	excellent		
1153			Shrub	Larrea tridentata	75	35	-	-	excellent		
1154			Shrub	Larrea tridentata	48	29	-	-	excellent		
1155			Tree	Prosopis spp.	103	83	< 3	-	excellent		
1156			Shrub	Larrea tridentata	53	56	-	-	excellent		
1157			Shrub	Larrea tridentata	90	61	-	-	excellent		
1158			Shrub	Larrea tridentata	68	36	-	-	excellent		
1159			Tree	Prosopis spp.	106	78	< 3	-	excellent		
1160			Shrub	Larrea tridentata	70	56	-	-	excellent		
1161			Shrub	Larrea tridentata	80	62	-	-	excellent		
1162			Shrub	Larrea tridentata	48	49	-	-	excellent		
1163			Shrub	Larrea tridentata	75	63	-	-	excellent		
1164			Shrub	Larrea tridentata	55	38	-	-	excellent		
1165			Tree	Prosopis spp.	60	72	< 3	-	excellent		
1166										Number Not Used	
1167	X	1167	Tree	Prosopis spp.	80	90	3 to 6	-	excellent	Salvage for fuel wood	
1168	X	1168	Tree	Prosopis spp.	60	84	3 to 6	-	excellent	Salvage for fuel wood	
1169	X	1169	Tree	Prosopis spp.	160	140	> 12	-	excellent	Salvage for fuel wood	
1170	X	1170	Tree	Prosopis spp.	125	108	> 12	-	excellent	Salvage for fuel wood	
1171			Tree	Prosopis spp.	67	84	< 3	-	excellent		
1172	X	1172	Tree	Prosopis spp.	160	144	> 12	-	excellent	Salvage for fuel wood	
1173	X	1173	Tree	Prosopis spp.	120	100	> 12	-	excellent	Salvage for fuel wood	
1174	X	1174	Tree	Prosopis spp.	120	120	> 12	-	excellent	Salvage for fuel wood	
1175	X	1175	Tree	Prosopis spp.	120	140	> 12	-	excellent	Salvage for fuel wood	
1176	X	1176	Tree	Prosopis spp.	160	150	> 12	-	excellent	Salvage for fuel wood	
1177			Tree	Prosopis spp.	80	98	< 3	-	excellent		
1178			Tree	Prosopis spp.	81	60	< 3	-	excellent		
1179	X	1179	Tree	Prosopis spp.	162	122	6 to 12	-	excellent	Salvage for fuel wood	
1180	X	1180	Tree	Prosopis spp.	100	120	> 12	-	excellent	Salvage for fuel wood	
1181	X	1181	Tree	Prosopis spp.	103	84	6 to 12	-	excellent	Salvage for fuel wood	
1182			Tree	Prosopis spp.	40	36	< 3	-	excellent		
1183	X	1183	Tree	Prosopis spp.	115	92	> 12	-	excellent	Salvage for fuel wood	
1184	X	1184	Tree	Prosopis spp.	165	130	> 12	-	excellent	Salvage for fuel wood	
1185	X	1185	Tree	Prosopis spp.	100	120	> 12	-	excellent	Salvage for fuel wood	
1186			Shrub	Larrea tridentata	70	64	-	-	excellent		
1187			Shrub	Larrea tridentata	77	68	-	-	excellent		
1188			Shrub	Larrea tridentata	81	73	-	-	excellent		
1189	X	1189	Tree	Prosopis spp.	105	100	> 12	-	excellent	Salvage for fuel wood	
1190			Shrub	Larrea tridentata	85	39	-	-	excellent		
1191			Shrub	Larrea tridentata	63	51	-	-	excellent		
1192			Shrub	Larrea tridentata	92	75	-	-	excellent		
1193			Tree	Parkinsonia aculeata	45	39	< 3	-	excellent		
1194			Tree	Prosopis spp.	79	70	< 3	-	excellent		
1195			Shrub	Larrea tridentata	95	80	-	-	excellent		
1196			Tree	Prosopis spp.	75	80	< 3	-	excellent		
1197			Shrub	Larrea tridentata	83	74	-	-	excellent		
1198			Shrub	Larrea tridentata	92	76	-	-	excellent		
1199			Tree	Prosopis spp.	96	42	< 3	-	excellent		
1200	X	1200	Tree	Prosopis spp.	100	90	6 to 12	-	excellent	Salvage for fuel wood	
1201			Tree	Prosopis spp.	104	81	< 3	-	excellent		
1202			Tree	Prosopis spp.	36	48	< 3	-	excellent		
1203			Tree	Parkinsonia spp.	60	48	3 to 6	-	excellent		
1204	X	1204	Tree	Prosopis spp.	100	100	6 to 12	-	excellent	Salvage for fuel wood	
1205	X	1205	Tree	Prosopis spp.	110	100	6 to 12	-	excellent	Salvage for fuel wood	
1206			Tree	Prosopis spp.	50	72	< 3	-	excellent		
1207	X	1207	Tree	Prosopis spp.	92	70	3 to 6	-	excellent	Salvage for fuel wood	
1208			Tree	Prosopis spp.	72	60	< 3	-	excellent		
1209	X	1209	Tree	Prosopis spp.	60	72	3 to 6	-	excellent	Salvage for fuel wood	

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
1210			Tree	Parkinsonia aculeata	190	183	> 12	-	excellent		
1211			Tree	Parkinsonia aculeata	130	134	> 12	-	excellent		
1212			Tree	Prosopis spp.	50	48	< 3	-	excellent		
1213			Tree	Parkinsonia aculeata	142	130	> 12	-	excellent		
1214	X	1214	Tree	Prosopis spp.	280	150	> 12	-	excellent	Salvage for fuel wood	
1215			Tree	Parkinsonia aculeata	128	145	> 12	-	excellent		
1216			Tree	Parkinsonia aculeata	128	140	> 12	-	excellent		
1217			Tree	Parkinsonia aculeata	125	108	> 12	-	excellent		
1218	X	1218	Tree	Prosopis spp.	100	120	> 12	-	excellent	Salvage for fuel wood	
1219			Tree	Prosopis spp.	125	118	> 12	-	excellent		
1220			Tree	Parkinsonia aculeata	162	130	> 12	-	excellent		
1221			Tree	Parkinsonia aculeata	108	116	3 to 6	-	excellent		
1222			Tree	Parkinsonia aculeata	110	116	6 to 12	-	excellent		
1223			Tree	Parkinsonia aculeata	206	170	> 12	-	excellent		
1224	X	1224	Tree	Prosopis spp.	90	84	> 12	-	excellent	Salvage for fuel wood	
1225			Tree	Parkinsonia aculeata	153	125	> 12	-	excellent		
1226			Tree	Prosopis spp.	311	221	> 12	-	excellent		
1227			Tree	Parkinsonia aculeata	170	165	> 12	-	excellent		
1228	X	1228	Tree	Prosopis spp.	180	120	> 12	-	excellent	Salvage for fuel wood	
1229			Tree	Prosopis spp.	74	56	< 3	-	excellent		
1230			Tree	Parkinsonia aculeata	5	80	< 3	-	excellent		
1231			Tree	Tamarix ramosissima	60	72	< 3	-	excellent		
1232			Shrub	Larrea tridentata	46	60	-	-	excellent		
1233	X	1233	Tree	Prosopis spp.	110	90	6 to 12	-	excellent	Salvage for fuel wood	
1234			Tree	Parkinsonia aculeata	152	128	> 12	-	excellent		
1235			Tree	Parkinsonia aculeata	92	95	3 to 6	-	excellent		
1236			Tree	Parkinsonia aculeata	95	87	3 to 6	-	excellent		
1237			Tree	Prosopis spp.	81	77	< 3	-	excellent		
1238			Tree	Parkinsonia aculeata	163	155	> 12	-	excellent		
1239			Tree	Prosopis spp.	178	135	6 to 12	-	excellent		
1240			Tree	Parkinsonia aculeata	276	144	> 12	-	excellent		
1241			Tree	Parkinsonia aculeata	153	130	> 12	-	excellent		
1242			Tree	Prosopis spp.	162	157	> 12	-	excellent		
1243			Tree	Prosopis spp.	118	124	< 3	-	excellent		
1244			Tree	Parkinsonia aculeata	168	142	6 to 12	-	excellent		
1245			Shrub	Larrea tridentata	75	63	-	-	excellent		
1246	X	1246	Tree	Prosopis spp.	137	123	3 to 6	-	excellent	Salvage for fuel wood	
1247			Tree	Parkinsonia spp.	141	133	> 12	-	excellent		
1248			Tree	Prosopis spp.	104	87	< 3	-	excellent		
1249			Tree	Prosopis spp.	48	72	< 3	-	excellent		
1250			Tree	Prosopis spp.	48	50	< 3	-	excellent		
1251	X	1251	Tree	Prosopis spp.	152	138	> 12	-	excellent	Salvage for fuel wood	
1252										Number Not Used	
1253			Tree	Prosopis spp.	94	83	< 3	-	excellent		
1254	X	1254	Tree	Prosopis spp.	84	90	3 to 6	-	excellent	Salvage for fuel wood	
1255			Tree	Prosopis spp.	193	175	> 12	-	excellent		
1256			Tree	Prosopis spp.	92	65	< 3	-	excellent		
1257	X	1257	Tree	Prosopis spp.	125	103	3 to 6	-	excellent	Salvage for fuel wood	
1258										Number Not Used	
1259	X	1259	Tree	Prosopis spp.	60	102	6 to 12	-	excellent	Salvage for fuel wood	
1260			Tree	Prosopis spp.	115	88	< 3	-	excellent		
1261	X	1261	Tree	Prosopis spp.	100	108	6 to 12	-	excellent	Salvage for fuel wood	
1262	X	1262	Tree	Prosopis spp.	157	190	6 to 12	-	excellent	Salvage for fuel wood	
1263	X	1263	Cactus	Carnegiea gigantea	0	264	-	6	fair	Salvage and Replant	
1264										Number Not Used	
1265	X	1265	Tree	Prosopis spp.	75	85	3 to 6	-	excellent	Salvage for fuel wood	
1266			Tree	Prosopis spp.	112	80	< 3	-	excellent		
1267	X	1267	Cactus	Carnegiea gigantea	0	312	-	4	poor	Salvage and Replant	
1268	X	1268	Tree	Prosopis spp.	65	72	6 to 12	-	excellent	Salvage for fuel wood	
1269	X	1269	Tree	Prosopis spp.	360	215	> 12	-	excellent	Salvage for fuel wood	
1270			Tree	Prosopis spp.	63	52	< 3	-	excellent		
1271			Tree	Prosopis spp.	120	60	< 3	-	excellent		
1272			Tree	Prosopis spp.	50	60	< 3	-	excellent		
1273	X	1273	Tree	Prosopis spp.	124	85	3 to 6	-	excellent	Salvage for fuel wood	
1274	X	1274	Tree	Prosopis spp.	129	98	3 to 6	-	excellent	Salvage for fuel wood	
1275	X	1275	Tree	Prosopis spp.	65	180	> 12	-	excellent	Salvage for fuel wood	
1276	X	1276	Tree	Prosopis spp.	177	150	6 to 12	-	excellent	Salvage for fuel wood	
1277			Tree	Prosopis spp.	65	70	< 3	-	excellent		
1278	X	1278	Tree	Prosopis spp.	190	150	> 12	-	excellent	Salvage for fuel wood	
1279	X	1279	Tree	Prosopis spp.	72	72	3 to 6	-	excellent	Salvage for fuel wood	
1280			Tree	Prosopis spp.	112	170	< 3	-	excellent		
1281	X	1281	Tree	Prosopis spp.	165	158	6 to 12	-	excellent	Salvage for fuel wood	
1282			Tree	Prosopis spp.	48	48	< 3	-	excellent		
1283	X	1283	Tree	Prosopis spp.	150	110	6 to 12	-	excellent	Salvage for fuel wood	
1284	X	1284	Tree	Prosopis spp.	84	72	3 to 6	-	excellent	Salvage for fuel wood	
1285	X	1285	Tree	Prosopis spp.	84	72	3 to 6	-	excellent	Salvage for fuel wood	
1286	X	1286	Tree	Prosopis spp.	87	75	3 to 6	-	excellent	Salvage for fuel wood	
1287	X	1287	Tree	Prosopis spp.	85	120	3 to 6	-	excellent	Salvage for fuel wood	
1288	X	1288	Tree	Prosopis spp.	305	163	> 12	-	excellent	Salvage for fuel wood	
1289			Tree	Prosopis spp.	50	72	< 3	-	excellent		
1290	X	1290	Tree	Prosopis spp.	178	120	> 12	-	excellent	Salvage for fuel wood	
1291			Tree	Prosopis spp.	84	60	< 3	-	excellent		
1292	X	1292	Tree	Prosopis spp.	315	192	> 12	-	excellent	Salvage for fuel wood	
1293										Number Not Used	
1294	X	1294	Tree	Prosopis spp.	85	95	3 to 6	-	excellent	Salvage for fuel wood	
1295			Tree	Prosopis spp.	85	70	< 3	-	excellent		
1296			Tree	Prosopis spp.	92	83	< 3	-	excellent		
1297			Tree	Prosopis spp.	87	68	< 3	-	excellent		
1298	X	1298	Tree	Prosopis spp.	432	198	> 12	-	excellent	Salvage for fuel wood	
1299			Tree	Prosopis spp.	102	66	< 3	-	excellent		
1300			Tree	Parkinsonia aculeata	168	135	6 to 12	-	excellent		
1301			Tree	Parkinsonia aculeata	180	162	> 12	-	excellent		
1302	X	1302	Tree	Prosopis spp.	144	120	> 12	-	excellent	Salvage for fuel wood	

NOTE:

All plant material noted to be 'Salvage for Fuel Wood' or 'Salvage and Replant', that will not be disturbed by construction, is to be protected-in-place.

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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501 N 44th St, Suite 300
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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

PLANT INVENTORY DATA TABLES

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	9	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-02.07

TRACS NO. F0721 01C

ADOT

____ OF ____

PLANT INVENTORY DATA TABLES

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
1303	X	1303	Cactus	Carnegiea gigantea	0	168	-	6	fair	Salvage and Replant	
1304			Tree	Prosopis spp.	48	36	< 3	-	excellent		
1305			Tree	Parkinsonia spp.	86	95	6 to 12	-	excellent		
1306			Tree	Parkinsonia aculeata	123	118	6 to 12	-	excellent		
1307			Tree	Parkinsonia spp.	65	84	< 3	-	excellent		
1308			Tree	Parkinsonia aculeata	118	115	3 to 6	-	excellent		
1309	X	1309	Tree	Prosopis spp.	120	100	> 12	-	excellent	Salvage for fuel wood	
1310			Tree	Parkinsonia spp.	48	36	< 3	-	excellent		
1311	X	1311	Tree	Prosopis spp.	298	190	> 12	-	excellent	Salvage for fuel wood	
1312										Number Not Used	
1313	X	1313	Tree	Prosopis spp.	100	95	3 to 6	-	excellent	Salvage for fuel wood	
1314	X	1314	Tree	Prosopis spp.	244	152	6 to 12	-	excellent	Salvage for fuel wood	
1315	X	1315	Tree	Prosopis spp.	95	100	3 to 6	-	excellent	Salvage for fuel wood	
1316			Tree	Prosopis spp.	105	83	< 3	-	excellent		
1317										Number Not Used	
1318			Tree	Parkinsonia spp.	118	112	6 to 12	-	excellent		
1319	X	1319	Tree	Prosopis spp.	90	84	3 to 6	-	excellent	Salvage for fuel wood	
1320	X	1320	Tree	Prosopis spp.	100	93	3 to 6	-	excellent	Salvage for fuel wood	
1321	X	1321	Tree	Prosopis spp.	120	165	> 12	-	excellent	Salvage for fuel wood	
1322	X	1322	Tree	Prosopis spp.	125	103	3 to 6	-	excellent	Salvage for fuel wood	
1323	X	1323	Tree	Prosopis spp.	72	108	3 to 6	-	excellent		
1324	X	1324	Tree	Prosopis spp.	148	122	3 to 6	-	excellent	Salvage for fuel wood	
1325	X	1325	Tree	Prosopis spp.	165	144	> 12	-	excellent	Salvage for fuel wood	
1326	X	1326	Tree	Prosopis spp.	162	138	6 to 12	-	excellent	Salvage for fuel wood	
1327	X	1327	Tree	Prosopis spp.	183	145	6 to 12	-	excellent	Salvage for fuel wood	
1328			Tree	Prosopis spp.	85	82	< 3	-	excellent		
1329	X	1329	Tree	Prosopis spp.	175	180	> 12	-	excellent	Salvage for fuel wood	
1330	X	1330	Tree	Prosopis spp.	193	122	> 12	-	poor	Salvage for fuel wood	
1331	X	1331	Tree	Prosopis spp.	100	84	6 to 12	-	excellent	Salvage for fuel wood	
1332	X	1332	Tree	Prosopis spp.	130	124	3 to 6	-	excellent	Salvage for fuel wood	
1333	X	1333	Tree	Prosopis spp.	300	150	> 12	-	excellent	Salvage for fuel wood	
1334	X	1334	Tree	Prosopis spp.	202	125	6 to 12	-	excellent	Salvage for fuel wood	
1335	X	1335	Tree	Prosopis spp.	120	100	> 12	-	excellent	Salvage for fuel wood	
1336	X	1336	Tree	Prosopis spp.	173	138	6 to 12	-	excellent	Salvage for fuel wood	
1337	X	1337	Tree	Prosopis spp.	125	93	> 12	-	excellent	Salvage for fuel wood	
1338			Tree	Prosopis spp.	88	67	< 3	-	excellent		
1339			Tree	Prosopis spp.	88	65	< 3	-	excellent		
1340			Shrub	Baccharis spp.	106	96	-	-	excellent		
1341	X	1341	Tree	Prosopis spp.	250	250	> 12	-	excellent	Salvage for fuel wood	
1342	X	1342	Tree	Prosopis spp.	350	200	> 12	-	excellent	Salvage for fuel wood	
1343	X	1343	Tree	Prosopis spp.	100	120	> 12	-	excellent	Salvage for fuel wood	
1344	X	1344	Tree	Prosopis spp.	280	150	> 12	-	excellent	Salvage for fuel wood	
1345	X	1345	Tree	Prosopis spp.	300	200	> 12	-	excellent	Salvage for fuel wood	
1346	X	1346	Tree	Prosopis spp.	100	100	6 to 12	-	excellent	Salvage for fuel wood	
1347										Number Not Used	
1348	X	1348	Tree	Prosopis spp.	180	180	> 12	-	excellent	Salvage for fuel wood	
1349	X	1349	Tree	Prosopis spp.	85	96	3 to 6	-	excellent	Salvage for fuel wood	
1350	X	1350	Tree	Prosopis spp.	150	120	> 12	-	excellent	Salvage for fuel wood	
1351	X	1351	Tree	Prosopis spp.	200	180	> 12	-	excellent	Salvage for fuel wood	
1352			Shrub	Baccharis spp.	87	76	-	-	excellent		
1353	X	1353	Tree	Prosopis spp.	175	200	> 12	-	excellent	Salvage for fuel wood	
1354	X	1354	Tree	Prosopis spp.	185	150	> 12	-	excellent	Salvage for fuel wood	
1355	X	1355	Tree	Prosopis spp.	115	83	3 to 6	-	excellent	Salvage for fuel wood	
1356	X	1356	Tree	Prosopis spp.	125	130	> 12	-	excellent	Salvage for fuel wood	
1357	X	1357	Tree	Prosopis spp.	150	120	> 12	-	excellent	Salvage for fuel wood	
1358			Shrub	Baccharis spp.	85	60	-	-	excellent		
1359			Shrub	Baccharis spp.	77	83	-	-	excellent		
1360	X	1360	Tree	Prosopis spp.	120	100	6 to 12	-	excellent	Salvage for fuel wood	
1361			Shrub	Baccharis spp.	90	88	-	-	excellent		
1362			Shrub	Baccharis spp.	84	63	-	-	excellent		
1363			Tree	Prosopis spp.	83	75	< 3	-	excellent		
1364	X	1364	Tree	Prosopis spp.	145	122	3 to 6	-	excellent	Salvage for fuel wood	
1365			Tree	Prosopis spp.	72	65	< 3	-	excellent		
1366	X	1366	Tree	Prosopis spp.	330	282	> 12	-	excellent	Salvage for fuel wood	
1367			Tree	Parkinsonia spp.	48	48	< 3	-	excellent		
1368	X	1368	Tree	Prosopis spp.	177	130	> 12	-	excellent	Salvage for fuel wood	
1369	X	1369	Tree	Prosopis spp.	160	150	> 12	-	excellent	Salvage for fuel wood	
1370	X	1370	Tree	Prosopis spp.	172	140	6 to 12	-	excellent	Salvage for fuel wood	
1371			Tree	Parkinsonia spp.	48	36	< 3	-	excellent		
1372			Tree	Parkinsonia spp.	72	78	< 3	-	excellent		
1373	X	1373	Tree	Prosopis spp.	168	145	6 to 12	-	excellent	Salvage for fuel wood	
1374	X	1374	Tree	Prosopis spp.	60	80	3 to 6	-	excellent	Salvage for fuel wood	
1375			Tree	Prosopis spp.	105	93	< 3	-	excellent		
1376	X	1376	Tree	Prosopis spp.	95	120	> 12	-	excellent	Salvage for fuel wood	
1377			Shrub	Baccharis spp.	64	74	-	-	good		
1378			Shrub	Baccharis spp.	92	75	-	-	good		
1379	X	1379	Tree	Prosopis spp.	70	90	6 to 12	-	excellent	Salvage for fuel wood	
1380			Shrub	Baccharis spp.	50	60	-	-	excellent		
1381	X	1381	Tree	Prosopis spp.	183	165	3 to 6	-	excellent	Salvage for fuel wood	
1382	X	1382	Tree	Prosopis spp.	305	270	> 12	-	excellent	Salvage for fuel wood	
1383	X	1383	Tree	Prosopis spp.	190	180	> 12	-	excellent	Salvage for fuel wood	
1384			Tree	Prosopis spp.	92	82	< 3	-	excellent		
1385			Tree	Prosopis spp.	67	74	< 3	-	excellent		
1386			Tree	Prosopis spp.	60	50	< 3	-	excellent		
1387			Tree	Prosopis spp.	72	73	< 3	-	excellent		
1388	X	1388	Tree	Prosopis spp.	142	116	3 to 6	-	excellent	Salvage for fuel wood	
1389	X	1389	Tree	Prosopis spp.	160	144	> 12	-	excellent	Salvage for fuel wood	
1390	X	1390	Tree	Prosopis spp.	110	140	3 to 6	-	excellent	Salvage for fuel wood	
1391	X	1391	Tree	Prosopis spp.	200	216	> 12	-	excellent	Salvage for fuel wood	
1392			Tree	Prosopis spp.	80	78	< 3	-	excellent		
1393			Shrub	Baccharis spp.	48	98	-	-	excellent		
1394	X	1394	Tree	Prosopis spp.	98	82	3 to 6	-	excellent	Salvage for fuel wood	
1395			Tree	Prosopis spp.	70	73	< 3	-	excellent		
1396	X	1396	Tree	Prosopis spp.	140	120	3 to 6	-	excellent	Salvage for fuel wood	
1397										Number Not Used	
1398	X	1398	Tree	Prosopis spp.	430	288	> 12	-	fair	Salvage for fuel wood	
1399	X	1399	Tree	Prosopis spp.	180	132	> 12	-	excellent	Salvage for fuel wood	
1400			Shrub	Baccharis spp.	36	36	-	-	good		
1401			Tree	Parkinsonia aculeata	128	128	> 12	-	excellent		
1402	X	1402	Tree	Prosopis spp.	140	120	6 to 12	-	excellent	Salvage for fuel wood	
1403			Tree	Prosopis spp.	122	85	< 3	-	excellent		
1404	X	1404	Tree	Prosopis spp.	268	240	6 to 12	-	excellent	Salvage for fuel wood	
1405			Tree	Parkinsonia aculeata	95	120	3 to 6	-	excellent		
1406	X	1406	Tree	Prosopis spp.	384	298	> 12	-	good	Salvage for fuel wood	
1407	X	1407	Tree	Prosopis spp.	100	72	3 to 6	-	excellent	Salvage for fuel wood	
1408			Tree	Prosopis spp.	102	94	< 3	-	excellent		
1409	X	1409	Tree	Prosopis spp.	173	148	6 to 12	-	excellent	Salvage for fuel wood	
1410	X	1410	Tree	Prosopis spp.	84	84	3 to 6	-	excellent	Salvage for fuel wood	
1411			Tree	Prosopis spp.	67	60	< 3	-	excellent		
1412	X	1412	Tree	Prosopis spp.	177	139	6 to 12	-	excellent	Salvage for fuel wood	
1413			Tree	Prosopis spp.	65	98	< 3	-	excellent		
1414			Tree	Prosopis spp.	72	72	< 3	-	excellent		
1415	X	1415	Tree	Prosopis spp.	202	190	6 to 12	-	excellent	Salvage for fuel wood	
1416			Tree		84	84	< 3	-	excellent		
1417			Tree	Prosopis spp.	48	48	< 3	-	excellent		
1418										Number Not Used	
1419	X	1419	Tree	Prosopis spp.	84	84	3 to 6	-	excellent	Salvage for fuel wood	
1420			Tree	Prosopis spp.	48	60	< 3	-	excellent		
1421	X	1421	Tree	Prosopis spp.	84	96	3 to 6	-	excellent	Salvage for fuel wood	
1422			Tree	Prosopis spp.	119	122	< 3	-	excellent		
1423			Tree	Prosopis spp.	72	80	< 3	-	excellent		
1424			Tree	Prosopis spp.	77	65	< 3	-	excellent		
1425	X	1425	Tree	Prosopis spp.	115	96	3 to 6	-	excellent	Salvage for fuel wood	
1426	X	1426	Tree	Prosopis spp.	72	84	3 to 6	-	good	Salvage for fuel wood	
1427	X	1427	Tree	Prosopis spp.	208	150	6 to 12	-	excellent	Salvage for fuel wood	
1428	X	1428	Tree	Prosopis spp.	120	120	6 to 12	-	excellent	Salvage for fuel wood	
1429			Tree	Prosopis spp.	84	72	< 3	-	excellent		
1430			Tree	Prosopis spp.	84	48	< 3	-	excellent		
1431	X	1431	Tree	Prosopis spp.	118	85	3 to 6	-	excellent	Salvage for fuel wood	
1432	X	1432	Tree	Prosopis spp.	84	72	3 to 6	-	excellent	Salvage for fuel wood	
1433	X	1433	Tree	Prosopis spp.	355	278	> 12	-	excellent	Salvage for fuel wood	
1434			Tree	Parkinsonia aculeata	86	108	< 3	-	excellent		
1435	X	1435	Tree	Prosopis spp.	84	84	3 to 6	-	excellent	Salvage for fuel wood	
1436	X	1436	Tree	Prosopis spp.	72	84	3 to 6	-	excellent	Salvage for fuel wood	
1437	X	1437	Tree	Prosopis spp.	324	300	> 12	-	excellent	Salvage for fuel wood	
1438	X	1438	Tree	Prosopis spp.	302	320	> 12	-	excellent	Salvage for fuel wood	
1439	X	1439	Tree	Prosopis spp.	85	108	6 to 12	-	excellent	Salvage for fuel wood	
1440	X	1440	Tree	Prosopis spp.	125	120	> 12	-	excellent	Salvage for fuel wood	
1441	X	1441	Tree	Prosopis spp.	245	203	> 12	-	excellent	Salvage for fuel wood	
1442			Tree	Prosopis spp.	65	60	< 3	-	excellent		
1443			Tree	Prosopis spp.	85	84	< 3	-	excellent		
1444	X	1444	Tree	Prosopis spp.	108	108	3 to 6	-	excellent	Salvage for fuel wood	
1445	X	1445	Tree	Prosopis spp.	362	330	> 12	-	excellent	Salvage for fuel wood	
1446	X	1446	Tree	Prosopis spp.	120	120	3 to 6	-	excellent	Salvage for fuel wood	
1447	X	1447	Tree	Prosopis spp.	144	120	3 to 6	-	excellent	Salvage for fuel wood	
1448	X	1448	Tree	Prosopis spp.	85	79	6 to 12	-	excellent	Salvage for fuel wood	
1449			Shrub	Baccharis spp.	55	72	-	-	excellent		
1450			Tree	Prosopis spp.	60	72	< 3	-	excellent		
1451			Tree	Prosopis spp.	55	84	< 3	-	excellent		
1452										Number Not Used	
1453	X	1453	Tree	Prosopis spp.	98	84	3 to 6	-	excellent	Salvage for fuel wood	
1454	X	1454	Tree	Prosopis spp.	300	280	> 12	-	excellent	Salvage for fuel wood	
1455			Tree	Prosopis spp.	50	72	< 3	-	excellent		
1456										Number Not Used	
1457										Number Not Used	
1458	X	1458	Cactus	Carnegiea gigantea	0	180	-	3	fair	Salvage and Replant	
1459			Shrub	Larrea tridentata	36	36	-	-	excellent		
1460	X	1460	Tree	Prosopis spp.	92	48	3 to 6	-	excellent	Salvage for fuel wood	
1461	X	1461	Tree	Prosopis spp.	96	108	3 to 6	-	excellent	Salvage for fuel wood	
1462			Tree	Parkinsonia aculeata	86	100	3 to 6	-	excellent		
1463	X	1463	Tree	Prosopis spp.	72	86	3 to 6	-	excellent	Salvage for fuel wood	
1464	X	1464	Tree	Prosopis spp.	72	84	3 to 6	-	excellent	Salvage for fuel wood	
1465			Tree	Prosopis spp.	65	80	< 3	-	excellent		
1466			Tree	Prosopis spp.	72	84	< 3	-	excellent		
1467	X	1467	Tree	Prosopis spp.	230	160	> 12	-	excellent	Salvage for fuel wood	
1468	X	1468	Tree	Prosopis spp.	50	96	3 to 6	-	excellent	Salvage for fuel wood	
1469	X	1469	Tree	Prosopis spp.	188	163	> 12	-	excellent	Salvage for fuel wood	
1470	X	1470	Tree	Prosopis spp.	108	84	3 to 6	-	excellent	Salvage for fuel wood	
1471	X	1471	Tree	Prosopis spp.	162	149	> 12	-	excellent	Salvage for fuel wood	
1472	X	1472	Tree	Prosopis spp.	95	110	6 to 12	-	excellent	Salvage for fuel wood	
1473	X	1473	Tree	Prosopis spp.	158	140	> 12	-	excellent	Salvage for fuel wood	
1474	X	1474	Tree	Prosopis spp.	65	72	< 3	-	excellent	Salvage for fuel wood	
1475	X	1475	Tree	Prosopis spp.	160	108	> 12	-	excellent	Salvage for fuel wood	
1476	X	1476	Tree	Prosopis spp.	145	118	6 to 12	-	excellent	Salvage for fuel wood	
1477			Tree	Prosopis spp.	72	60	< 3	-	excellent		
1478	X	1478	Tree	Prosopis spp.	250	180	> 12	-	excellent	Salvage for fuel wood	
1479	X	1479	Tree	Prosopis spp.	368	231	> 12	-	excellent	Salvage for fuel wood	
1480	X	1480	Tree	Parkinsonia spp.	50	100	3 to 6	-	excellent		
1481	X	1481	Tree	Prosopis spp.	95	84	3 to 6	-	excellent	Salvage for fuel wood	
1482	X	1482	Tree	Prosopis spp.	75	95	3 to 6	-	excellent	Salvage for fuel wood	
1483	X	1483	Tree	Prosopis spp.	220	138	> 12	-	excellent	Salvage for fuel wood	
1484	X	1484	Tree	Prosopis spp.	108	95	3 to 6	-	excellent	Salvage for fuel wood	
1485	X	1485	Tree	Prosopis spp.	260	180	> 12	-	excellent	Salvage for fuel wood	
1486	X	1486	Tree	Prosopis spp.	163	122	6 to 12	-	excellent	Salvage for fuel wood	
1487	X	1487	Tree	Prosopis spp.	180	100	> 12	-	excellent	Salvage for fuel wood	
1488	X	1488	Tree	Prosopis spp.	167	118	> 12	-	excellent	Salvage for fuel wood	

NOTE:

All plant material noted to be 'Salvage for Fuel Wood' or 'Salvage and Replant', that will not be disturbed by construction, is to be protected-in-place.

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

PLANT INVENTORY DATA TABLES

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	10	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-02.08

TRACS NO. F0721 01C

ADOT

____ OF ____

PLANT INVENTORY DATA TABLES

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
1489	X	1489	Tree	Prosopis spp.	350	288	> 12	-	excellent	Salvage for fuel wood	
1490	X	1490	Tree	Prosopis spp.	133	112	6 to 12	-	excellent	Salvage for fuel wood	
1491	X	1491	Tree	Prosopis spp.	138	91	6 to 12	-	excellent	Salvage for fuel wood	
1492			Tree	Prosopis spp.	75	68	< 3	-	excellent		
1493	X	1493	Tree	Prosopis spp.	167	140	> 12	-	excellent	Salvage for fuel wood	
1494	X	1494	Tree	Prosopis spp.	100	80	3 to 6	-	fair	Salvage for fuel wood	
1495	X	1495	Tree	Prosopis spp.	125	120	6 to 12	-	excellent	Salvage for fuel wood	
1496	X	1496	Tree	Prosopis spp.	100	120	3 to 6	-	excellent	Salvage for fuel wood	
1497	X	1497	Tree	Prosopis spp.	182	150	> 12	-	excellent	Salvage for fuel wood	
1498	X	1498	Tree	Prosopis spp.	200	110	6 to 12	-	excellent	Salvage for fuel wood	
1499			Tree	Prosopis spp.	85	83	< 3	-	excellent		
1500	X	1500	Tree	Prosopis spp.	151	135	> 12	-	excellent	Salvage for fuel wood	
1501	X	1501	Tree	Prosopis spp.	98	98	3 to 6	-	excellent	Salvage for fuel wood	
1502	X	1502	Tree	Prosopis spp.	90	108	3 to 6	-	excellent	Salvage for fuel wood	
1503	X	1503	Tree	Prosopis spp.	148	130	> 12	-	excellent	Salvage for fuel wood	
1504	X	1504	Tree	Prosopis spp.	50	80	3 to 6	-	good	Salvage for fuel wood	
1505	X	1505	Tree	Prosopis spp.	75	80	3 to 6	-	excellent	Salvage for fuel wood	
1506	X	1506	Tree	Prosopis spp.	112	80	6 to 12	-	excellent	Salvage for fuel wood	
1507	X	1507	Tree	Prosopis spp.	130	108	3 to 6	-	excellent	Salvage for fuel wood	
1508	X	1508	Tree	Prosopis spp.	115	97	3 to 6	-	excellent	Salvage for fuel wood	
1509	X	1509	Tree	Prosopis spp.	100	79	3 to 6	-	excellent	Salvage for fuel wood	
1510	X	1510	Tree	Prosopis spp.	100	72	6 to 12	-	excellent	Salvage for fuel wood	
1511			Tree	Prosopis spp.	36	50	< 3	-	excellent		
1512	X	1512	Tree	Prosopis spp.	172	150	> 12	-	excellent	Salvage for fuel wood	
1513	X	1513	Tree	Prosopis spp.	100	85	3 to 6	-	excellent	Salvage for fuel wood	
1514	X	1514	Tree	Prosopis spp.	85	110	6 to 12	-	excellent	Salvage for fuel wood	
1515	X	1515	Tree	Prosopis spp.	127	88	3 to 6	-	excellent	Salvage for fuel wood	
1516			Tree	Prosopis spp.	110	86	< 3	-	excellent		
1517	X	1517	Tree	Prosopis spp.	188	146	> 12	-	excellent	Salvage for fuel wood	
1518	X	1518	Tree	Prosopis spp.	180	108	6 to 12	-	excellent	Salvage for fuel wood	
1519	X	1519	Tree	Prosopis spp.	166	146	6 to 12	-	fair	Salvage for fuel wood	
1520	X	1520	Tree	Prosopis spp.	100	80	6 to 12	-	excellent	Salvage for fuel wood	
1521	X	1521	Tree	Prosopis spp.	199	148	6 to 12	-	excellent	Salvage for fuel wood	
1522			Tree	Prosopis spp.	60	60	< 3	-	excellent		
1523	X	1523	Tree	Prosopis spp.	135	83	6 to 12	-	excellent	Salvage for fuel wood	
1524	X	1524	Tree	Prosopis spp.	108	72	3 to 6	-	excellent	Salvage for fuel wood	
1525	X	1525	Tree	Prosopis spp.	120	95	3 to 6	-	excellent	Salvage for fuel wood	
1526	X	1526	Tree	Prosopis spp.	152	77	3 to 6	-	excellent	Salvage for fuel wood	
1527	X	1527	Tree	Prosopis spp.	95	108	3 to 6	-	excellent	Salvage for fuel wood	
1528	X	1528	Cactus	Carnegiea gigantea	0	144	-	-	excellent	Salvage and Replant	
1529	X	1529	Tree	Prosopis spp.	69	85	3 to 6	-	excellent	Salvage for fuel wood	
1530	X	1530	Tree	Prosopis spp.	155	129	6 to 12	-	excellent	Salvage for fuel wood	
1531	X	1531	Tree	Prosopis spp.	86	108	6 to 12	-	excellent	Salvage for fuel wood	
1532	X	1532	Tree	Prosopis spp.	123	118	6 to 12	-	excellent	Salvage for fuel wood	
1533			Tree	Prosopis spp.	80	50	< 3	-	excellent		
1534	X	1534	Tree	Prosopis spp.	96	135	> 12	-	dead	Salvage for fuel wood	
1535			Tree	Prosopis spp.	50	68	< 3	-	excellent		
1536	X	1536	Tree	Prosopis spp.	100	108	3 to 6	-	excellent	Salvage for fuel wood	
1537			Tree	Prosopis spp.	36	72	< 3	-	excellent		
1538	X	1538	Tree	Prosopis spp.	102	144	> 12	-	excellent	Salvage for fuel wood	
1539			Tree	Prosopis spp.	60	72	< 3	-	excellent		
1540			Tree	Prosopis spp.	60	72	< 3	-	excellent		
1541	X	1541	Tree	Prosopis spp.	144	120	> 12	-	excellent	Salvage for fuel wood	
1542	X	1542	Tree	Prosopis spp.	60	100	3 to 6	-	excellent	Salvage for fuel wood	
1543			Tree	Prosopis spp.	48	72	< 3	-	excellent		
1544	X	1544	Tree	Prosopis spp.	85	50	3 to 6	-	excellent	Salvage for fuel wood	
1545			Tree	Prosopis spp.	72	82	< 3	-	excellent		
1546	X	1546	Tree	Prosopis spp.	145	117	3 to 6	-	excellent	Salvage for fuel wood	
1547			Tree	Prosopis spp.	30	72	< 3	-	excellent		
1548	X	1548	Tree	Prosopis spp.	90	79	6 to 12	-	excellent	Salvage for fuel wood	
1549			Tree	Prosopis spp.	166	92	< 3	-	excellent		
1550	X	1550	Tree	Prosopis spp.	48	100	3 to 6	-	excellent	Salvage for fuel wood	
1551			Tree	Prosopis spp.	77	56	< 3	-	excellent		
1552			Tree	Prosopis spp.	103	85	< 3	-	excellent		
1553			Tree	Prosopis spp.	135	98	< 3	-	excellent		
1554	X	1554	Tree	Prosopis spp.	140	100	6 to 12	-	excellent	Salvage for fuel wood	
1555	X	1555	Tree	Prosopis spp.	90	80	3 to 6	-	excellent	Salvage for fuel wood	
1556	X	1556	Tree	Prosopis spp.	187	153	6 to 12	-	excellent	Salvage for fuel wood	
1557			Tree	Prosopis spp.	138	99	< 3	-	excellent		
1558			Tree	Prosopis spp.	72	72	< 3	-	excellent		
1559	X	1559	Tree	Prosopis spp.	166	150	6 to 12	-	excellent	Salvage for fuel wood	
1560	X	1560	Tree	Prosopis spp.	125	95	6 to 12	-	excellent	Salvage for fuel wood	
1561	X	1561	Tree	Prosopis spp.	195	147	6 to 12	-	excellent	Salvage for fuel wood	
1562			Tree	Prosopis spp.	72	80	< 3	-	excellent		
1563	X	1563	Tree	Prosopis spp.	85	85	3 to 6	-	excellent	Salvage for fuel wood	
1564										Number Not Used	
1565	X	1565	Tree	Prosopis spp.	120	100	6 to 12	-	excellent	Salvage for fuel wood	
1566	X	1566	Tree	Prosopis spp.	91	92	3 to 6	-	excellent	Salvage for fuel wood	
1567			Tree	Prosopis spp.	110	75	< 3	-	excellent		
1568			Tree	Prosopis spp.	72	84	< 3	-	fair		
1569	X	1569	Tree	Prosopis spp.	114	67	3 to 6	-	excellent	Salvage for fuel wood	
1570	X	1570	Tree	Prosopis spp.	260	120	> 12	-	excellent	Salvage for fuel wood	
1571			Tree	Parkinsonia spp.	177	158	3 to 6	-	excellent		
1572			Tree	Parkinsonia spp.	162	155	3 to 6	-	excellent		
1573			Tree	Prosopis spp.	48	60	< 3	-	excellent		
1574			Tree	Parkinsonia spp.	103	66	3 to 6	-	good		
1575	X	1575	Tree	Prosopis spp.	48	84	3 to 6	-	excellent	Salvage for fuel wood	
1576	X	1576	Tree	Prosopis spp.	180	130	> 12	-	excellent	Salvage for fuel wood	
1577	X	1577	Tree	Prosopis spp.	72	84	3 to 6	-	excellent	Salvage for fuel wood	
1578	X	1578	Tree	Prosopis spp.	172	147	3 to 6	-	excellent	Salvage for fuel wood	
1579	X	1579	Tree	Prosopis spp.	178	140	3 to 6	-	excellent	Salvage for fuel wood	
1580	X	1580	Tree	Prosopis spp.	178	140	3 to 6	-	excellent	Salvage for fuel wood	
1581	X	1581	Tree	Prosopis spp.	165	108	6 to 12	-	excellent	Salvage for fuel wood	
1582	X	1582	Tree	Prosopis spp.	178	140	3 to 6	-	excellent	Salvage for fuel wood	
1583	X	1583	Tree	Prosopis spp.	152	190	> 12	-	fair	Salvage for fuel wood	
1584	X	1584	Tree	Prosopis spp.	100	105	3 to 6	-	excellent	Salvage for fuel wood	
1585	X	1585	Tree	Prosopis spp.	185	162	> 12	-	excellent	Salvage for fuel wood	
1586			Tree	Prosopis spp.	92	70	< 3	-	excellent		
1587	X	1587	Tree	Prosopis spp.	96	84	3 to 6	-	excellent	Salvage for fuel wood	
1588	X	1588	Tree	Prosopis spp.	147	103	3 to 6	-	excellent	Salvage for fuel wood	
1589			Tree	Prosopis spp.	160	69	< 3	-	excellent		
1590	X	1590	Tree	Prosopis spp.	129	78	3 to 6	-	excellent	Salvage for fuel wood	
1591			Tree	Prosopis spp.	50	60	< 3	-	excellent		
1592			Shrub	Larrea tridentata	77	50	-	-	excellent		
1593			Tree	Prosopis spp.	60	72	< 3	-	excellent		
1594	X	1594	Tree	Prosopis spp.	110	98	3 to 6	-	excellent	Salvage for fuel wood	
1595	X	1595	Tree	Prosopis spp.	133	92	3 to 6	-	excellent	Salvage for fuel wood	
1596			Shrub	Larrea tridentata	52	58	-	-	excellent		
1597	X	1597	Tree	Prosopis spp.	100	108	6 to 12	-	excellent	Salvage for fuel wood	
1598			Shrub	Larrea tridentata	75	60	-	-	excellent		
1599			Shrub	Larrea tridentata	75	50	-	-	excellent		
1600	X	1600	Tree	Prosopis spp.	85	72	3 to 6	-	excellent	Salvage for fuel wood	
1601	X	1601	Tree	Prosopis spp.	150	120	> 12	-	excellent	Salvage for fuel wood	
1602	X	1602	Tree	Prosopis spp.	170	152	6 to 12	-	excellent	Salvage for fuel wood	
1603	X	1603	Tree	Prosopis spp.	300	130	> 12	-	excellent	Salvage for fuel wood	
1604	X	1604	Tree	Prosopis spp.	176	140	6 to 12	-	excellent	Salvage for fuel wood	
1605			Tree	Prosopis spp.	50	50	< 3	-	excellent		
1606	X	1606	Tree	Prosopis spp.	250	108	> 12	-	excellent	Salvage for fuel wood	
1607	X	1607	Tree	Prosopis spp.	100	108	> 12	-	excellent	Salvage for fuel wood	
1608	X	1608	Tree	Prosopis spp.	178	123	6 to 12	-	excellent	Salvage for fuel wood	
1609	X	1609	Tree	Prosopis spp.	120	110	6 to 12	-	excellent	Salvage for fuel wood	
1610	X	1610	Tree	Prosopis spp.	155	115	3 to 6	-	excellent	Salvage for fuel wood	
1611	X	1611	Tree	Prosopis spp.	120	108	6 to 12	-	excellent	Salvage for fuel wood	
1612			Tree	Prosopis spp.	72	80	< 3	-	excellent		
1613	X	1613	Tree	Prosopis spp.	183	120	> 12	-	excellent	Salvage for fuel wood	
1614			Shrub	Larrea tridentata	24	48	-	-	excellent		
1615	X	1615	Tree	Prosopis spp.	170	144	> 12	-	excellent	Salvage for fuel wood	
1616	X	1616	Tree	Prosopis spp.	72	84	3 to 6	-	excellent	Salvage for fuel wood	
1617	X	1617	Tree	Prosopis spp.	72	84	3 to 6	-	excellent	Salvage for fuel wood	
1618			Tree	Prosopis spp.	129	85	< 3	-	excellent		
1619			Tree	Prosopis spp.	84	84	< 3	-	excellent		
1620			Tree	Prosopis spp.	78	48	< 3	-	excellent		
1621			Tree	Prosopis spp.	78	72	< 3	-	excellent		
1622	X	1622	Tree	Prosopis spp.	153	111	6 to 12	-	excellent	Salvage for fuel wood	
1623			Tree	Prosopis spp.	60	78	< 3	-	excellent		
1624										Number Not Used	
1625	X	1625	Tree	Prosopis spp.	100	120	3 to 6	-	excellent	Salvage for fuel wood	
1626			Tree	Prosopis spp.	147	88	< 3	-	excellent		
1627			Tree	Prosopis spp.	60	50	< 3	-	excellent		
1628	X	1628	Tree	Prosopis spp.	150	89	3 to 6	-	excellent	Salvage for fuel wood	
1629			Shrub	Larrea tridentata	36	36	-	-	excellent		
1630			Tree	Prosopis spp.	118	75	< 3	-	excellent		
1631			Shrub	Larrea tridentata	12	24	-	-	excellent		
1632			Tree	Prosopis spp.	93	70	< 3	-	excellent		
1633	X	1633	Tree	Prosopis spp.	108	96	6 to 12	-	excellent	Salvage for fuel wood	
1634			Tree	Prosopis spp.	174	120	> 12	-	excellent		
1635			Tree	Prosopis spp.	168	85	< 3	-	excellent		
1636	X	1636	Tree	Prosopis spp.	100	108	3 to 6	-	excellent	Salvage for fuel wood	
1637			Tree	Prosopis spp.	159	84	< 3	-	excellent		
1638			Tree	Prosopis spp.	64	58	< 3	-	excellent		
1639			Tree	Prosopis spp.	47	66	< 3	-	excellent		
1640	X	1640	Tree	Prosopis spp.	130	110	3 to 6	-	excellent	Salvage for fuel wood	
1641			Tree	Prosopis spp.	45	49	< 3	-	excellent		
1642			Tree	Prosopis spp.	50	72	< 3	-	excellent		
1643			Shrub	Larrea tridentata	10	8	-	-	excellent		
1644	X	1644	Tree	Prosopis spp.	149	120	6 to 12	-	excellent	Salvage for fuel wood	
1645			Shrub	Larrea tridentata	72	60	-	-	excellent		
1646	X	1646	Tree	Prosopis spp.	120	90	3 to 6	-	excellent	Salvage for fuel wood	
1647	X	1647	Tree	Prosopis spp.	145	120	3 to 6	-	excellent	Salvage for fuel wood	
1648			Tree	Prosopis spp.	80	72	< 3	-	excellent		
1649			Tree	Prosopis spp.	69	55	< 3	-	excellent		
1650			Tree	Prosopis spp.	100	80	< 3	-	excellent		
1651			Tree	Prosopis spp.	103	66	< 3	-	excellent		
1652			Shrub	Larrea tridentata	36	36	-	-	excellent		
1653			Shrub	Larrea tridentata	80	60	-	-	excellent		
1654			Shrub	Larrea tridentata	36	72	-	-	excellent		
1655			Tree	Prosopis spp.	84	75	< 3	-	excellent		
1656			Tree	Prosopis spp.	59	65	< 3	-	excellent		
1657			Shrub	Larrea tridentata	110	90	-	-	excellent		
1658			Tree	Prosopis spp.	78	71	< 3	-	excellent		
1659			Tree	Prosopis spp.	110	96	< 3	-	excellent		
1660			Tree	Prosopis spp.	108	82	< 3	-	excellent		
1661			Tree	Prosopis spp.	149	97	< 3	-	excellent		
1662			Tree	Parkinsonia spp.	100	90	3 to 6	-	excellent		
1663			Shrub	Larrea tridentata	12	36	-	-	excellent		
1664	X	1664	Tree	Prosopis spp.	300	198	> 12	-	excellent	Salvage for fuel wood	
1665			Shrub	Larrea tridentata	48	84	-	-	excellent		
1666			Shrub	Larrea tridentata	18	50	-	-	excellent		
1667			Shrub	Larrea tridentata	8	18	-	-	excellent		
1668			Tree	Prosopis spp.	104	74	< 3	-	excellent		
1669										Number Not Used	
1670			Shrub	Larrea tridentata	4	12	-	-	excellent		
1671			Shrub	Larrea tridentata	12	40	-	-	excellent		
1672			Shrub	Larrea tridentata	72	84	-	-	excellent		
1673	X	1673	Tree	Prosopis spp.	170	162	> 12	-	excellent	Salvage for fuel wood	
1674	X	1674	Tree	Prosopis spp.	182	160	> 12	-	excellent	Salvage for fuel wood	

NOTE:

All plant material noted to be 'Salvage for Fuel Wood' or 'Salvage and Replant', that will not be disturbed by construction, is to be protected-in-place.

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT — CERTIFICATE NO. 27437 — STEVEN E. LOHIDE — Date Signed 06/11/2024 — ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

PLANT INVENTORY DATA TABLES

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division | STATE ARIZ. | PROJECT NO. 010 MA 161 | FEDERAL ID NO. 010-C(NFA) | SHEET NO. 11 | TOTAL SHEETS 64 | RECORD DRAWING

LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-02.09

TRACS NO. F0721 01C

ADOT

____ OF ____

PLANT INVENTORY DATA TABLES

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
1675			Tree	Prosopis spp.	100	84	< 3	-	excellent		
1676	X	1676	Tree	Prosopis spp.	175	138	> 12	-	excellent	Salvage for fuel wood	
1677	X	1677	Tree	Prosopis spp.	88	84	3 to 6	-	excellent	Salvage for fuel wood	
1678			Tree	Prosopis spp.	77	58	< 3	-	excellent		
1679			Shrub	Larrea tridentata	40	79	-	-	excellent		
1680			Tree	Prosopis spp.	82	52	< 3	-	excellent		
1681			Tree	Prosopis spp.	46	48	< 3	-	excellent		
1682	X	1682	Tree	Prosopis spp.	203	133	6 to 12	-	excellent	Salvage for fuel wood	
1683			Shrub	Larrea tridentata	100	72	-	-	excellent		
1684			Tree	Prosopis spp.	115	93	< 3	-	excellent		
1685	X	1685	Tree	Prosopis spp.	121	107	3 to 6	-	excellent	Salvage for fuel wood	
1686	X	1686	Tree	Prosopis spp.	100	84	3 to 6	-	excellent	Salvage for fuel wood	
1687	X	1687	Cactus	Fouquieria splendens	0	104	-	6	fair	Salvage and Replant	
1688	X	1688	Tree	Prosopis spp.	110	96	3 to 6	-	excellent	Salvage for fuel wood	
1689	X	1689	Tree	Prosopis spp.	210	169	> 12	-	excellent	Salvage for fuel wood	
1690	X	1690	Tree	Prosopis spp.	180	120	> 12	-	excellent	Salvage for fuel wood	
1691	X	1691	Tree	Prosopis spp.	152	138	3 to 6	-	excellent	Salvage for fuel wood	
1692	X	1692	Tree	Prosopis spp.	166	122	6 to 12	-	excellent	Salvage for fuel wood	
1693	X	1693	Tree	Prosopis spp.	160	160	> 12	-	excellent	Salvage for fuel wood	
1694	X	1694	Tree	Prosopis spp.	155	112	3 to 6	-	excellent	Salvage for fuel wood	
1695	X	1695	Tree	Prosopis spp.	223	175	> 12	-	excellent	Salvage for fuel wood	
1696	X	1696	Tree	Prosopis spp.	200	230	> 12	-	excellent	Salvage for fuel wood	
1697	X	1697	Tree	Prosopis spp.	204	136	6 to 12	-	excellent	Salvage for fuel wood	
1698			Tree	Prosopis spp.	75	72	< 3	-	excellent		
1699			Tree	Prosopis spp.	88	71	< 3	-	excellent		
1700	X	1700	Tree	Prosopis spp.	188	163	> 12	-	excellent	Salvage for fuel wood	
1701	X	1701	Tree	Prosopis spp.	162	140	6 to 12	-	excellent	Salvage for fuel wood	
1702	X	1702	Cactus	Echinocactus spp.	0	15	-	-	excellent	Salvage and Replant	
1703	X	1703	Tree	Prosopis spp.	143	104	3 to 6	-	excellent	Salvage for fuel wood	
1704	X	1704	Tree	Prosopis spp.	112	192	3 to 6	-	excellent	Salvage for fuel wood	
1705			Tree	Parkinsonia spp.	88	91	3 to 6	-	excellent		
1706	X	1706	Tree	Prosopis spp.	100	84	> 12	-	excellent	Salvage for fuel wood	
1707	X	1707	Tree	Prosopis spp.	150	108	> 12	-	excellent	Salvage for fuel wood	
1708	X	1708	Tree	Prosopis spp.	120	108	3 to 6	-	excellent	Salvage for fuel wood	
1709			Tree	Prosopis spp.	100	96	< 3	-	excellent		
1710										Number Not Used	
1711	X	1711	Tree	Prosopis spp.	190	150	> 12	-	excellent	Salvage for fuel wood	
1712	X	1712	Tree	Prosopis spp.	120	100	3 to 6	-	excellent	Salvage for fuel wood	
1713	X	1713	Tree	Prosopis spp.	172	160	> 12	-	excellent	Salvage for fuel wood	
1714	X	1714	Tree	Prosopis spp.	166	142	6 to 12	-	excellent	Salvage for fuel wood	
1715	X	1715	Tree	Prosopis spp.	200	160	> 12	-	excellent	Salvage for fuel wood	
1716			Tree	Prosopis spp.	112	77	< 3	-	excellent		
1717	X	1717	Tree	Prosopis spp.	129	120	3 to 6	-	excellent	Salvage for fuel wood	
1718	X	1718	Tree	Prosopis spp.	204	185	6 to 12	-	excellent	Salvage for fuel wood	
1719			Tree	Prosopis spp.	122	96	< 3	-	excellent		
1720			Tree	Prosopis spp.	72	60	< 3	-	excellent		
1721			Tree	Prosopis spp.	66	48	< 3	-	excellent		
1722			Tree	Prosopis spp.	60	72	< 3	-	excellent		
1723			Tree	Prosopis spp.	121	98	< 3	-	excellent		
1724			Tree	Prosopis spp.	50	65	< 3	-	excellent		
1725	X	1725	Tree	Prosopis spp.	140	120	3 to 6	-	excellent	Salvage for fuel wood	
1726	X	1726	Tree	Prosopis spp.	80	120	3 to 6	-	excellent	Salvage for fuel wood	
1727	X	1727	Tree	Prosopis spp.	175	122	3 to 6	-	excellent	Salvage for fuel wood	
1728	X	1728	Tree	Prosopis spp.	167	102	6 to 12	-	excellent	Salvage for fuel wood	
1729	X	1729	Tree	Prosopis spp.	144	92	3 to 6	-	excellent	Salvage for fuel wood	
1730	X	1730	Tree	Prosopis spp.	125	125	> 12	-	excellent	Salvage for fuel wood	
1731			Tree	Prosopis spp.	162	103	< 3	-	excellent		
1732			Tree	Prosopis spp.	161	88	3 to 6	-	excellent		
1733										Number Not Used	
1734		1734	Tree	Prosopis spp.	100	82	3 to 6	-	excellent	No physical tag, tree in median, salvage for fuel wood	
1735	X	1735	Tree	Prosopis spp.	163	96	3 to 6	-	excellent	Salvage for fuel wood	
1736		1736	Tree	Prosopis spp.	60	84	3 to 6	-	excellent	No physical tag, tree in median, salvage for fuel wood	
1737		1737	Tree	Prosopis spp.	100	80	3 to 6	-	excellent	No physical tag, tree in median, salvage for fuel wood	
1738	X	1738	Tree	Prosopis spp.	149	135	3 to 6	-	excellent	Salvage for fuel wood	
1739										Number Not Used	
1740			Tree	Prosopis spp.	166	112	< 3	-	excellent		
1741	X	1741	Tree	Prosopis spp.	170	112	3 to 6	-	excellent	Salvage for fuel wood	
1742			Tree	Prosopis spp.	72	80	< 3	-	excellent		
1743	X	1743	Tree	Prosopis spp.	95	82	3 to 6	-	excellent	Salvage for fuel wood	
1744			Tree	Prosopis spp.	110	63	< 3	-	excellent		
1745	X	1745	Cactus	Carnegiea gigantea	0	120	-	1	excellent	Salvage and Replant	
1746	X	1746	Tree	Prosopis spp.	167	90	3 to 6	-	excellent	Salvage for fuel wood	
1747	X	1747	Tree	Prosopis spp.	143	90	6 to 12	-	excellent	Salvage for fuel wood	
1748			Tree	Prosopis spp.	80	55	< 3	-	excellent		
1749			Tree	Prosopis spp.	100	72	< 3	-	excellent		
1750	X	1750	Tree	Prosopis spp.	140	121	3 to 6	-	excellent	Salvage for fuel wood	
1751	X	1751	Tree	Prosopis spp.	140	120	3 to 6	-	excellent	Salvage for fuel wood	
1752	X	1752	Tree	Prosopis spp.	155	128	6 to 12	-	excellent	Salvage for fuel wood	
1753	X	1753	Tree	Prosopis spp.	142	102	3 to 6	-	excellent	Salvage for fuel wood	
1754	X	1754	Tree	Prosopis spp.	177	159	> 12	-	excellent	Salvage for fuel wood	
1755			Tree	Parkinsonia spp.	84	84	3 to 6	-	excellent		
1756	X	1756	Tree	Prosopis spp.	191	170	6 to 12	-	excellent	Salvage for fuel wood	
1757			Tree	Prosopis spp.	125	77	< 3	-	excellent		
1758	X	1758	Tree	Prosopis spp.	189	150	6 to 12	-	excellent	Salvage for fuel wood	
1759	X	1759	Tree	Prosopis spp.	140	120	> 12	-	excellent	Salvage for fuel wood	
1760			Tree	Parkinsonia spp.	118	97	3 to 6	-	excellent		
1761			Tree	Prosopis spp.	121	100	< 3	-	excellent		
1762	X	1762	Tree	Prosopis spp.	166	132	6 to 12	-	excellent	Salvage for fuel wood	
1763	X	1763	Tree	Prosopis spp.	140	120	3 to 6	-	excellent	Salvage for fuel wood	
1764			Tree	Prosopis spp.	87	71	< 3	-	excellent		
1765			Tree	Prosopis spp.	132	112	< 3	-	excellent		
1766			Tree	Prosopis spp.	125	72	< 3	-	excellent		
1767										Number Not Used	
1768	X	1768	Tree	Prosopis spp.	225	162	> 12	-	excellent	Salvage for fuel wood	
1769			Tree	Tamarix ramosissima	280	244	> 12	-	excellent		
1770	X	1770	Tree	Prosopis spp.	200	120	6 to 12	-	excellent	Salvage for fuel wood	
1771			Tree	Prosopis spp.	165	115	< 3	-	excellent	no tag on mesquite	
1772										Number Not Used	
1773			Tree	Prosopis spp.	138	105	< 3	-	excellent		
1774			Shrub	Baccharis spp.	180	100	-	-	excellent		
1775			Tree	Prosopis spp.	96	78	< 3	-	good		
1776			Tree	Prosopis spp.	146	95	< 3	-	excellent		
1777			Tree	Prosopis spp.	123	80	< 3	-	excellent		
1778	X	1778	Tree	Prosopis spp.	152	140	3 to 6	-	excellent	Salvage for fuel wood	
1779	X	1779	Tree	Prosopis spp.	100	110	6 to 12	-	excellent	Salvage for fuel wood	
1780	X	1780	Tree	Prosopis spp.	228	155	6 to 12	-	excellent	Salvage for fuel wood	
1781			Tree	Prosopis spp.	120	80	< 3	-	excellent		
1782	X	1782	Tree	Prosopis spp.	209	166	6 to 12	-	excellent	Salvage for fuel wood	
1783			Tree	Prosopis spp.	136	102	< 3	-	excellent		
1784			Tree	Prosopis spp.	145	97	< 3	-	excellent		
1785			Tree	Prosopis spp.	95	78	< 3	-	excellent		
1786			Tree	Prosopis spp.	95	92	< 3	-	excellent		
1787	X	1787	Tree	Prosopis spp.	198	122	6 to 12	-	excellent	Salvage for fuel wood	
1788			Tree	Prosopis spp.	102	80	< 3	-	excellent		
1789			Tree	Prosopis spp.	79	55	< 3	-	excellent		
1790	X	1790	Tree	Prosopis spp.	192	130	6 to 12	-	excellent	Salvage for fuel wood	
1791	X	1791	Tree	Prosopis spp.	205	162	> 12	-	excellent	Salvage for fuel wood	
1792	X	1792	Tree	Prosopis spp.	142	103	3 to 6	-	excellent	Salvage for fuel wood	
1793			Tree	Prosopis spp.	96	81	< 3	-	excellent		
1794	X	1794	Tree	Prosopis spp.	118	131	6 to 12	-	excellent	Salvage for fuel wood	
1795			Tree	Prosopis spp.	147	105	< 3	-	excellent		
1796			Tree	Prosopis spp.	158	99	< 3	-	excellent		
1797			Tree	Prosopis spp.	103	80	< 3	-	excellent		
1798	X	1798	Tree	Prosopis spp.	210	137	> 12	-	excellent	Salvage for fuel wood	
1799			Tree	Prosopis spp.	77	68	< 3	-	excellent		
1800	X	1800	Tree	Prosopis spp.	137	105	3 to 6	-	excellent	Salvage for fuel wood	
1801			Tree		140	92	< 3	-	excellent		
1802	X	1802	Tree	Prosopis spp.	195	150	6 to 12	-	excellent	Salvage for fuel wood	
1803			Tree	Prosopis spp.	145	97	< 3	-	excellent		
1804	X	1804	Tree	Prosopis spp.	206	130	6 to 12	-	excellent	Salvage for fuel wood	
1805			Tree	Prosopis spp.	94	66	< 3	-	excellent		
1806			Tree	Parkinsonia spp.	170	150	6 to 12	-	excellent		
1807	X	1807	Tree	Prosopis spp.	174	140	6 to 12	-	excellent	Salvage for fuel wood	
1808			Tree	Prosopis spp.	144	88	< 3	-	excellent		
1809	X	1809	Tree	Prosopis spp.	195	150	> 12	-	excellent	Salvage for fuel wood	
1810			Tree	Prosopis spp.	60	84	< 3	-	excellent		
1811			Tree	Prosopis spp.	162	105	< 3	-	excellent		
1812			Tree	Prosopis spp.	173	115	> 12	-	excellent		
1813	X	1813	Tree	Prosopis spp.	108	96	3 to 6	-	excellent	Salvage for fuel wood	
1814			Tree	Parkinsonia spp.	145	150	6 to 12	-	excellent		
1815	X	1815	Tree	Prosopis spp.	212	195	> 12	-	excellent	Salvage for fuel wood	
1816			Tree	Prosopis spp.	48	48	< 3	-	excellent		
1817			Tree	Parkinsonia aculeata	58	86	3 to 6	-	excellent		
1818			Tree	Prosopis spp.	135	111	< 3	-	excellent		
1819			Tree	Prosopis spp.	157	85	< 3	-	excellent		
1820			Tree	Prosopis spp.	83	96	< 3	-	excellent		
1821			Tree	Parkinsonia aculeata	122	115	> 12	-	excellent		
1822			Tree	Parkinsonia aculeata	130	116	> 12	-	excellent		
1823	X	1823	Tree	Prosopis spp.	120	86	3 to 6	-	excellent	Salvage for fuel wood	
1824			Tree	Parkinsonia aculeata	173	137	> 12	-	excellent		
1825			Tree	Prosopis spp.	159	83	< 3	-	excellent		
1826			Tree	Prosopis spp.	147	85	< 3	-	excellent		
1827			Tree	Prosopis spp.	147	51	< 3	-	excellent		
1828	X	1828	Tree	Prosopis spp.	162	98	3 to 6	-	excellent	Salvage for fuel wood	
1829			Tree	Parkinsonia aculeata	87	94	6 to 12	-	excellent		
1830	X	1830	Tree	Prosopis spp.	183	110	3 to 6	-	excellent	Salvage for fuel wood	
1831			Tree	Prosopis spp.	158	97	< 3	-	excellent		
1832	X	1832	Cactus	Cylindropuntia acanth	86	72	-	18	excellent	Salvage and Replant	
1833			Tree	Prosopis spp.	106	88	< 3	-	excellent		
1834	X	1834	Tree	Prosopis spp.	167	95	3 to 6	-	excellent	Salvage for fuel wood	
1835	X	1835	Tree	Prosopis spp.	130	135	6 to 12	-	excellent	Salvage for fuel wood	
1836			Tree	Prosopis spp.	172	89	< 3	-	excellent		
1837			Tree	Prosopis spp.	132	85	< 3	-	excellent		
1838			Tree	Prosopis spp.	163	80	< 3	-	excellent		
1839			Tree	Parkinsonia spp.	50	50	< 3	-	excellent		
1840	X	1840	Tree	Prosopis spp.	158	102	3 to 6	-	excellent	Salvage for fuel wood	
1841			Shrub	Larrea tridentata	90	84	-	-	excellent		
1842			Tree	Parkinsonia spp.	163	159	> 12	-	excellent		
1843			Tree	Parkinsonia spp.	95	115	< 3	-	excellent		
1844			Tree	Parkinsonia spp.	95	92	< 3	-	excellent		
1845			Tree	Prosopis spp.	122	98	< 3	-	excellent		
1846	X	1846	Tree	Prosopis spp.	9192	154	6 to 12	-	excellent	Salvage for fuel wood	
1847	X	1847	Cactus	Carnegiea gigantea	0	216	-	2	excellent	Salvage and Replant	
1848			Tree	Parkinsonia spp.	98	85	6 to 12	-	excellent		
1849	X	1849	Tree	Prosopis spp.	120	86	6 to 12	-	excellent	Salvage for fuel wood	
1850	X	1850	Tree	Prosopis spp.	100	84	3 to 6	-	excellent	Salvage for fuel wood	
1851			Tree	Prosopis spp.	79	84	< 3	-	excellent		
1852			Tree	Parkinsonia aculeata	60	72	< 3	-	excellent		
1853	X	1853	Tree	Prosopis spp.	185	142	6 to 12	-	excellent	Salvage for fuel wood	
1854	X	1854	Tree	Prosopis spp.	153	120	3 to 6	-	excellent	Salvage for fuel wood	
1855			Tree	Prosopis spp.	72	84	< 3	-	excellent		
1856			Shrub	Larrea tridentata	50	50	-	-	good		

NOTE:

All plant material noted to be 'Salvage for Fuel Wood' or 'Salvage and Replant', that will not be disturbed by construction, is to be protected-in-place.

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT — CERTIFICATE NO. 27437 — STEVEN E. LOHIDE — 06/11/2024 — ARIZONA

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

PLANT INVENTORY DATA TABLES

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	12	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-02.10

TRACS NO. F0721 01C

ADOT

____ OF ____

PLANT INVENTORY DATA TABLES

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
1857			Shrub	Larrea tridentata	60	50	-	-	excellent		
1858	X	1858	Tree	Prosopis spp.	172	140	3 to 6	-	excellent	Salvage for fuel wood	
1859		1859	Tree	Prosopis spp.	96	84	3 to 6	-	excellent	No physical tag, tree in median, salvage for fuel wood	
1860	X	1860	Tree	Prosopis spp.	163	117	3 to 6	-	excellent	Salvage for fuel wood	
1861										Number Not Used	
1862			Tree	Prosopis spp.	112	98	< 3	-	excellent		
1863			Tree	Prosopis spp.	102	84	< 3	-	excellent		
1864			Tree	Prosopis spp.	180	94	< 3	-	excellent		
1865	X	1865	Tree	Prosopis spp.	166	97	3 to 6	-	excellent	Salvage for fuel wood	
1866	X	1866	Tree	Prosopis spp.	185	160	> 12	-	excellent	Salvage for fuel wood	
1867	X	1867	Tree	Prosopis spp.	162	140	> 12	-	excellent	Salvage for fuel wood	
1868	X	1868	Tree	Prosopis spp.	183	220	> 12	-	excellent	Salvage for fuel wood	
1869	X	1869	Tree	Prosopis spp.	153	125	> 12	-	excellent	Salvage for fuel wood	
1870	X	1870	Tree	Prosopis spp.	202	154	> 12	-	excellent	Salvage for fuel wood	
1871	X	1871	Tree	Prosopis spp.	165	122	> 12	-	excellent	Salvage for fuel wood	
1872	X	1872	Tree	Prosopis spp.	157	147	> 12	-	excellent	Salvage for fuel wood	
1873	X	1873	Tree	Prosopis spp.	179	140	> 12	-	excellent	Salvage for fuel wood	
1874			Tree	Prosopis spp.	120	60	< 3	-	excellent		
1875			Tree	Prosopis spp.	163	102	< 3	-	excellent		
1876			Tree	Prosopis spp.	98	64	< 3	-	excellent		
1877	X	1877	Tree	Prosopis spp.	173	127	> 12	-	excellent	Salvage for fuel wood	
1878	X	1878	Tree	Prosopis spp.	171	125	> 12	-	excellent	Salvage for fuel wood	
1879	X	1879	Tree	Prosopis spp.	130	115	3 to 6	-	excellent	Salvage for fuel wood	
1880			Tree	Prosopis spp.	163	76	< 3	-	excellent		
1881			Tree	Prosopis spp.	94	57	< 3	-	excellent		
1882			Tree	Prosopis spp.	149	89	< 3	-	poor		
1883	X	1883	Tree	Prosopis spp.	130	110	3 to 6	-	excellent	Salvage for fuel wood	
1884			Tree	Prosopis spp.	165	118	< 3	-	excellent		
1885			Tree	Prosopis spp.	146	89	< 3	-	excellent		
1886	X	1886	Tree	Prosopis spp.	120	108	3 to 6	-	excellent	Salvage for fuel wood	
1887	X	1887	Tree	Prosopis spp.	130	125	3 to 6	-	excellent	Salvage for fuel wood	
1888	X	1888	Tree	Prosopis spp.	130	120	3 to 6	-	excellent	Salvage for fuel wood	
1889	X	1889	Tree	Prosopis spp.	177	112	3 to 6	-	excellent	Salvage for fuel wood	
1890	X	1890	Tree	Prosopis spp.	110	108	3 to 6	-	excellent	Salvage for fuel wood	
1891			Tree	Prosopis spp.	132	84	< 3	-	excellent		
1892	X	1892	Tree	Prosopis spp.	245	210	> 12	-	excellent	Salvage for fuel wood	
1893	X	1893	Tree	Prosopis spp.	210	200	> 12	-	excellent	Salvage for fuel wood	
1894	X	1894	Tree	Prosopis spp.	205	130	6 to 12	-	excellent	Salvage for fuel wood	
1895	X	1895	Tree	Prosopis spp.	182	96	3 to 6	-	excellent	Salvage for fuel wood	
1896	X	1896	Tree	Prosopis spp.	84	96	3 to 6	-	excellent	Salvage for fuel wood	
1897	X	1897	Tree	Prosopis spp.	173	122	6 to 12	-	excellent	Salvage for fuel wood	
1898	X	1898	Tree	Prosopis spp.	164	118	6 to 12	-	excellent	Salvage for fuel wood	
1899	X	1899	Tree	Prosopis spp.	178	119	3 to 6	-	excellent	Salvage for fuel wood	
1900			Tree	Prosopis spp.	82	79	< 3	-	excellent		
1901			Tree	Prosopis spp.	139	114	< 3	-	excellent		
1902	X	1902	Tree	Prosopis spp.	176	127	3 to 6	-	excellent	Salvage for fuel wood	
1903			Tree	Parkinsonia spp.	36	48	< 3	-	excellent		
1904			Tree	Parkinsonia spp.	120	108	3 to 6	-	excellent		
1905	X	1905	Tree	Prosopis spp.	156	140	3 to 6	-	excellent	Salvage for fuel wood	
1906	X	1906	Tree	Prosopis spp.	184	131	6 to 12	-	excellent	Salvage for fuel wood	
1907	X	1907	Tree	Prosopis spp.	140	130	> 12	-	excellent	Salvage for fuel wood	
1908			Tree	Prosopis spp.	102	94	< 3	-	excellent		
1909			Tree	Prosopis spp.	97	108	< 3	-	excellent		
1910			Tree	Prosopis spp.	103	66	< 3	-	excellent		
1911			Tree	Prosopis spp.	128	89	< 3	-	excellent		
1912	X	1912	Tree	Prosopis spp.	159	144	6 to 12	-	excellent	Salvage for fuel wood	
1913	X	1913	Tree	Prosopis spp.	130	120	> 12	-	excellent	Salvage for fuel wood	
1914			Tree	Prosopis spp.	68	84	< 3	-	excellent		
1915			Tree	Prosopis spp.	112	85	< 3	-	excellent		
1916			Tree	Prosopis spp.	139	94	< 3	-	excellent		
1917	X	1917	Tree	Prosopis spp.	158	120	3 to 6	-	excellent	Salvage for fuel wood	
1918	X	1918	Tree	Prosopis spp.	156	92	3 to 6	-	excellent	Salvage for fuel wood	
1919	X	1919	Tree	Prosopis spp.	162	110	3 to 6	-	excellent	Salvage for fuel wood	
1920	X	1920	Cactus	Carnegiea gigantea	0	120	-	1	excellent	Salvage and Replant	
1921	X	1921	Tree	Prosopis spp.	195	123	3 to 6	-	excellent	Salvage for fuel wood	
1922			Tree	Prosopis spp.	142	89	< 3	-	excellent		
1923			Tree	Prosopis spp.	100	79	< 3	-	excellent		
1924	X	1924	Cactus	Carnegiea gigantea	0	122	-	1	fair	Salvage and Replant	
1925	X	1925	Tree	Prosopis spp.	154	138	3 to 6	-	excellent	Salvage for fuel wood	
1926	X	1926	Cactus	Carnegiea gigantea	0	110	-	2	excellent	Salvage and Replant	
1927			Tree	Prosopis spp.	67	73	< 3	-	excellent		
1928	X	1928	Tree	Prosopis spp.	159	122	6 to 12	-	excellent	Salvage for fuel wood	
1929			Tree	Prosopis spp.	171	115	6 to 12	-	excellent		
1930	X	1930	Tree	Prosopis spp.	182	135	6 to 12	-	excellent		
1931	X	1931	Tree	Prosopis spp.	150	150	> 12	-	excellent	Salvage for fuel wood	
1932			Tree	Prosopis spp.	36	48	< 3	-	excellent		
1933	X	1933	Tree	Prosopis spp.	179	92	3 to 6	-	excellent	Salvage for fuel wood	
1934			Tree	Prosopis spp.	50	36	< 3	-	excellent		
1935	X	1935	Tree	Prosopis spp.	183	120	6 to 12	-	excellent	Salvage for fuel wood	
1936										Number Not Used	
1937	X	1937	Tree	Prosopis spp.	80	60	3 to 6	-	excellent	No physical tag, tree in median, salvage for fuel wood	
1938										Number Not Used	
1939			Tree	Prosopis spp.	185	122	6 to 12	-	excellent		
1940	X	1940	Tree	Prosopis spp.	187	152	> 12	-	excellent	Salvage for fuel wood	
1941			Tree	Prosopis spp.	93	88	< 3	-	excellent		
1942	X	1942	Tree	Prosopis spp.	169	150	6 to 12	-	excellent	Salvage for fuel wood	
1943			Tree	Prosopis spp.	128	107	< 3	-	excellent		
1944			Tree	Prosopis spp.	100	72	< 3	-	excellent		
1945	X	1945	Tree	Prosopis spp.	60	60	3 to 6	-	excellent	Salvage for fuel wood	
1946	X	1946	Cactus	Carnegiea gigantea	0	150	-	-	poor	Salvage and Replant	
1947	X	1947	Tree	Prosopis spp.	90	78	3 to 6	-	excellent	Salvage for fuel wood	
1948	X	1948	Cactus	Carnegiea gigantea	0	180	-	-	excellent	Salvage and Replant	
1949	X	1949	Tree	Prosopis spp.	120	130	> 12	-	excellent	Salvage for fuel wood	
1950	X	1950	Tree	Prosopis spp.	120	120	3 to 6	-	excellent	Salvage for fuel wood	
1951	X	1951	Tree	Prosopis spp.	180	108	3 to 6	-	excellent	Salvage for fuel wood	
1952										Number Not Used	
1953	X	1953	Tree	Prosopis spp.	240	120	6 to 12	-	excellent	Salvage for fuel wood	
1954	X	1954	Tree	Prosopis spp.	125	110	3 to 6	-	excellent	Salvage for fuel wood	
1955			Tree	Prosopis spp.	108	96	< 3	-	excellent		
1956	X	1956	Tree	Prosopis spp.	120	96	3 to 6	-	excellent	Salvage for fuel wood	
1957	X	1957	Tree	Prosopis spp.	140	144	3 to 6	-	excellent	Salvage for fuel wood	
1958	X	1958	Tree	Prosopis spp.	144	180	3 to 6	-	excellent	Salvage for fuel wood	
1959	X	1959	Cactus	Carnegiea gigantea	0	150	-	5	excellent	Salvage and Replant	
1960			Tree	Prosopis spp.	72	86	< 3	-	excellent		
1961	X	1961	Cactus	Carnegiea gigantea	0	160	-	5	excellent	Salvage and Replant	
1962			Tree	Parkinsonia spp.	216	240	6 to 12	-	excellent		
1963			Tree	Prosopis spp.	72	84	< 3	-	excellent		
1964			Tree	Prosopis spp.	96	84	< 3	-	excellent		
1965	X	1965	Tree	Prosopis spp.	120	144	6 to 12	-	excellent	Salvage for fuel wood	
1966			Tree	Prosopis spp.	80	72	< 3	-	excellent		
1967			Tree	Prosopis spp.	60	50	< 3	-	excellent		
1968	X	1968	Tree	Prosopis spp.	108	144	3 to 6	-	excellent	Salvage for fuel wood	
1969	X	1969	Tree	Prosopis spp.	108	120	3 to 6	-	excellent	Salvage for fuel wood	
1970			Tree	Prosopis spp.	48	60	< 3	-	excellent		
1971	X	1971	Tree	Prosopis spp.	144	132	3 to 6	-	excellent	Salvage for fuel wood	
1972	X	1972	Tree	Prosopis spp.	100	84	3 to 6	-	excellent	Salvage for fuel wood	
1973	X	1973	Tree	Prosopis spp.	144	108	3 to 6	-	excellent		
1974			Tree	Prosopis spp.	72	72	< 3	-	excellent		
1975			Tree	Parkinsonia aculeata	36	80	< 3	-	excellent		
1976	X	1976	Tree	Prosopis spp.	120	84	3 to 6	-	excellent	Salvage for fuel wood	
1977	X	1977	Tree	Prosopis spp.	48	75	3 to 6	-	excellent	Salvage for fuel wood	
1978	X	1978	Tree	Prosopis spp.	120	84	3 to 6	-	excellent	Salvage for fuel wood	
1979	X	1979	Tree	Prosopis spp.	150	144	3 to 6	-	excellent	Salvage for fuel wood	
1980			Shrub	Larrea tridentata	70	40	-	-	excellent		
1981			Tree	Prosopis spp.	144	84	< 3	-	excellent		
1982			Tree	Prosopis spp.	84	60	< 3	-	excellent		
1983	X	1983	Tree	Prosopis spp.	120	108	3 to 6	-	excellent	Salvage for fuel wood	
1984			Tree		200	150	> 12	-	excellent		
1985			Tree	Prosopis spp.	108	84	< 3	-	excellent		
1986			Tree	Prosopis spp.	120	84	6 to 12	-	excellent		
1987			Tree	Prosopis spp.	72	72	< 3	-	excellent		
1988	X	1988	Tree	Prosopis spp.	120	108	3 to 6	-	excellent	Salvage for fuel wood	
1989	X	1989	Tree	Prosopis spp.	90	80	3 to 6	-	excellent	Salvage for fuel wood	
1990	X	1990	Tree	Prosopis spp.	240	156	3 to 6	-	excellent	Salvage for fuel wood	
1991			Tree	Prosopis spp.	96	156	< 3	-	excellent		
1992			Tree	Prosopis spp.	216	156	< 3	-	excellent		
1993	X	1993	Tree	Prosopis spp.	180	150	> 12	-	excellent	Salvage for fuel wood	
1994	X	1994	Tree	Prosopis spp.	256	156	> 12	-	excellent	Salvage for fuel wood	
1995	X	1995	Tree	Prosopis spp.	120	132	3 to 6	-	excellent	Salvage for fuel wood	
1996	X	1996	Tree	Prosopis spp.	140	120	3 to 6	-	excellent	Salvage for fuel wood	
1997			Tree	Prosopis spp.	84	96	< 3	-	excellent		
1998			Tree	Prosopis spp.	120	108	< 3	-	excellent		
1999	X	1999	Tree	Prosopis spp.	96	96	3 to 6	-	excellent	Salvage for fuel wood	
2000	X	2000	Tree	Prosopis spp.	80	84	3 to 6	-	excellent	Salvage for fuel wood	
2001			Tree	Prosopis spp.	52	60	< 3	-	excellent		
2002	X	2002	Tree	Prosopis spp.	84	90	3 to 6	-	excellent	Salvage for fuel wood	
2003			Tree	Prosopis spp.	84	72	< 3	-	excellent		
2004	X	2004	Tree	Prosopis spp.	80	108	3 to 6	-	excellent	Salvage for fuel wood	
2005	X	2005	Tree	Prosopis spp.	120	120	6 to 12	-	excellent	Salvage for fuel wood	
2006	X	2006	Tree	Prosopis spp.	420	360	> 12	-	excellent	Salvage for fuel wood	
2007	X	2007	Tree	Prosopis spp.	144	128	3 to 6	-	excellent	Salvage for fuel wood	
2008			Tree	Parkinsonia aculeata	300	356	6 to 12	-	excellent		
2009	X	2009	Tree	Prosopis spp.	60	72	3 to 6	-	excellent	Salvage for fuel wood	
2010	X	2010	Tree	Prosopis spp.	140	108	3 to 6	-	excellent	Salvage for fuel wood	
2011	X	2011	Tree	Prosopis spp.	240	180	6 to 12	-	excellent	Salvage for fuel wood	
2012	X	2012	Tree	Prosopis spp.	80	80	3 to 6	-	excellent	Salvage for fuel wood	
2013			Tree	Prosopis spp.	240	180	< 3	-	excellent		
2014	X	2014	Tree	Prosopis spp.	120	120	3 to 6	-	excellent	Salvage for fuel wood	
2015			Tree	Prosopis spp.	144	180	< 3	-	excellent		
2016	X	2016	Tree	Prosopis spp.	90	85	3 to 6	-	excellent	Salvage for fuel wood	
2017	X	2017	Tree	Prosopis spp.	144	180	3 to 6	-	excellent		
2018	X	2018	Tree	Prosopis spp.	120	100	3 to 6	-	excellent	Salvage for fuel wood	
2019	X	2019	Tree	Prosopis spp.	240	180	6 to 12	-	excellent	Salvage for fuel wood	
2020	X	2020	Tree	Prosopis spp.	125	120	3 to 6	-	excellent	Salvage for fuel wood	
2021	X	2021	Tree	Prosopis spp.	180	120	> 12	-	excellent	Salvage for fuel wood	
2022	X	2022	Tree	Prosopis spp.	50	108	3 to 6	-	excellent	Salvage for fuel wood	
2023	X	2023	Tree	Prosopis spp.	75	85	3 to 6	-	excellent	Salvage for fuel wood	
2024			Tree	Prosopis spp.	144	120	6 to 12	-	excellent		
2025	X	2025	Tree	Prosopis spp.	120	132	6 to 12	-	excellent	Salvage for fuel wood	
2026	X	2026	Tree	Prosopis spp.	80	90	3 to 6	-	excellent	Salvage for fuel wood	
2027	X	2027	Tree	Prosopis spp.	110	96	3 to 6	-	excellent	Salvage for fuel wood	
2028			Tree	Prosopis spp.	120	86	< 3	-	excellent		
2029	X	2029	Tree	Prosopis spp.	144	120	6 to 12	-	excellent	Salvage for fuel wood	
2030	X	2030	Tree	Prosopis spp.	168	144	6 to 12	-	excellent	Salvage for fuel wood	
2031	X	2031	Tree	Prosopis spp.	180	120	3 to 6	-	excellent	Salvage for fuel wood	
2032	X	2032	Tree	Prosopis spp.	144	120	3 to 6	-	excellent	Salvage for fuel wood	
2033	X	2033	Tree	Prosopis spp.	216	144	> 12	-	excellent	Salvage for fuel wood	
2034	X	2034	Tree	Prosopis spp.	90	108	6 to 12	-	excellent	Salvage for fuel wood	
2035	X	2035	Tree	Prosopis spp.	96	84	3 to 6	-	excellent	Salvage for fuel wood	
2036	X	2036	Tree	Prosopis spp.	100	108	3 to 6	-	excellent	Salvage for fuel wood	
2037	X	2037	Tree	Prosopis spp.	120	120	3 to 6	-	excellent	Salvage for fuel wood	
2038	X	2038	Tree	Prosopis spp.	160	110	6 to 12	-	excellent	Salvage for fuel wood	
2039			Shrub	Larrea tridentata	96	72	-	-	excellent		
2040	X	2040	Tree	Prosopis spp.	95	85	3 to 6	-	excellent	Salvage for fuel wood	

NOTE:

All plant material noted to be 'Salvage for Fuel Wood' or 'Salvage and Replant', that will not be disturbed by construction, is to be protected-in-place.

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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501 N 44th St, Suite 300
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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

PLANT INVENTORY DATA TABLES

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	13	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-02.11

TRACS NO. F0721 01C

ADOT

____ OF ____

PLANT INVENTORY DATA TABLES

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
2041			Shrub	Larrea tridentata	72	60	-	-	excellent		
2042			Shrub	Larrea tridentata	72	72	-	-	excellent		
2043	X	2043	Tree	Prosopis spp.	165	120	6 to 12	-	excellent	Salvage for fuel wood	
2044	X	2044	Tree	Prosopis spp.	120	120	3 to 6	-	excellent	Salvage for fuel wood	
2045	X	2045	Tree	Prosopis spp.	105	85	3 to 6	-	excellent	Salvage for fuel wood	
2046	X	2046	Tree	Prosopis spp.	100	85	3 to 6	-	excellent	Salvage for fuel wood	
2047	X	2047	Tree	Prosopis spp.	120	108	3 to 6	-	excellent	Salvage for fuel wood	
2048	X	2048	Tree	Prosopis spp.	240	180	6 to 12	-	excellent	Salvage for fuel wood	
2049	X	2049	Tree	Prosopis spp.	240	168	6 to 12	-	excellent	Salvage for fuel wood	
2050	X	2050	Tree	Prosopis spp.	100	96	3 to 6	-	excellent	Salvage for fuel wood	
2051	X	2051	Tree	Prosopis spp.	50	100	3 to 6	-	excellent	Salvage for fuel wood	
2052	X	2052	Tree	Prosopis spp.	100	90	3 to 6	-	excellent	Salvage for fuel wood	
2053	X	2053	Tree	Prosopis spp.	144	120	3 to 6	-	excellent	Salvage for fuel wood	
2054			Tree	Parkinsonia aculeata	120	120	6 to 12	-	excellent		
2055	X	2055	Tree	Prosopis spp.	100	100	3 to 6	-	excellent	Salvage for fuel wood	
2056	X	2056	Tree	Prosopis spp.	168	120	3 to 6	-	excellent	Salvage for fuel wood	
2057			Tree	Prosopis spp.	60	80	< 3	-	excellent		
2058			Tree	Parkinsonia spp.	50	75	3 to 6	-	excellent		
2059	X	2059	Tree	Prosopis spp.	200	160	> 12	-	excellent	Salvage for fuel wood	
2060	X	2060	Tree	Prosopis spp.	180	144	3 to 6	-	excellent	Salvage for fuel wood	
2061	X	2061	Tree	Prosopis spp.	130	125	6 to 12	-	excellent	Salvage for fuel wood	
2062	X	2062	Tree	Prosopis spp.	216	168	3 to 6	-	excellent	Salvage for fuel wood	
2063	X	2063	Tree	Prosopis spp.	200	160	> 12	-	excellent	Salvage for fuel wood	
2064	X	2064	Tree	Prosopis spp.	168	120	3 to 6	-	excellent	Salvage for fuel wood	
2065	X	2065	Tree	Prosopis spp.	150	120	3 to 6	-	excellent	Salvage for fuel wood	
2066	X	2066	Tree	Prosopis spp.	160	120	3 to 6	-	excellent	Salvage for fuel wood	
2067	X	2067	Tree	Prosopis spp.	144	120	3 to 6	-	excellent	Salvage for fuel wood	
2068	X	2068	Tree	Prosopis spp.	175	130	6 to 12	-	excellent	Salvage for fuel wood	
2069			Tree	Prosopis spp.	96	84	< 3	-	excellent		
2070			Tree	Prosopis spp.	108	84	< 3	-	excellent		
2071	X	2071	Tree	Prosopis spp.	140	125	6 to 12	-	excellent	Salvage for fuel wood	
2072			Tree	Prosopis spp.	108	86	< 3	-	excellent		
2073			Tree	Prosopis spp.	96	72	< 3	-	excellent		
2074	X	2074	Tree	Prosopis spp.	360	248	> 12	-	excellent	Salvage for fuel wood	
2075			Tree	Prosopis spp.	120	108	< 3	-	excellent		
2076			Tree	Prosopis spp.	96	84	< 3	-	excellent		
2077	X	2077	Tree	Prosopis spp.	120	120	3 to 6	-	excellent	Salvage for fuel wood	
2078	X	2078	Tree	Prosopis spp.	144	144	3 to 6	-	excellent	Salvage for fuel wood	
2079	X	2079	Tree	Prosopis spp.	130	108	3 to 6	-	excellent	Salvage for fuel wood	
2080	X	2080	Tree	Prosopis spp.	120	120	6 to 12	-	excellent	Salvage for fuel wood	
2081	X	2081	Tree	Prosopis spp.	180	120	> 12	-	excellent	Salvage for fuel wood	
2082			Shrub	Larrea tridentata	48	38	-	-	excellent		
2083	X	2083	Tree	Prosopis spp.	48	80	3 to 6	-	excellent	Salvage for fuel wood	
2084	X	2084	Tree	Prosopis spp.	216	168	6 to 12	-	excellent	Salvage for fuel wood	
2085	X	2085	Tree	Prosopis spp.	144	120	3 to 6	-	excellent	Salvage for fuel wood	
2086			Tree	Prosopis spp.	72	72	< 3	-	excellent		
2087			Tree	Prosopis spp.	120	72	< 3	-	excellent		
2088			Tree	Prosopis spp.	108	84	< 3	-	excellent		
2089	X	2089	Tree	Prosopis spp.	144	96	3 to 6	-	excellent	Salvage for fuel wood	
2090										Number Not Used	
2091	X	2091	Cactus	Echinocactus spp.	48	36	-	31	excellent	Salvage and Replant	
2092	X	2092	Tree	Prosopis spp.	240	168	6 to 12	-	excellent	Salvage for fuel wood	
2093	X	2093	Tree	Prosopis spp.	168	120	3 to 6	-	excellent	Salvage for fuel wood	
2094			Tree	Prosopis spp.	144	120	6 to 12	-	excellent		
2095	X	2095	Tree	Prosopis spp.	168	120	6 to 12	-	excellent	Salvage for fuel wood	
2096			Tree	Parkinsonia spp.	60	60	< 3	-	excellent		
2097	X	2097	Tree	Prosopis spp.	144	120	3 to 6	-	excellent	Salvage for fuel wood	
2098			Tree	Parkinsonia spp.	50	85	3 to 6	-	excellent		
2099	X	2099	Tree	Prosopis spp.	144	120	3 to 6	-	excellent	Salvage for fuel wood	
2100	X	2100	Tree	Prosopis spp.	320	210	> 12	-	excellent	Salvage for fuel wood	
2101			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2102	X	2102	Tree	Prosopis spp.	60	72	3 to 6	-	excellent	Salvage for fuel wood	
2103	X	2103	Tree	Prosopis spp.	240	144	6 to 12	-	excellent	Salvage for fuel wood	
2104	X	2104	Tree	Prosopis spp.	156	120	3 to 6	-	excellent	Salvage for fuel wood	
2105			Tree	Prosopis spp.	96	72	< 3	-	excellent		
2106			Tree	Prosopis spp.	108	84	< 3	-	excellent		
2107			Tree	Prosopis spp.	110	96	< 3	-	excellent		
2108			Tree	Parkinsonia spp.	60	80	< 3	-	excellent		
2109			Tree	Prosopis spp.	108	84	< 3	-	excellent		
2110	X	2110	Tree	Prosopis spp.	180	120	3 to 6	-	excellent	Salvage for fuel wood	
2111	X	2111	Tree	Prosopis spp.	30	60	3 to 6	-	excellent	Salvage for fuel wood	
2112			Tree	Prosopis spp.	76	74	< 3	-	excellent		
2113	X	2113	Tree	Prosopis spp.	55	95	3 to 6	-	excellent	Salvage for fuel wood	
2114	X	2114	Tree	Prosopis spp.	288	180	6 to 12	-	excellent	Salvage for fuel wood	
2115	X	2115	Tree	Prosopis spp.	168	120	3 to 6	-	excellent	Salvage for fuel wood	
2116	X	2116	Tree	Prosopis spp.	192	120	3 to 6	-	excellent	Salvage for fuel wood	
2117	X	2117	Tree	Prosopis spp.	168	120	3 to 6	-	excellent	Salvage for fuel wood	
2118	X	2118	Tree	Prosopis spp.	240	144	6 to 12	-	excellent	Salvage for fuel wood	
2119	X	2119	Tree	Prosopis spp.	150	170	6 to 12	-	excellent	Salvage for fuel wood	
2120			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2121			Tree	Parkinsonia spp.	25	108	< 3	-	excellent		
2122			Tree	Prosopis spp.	120	108	< 3	-	excellent		
2123			Tree	Parkinsonia spp.	25	90	< 3	-	excellent		
2124			Tree	Prosopis spp.	12	84	< 3	-	excellent		
2125			Tree	Prosopis spp.	96	72	< 3	-	excellent		
2126	X	2126	Tree	Prosopis spp.	110	98	3 to 6	-	excellent	Salvage for fuel wood	
2127			Tree	Prosopis spp.	96	72	< 3	-	excellent		
2128			Tree	Prosopis spp.	120	84	< 3	-	excellent		
2129			Tree	Prosopis spp.	96	72	< 3	-	excellent		
2130			Tree	Prosopis spp.	120	72	6 to 12	-	excellent		
2131			Tree	Prosopis spp.	10	84	< 3	-	excellent		
2132	X	2132	Tree	Prosopis spp.	216	180	6 to 12	-	excellent	Salvage for fuel wood	
2133			Tree	Prosopis spp.	50	70	< 3	-	excellent		
2134			Tree	Prosopis spp.	50	60	< 3	-	excellent		
2135	X	2135	Tree	Prosopis spp.	216	168	6 to 12	-	excellent	Salvage for fuel wood	
2136	X	2136	Tree	Prosopis spp.	216	144	6 to 12	-	excellent	Salvage for fuel wood	
2137	X	2137	Tree	Prosopis spp.	85	80	3 to 6	-	excellent	Salvage for fuel wood	
2138			Tree	Prosopis spp.	108	86	< 3	-	excellent		
2139			Tree	Prosopis spp.	108	84	< 3	-	excellent		
2140			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2141			Tree	Prosopis spp.	96	72	< 3	-	excellent		
2142	X	2142	Tree	Prosopis spp.	120	125	6 to 12	-	excellent	Salvage for fuel wood	
2143	X	2143	Tree	Prosopis spp.	196	144	3 to 6	-	excellent	Salvage for fuel wood	
2144	X	2144	Tree	Prosopis spp.	120	108	6 to 12	-	excellent	Salvage for fuel wood	
2145	X	2145	Tree	Prosopis spp.	240	180	> 12	-	excellent	Salvage for fuel wood	
2146	X	2146	Tree	Prosopis spp.	216	168	6 to 12	-	excellent	Salvage for fuel wood	
2147			Tree	Prosopis spp.	96	72	< 3	-	excellent		
2148			Tree	Prosopis spp.	96	72	< 3	-	excellent		
2149	X	2149	Tree	Prosopis spp.	140	130	6 to 12	-	excellent	Salvage for fuel wood	
2150			Tree	Prosopis spp.	96	96	< 3	-	excellent		
2151	X	2151	Tree	Prosopis spp.	240	144	6 to 12	-	excellent	Salvage for fuel wood	
2152			Tree	Prosopis spp.	55	50	< 3	-	excellent		
2153			Tree	Prosopis spp.	106	86	< 3	-	excellent		
2154			Tree	Prosopis spp.	108	86	< 3	-	excellent		
2155			Tree	Prosopis spp.	96	72	< 3	-	excellent		
2156	X	2156	Tree	Prosopis spp.	156	120	3 to 6	-	excellent	Salvage for fuel wood	
2157	X	2157	Tree	Prosopis spp.	240	180	> 12	-	excellent	Salvage for fuel wood	
2158	X	2158	Tree	Prosopis spp.	156	128	3 to 6	-	excellent	Salvage for fuel wood	
2159	X	2159	Tree	Prosopis spp.	140	120	3 to 6	-	excellent	Salvage for fuel wood	
2160	X	2160	Tree	Prosopis spp.	120	108	3 to 6	-	excellent	Salvage for fuel wood	
2161			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2162			Tree	Prosopis spp.	60	50	< 3	-	excellent		
2163	X	2163	Tree	Prosopis spp.	360	240	> 12	-	excellent	Salvage for fuel wood	
2164	X	2164	Tree	Prosopis spp.	120	108	3 to 6	-	excellent	Salvage for fuel wood	
2165	X	2165	Tree	Prosopis spp.	240	192	6 to 12	-	excellent	Salvage for fuel wood	
2166	X	2166	Tree	Prosopis spp.	150	135	3 to 6	-	excellent	Salvage for fuel wood	
2167	X	2167	Tree	Prosopis spp.	175	140	3 to 6	-	excellent	Salvage for fuel wood	
2168	X	2168	Tree	Prosopis spp.	196	144	3 to 6	-	excellent	Salvage for fuel wood	
2169			Tree	Prosopis spp.	65	72	< 3	-	excellent		
2170			Tree	Prosopis spp.	48	50	< 3	-	excellent		
2171	X	2171	Tree	Prosopis spp.	360	196	> 12	-	excellent	Salvage for fuel wood	
2172			Tree	Prosopis spp.	109	96	< 3	-	excellent		
2173			Tree	Prosopis spp.	60	50	< 3	-	excellent		
2174	X	2174	Tree	Prosopis spp.	198	120	6 to 12	-	excellent	Salvage for fuel wood	
2175	X	2175	Tree	Prosopis spp.	108	80	3 to 6	-	excellent	Salvage for fuel wood	
2176			Tree	Prosopis spp.	108	60	< 3	-	excellent		
2177	X	2177	Tree	Prosopis spp.	120	96	3 to 6	-	excellent	Salvage for fuel wood	
2178			Tree	Prosopis spp.	120	108	< 3	-	excellent		
2179			Tree	Prosopis spp.	84	84	< 3	-	excellent		
2180	X	2180	Tree	Prosopis spp.	120	100	3 to 6	-	excellent	Salvage for fuel wood	
2181			Tree	Prosopis spp.	132	96	< 3	-	excellent		
2182	X	2182	Tree	Prosopis spp.	180	120	3 to 6	-	excellent	Salvage for fuel wood	
2183			Tree	Prosopis spp.	120	108	< 3	-	excellent		
2184			Tree	Prosopis spp.	55	70	< 3	-	excellent		
2185	X	2185	Tree	Prosopis spp.	216	144	6 to 12	-	excellent	Salvage for fuel wood	
2186	X	2186	Tree	Prosopis spp.	90	80	3 to 6	-	excellent	Salvage for fuel wood	
2187			Tree	Prosopis spp.	144	120	< 3	-	excellent		
2188	X	2188	Tree	Prosopis spp.	100	90	3 to 6	-	excellent	Salvage for fuel wood	
2189	X	2189	Tree	Prosopis spp.	156	128	3 to 6	-	excellent	Salvage for fuel wood	
2190			Tree	Prosopis spp.	120	128	< 3	-	excellent		
2191			Tree	Prosopis spp.	108	108	< 3	-	excellent		
2192	X	2192	Tree	Prosopis spp.	156	132	6 to 12	-	excellent	Salvage for fuel wood	
2193	X	2193	Tree	Prosopis spp.	90	80	3 to 6	-	excellent	Salvage for fuel wood	
2194			Tree	Prosopis spp.	109	144	< 3	-	excellent		
2195			Tree	Prosopis spp.	120	108	< 3	-	excellent		
2196			Tree	Prosopis spp.	40	70	< 3	-	excellent		
2197	X	2197	Tree	Prosopis spp.	196	144	6 to 12	-	excellent	Salvage for fuel wood	
2198			Tree	Prosopis spp.	192	144	< 3	-	excellent		
2199	X	2199	Tree	Prosopis spp.	250	160	> 12	-	excellent	Salvage for fuel wood	
2200			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2201			Tree	Prosopis spp.	144	120	< 3	-	excellent		
2202	X	2202	Tree	Prosopis spp.	175	130	> 12	-	excellent	Salvage for fuel wood	
2203			Tree	Prosopis spp.	192	144	6 to 12	-	excellent		
2204	X	2204	Tree	Prosopis spp.	156	144	6 to 12	-	excellent	Salvage for fuel wood	
2205			Tree	Prosopis spp.	40	60	< 3	-	excellent		
2206	X	2206	Tree	Prosopis spp.	150	150	> 12	-	excellent	Salvage for fuel wood	
2207	X	2207	Tree	Prosopis spp.	180	144	6 to 12	-	excellent	Salvage for fuel wood	
2208			Tree	Prosopis spp.	132	108	< 3	-	excellent		
2209			Tree	Prosopis spp.	90	80	< 3	-	excellent		
2210			Tree	Parkinsonia aculeata	130	110	3 to 6	-	excellent		
2211	X	2211	Tree	Prosopis spp.	216	168	6 to 12	-	excellent	Salvage for fuel wood	
2212	X	2212	Tree	Prosopis spp.	216	168	3 to 6	-	excellent	Salvage for fuel wood	
2213	X	2213	Tree	Prosopis spp.	100	90	3 to 6	-	excellent	Salvage for fuel wood	
2214	X	2214	Tree	Prosopis spp.	155	130	3 to 6	-	excellent	Salvage for fuel wood	
2215	X	2215	Tree	Prosopis spp.	216	168	6 to 12	-	excellent	Salvage for fuel wood	
2216	X	2216	Tree	Prosopis spp.	180	144	6 to 12	-	excellent	Salvage for fuel wood	
2217	X	2217	Tree	Prosopis spp.	300	150	> 12	-	excellent	Salvage for fuel wood	
2218	X	2218	Tree	Prosopis spp.	240	196	6 to 12	-	excellent	Salvage for fuel wood	
2219	X	2219	Tree	Prosopis spp.	216	156	3 to 6	-	excellent	Salvage for fuel wood	
2220	X	2220	Tree	Prosopis spp.	216	156	6 to 12	-	excellent	Salvage for fuel wood	
2221	X	2221	Tree	Prosopis spp.	250	144	> 12	-	excellent	Salvage for fuel wood	
2222			Tree	Prosopis spp.	50	85	< 3	-	excellent		
2223	X	2223	Tree	Prosopis spp.	288	196	6 to 12	-	excellent	Salvage for fuel wood	
2224			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2225	X	2225	Tree	Prosopis spp.	300	216	6 to 12	-	excellent	Salvage for fuel wood	
2226	X	2226	Tree	Prosopis spp.	90	88	3 to 6	-	excellent	Salvage for fuel wood	

NOTE:

All plant material noted to be 'Salvage for Fuel Wood' or 'Salvage and Replant', that will not be disturbed by construction, is to be protected-in-place.

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT — CERTIFICATE NO. 27437 — STEVEN E. LOHIDE — ARIZONA — 06/11/2024

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

PLANT INVENTORY DATA TABLES

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	14	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-02.12

TRACS NO. F0721 01C

ADOT

____ OF ____

PLANT INVENTORY DATA TABLES

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
2227	X	2227	Tree	Prosopis spp.	600	360	> 12	-	excellent	Salvage for fuel wood	
2228	X	2228	Tree	Prosopis spp.	140	150	6 to 12	-	excellent	Salvage for fuel wood	
2229			Tree	Prosopis spp.	120	109	< 3	-	excellent		
2230			Tree	Prosopis spp.	144	109	< 3	-	excellent		
2231	X	2231	Tree	Prosopis spp.	196	144	> 12	-	excellent	Salvage for fuel wood	
2232			Tree	Prosopis spp.	108	86	< 3	-	excellent		
2233			Tree	Prosopis spp.	96	84	< 3	-	excellent		
2234	X	2234	Tree	Prosopis spp.	200	120	6 to 12	-	excellent	Salvage for fuel wood	
2235			Tree	Prosopis spp.	84	72	< 3	-	excellent		
2236			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2237	X	2237	Tree	Prosopis spp.	240	196	6 to 12	-	excellent	Salvage for fuel wood	
2238	X	2238	Tree	Prosopis spp.	70	48	3 to 6	-	excellent	Salvage for fuel wood	
2239	X	2239	Tree	Prosopis spp.	156	120	3 to 6	-	excellent	Salvage for fuel wood	
2240	X	2240	Tree	Prosopis spp.	140	160	> 12	-	excellent	Salvage for fuel wood	
2241			Tree	Parkinsonia aculeata	54	60	6 to 12	-	excellent		
2242	X	2242	Tree	Prosopis spp.	180	144	3 to 6	-	excellent	Salvage for fuel wood	
2243			Tree	Prosopis spp.	109	84	< 3	-	excellent		
2244			Tree	Prosopis spp.	72	70	< 3	-	excellent		
2245	X	2245	Tree	Prosopis spp.	156	120	3 to 6	-	excellent	Salvage for fuel wood	
2246			Tree	Prosopis spp.	70	75	< 3	-	excellent		
2247	X	2247	Tree	Prosopis spp.	216	156	6 to 12	-	excellent	Salvage for fuel wood	
2248	X	2248	Tree	Prosopis spp.	80	80	3 to 6	-	excellent	Salvage for fuel wood	
2249			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2250			Tree	Prosopis spp.	84	72	< 3	-	excellent		
2251	X	2251	Tree	Prosopis spp.	180	168	3 to 6	-	excellent	Salvage for fuel wood	
2252			Tree	Prosopis spp.	120	120	< 3	-	excellent		
2253	X	2253	Tree	Prosopis spp.	120	110	3 to 6	-	excellent	Salvage for fuel wood	
2254	X	2254	Tree	Prosopis spp.	196	144	3 to 6	-	excellent	Salvage for fuel wood	
2255	X	2255	Tree	Prosopis spp.	120	110	3 to 6	-	excellent	Salvage for fuel wood	
2256	X	2256	Tree	Prosopis spp.	216	168	6 to 12	-	excellent	Salvage for fuel wood	
2257			Tree	Parkinsonia aculeata	80	100	3 to 6	-	excellent		
2258			Tree	Prosopis spp.	70	60	< 3	-	excellent		
2259	X	2259	Tree	Prosopis spp.	240	168	6 to 12	-	excellent	Salvage for fuel wood	
2260	X	2260	Tree	Prosopis spp.	720	480	> 12	-	excellent	Salvage for fuel wood	
2261	X	2261	Cactus	Carnegiea gigantea	0	125	-	8	excellent	Salvage and Replant	
2262			Tree	Prosopis spp.	120	109	< 3	-	excellent		
2263			Tree	Prosopis spp.	144	96	6 to 12	-	excellent		
2264			Tree	Parkinsonia aculeata	24	84	< 3	-	excellent		
2265			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2266			Tree	Prosopis spp.	144	144	< 3	-	excellent		
2267			Tree	Parkinsonia aculeata	72	120	< 3	-	excellent		
2268	X	2268	Tree	Prosopis spp.	300	216	6 to 12	-	excellent	Salvage for fuel wood	
2269			Tree	Prosopis spp.	156	128	< 3	-	excellent		
2270	X	2270	Tree	Prosopis spp.	196	144	> 12	-	excellent	Salvage for fuel wood	
2271			Tree	Prosopis spp.	72	60	< 3	-	excellent		
2272	X	2272	Tree	Prosopis spp.	240	480	> 12	-	excellent	Salvage for fuel wood	
2273			Tree	Parkinsonia aculeata	72	84	3 to 6	-	excellent		
2274			Tree	Prosopis spp.	84	72	< 3	-	excellent		
2275			Tree	Prosopis spp.	84	84	< 3	-	excellent		
2276	X	2276	Tree	Prosopis spp.	300	216	6 to 12	-	excellent	Salvage for fuel wood	
2277			Tree	Prosopis spp.	128	108	< 3	-	excellent		
2278	X	2278	Tree	Prosopis spp.	196	144	3 to 6	-	excellent	Salvage for fuel wood	
2279			Tree	Prosopis spp.	120	120	< 3	-	excellent		
2280			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2281			Tree	Prosopis spp.	144	120	< 3	-	excellent		
2282			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2283			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2284	X	2284	Tree	Prosopis spp.	80	84	3 to 6	-	excellent	Salvage for fuel wood	
2285			Tree	Prosopis spp.	144	96	< 3	-	excellent		
2286	X	2286	Tree	Prosopis spp.	156	144	3 to 6	-	excellent	Salvage for fuel wood	
2287			Tree	Prosopis spp.	108	84	< 3	-	excellent		
2288			Tree	Prosopis spp.	84	84	< 3	-	excellent		
2289			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2290			Tree	Prosopis spp.	96	84	< 3	-	excellent		
2291			Tree	Prosopis spp.	96	96	< 3	-	excellent		
2292	X	2292	Tree	Prosopis spp.	360	300	> 12	-	excellent	Salvage for fuel wood	
2293			Tree	Prosopis spp.	108	120	< 3	-	excellent		
2294			Tree	Prosopis spp.	108	120	< 3	-	excellent		
2295	X	2295	Tree	Prosopis spp.	96	144	6 to 12	-	excellent	Salvage for fuel wood	
2296	X	2296	Tree	Prosopis spp.	250	150	> 12	-	excellent	Salvage for fuel wood	
2297			Tree	Prosopis spp.	96	72	< 3	-	excellent		
2298			Tree	Prosopis spp.	96	96	< 3	-	excellent		
2299	X	2299	Tree	Prosopis spp.	80	110	3 to 6	-	excellent	Salvage for fuel wood	
2300			Tree	Prosopis spp.	120	120	< 3	-	excellent		
2301			Tree	Prosopis spp.	156	144	< 3	-	excellent		
2302	X	2302	Tree	Prosopis spp.	196	156	3 to 6	-	excellent	Salvage for fuel wood	
2303			Tree	Prosopis spp.	70	80	< 3	-	excellent		
2304			Tree	Prosopis spp.	156	144	< 3	-	excellent		
2305	X	2305	Tree	Prosopis spp.	144	120	3 to 6	-	excellent	Salvage for fuel wood	
2306			Tree	Prosopis spp.	40	60	< 3	-	excellent		
2307			Tree	Prosopis spp.	70	65	< 3	-	excellent		
2308			Tree	Prosopis spp.	50	72	< 3	-	excellent		
2309	X	2309	Tree	Prosopis spp.	156	144	3 to 6	-	excellent	Salvage for fuel wood	
2310	X	2310	Tree	Prosopis spp.	110	120	3 to 6	-	excellent	Salvage for fuel wood	
2311	X	2311	Tree	Prosopis spp.	216	144	6 to 12	-	excellent	Salvage for fuel wood	
2312			Shrub	Baccharis spp.	84	72	-	-	excellent		
2313	X	2313	Tree	Prosopis spp.	80	90	3 to 6	-	excellent	Salvage for fuel wood	
2314	X	2314	Tree	Prosopis spp.	144	108	6 to 12	-	excellent	Salvage for fuel wood	
2315			Tree	Prosopis spp.	132	120	< 3	-	excellent		
2316			Tree	Prosopis spp.	50	78	< 3	-	excellent		
2317			Tree	Parkinsonia aculeata	144	132	> 12	-	excellent		
2318			Tree	Prosopis spp.	128	120	< 3	-	excellent		
2319			Tree	Prosopis spp.	180	120	< 3	-	excellent		
2320	X	2320	Tree	Prosopis spp.	216	180	6 to 12	-	excellent	Salvage for fuel wood	
2321	X	2321	Tree	Prosopis spp.	240	140	> 12	-	excellent	Salvage for fuel wood	
2322	X	2322	Tree	Prosopis spp.	156	120	3 to 6	-	excellent	Salvage for fuel wood	
2323			Tree	Tamarix ramosissima	80	90	3 to 6	-	excellent		
2324			Tree	Prosopis spp.	120	108	< 3	-	excellent		
2325			Tree	Prosopis spp.	72	72	< 3	-	excellent		
2326	X	2326	Tree	Prosopis spp.	216	156	6 to 12	-	excellent	Salvage for fuel wood	
2327	X	2327	Tree	Prosopis spp.	210	150	6 to 12	-	excellent	Salvage for fuel wood	
2328	X	2328	Tree	Prosopis spp.	220	144	3 to 6	-	excellent	Salvage for fuel wood	
2329	X	2329	Tree	Prosopis spp.	144	144	3 to 6	-	excellent	Salvage for fuel wood	
2330	X	2330	Tree	Prosopis spp.	120	120	3 to 6	-	excellent	Salvage for fuel wood	
2331			Tree	Prosopis spp.	144	144	< 3	-	excellent		
2332			Shrub	Baccharis spp.	48	84	-	-	excellent		
2333			Shrub	Baccharis spp.	72	96	-	-	excellent		
2334			Shrub	Baccharis spp.	72	108	-	-	excellent		
2335	X	2335	Tree	Prosopis spp.	150	144	3 to 6	-	excellent	Salvage for fuel wood	
2336	X	2336	Tree	Prosopis spp.	156	120	3 to 6	-	excellent	Salvage for fuel wood	
2337	X	2337	Tree	Prosopis spp.	200	130	6 to 12	-	excellent	Salvage for fuel wood	
2338	X	2338	Tree	Prosopis spp.	240	156	6 to 12	-	excellent	Salvage for fuel wood	
2339			Tree	Prosopis spp.	108	84	< 3	-	excellent		
2340	X	2340	Tree	Prosopis spp.	105	85	3 to 6	-	excellent	Salvage for fuel wood	
2341	X	2341	Tree	Prosopis spp.	95	85	3 to 6	-	excellent	Salvage for fuel wood	
2342	X	2342	Tree	Prosopis spp.	180	150	> 12	-	excellent	Salvage for fuel wood	
2343	X	2343	Tree	Prosopis spp.	115	90	6 to 12	-	excellent	Salvage for fuel wood	
2344	X	2344	Tree	Prosopis spp.	100	90	3 to 6	-	excellent	Salvage for fuel wood	
2345	X	2345	Tree	Prosopis spp.	100	90	3 to 6	-	excellent	Salvage for fuel wood	
2346			Tree	Prosopis spp.	48	72	< 3	-	excellent		
2347	X	2347	Tree	Prosopis spp.	110	95	3 to 6	-	excellent	Salvage for fuel wood	
2348	X	2348	Tree	Prosopis spp.	210	160	> 12	-	excellent	Salvage for fuel wood	
2349	X	2349	Tree	Prosopis spp.	140	144	3 to 6	-	excellent	Salvage for fuel wood	
2350			Tree	Prosopis spp.	50	90	< 3	-	excellent		
2351			Tree	Prosopis spp.	70	60	< 3	-	excellent		
2352	X	2352	Tree	Prosopis spp.	110	85	3 to 6	-	excellent	Salvage for fuel wood	
2353			Tree	Prosopis spp.	96	96	< 3	-	excellent		
2354	X	2354	Tree	Prosopis spp.	120	96	3 to 6	-	excellent	Salvage for fuel wood	
2355	X	2355	Tree	Prosopis spp.	150	120	3 to 6	-	excellent	Salvage for fuel wood	
2356	X	2356	Tree	Prosopis spp.	95	84	3 to 6	-	excellent	Salvage for fuel wood	
2357	X	2357	Tree	Prosopis spp.	128	120	3 to 6	-	excellent	Salvage for fuel wood	
2358			Tree	Prosopis spp.	72	96	< 3	-	excellent		
2359			Tree	Prosopis spp.	84	96	< 3	-	excellent		
2360			Tree	Prosopis spp.	84	96	< 3	-	excellent		
2361			Tree	Prosopis spp.	120	120	< 3	-	excellent		
2362	X	2362	Tree	Prosopis spp.	250	180	> 12	-	excellent	Salvage for fuel wood	
2363			Tree	Prosopis spp.	156	120	6 to 12	-	excellent		
2364			Shrub	Baccharis spp.	84	72	-	-	excellent		
2365			Shrub	Baccharis spp.	72	84	-	-	excellent		
2366	X	2366	Tree	Prosopis spp.	90	120	3 to 6	-	excellent	Salvage for fuel wood	
2367	X	2367	Tree	Prosopis spp.	156	144	3 to 6	-	excellent	Salvage for fuel wood	
2368	X	2368	Tree	Prosopis spp.	216	168	6 to 12	-	excellent	Salvage for fuel wood	
2369	X	2369	Tree	Prosopis spp.	180	100	6 to 12	-	excellent	Salvage for fuel wood	
2370			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2371			Tree	Parkinsonia spp.	70	55	< 3	-	excellent		
2372			Tree	Prosopis spp.	120	96	< 3	-	excellent		
2373	X	2373	Tree	Prosopis spp.	75	100	3 to 6	-	excellent	Salvage for fuel wood	
2374	X	2374	Tree	Prosopis spp.	240	180	> 12	-	excellent	Salvage for fuel wood	
2375			Tree	Prosopis spp.	80	80	< 3	-	excellent		
2376			Tree	Prosopis spp.	96	84	< 3	-	excellent		
2377	X	2377	Tree	Prosopis spp.	90	85	6 to 12	-	excellent	Salvage for fuel wood	
2378	X	2378	Tree	Prosopis spp.	216	180	6 to 12	-	excellent	Salvage for fuel wood	
2379			Tree	Prosopis spp.	90	85	< 3	-	excellent		
2380	X	2380	Tree	Prosopis spp.	145	120	6 to 12	-	excellent	Salvage for fuel wood	
2381	X	2381	Tree	Prosopis spp.	264	180	> 12	-	excellent	Salvage for fuel wood	
2382	X	2382	Tree	Prosopis spp.	85	80	3 to 6	-	excellent	Salvage for fuel wood	
2383			Tree	Prosopis spp.	72	60	< 3	-	excellent		
2384	X	2384	Tree	Prosopis spp.	100	95	3 to 6	-	excellent	Salvage for fuel wood	
2385	X	2385	Tree	Prosopis spp.	200	120	6 to 12	-	excellent	Salvage for fuel wood	
2386			Tree	Prosopis spp.	110	90	< 3	-	excellent		
2387	X	2387	Tree	Prosopis spp.	250	120	3 to 6	-	excellent	Salvage for fuel wood	
2388			Shrub	Larrea tridentata	72	96	-	-	excellent		
2389										Number Not Used	
2390			Shrub	Larrea tridentata	120	84	-	-	excellent		
2391	X	2391	Tree	Prosopis spp.	100	90	3 to 6	-	excellent	Salvage for fuel wood	
2392			Tree	Parkinsonia aculeata	196	196	> 12	-	excellent		
2393			Shrub	Larrea tridentata	60	72	-	-	excellent		
2394	X	2394	Tree	Prosopis spp.	300	160	> 12	-	excellent	Salvage for fuel wood	
2395			Tree	Prosopis spp.	40	85	< 3	-	excellent		
2396	X	2396	Tree	Prosopis spp.	100	90	3 to 6	-	excellent	Salvage for fuel wood	
2397	X	2397	Tree	Prosopis spp.	130	120	3 to 6	-	excellent	Salvage for fuel wood	
2398	X	2398	Tree	Prosopis spp.	280	120	> 12	-	excellent	Salvage for fuel wood	
2399	X	2399	Tree	Prosopis spp.	170	144	6 to 12	-	excellent		
2400	X	2400	Tree	Prosopis spp.	180	150	3 to 6	-	excellent	Salvage for fuel wood	
2401	X	2401	Tree	Prosopis spp.	110	100	3 to 6	-	excellent	Salvage for fuel wood	
2402	X	2402	Tree	Prosopis spp.	75	80	3 to 6	-	excellent	Salvage for fuel wood	
2403	X	2403	Tree	Prosopis spp.	90	85	3 to 6	-	excellent	Salvage for fuel wood	
2404	X	2404	Tree	Prosopis spp.	180	130	6 to 12	-	excellent	Salvage for fuel wood	
2405	X	2405	Tree	Prosopis spp.	60	100	3 to 6	-	excellent	Salvage for fuel wood	
2406	X	2406	Tree	Prosopis spp.	200	144	3 to 6	-	excellent	Salvage for fuel wood	
2407			Tree	Prosopis spp.	72	84	< 3	-	excellent		
2408			Tree	Prosopis spp.	80	96	< 3	-	excellent		
2409	X	2409	Tree	Prosopis spp.	100	96	3 to 6	-	excellent	Salvage for fuel wood	
2410	X	2410	Tree	Prosopis spp.	110	108	3 to 6	-	excellent	Salvage for fuel wood	
2411			Tree	Prosopis spp.	65	60	< 3	-	excellent		
2412			Tree	Prosopis spp.	85	80	< 3	-	excellent		

NOTE:

All plant material noted to be 'Salvage for Fuel Wood' or 'Salvage and Replant', that will not be disturbed by construction, is to be protected-in-place.

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

PLANT INVENTORY DATA TABLES

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	15	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-02.13

TRACS NO. F0721 01C

ADOT

____ OF ____

PLANT INVENTORY DATA TABLES

Plant Number	Tag Attached	Tag Number	Point Type	Species	Width (inches)	Height (inches)	Caliper (inches)	No. of Arms or Canes	Health	Notes	Installed Landscape
2413	X	2413	Tree	Prosopis spp.	158	108	> 12	-	excellent	Salvage for fuel wood	
2414										Number Not Used	
2415	X	2415	Tree	Prosopis spp.	110	95	3 to 6	-	excellent	Salvage for fuel wood	
2416	X	2416	Tree	Prosopis spp.	128	120	3 to 6	-	excellent	Salvage for fuel wood	
2417	X	2417	Tree	Prosopis spp.	120	85	3 to 6	-	excellent	Salvage for fuel wood	
2418	X	2418	Tree	Prosopis spp.	85	110	3 to 6	-	excellent	Salvage for fuel wood	
2419	X	2419	Tree	Prosopis spp.	95	72	3 to 6	-	excellent	Salvage for fuel wood	
2420			Tree	Prosopis spp.	96	96	< 3	-	excellent		
2421			Tree	Prosopis spp.	96	96	< 3	-	excellent		
2422			Tree	Prosopis spp.	60	72	< 3	-	excellent		
2423	X	2423	Tree	Prosopis spp.	70	72	3 to 6	-	excellent	Salvage for fuel wood	
2424	X	2424	Tree	Prosopis spp.	132	108	3 to 6	-	excellent	Salvage for fuel wood	
2425	X	2425	Tree	Prosopis spp.	120	84	3 to 6	-	excellent	Salvage for fuel wood	
2426	X	2426	Tree	Prosopis spp.	144	108	3 to 6	-	excellent	Salvage for fuel wood	
2427			Tree	Prosopis spp.	96	84	< 3	-	excellent		

PLANT GROUP DATA TABLE

Plant Group Number	Plant Type	Dominant Species in Group	Group Height (inches)	Avg. Caliper (inches)	Group Width (inches)	Group Avg. Health	Note
3001	Cactus	Opuntia spp	0	-	0		
3002	Trees	Prosopis spp.	44	-	120	Excellent	
3003	Trees	Parkinsonia	8	0.5	5	Excellent	
3004	Trees	Parkinsonia	14	0.5	12	Excellent	
3005	Shrub	Larrea tridentata	0	-	0	Excellent	
3006	Trees	Tamarix ramosissima	48	0.5	36	Excellent	
3007	Trees	Parkinsonia	8	0.5	6	Excellent	
3008	Shrub	Larrea tridentata	0	-	0	Excellent	
3009	Trees	Prosopis spp.	5	0.1	12	Excellent	
3010	Trees	Parkinsonia	12	5	12	Excellent	
3011	Trees	Parkinsonia	12	0.1	5	Excellent	
3012	Shrub	Baccharis spp.	0	-	0	Excellent	
3013	Shrub	Larrea tridentata	50	-	240	Excellent	
3014	Shrub	Larrea tridentata	90	-	108	Excellent	
3015	Shrub	Larrea tridentata	55	-	120	Excellent	
3016	Shrub	Larrea tridentata	76	-	162	Excellent	
3017	Shrub	Larrea tridentata	62	-	180	Excellent	
3018	Shrub	Larrea tridentata	0	-	0	Excellent	
3019	Shrub	Larrea tridentata	72	-	252	Excellent	
3020	Shrub	Larrea tridentata	40	-	132	Excellent	
3021	Shrub	Larrea tridentata	110	-	260	Excellent	
3022	Cactus	Opuntia spp	20	-	192		
3023	Shrub	Larrea tridentata	8	-	10	Excellent	5 individuals
3024	Shrub	Larrea tridentata	10	-	10	Excellent	4 individuals
3025	Shrub	Larrea tridentata	12	-	15	Fair	6 individuals
3026	Trees	Prosopis spp.	36	1.5	60	Excellent	5 individuals
3027	Trees	Prosopis spp.	58	0.25	62	Excellent	35 saplings all multi trunk
3028	Trees	Prosopis spp.	54	0.3	65	Excellent	30 saplings all multi trunk
3029	Trees	Prosopis spp.	46	0.35	52	Excellent	25 sapling all multitrunk
3030	Trees	Prosopis spp.	72	2.5	72	Excellent	3 individuals
3031	Trees	Tamarix ramosissima	72	1.5	70	Good	4 individuals
3032	Trees	Tamarix ramosissima	50	1.5	48	Excellent	
3033	Trees	Prosopis spp.	80	2.5	68	Excellent	4 individuals
3034	Trees	Prosopis spp.	60	2	55	Excellent	3 individuals
3035	Shrub	Larrea tridentata	68	-	145	Excellent	
3036	Trees	Prosopis spp.	100	4	120	Excellent	no tag
3037	Trees	Prosopis spp.	36	1.5	36	Excellent	2 individuals
3038	Trees	Parkinsonia aculeata	86	1.5	72	Excellent	6 individuals
3039	Trees	Parkinsonia aculeata	84	1.5	72	Excellent	4 individuals
3040	Trees	Prosopis spp.	72	1.5	60	Excellent	12 individuals
3041	Shrub	Larrea tridentata	15	-	12	Excellent	8 individuals
3042	Shrub	Larrea tridentata	10	-	8	Excellent	189 individuals
3043	Shrub	Larrea tridentata	15	-	12	Excellent	60 individuals
3044	Trees	Parkinsonia	72	1.5	60	Excellent	4 individuals
3045	Shrub	Larrea tridentata	48	-	36	Excellent	5 individuals
3046	Trees	Prosopis spp.	72	3	96	Good	
3047	Trees	Prosopis spp.	60	2	48	Excellent	5 individuals
3048	Trees	Prosopis spp.	72	1.5	72	Excellent	3 individuals

Plant groupings are denoted on plans as polygon shapes, no tags placed for plant groupings,

NOTE:

All plant material noted to be 'Salvage for Fuel Wood' or 'Salvage and Replant', that will not be disturbed by construction, is to be protected-in-place.

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
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PLANT INVENTORY DATA TABLES

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	16	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

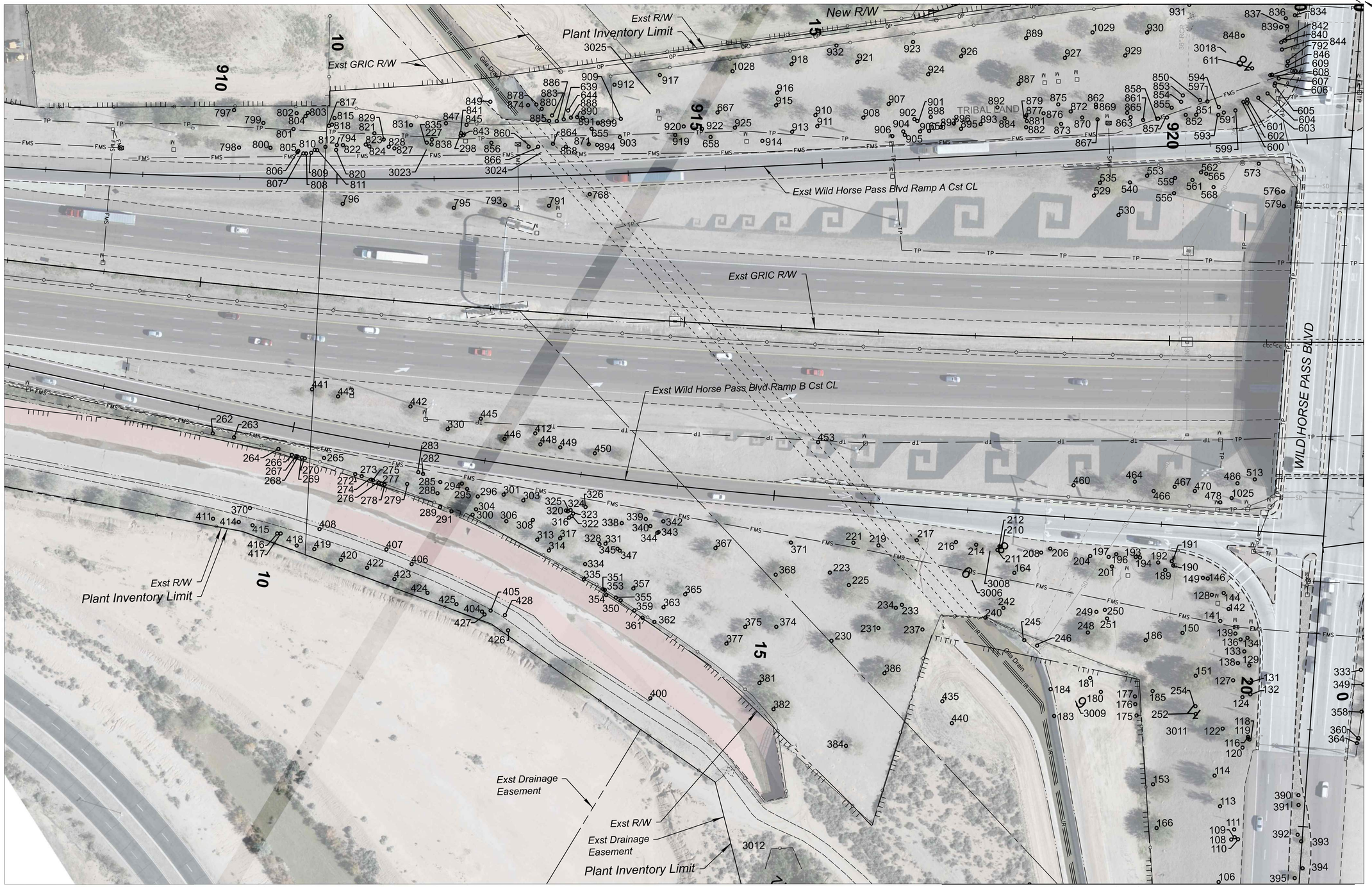
DWG NO. INV-02.14

TRACS NO. F0721 01C

ADOT

____ OF____

MATCHLINE - SEE SHEET INV-03.42



MATCHLINE - SEE SHEET INV-03.41

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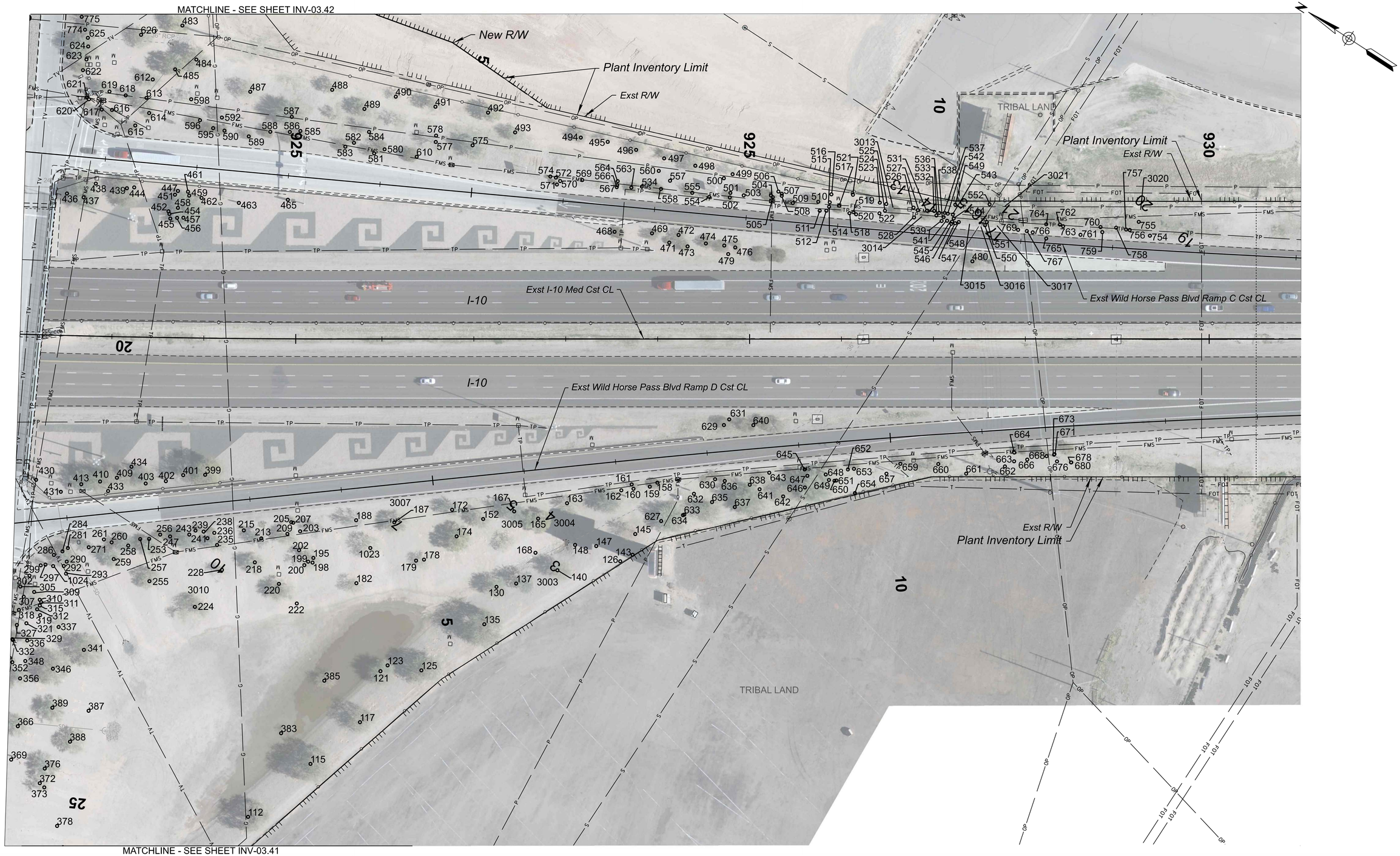
	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
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I-10 MAINLINE
PLANT INVENTORY PLAN
STA 910+00 TO STA 922+00

ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 MA 161	010-C(NFA)	17	64	
MILEPOST	LOCATION I-10 CORRIDOR: 202L TO SR 387						DWG NO. INV-03.01
STRUCTURE NO.	TRACS NO. F0721 01C		ADOT				____ OF ____



	NAME	DATE
DESIGN	SEL	06/24
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ARIZONA DEPARTMENT OF TRANSPORTATION
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I-10 MAINLINE
PLANT INVENTORY PLAN
STA 922+00 TO STA 931+00

ROUTE	MILEPOST	STRUCTURE NO.
I-10		

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	18	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

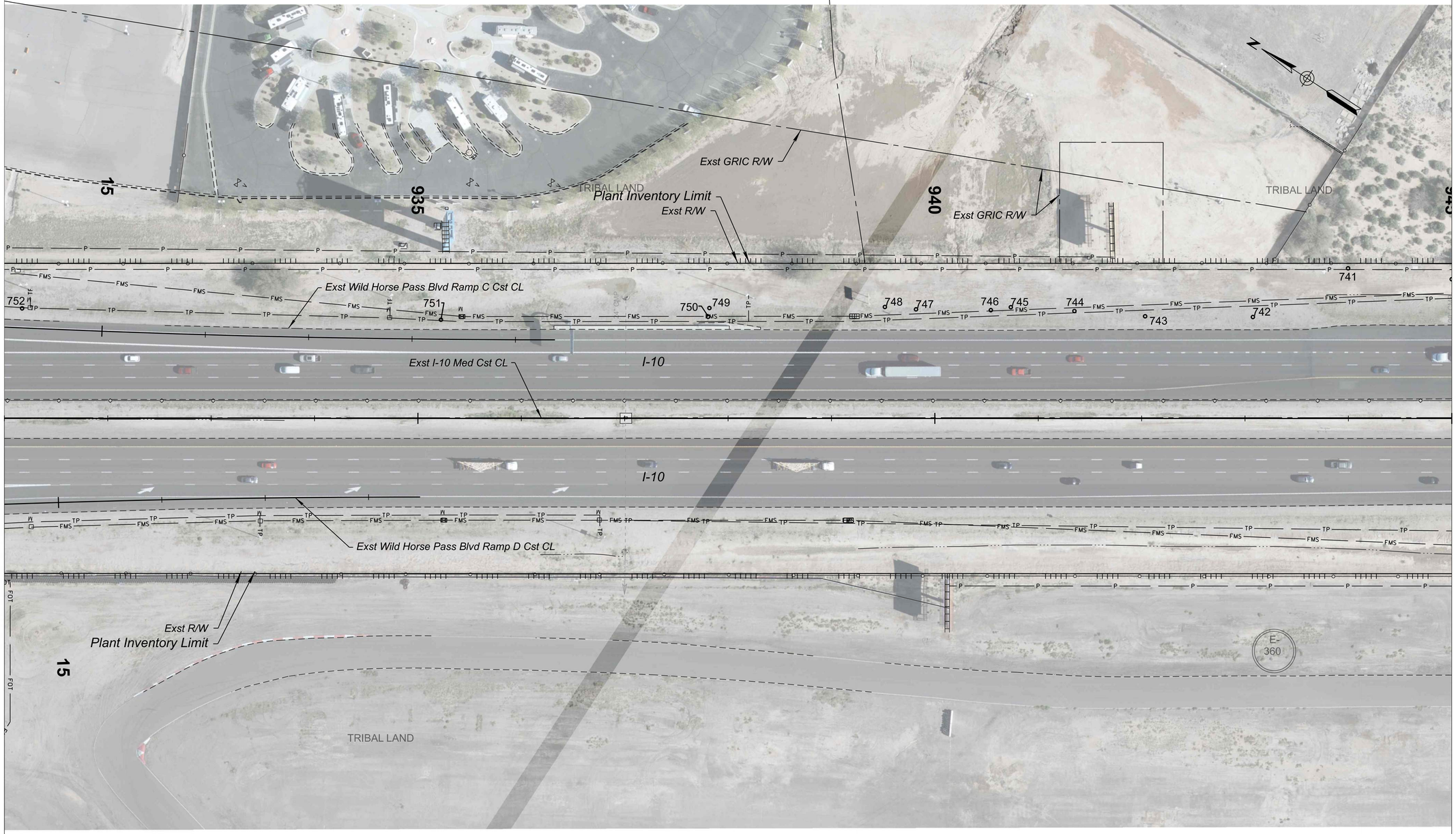
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TRACS NO. F0721 01C

ADOT

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I-10 MAINLINE
PLANT INVENTORY PLAN
STA 931+00 TO STA 945+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	19	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.03

TRACS NO. F0721 01C

ADOT

____ OF ____



	NAME	DATE
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DRAWN	JKP	06/24
CHECKED	SEL	06/24

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I-10 MAINLINE
PLANT INVENTORY PLAN
STA 945+00 TO STA 959+00

ROUTE	MILEPOST	STRUCTURE NO.
I-10		

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	20	64	

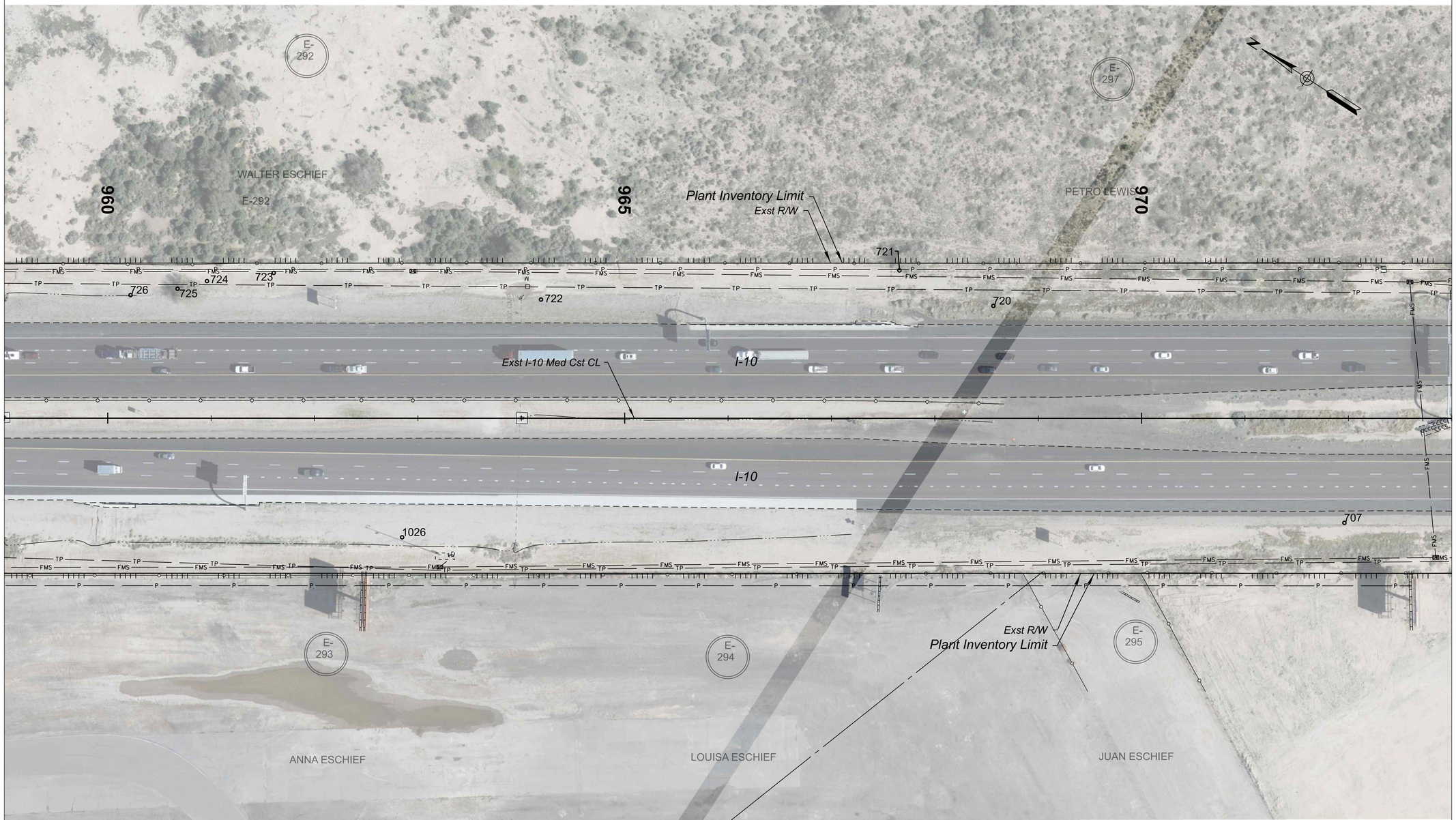
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.04

TRACS NO. F0721 01C

ADOT

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	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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I-10 MAINLINE
PLANT INVENTORY PLAN
STA 959+00 TO STA 973+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	21	64	

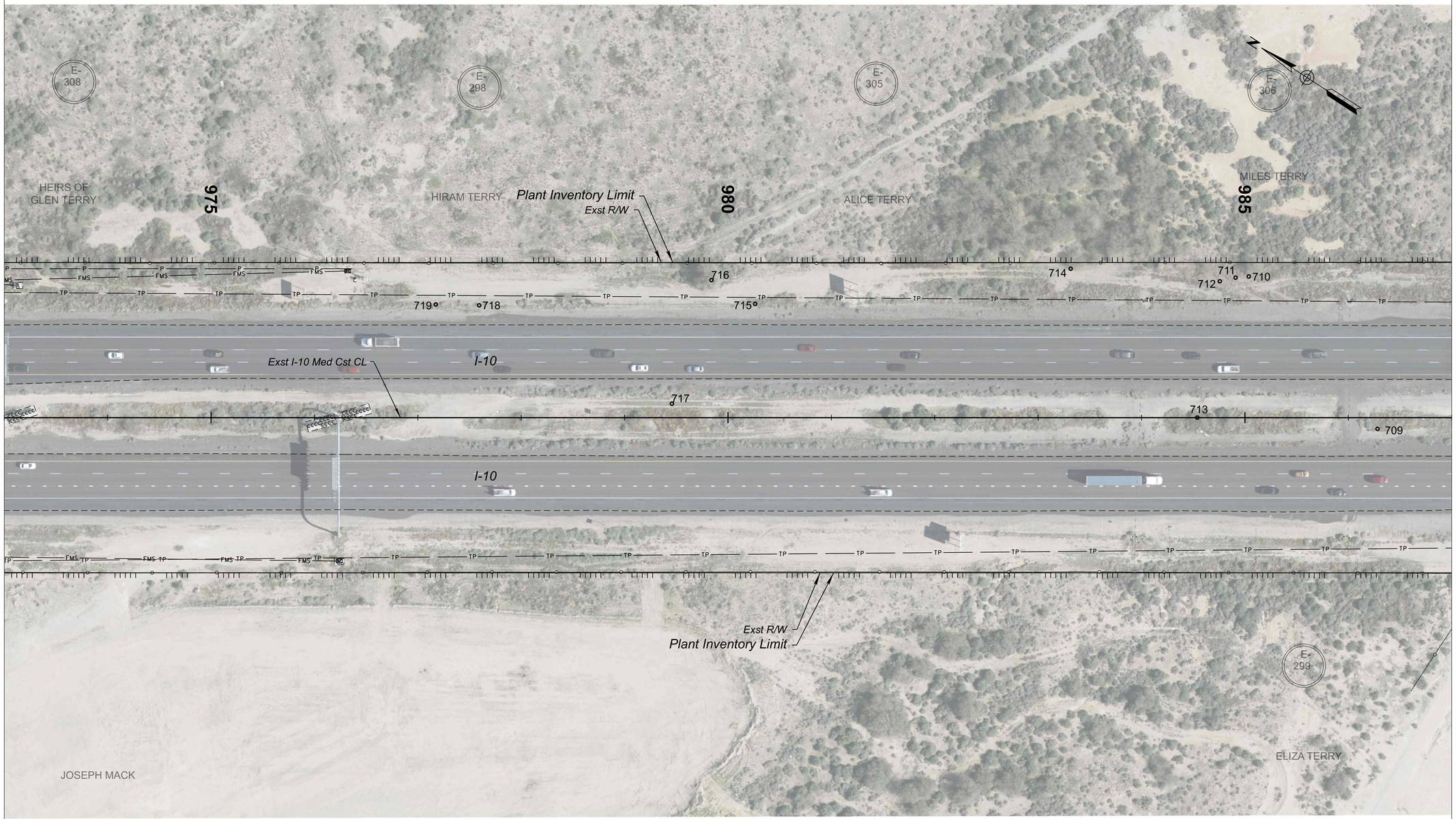
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.05

TRACS NO. F0721 01C

ADOT

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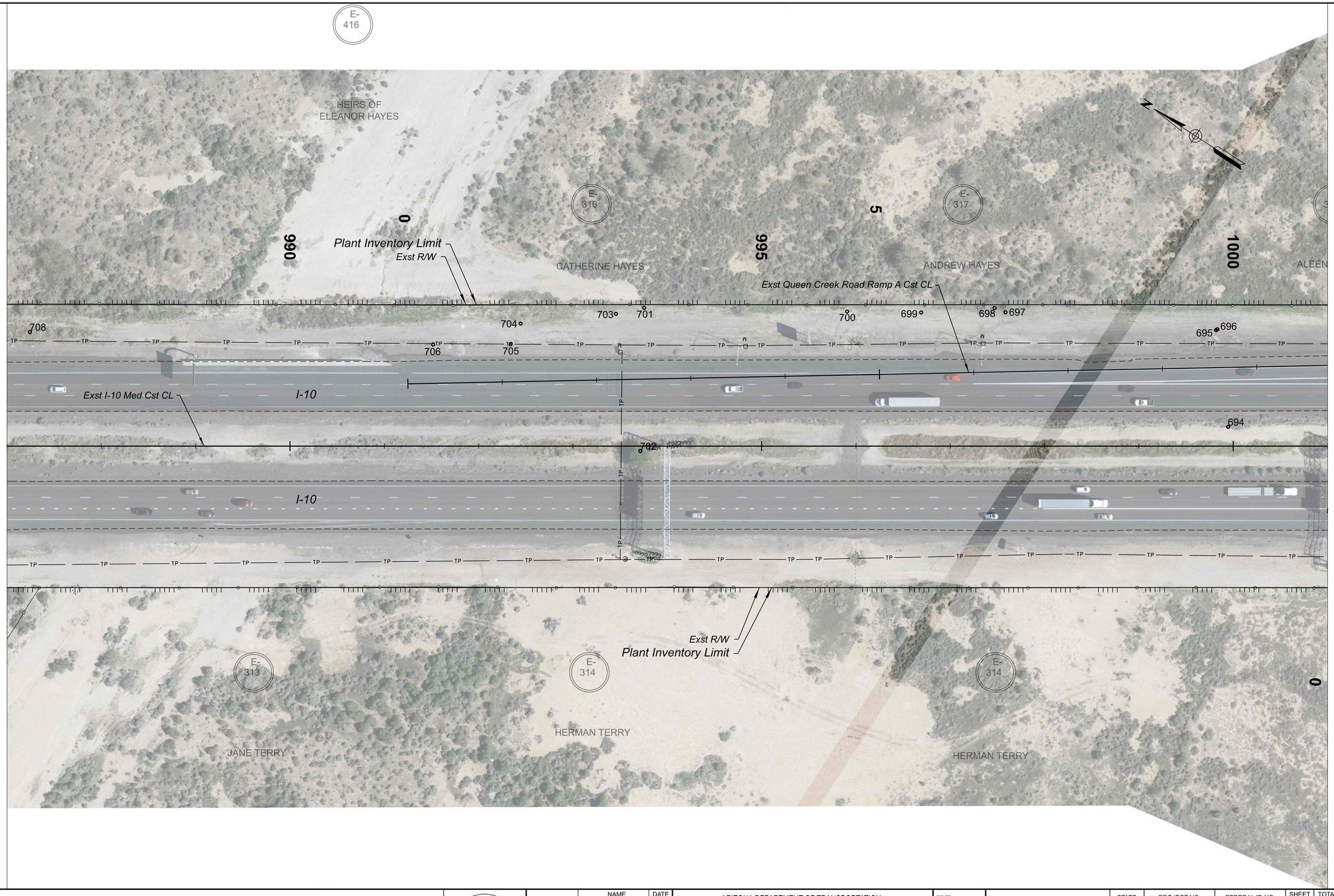
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I-10 MAINLINE
PLANT INVENTORY PLAN
STA 973+00 TO STA 987+00

ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 MA 161	010-C(NFA)	22	64	
MILEPOST	LOCATION I-10 CORRIDOR: 202L TO SR 387						DWG NO. INV-03.06
STRUCTURE NO.	TRACS NO. F0721 01C		ADOT				___ OF ___



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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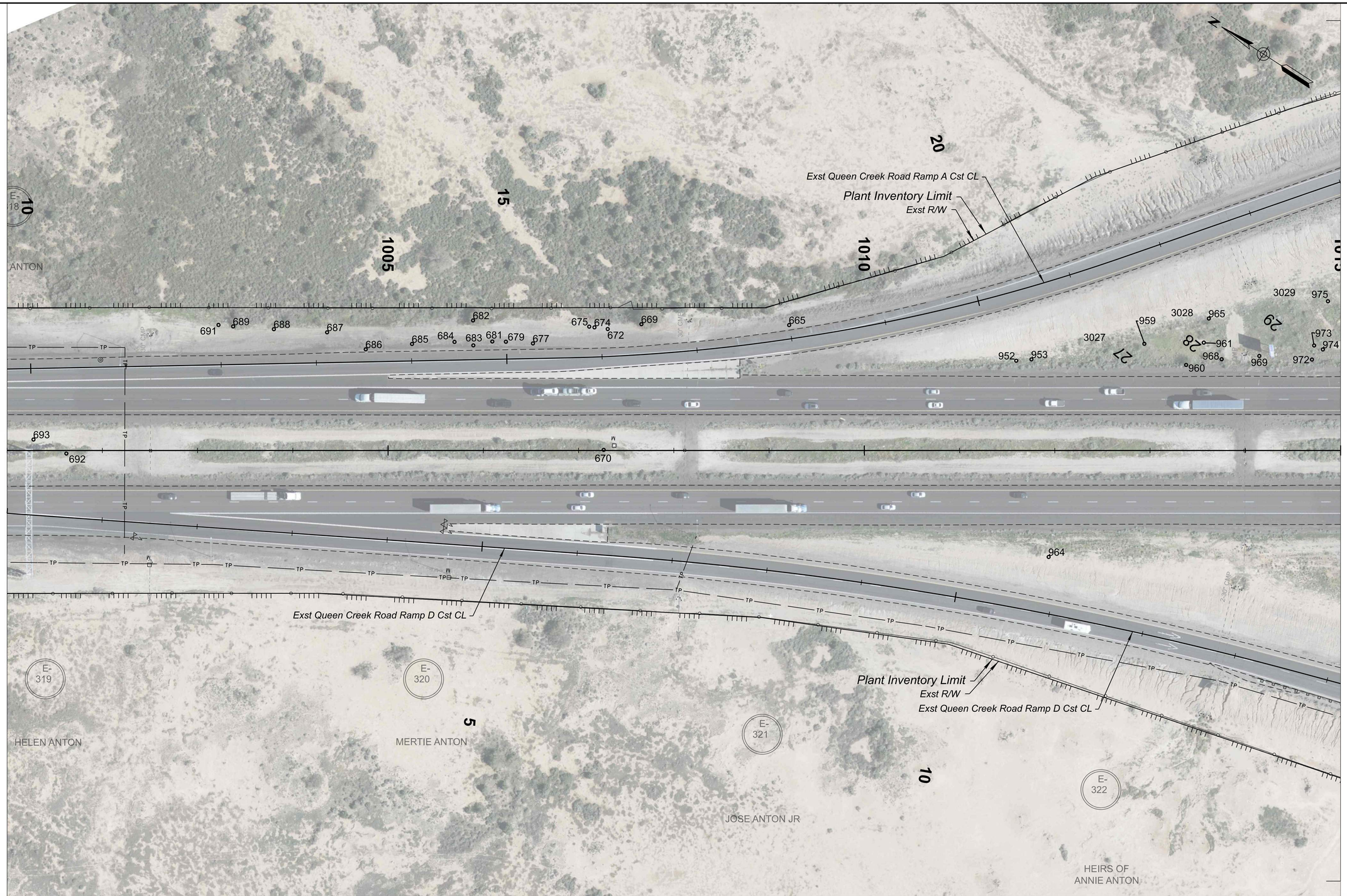
I-10 MAINLINE
PLANT INVENTORY PLAN
STA 987+00 TO STA 1001+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	23	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387
DWG NO. INV-03.07
TRACS NO. F0721 01C
ADOT
___ OF ___

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I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1001+00 TO STA 1015+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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LOCATION I-10 CORRIDOR: 202L TO SR 387

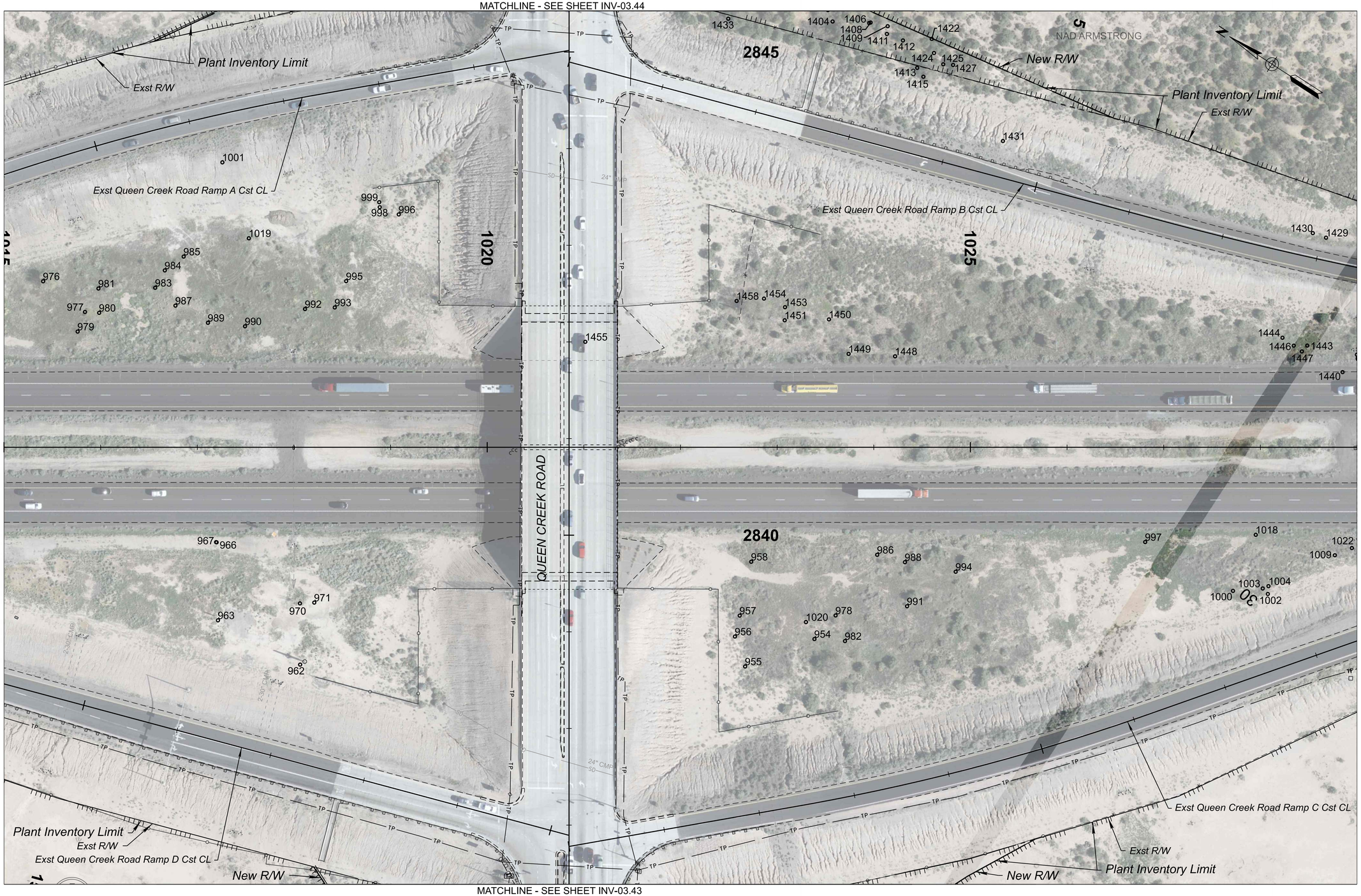
TRACS NO. F0721 01C

ADOT

DWG NO. INV-03.08

____ OF ____

MATCHLINE - SEE SHEET INV-03.44



MATCHLINE - SEE SHEET INV-03.43

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1015+00 TO STA 1029+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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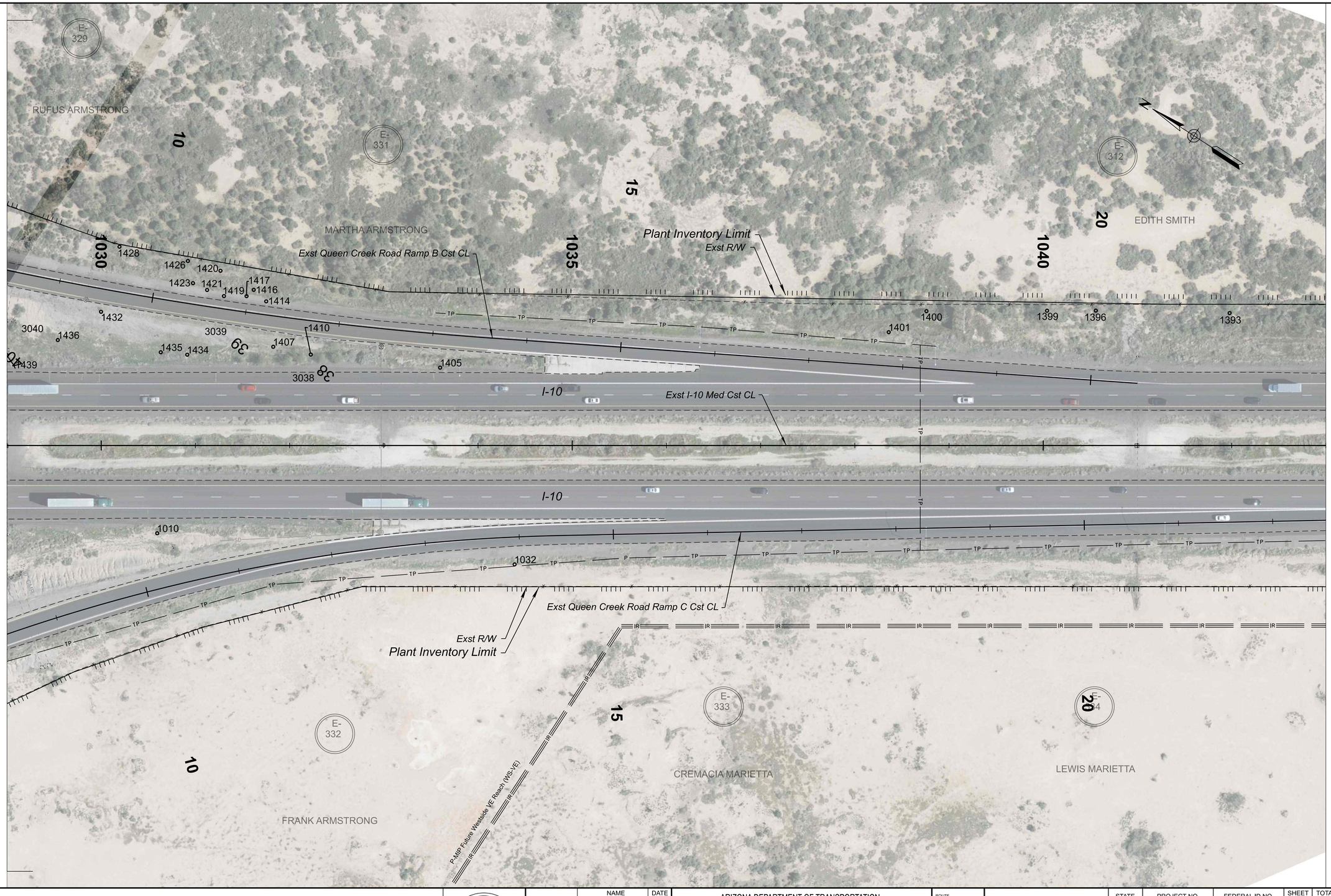
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.09

TRACS NO. F0721 01C

ADOT

____ OF ____



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1029+00 TO STA 1043+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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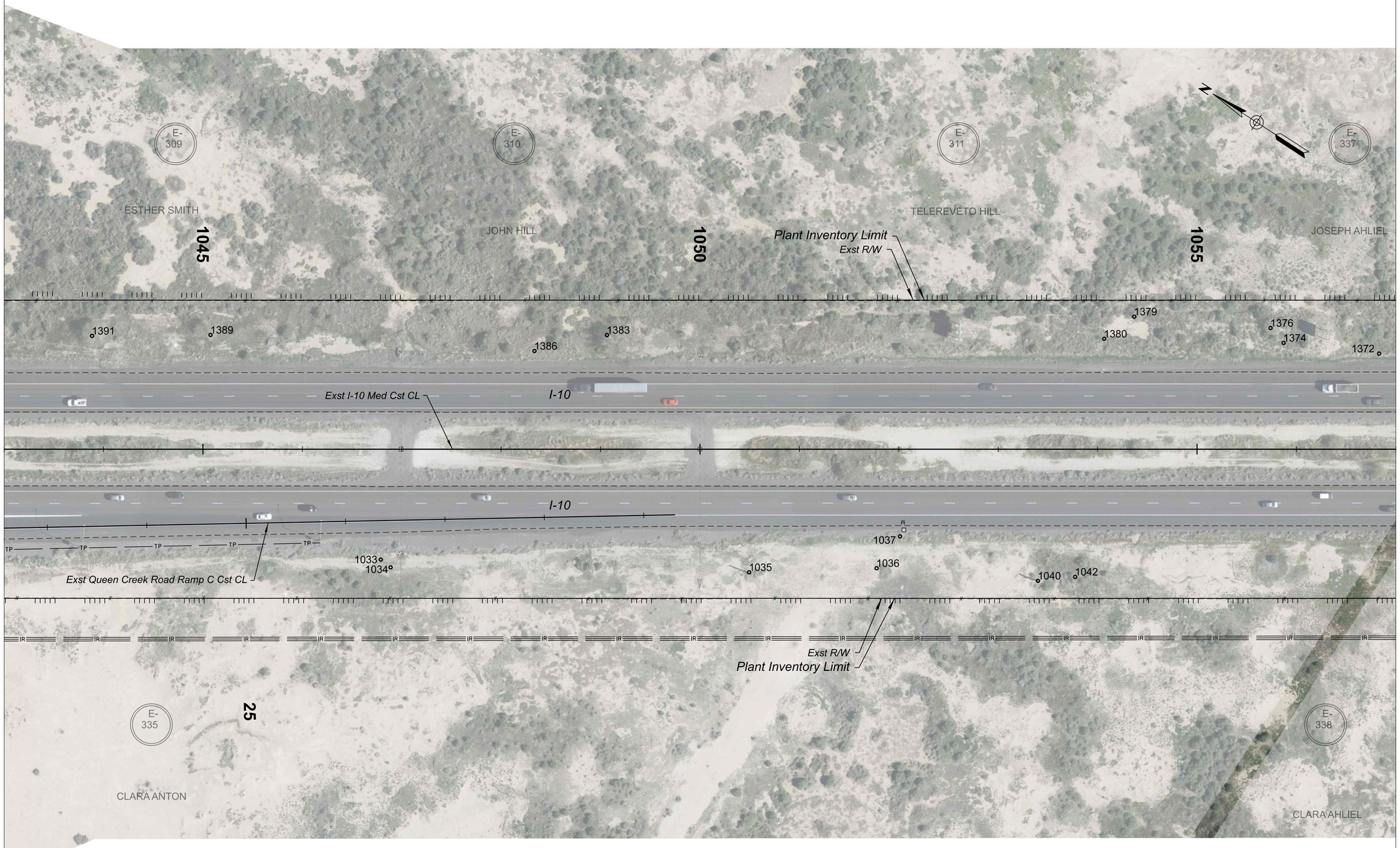
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.10

TRACS NO. F0721 01C

ADOT

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REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
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	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1043+00 TO STA 1057+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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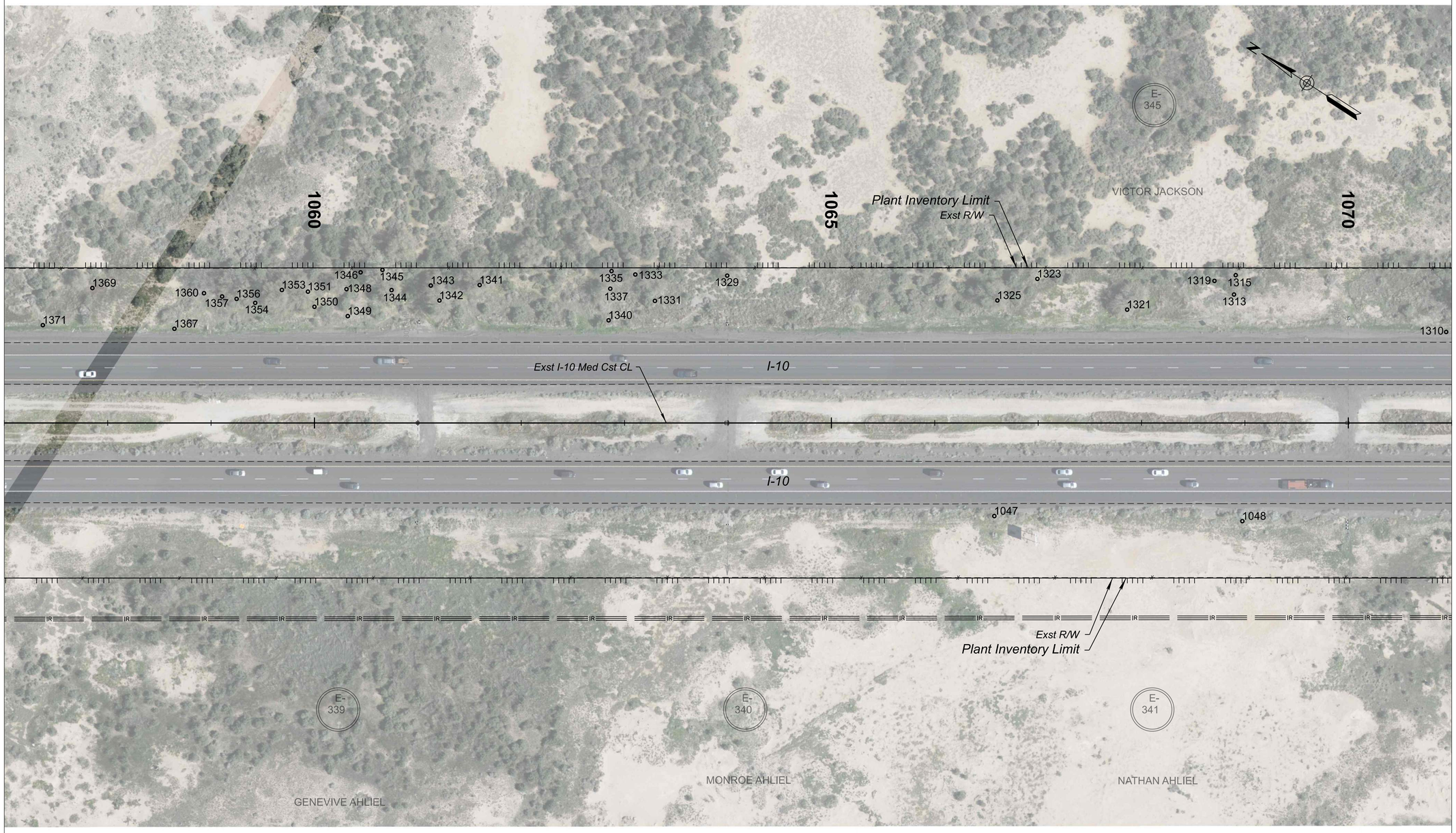
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.11

TRACS NO. F0721 01C

ADOT

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	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1057+00 TO STA 1071+00

ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 MA 161	010-C(NFA)	28	64	
MILEPOST	LOCATION I-10 CORRIDOR: 202L TO SR 387						DWG NO. INV-03.12
STRUCTURE NO.	TRACS NO. F0721 01C						___ OF ___

ADOT



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

AZTEC TYPSA
501 N 44th St, Suite 300
Phoenix, AZ 85008-6505
Tel (602) 454-0402
Fax (480) 499-5565
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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1071+00 TO STA 1085+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	29	64	

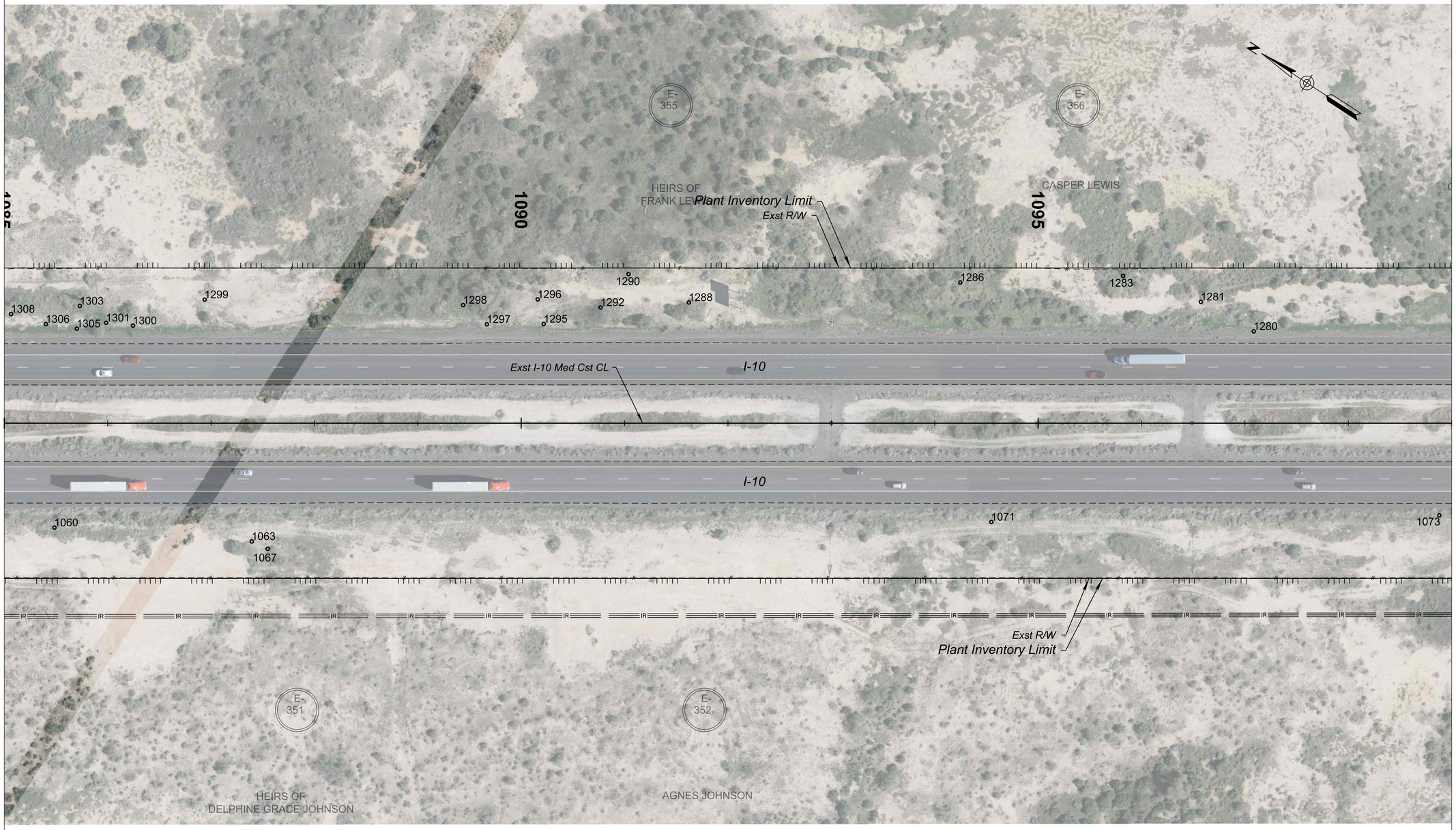
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.13

TRACS NO. F0721 01C

ADOT

___ OF ___



REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO. 27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
STATE OF ARIZONA

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1085+00 TO STA 1099+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	30	64	

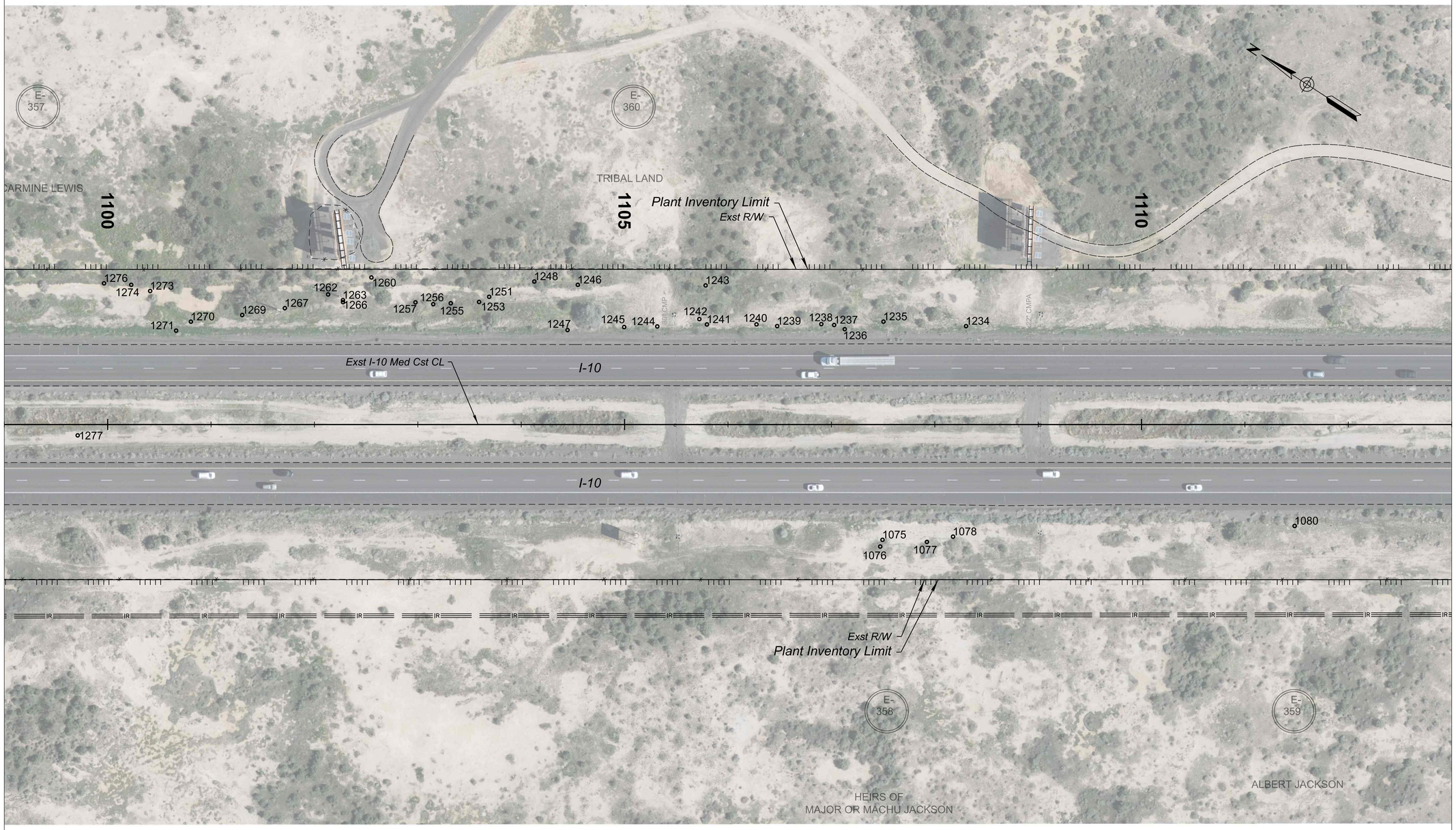
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.14

TRACS NO. F0721 01C

ADOT

____ OF ____



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO. 27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

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ARIZONA DEPARTMENT OF TRANSPORTATION
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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1099+00 TO STA 1113+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	31	64	

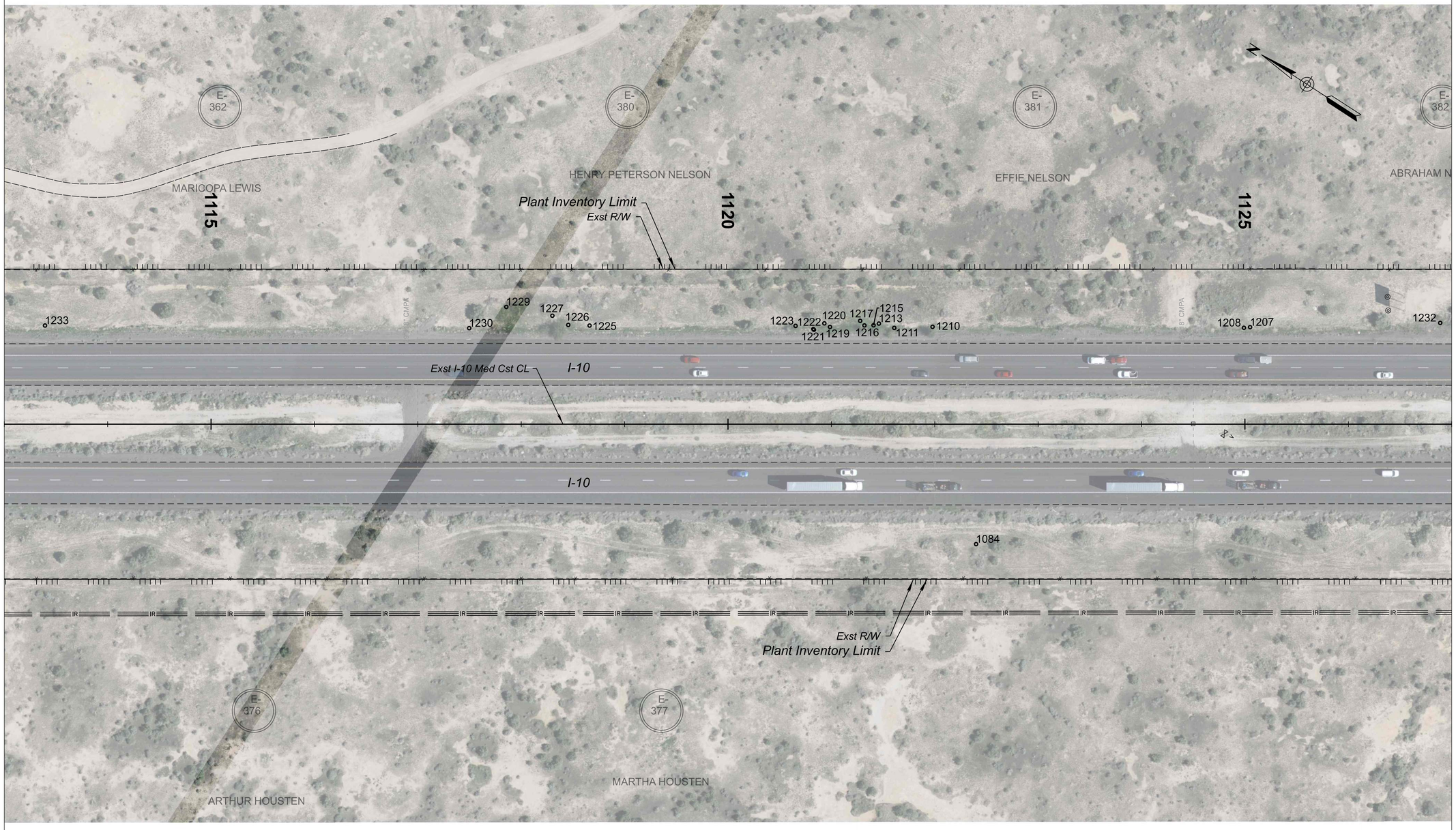
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.15

TRACS NO. F0721 01C

ADOT

____ OF ____



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1113+00 TO STA 1127+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	32	64	

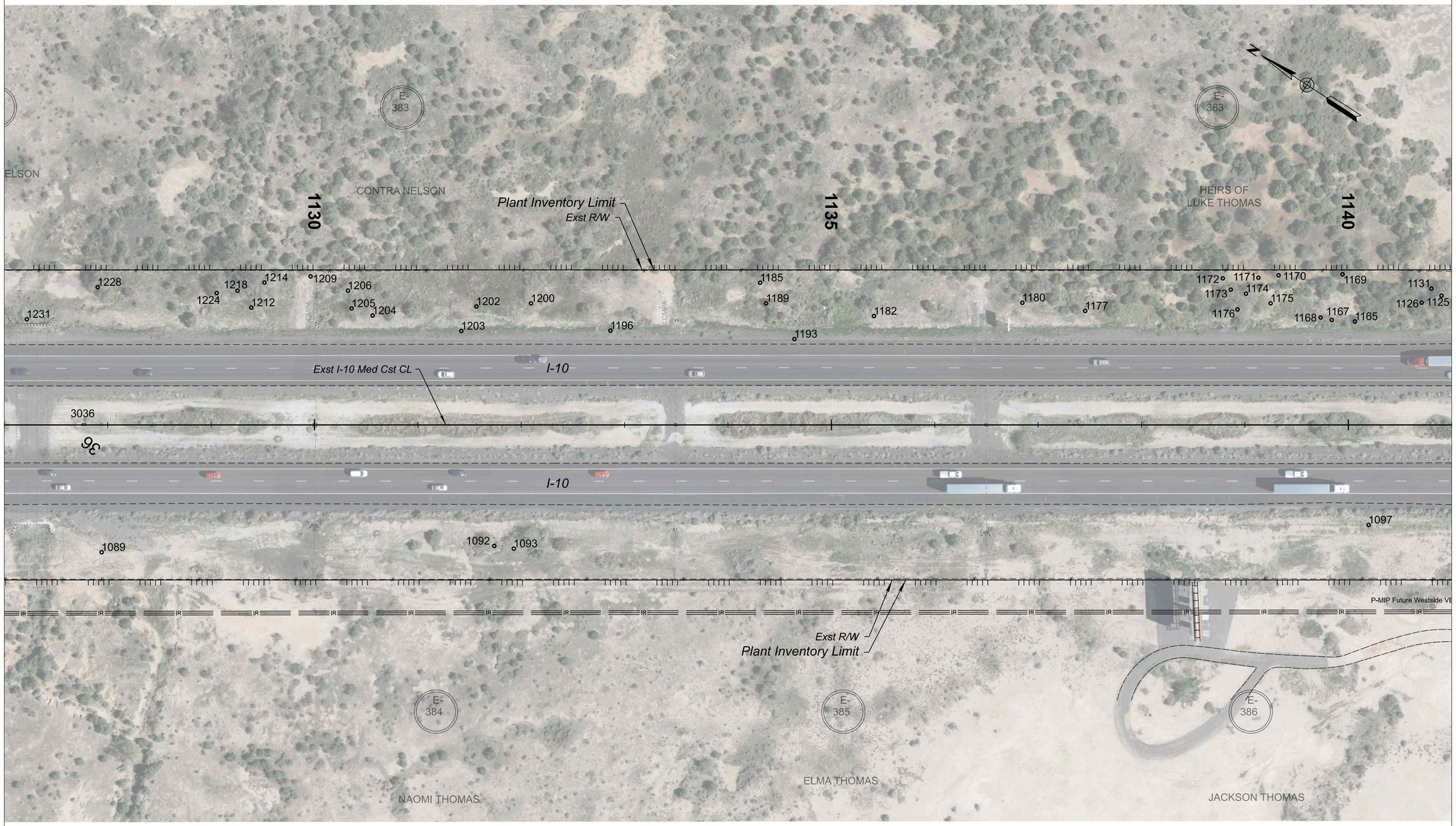
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.16

TRACS NO. F0721 01C

ADOT

____ OF____



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO. 27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
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ARIZONA DEPARTMENT OF TRANSPORTATION
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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1127+00 TO STA 1141+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	33	64	

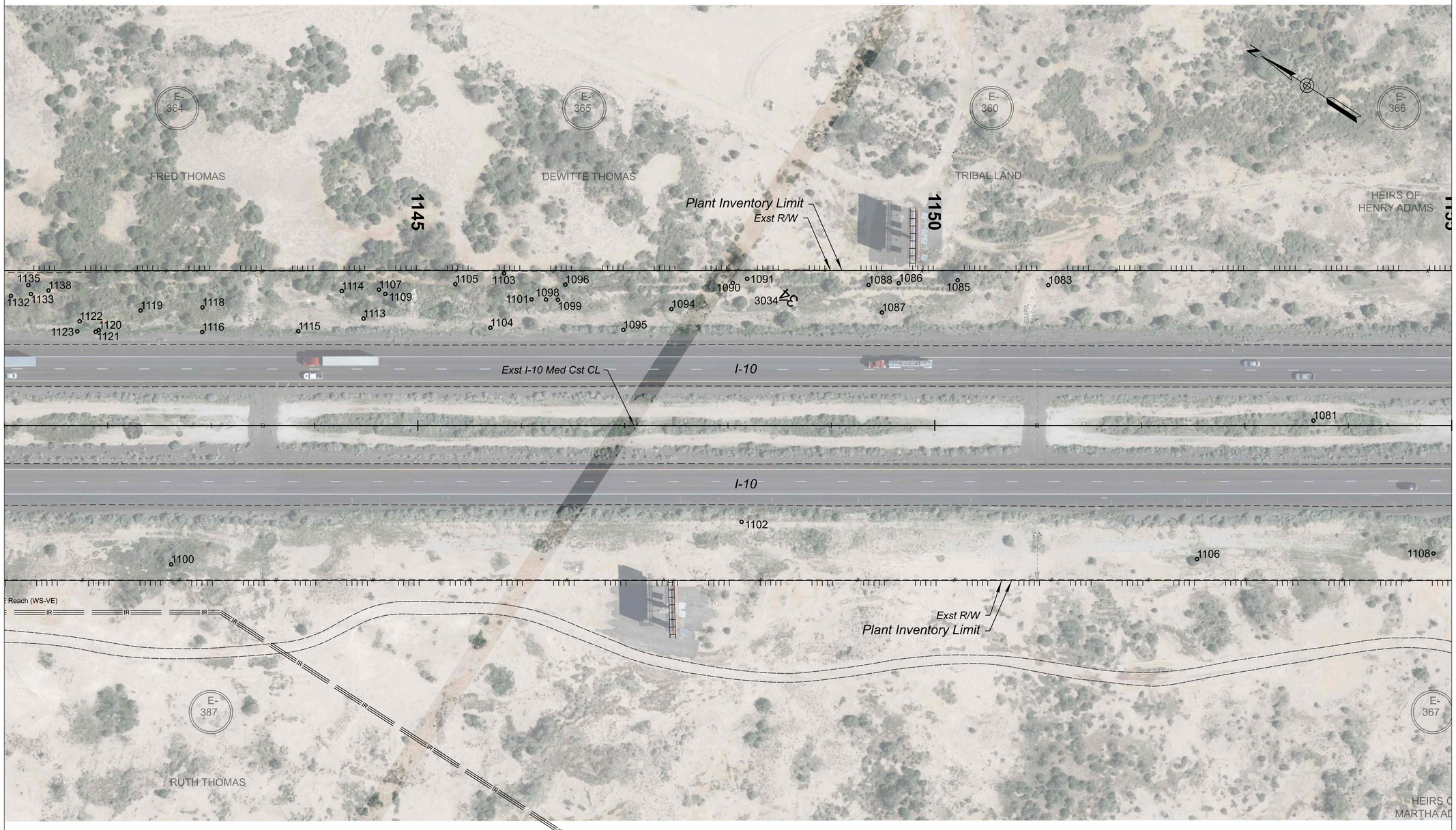
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.17

TRACS NO. F0721 01C

ADOT

____ OF ____



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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CERTIFICATE NO.
27437
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ARIZONA U.S.A.

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1141+00 TO STA 1155+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	34	64	

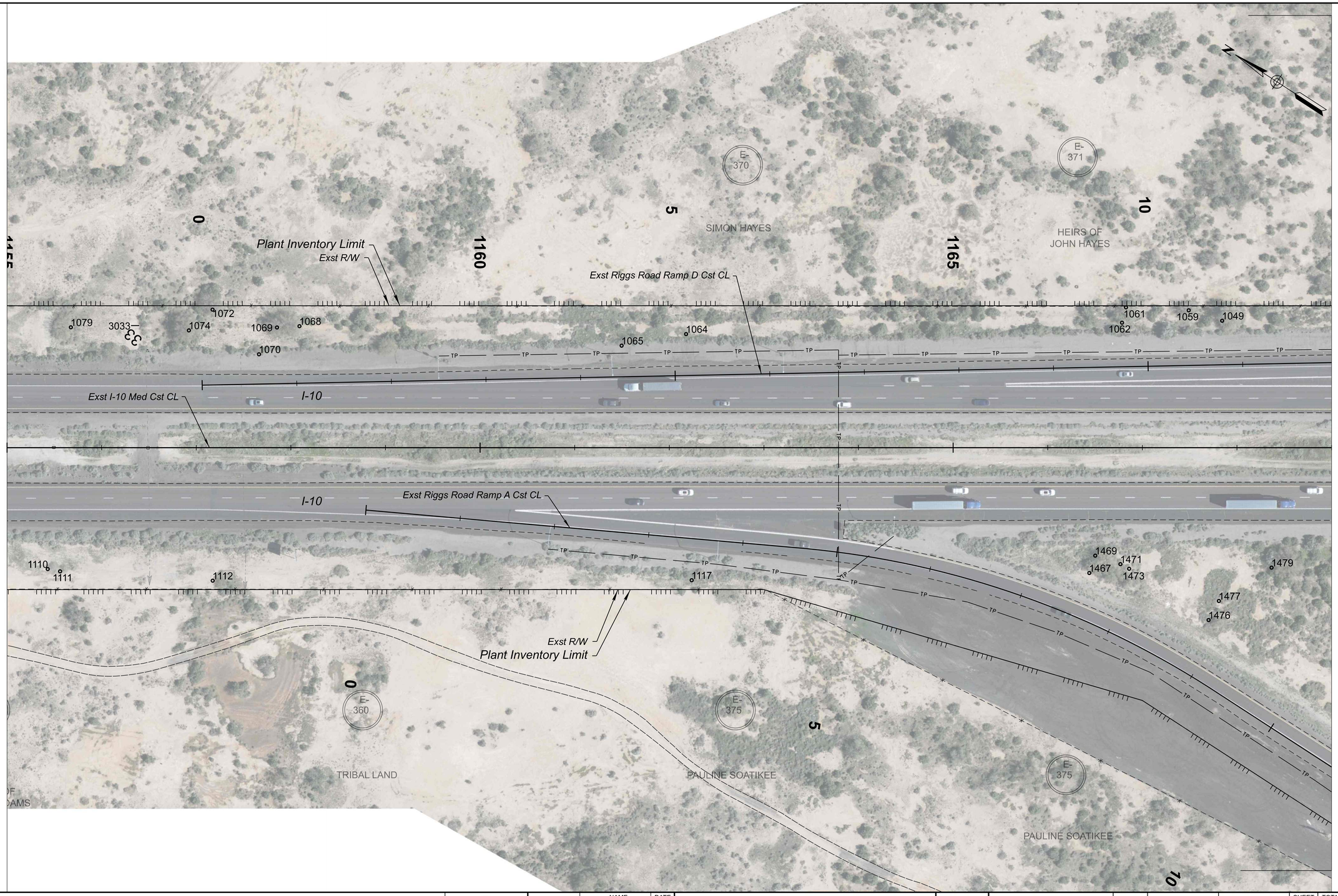
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.18

TRACS NO. F0721 01C

ADOT

____ OF____



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1155+00 TO STA 1169+00

ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 MA 161	010-C(NFA)	35	64	
MILEPOST	LOCATION I-10 CORRIDOR: 202L TO SR 387						DWG NO. INV-03.19
STRUCTURE NO.	TRACS NO. F0721 01C		ADOT				____ OF ____

MATCHLINE - SEE SHEET INV-3.46



MATCHLINE - SEE SHEET INV-3.45

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

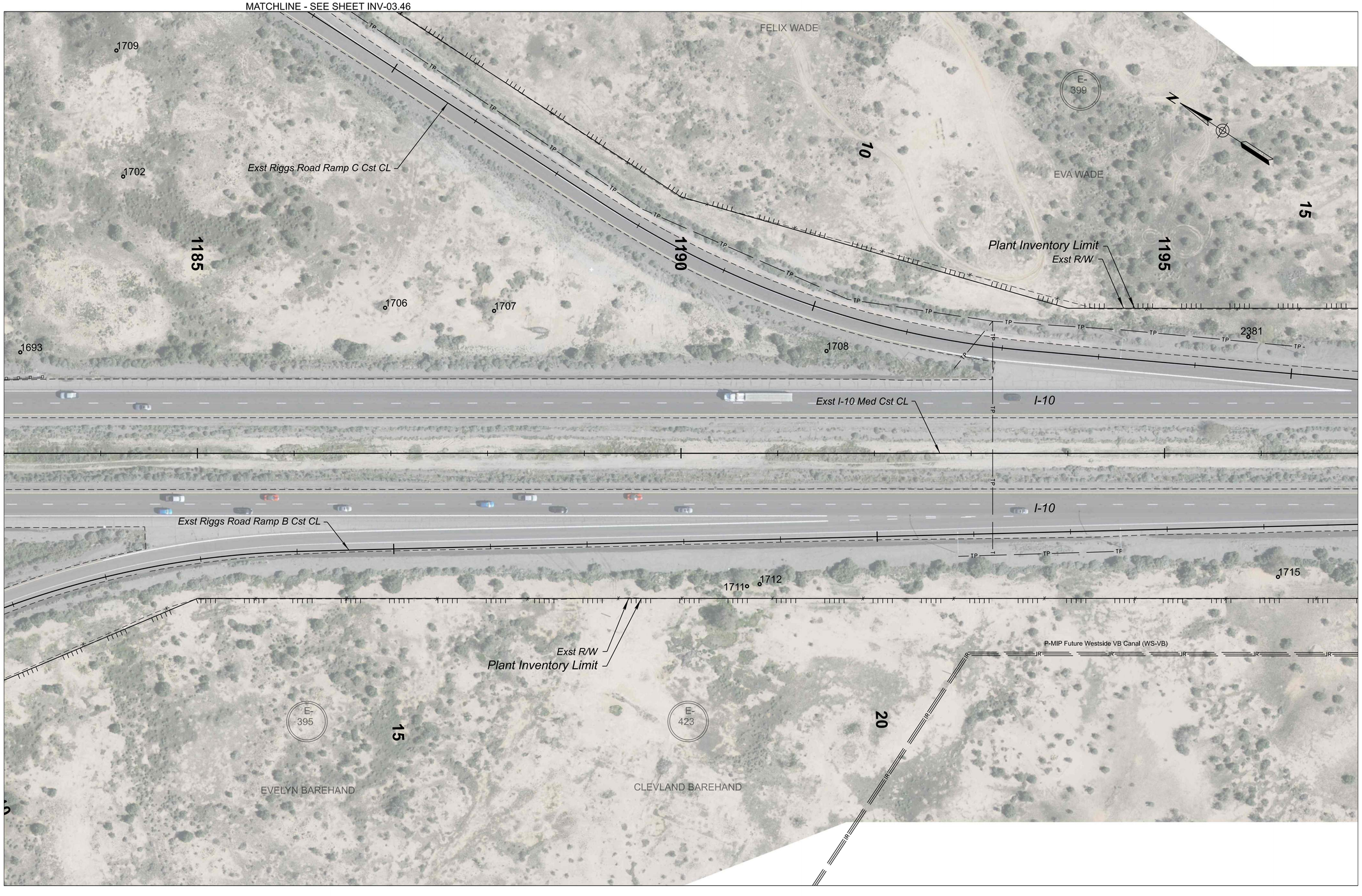
	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1169+00 TO STA 1183+00

ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 MA 161	010-C(NFA)	36	64	
MILEPOST	LOCATION I-10 CORRIDOR: 202L TO SR 387						DWG NO. INV-03.20
STRUCTURE NO.	TRACS NO. F0721 01C						ADOT ____ OF ____



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT — CERTIFICATE NO. 27437 — STEVEN E. LOHIDE — Date Signed 06/11/2024 — ARIZONA, U.S.A.

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1183+00 TO STA 1197+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	37	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

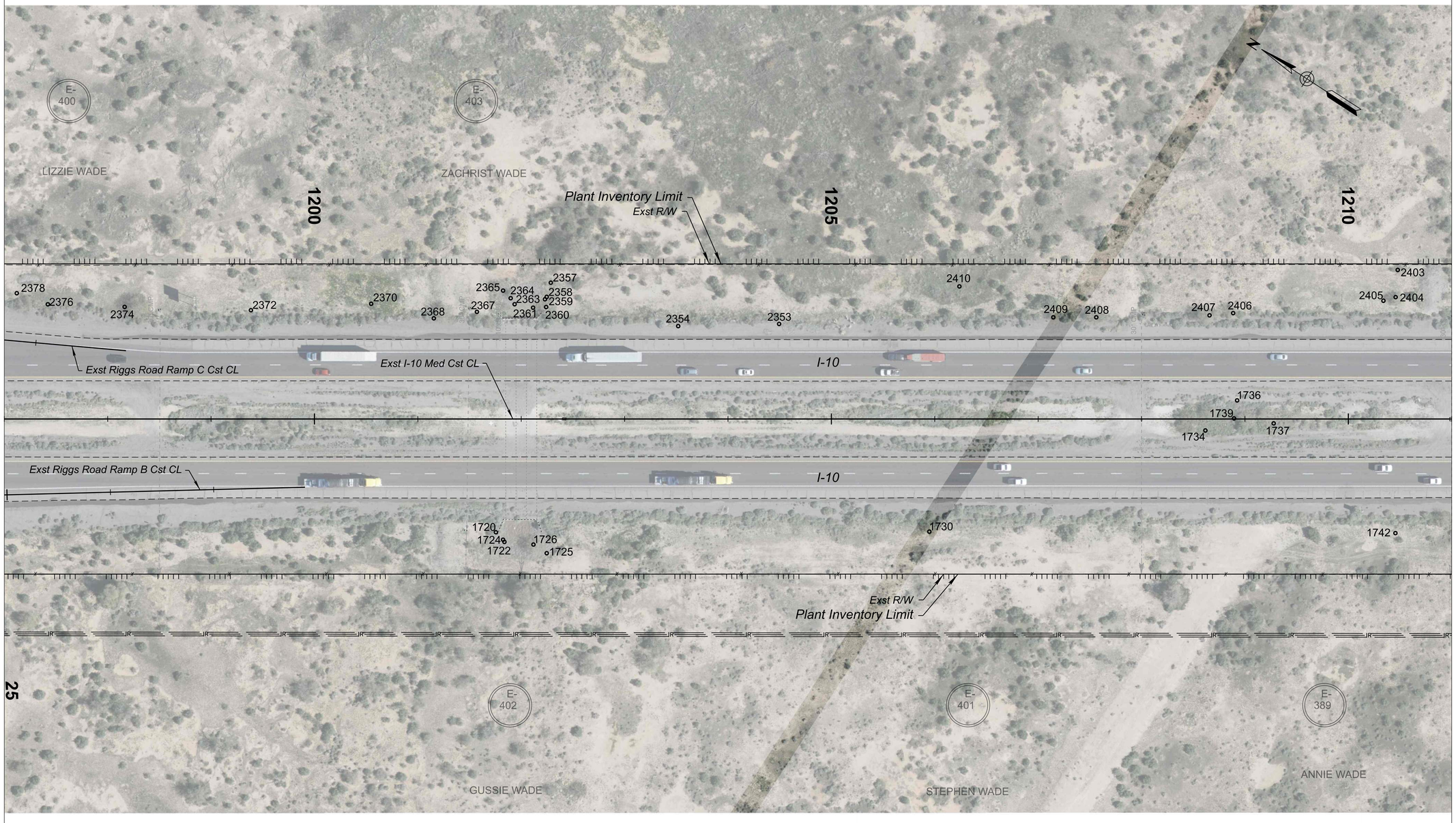
DWG NO. INV-03.21

TRACS NO. F0721 01C

ADOT

____ OF ____

KANTILL 6/10/2024 4:58:41 PM c:\pw_working\pw_prod\kantill\dms73998\r0252inv21.dgn \ Model Name: PlantInventory - INV21



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

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ARIZONA DEPARTMENT OF TRANSPORTATION
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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1197+00 TO STA 1211+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	38	64	

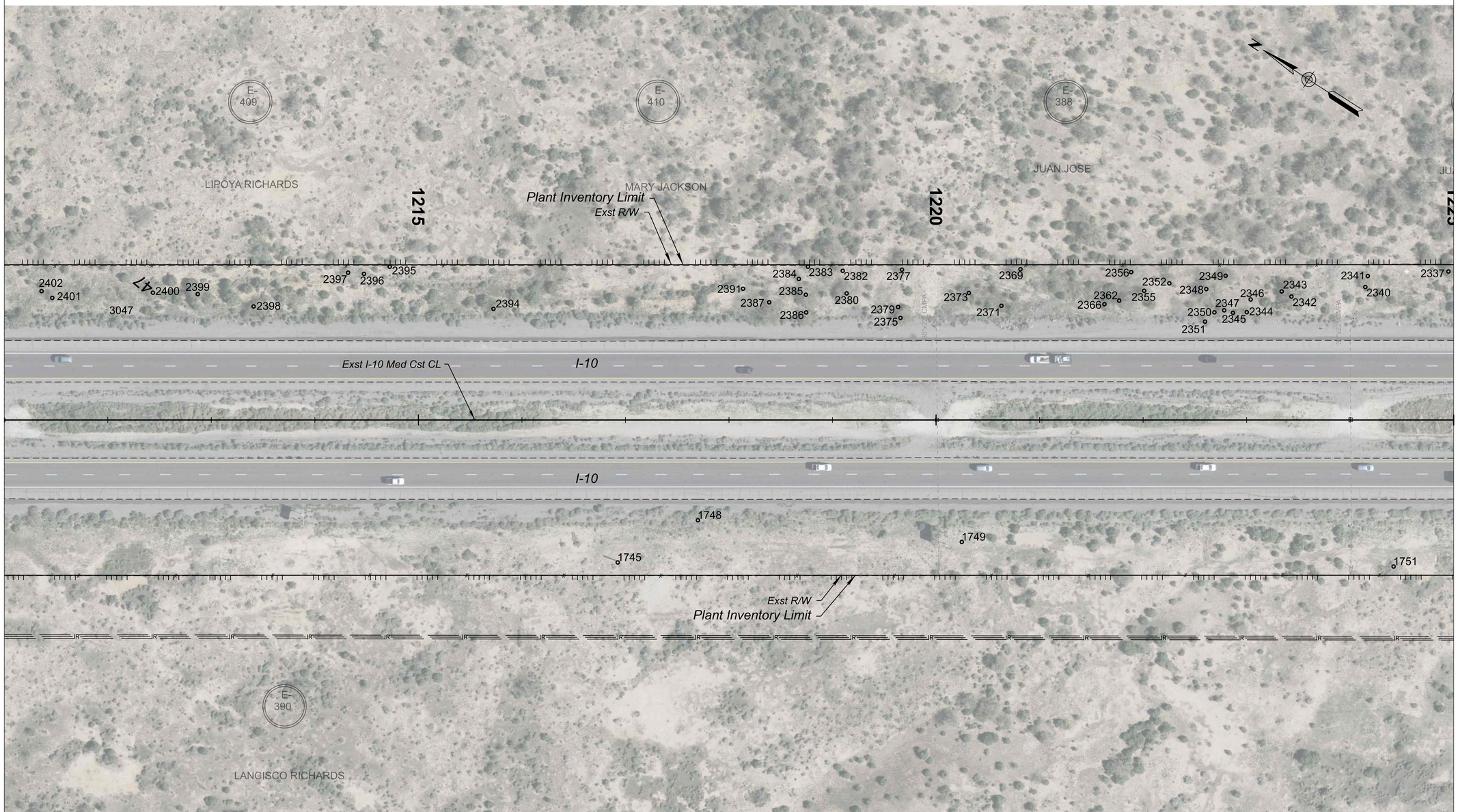
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.22

TRACS NO. F0721 01C

ADOT

___ OF ___



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT — CERTIFICATE NO. 27437 — STEVEN E. LOHIDE — Date Signed 06/11/2024 — ARIZONA U.S.A.

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1211+00 TO STA 1225+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	39	64	

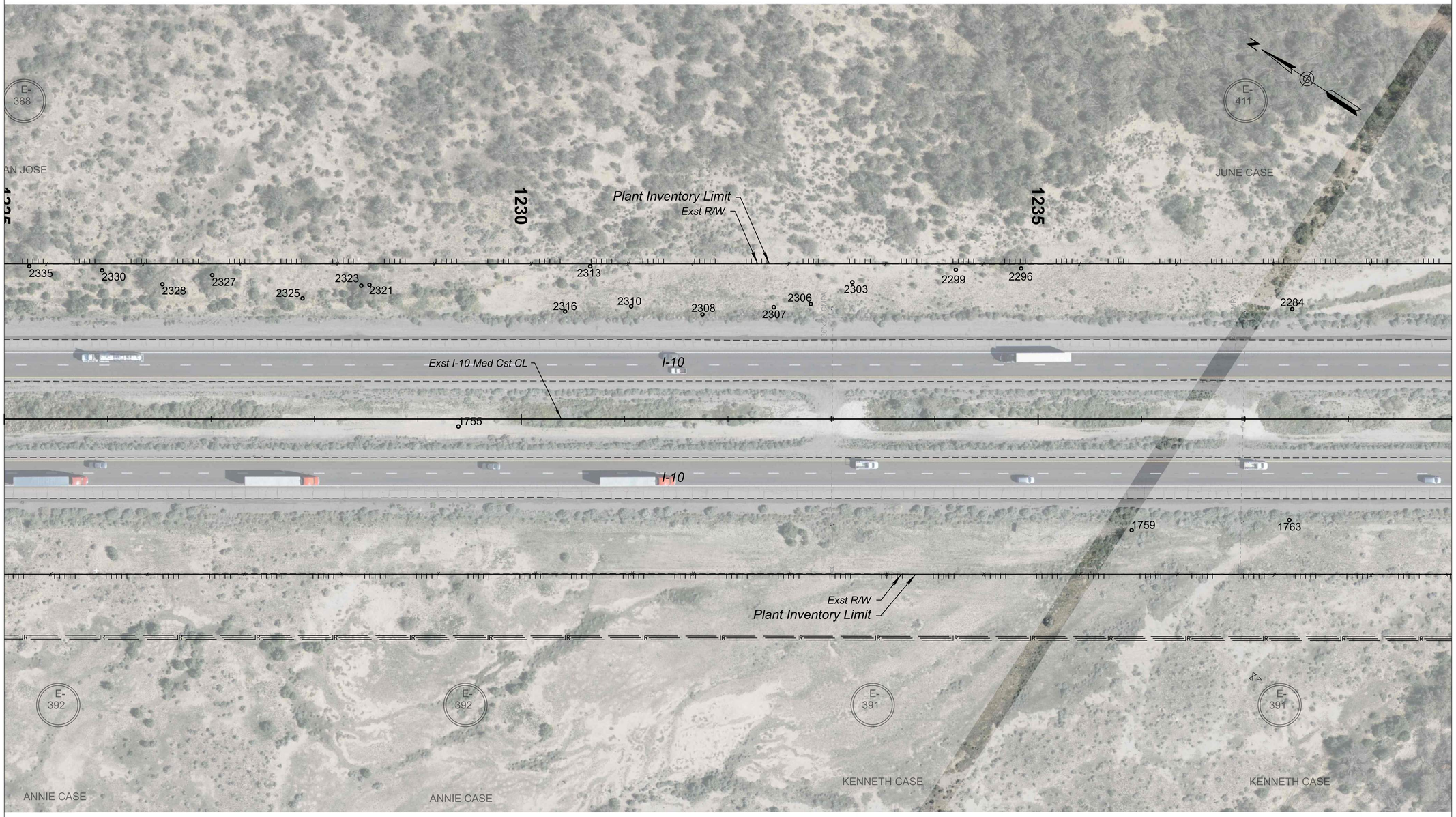
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.23

TRACS NO. F0721 01C

ADOT

____ OF ____



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO. 27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA

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ARIZONA DEPARTMENT OF TRANSPORTATION
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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1225+00 TO STA 1239+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	40	64	

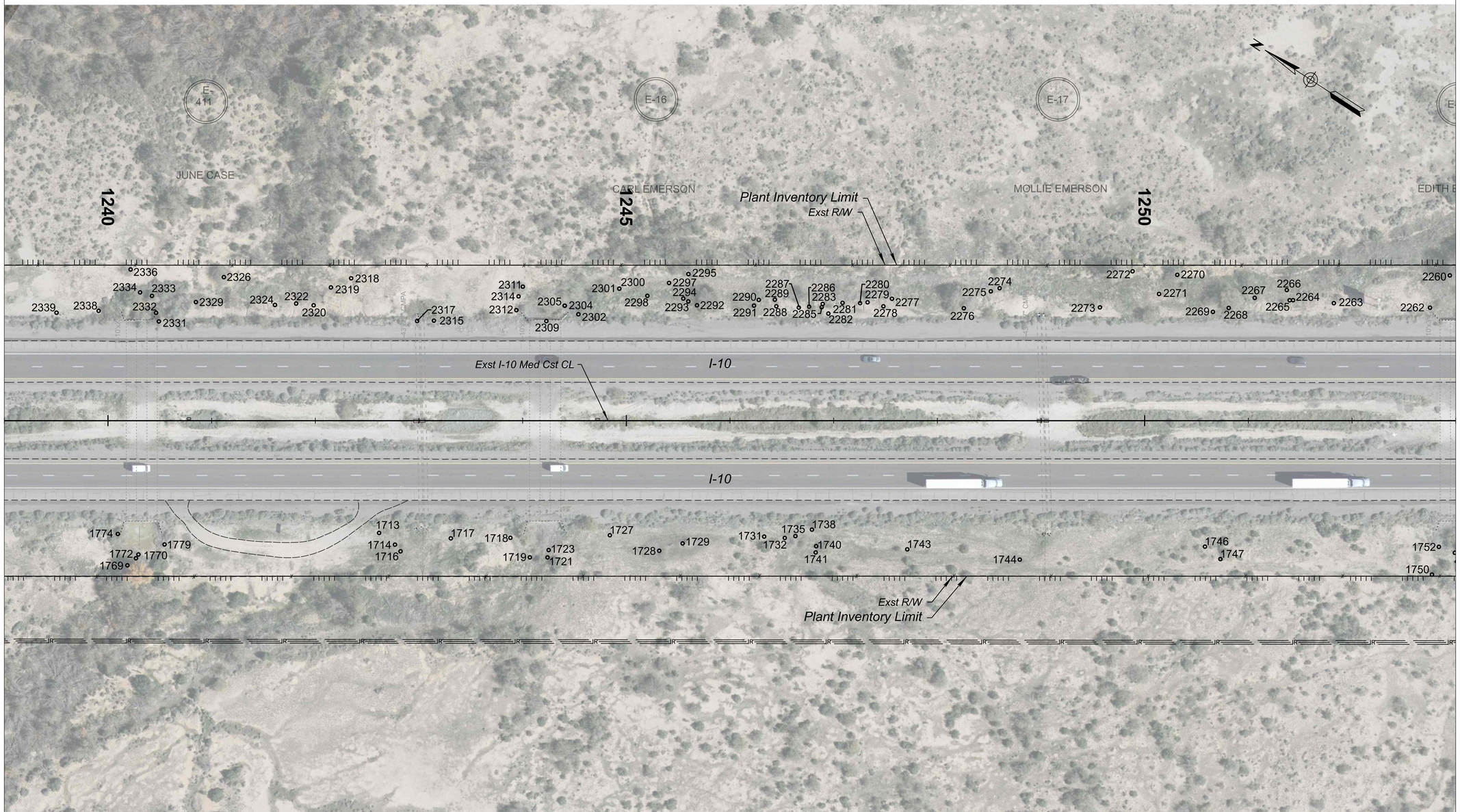
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.24

TRACS NO. F0721 01C

ADOT

____ OF ____



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO. 27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

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ARIZONA DEPARTMENT OF TRANSPORTATION
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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1239+00 TO STA 1253+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	41	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

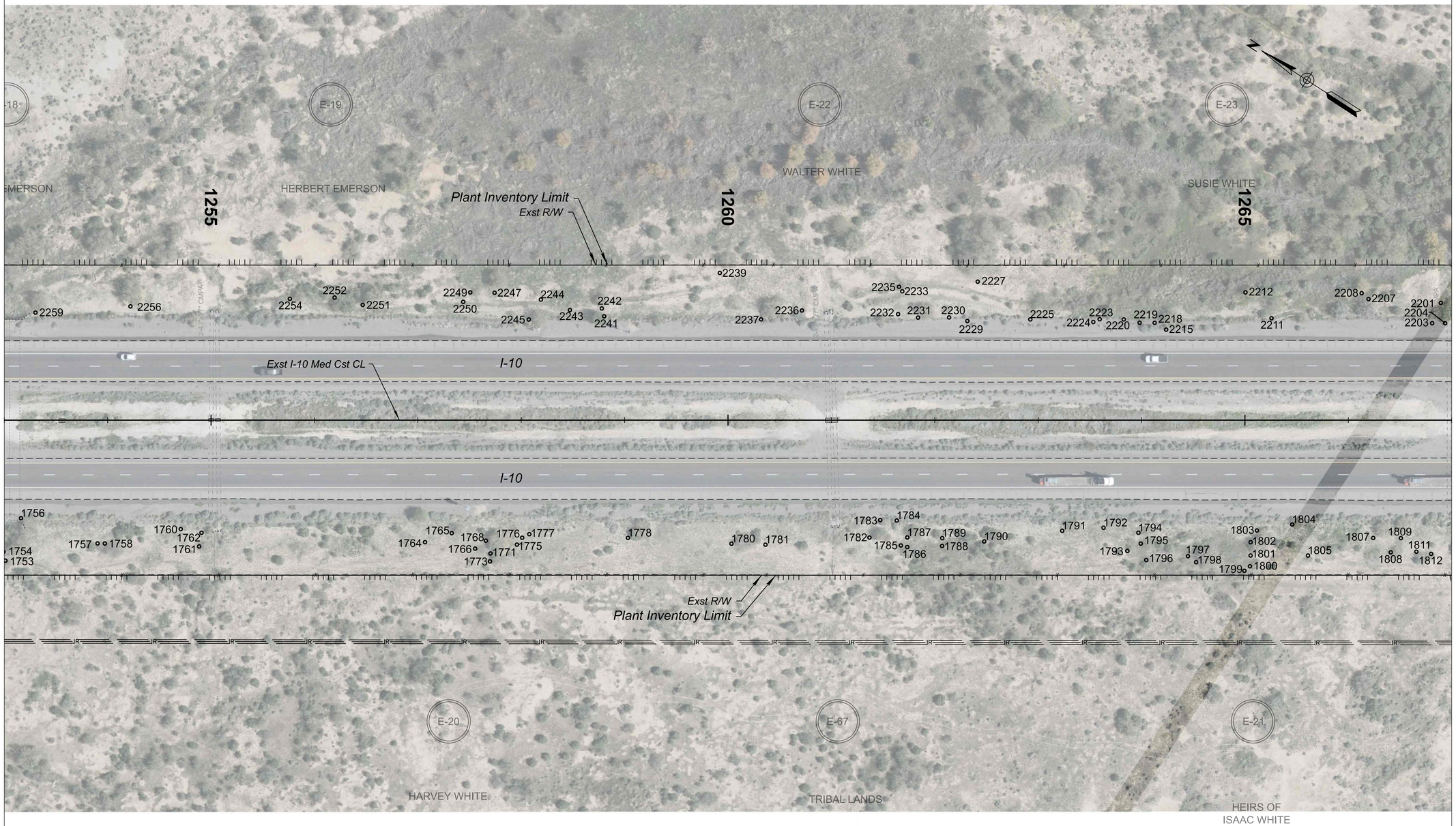
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TRACS NO. F0721 01C

ADOT

____ OF ____

KANTILL 6/10/2024 4:56:25 PM c:\pw_working\pw_prod\kantill\dms73998\r0252inv25.dgn \ Model Name: PlantInventory - INV25



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1253+00 TO STA 1267+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	42	64	

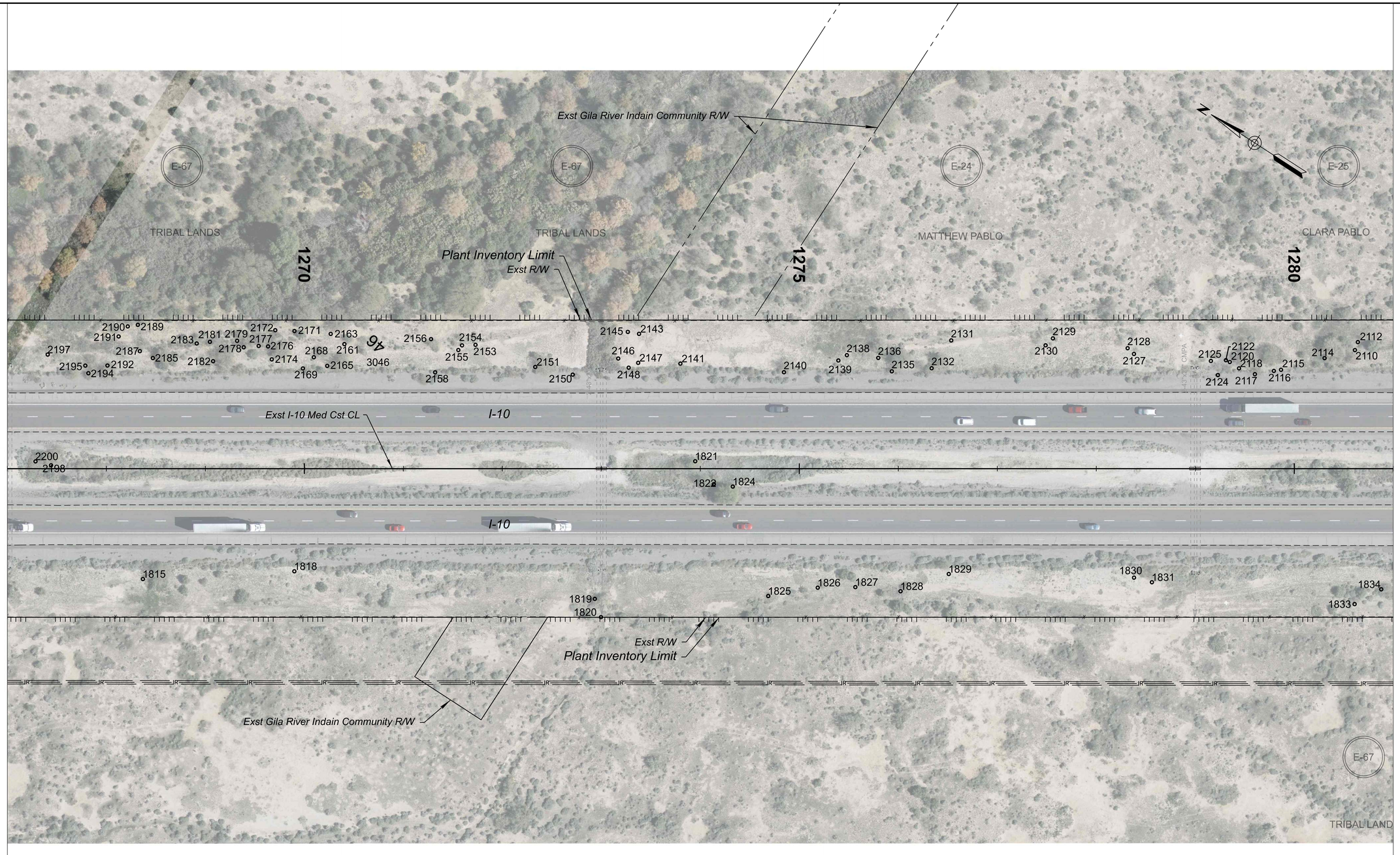
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.26

TRACS NO. F0721 01C

ADOT

___ OF ___



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1267+00 TO STA 1281+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	43	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

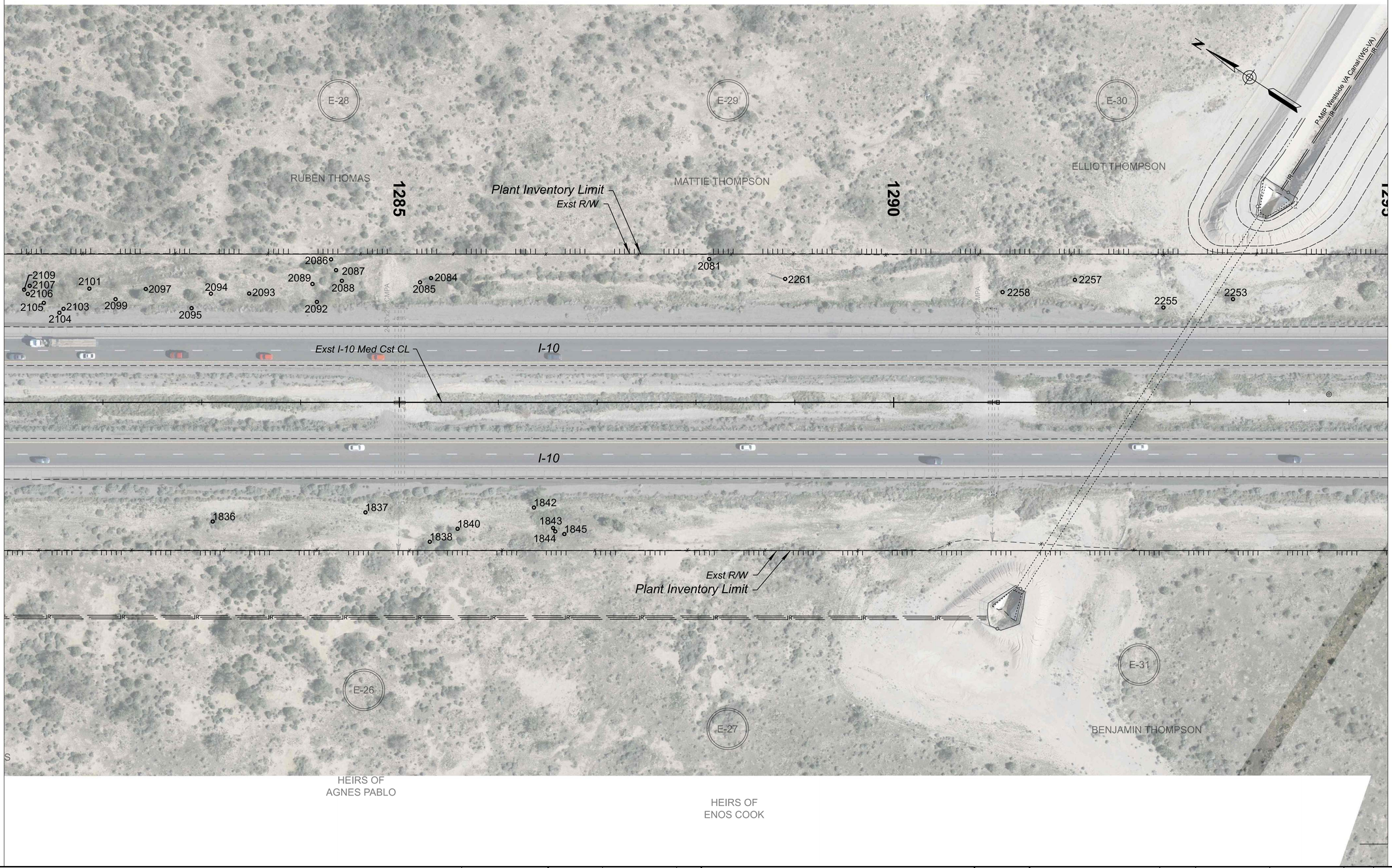
DWG NO. INV-03.27

TRACS NO. F0721 01C

ADOT

___ OF ___

KANTILL 6/10/2024 4:55:10 PM c:\pw_working\pw_prod\kantill\dms73998\r0252inv27.dgn \ Model Name: PlantInventory - INV27



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT — CERTIFICATE NO. 27437 — STEVEN E. LOHIDE — Date Signed 06/11/2024 — ARIZONA

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ARIZONA DEPARTMENT OF TRANSPORTATION
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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1281+00 TO STA 1295+00

ROUTE: I-10
MILEPOST:
STRUCTURE NO.:

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	44	64	

LOCATION: I-10 CORRIDOR: 202L TO SR 387

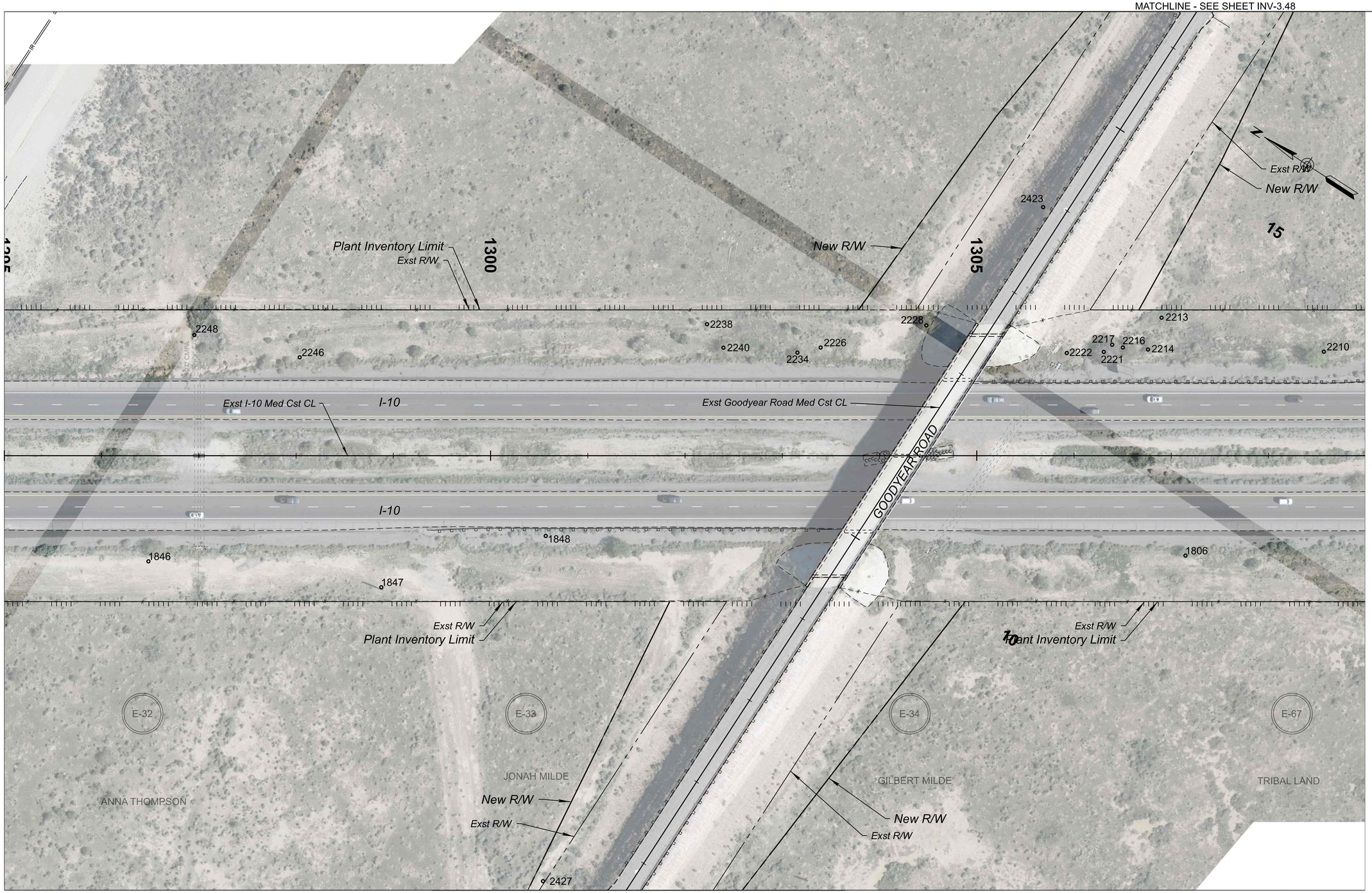
DWG NO. INV-03.28

TRACS NO. F0721 01C

ADOT

____ OF ____

MATCHLINE - SEE SHEET INV-3.48



MATCHLINE - SEE SHEET INV-3.47

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT — CERTIFICATE NO. 27437 — STEVEN E. LOHIDE — Date Signed 06/11/2024 — ARIZONA U.S.A.

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1295+00 TO STA 1309+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	45	64	

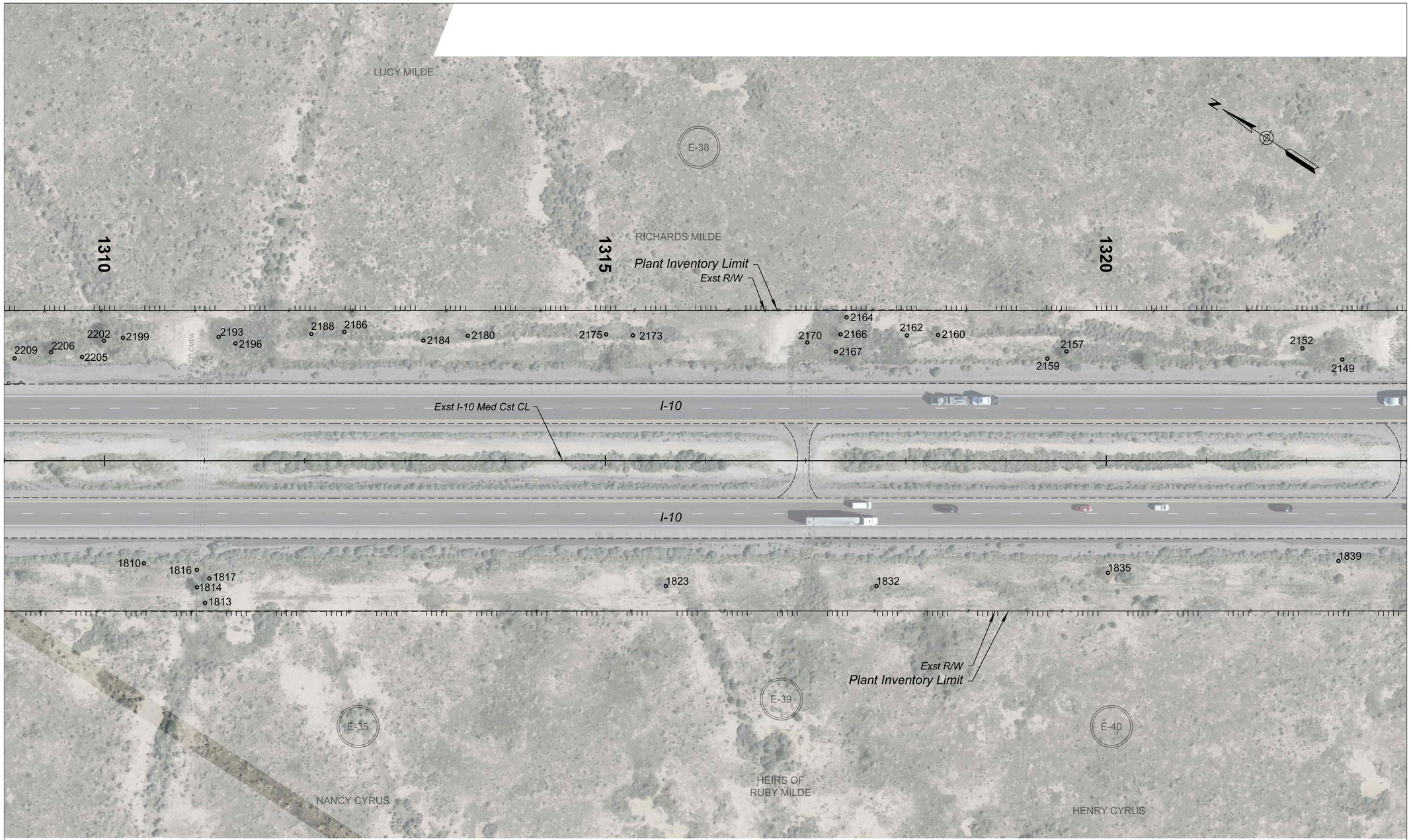
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.29

TRACS NO. F0721 01C

ADOT

____ OF ____



REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E.
LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1309+00 TO STA 1323+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	46	64	

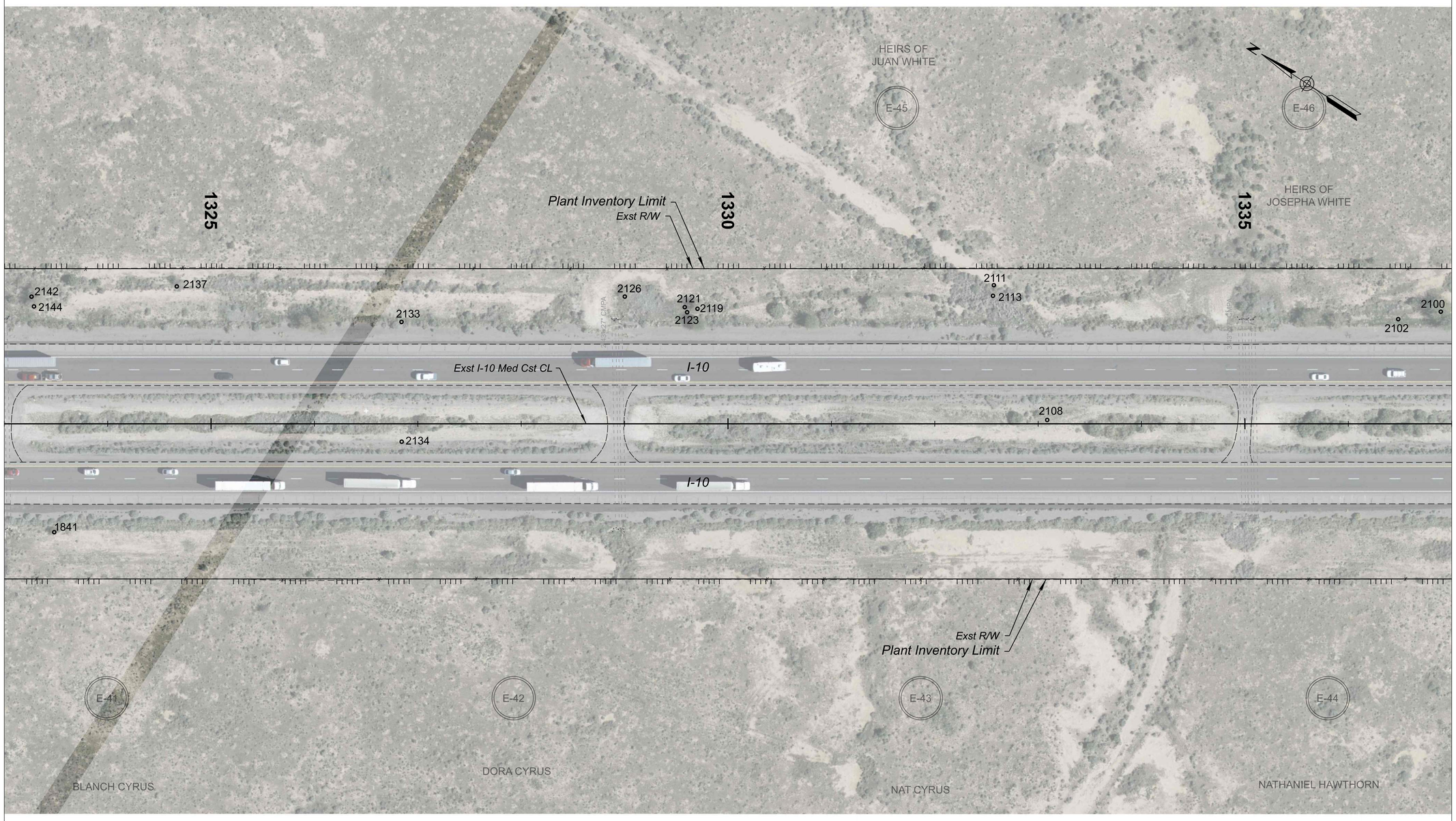
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.30

TRACS NO. F0721 01C

ADOT

____ OF____



REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E.
LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1323+00 TO STA 1337+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	47	64	

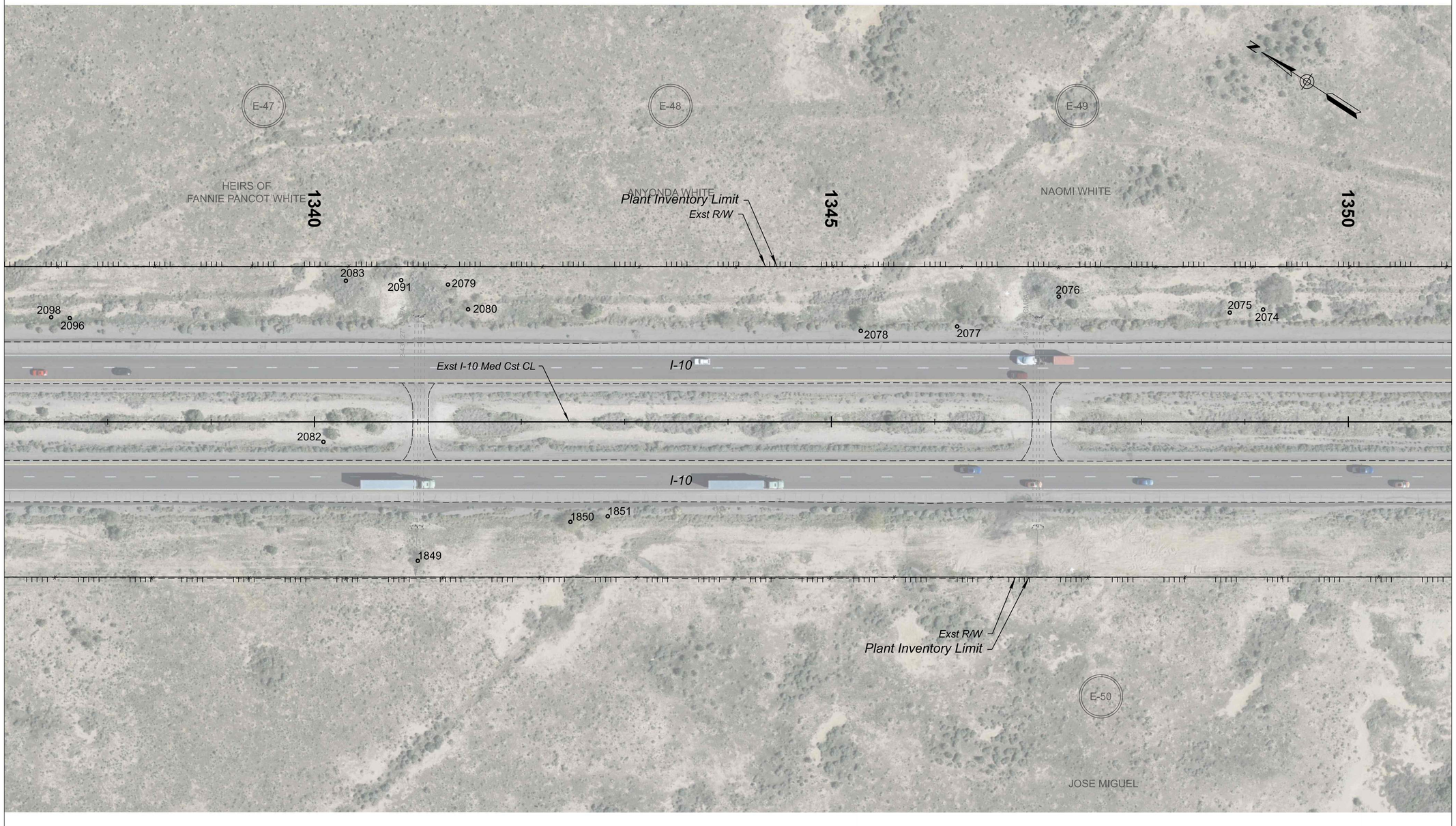
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.31

TRACS NO. F0721 01C

ADOT

___ OF ___



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E.
LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1337+00 TO STA 1351+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	48	64	

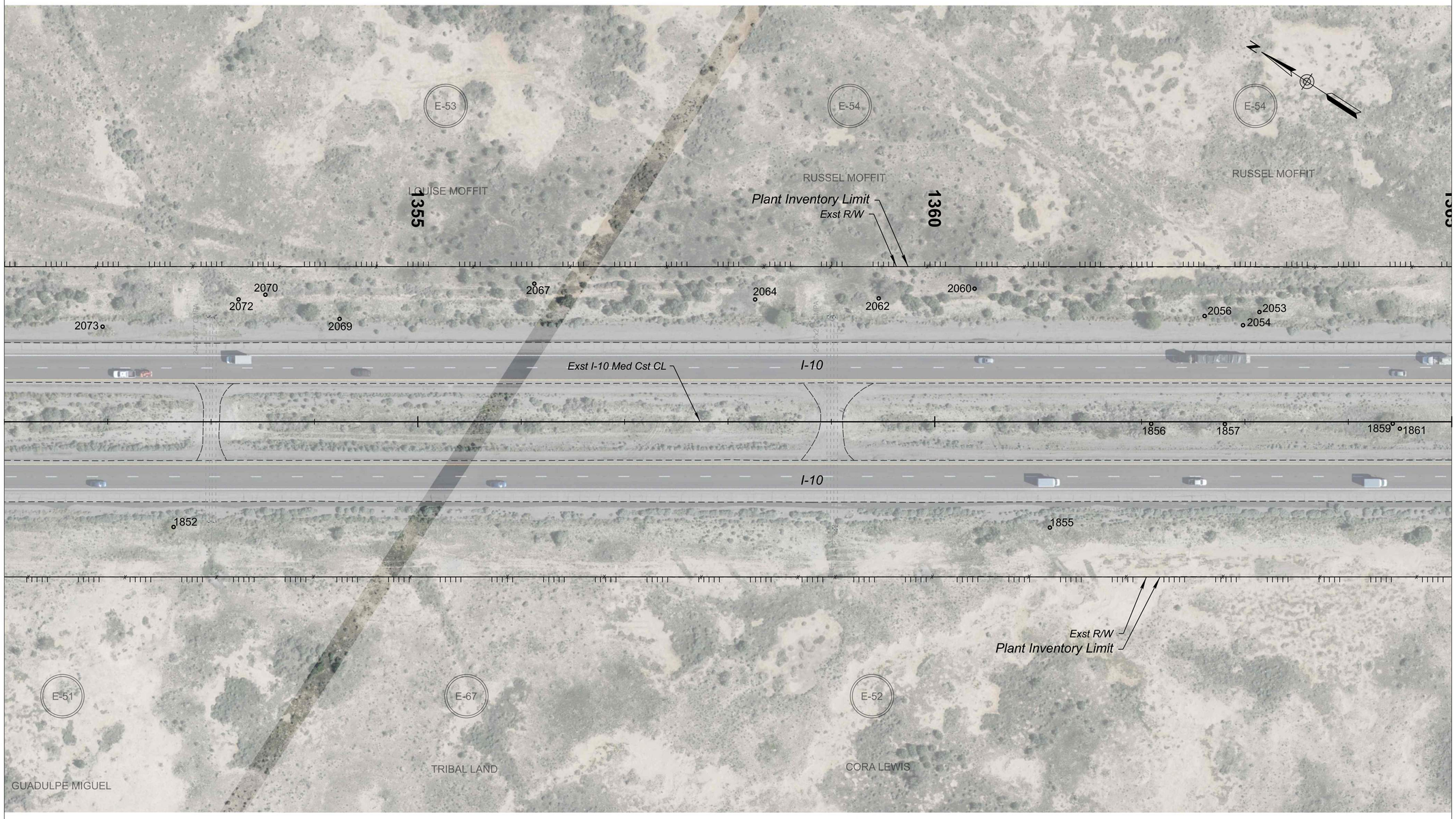
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.32

TRACS NO. F0721 01C

ADOT

___ OF ___



REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1351+00 TO STA 1365+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	49	64	

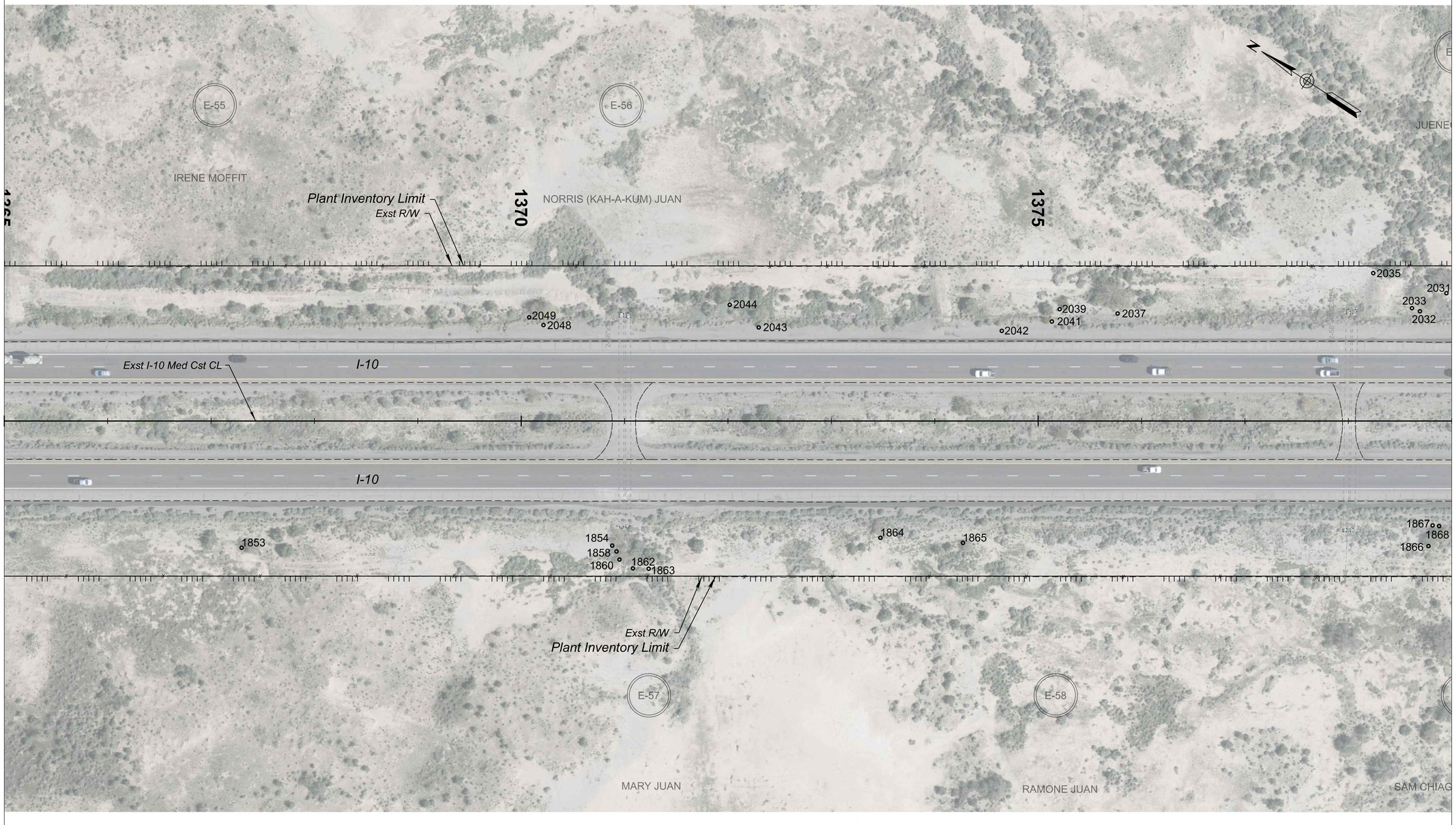
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.33

TRACS NO. F0721 01C

ADOT

___ OF ___



REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1365+00 TO STA 1379+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	50	64	

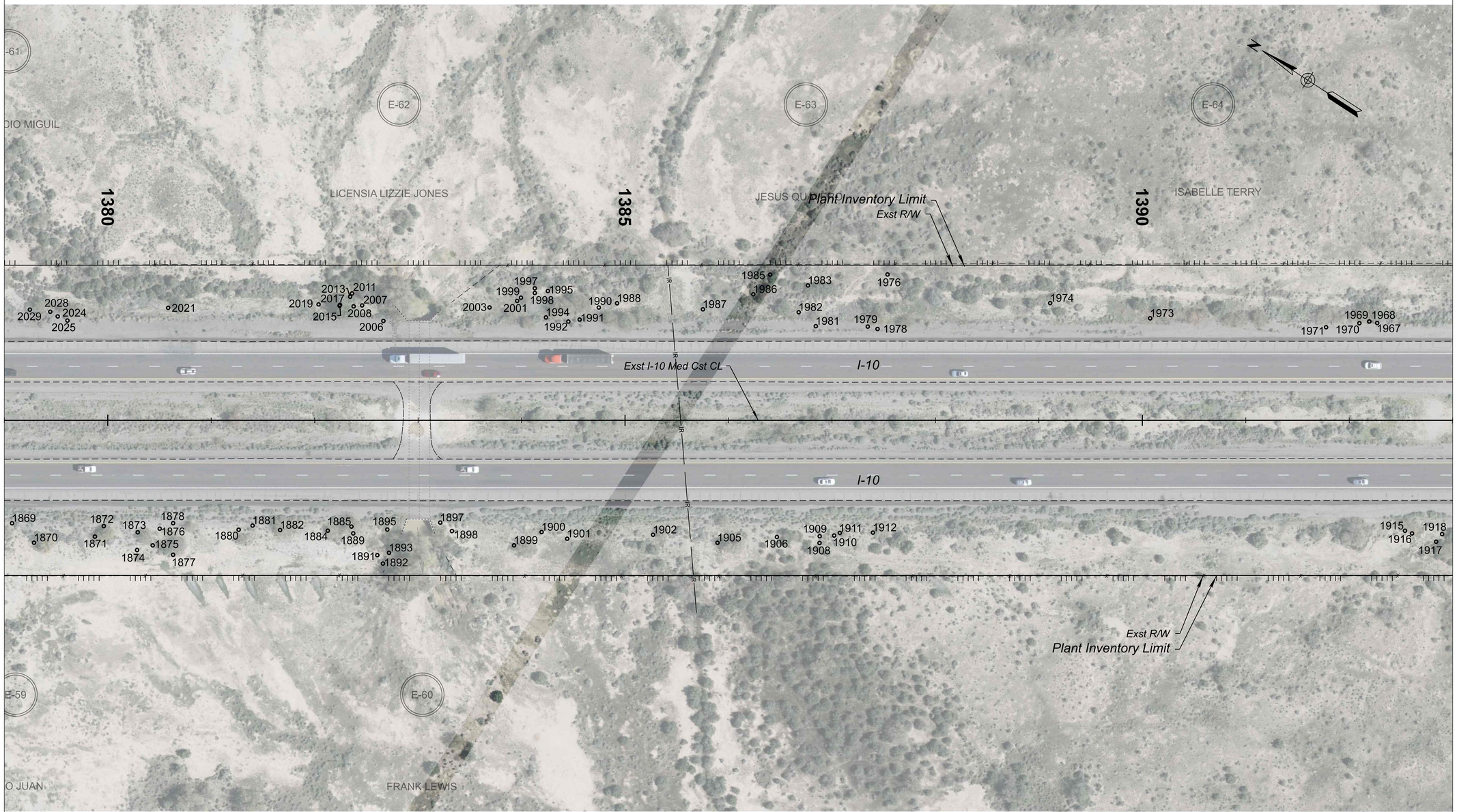
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.34

TRACS NO. F0721 01C

ADOT

___ OF ___



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1379+00 TO STA 1393+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	51	64	

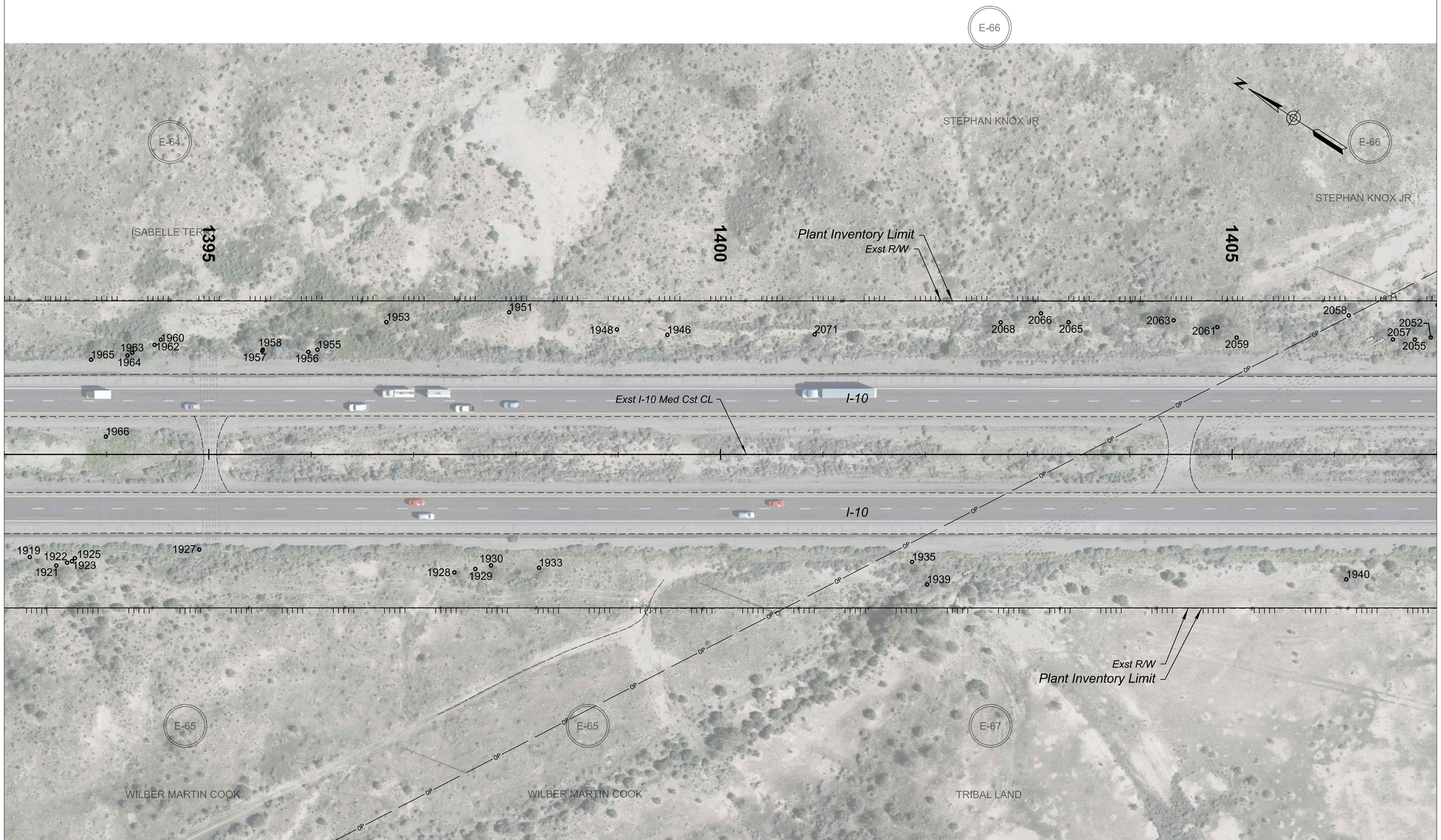
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.35

TRACS NO. F0721 01C

ADOT

____ OF ____



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E.
LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

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I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1393+00 TO STA 1407+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	52	64	

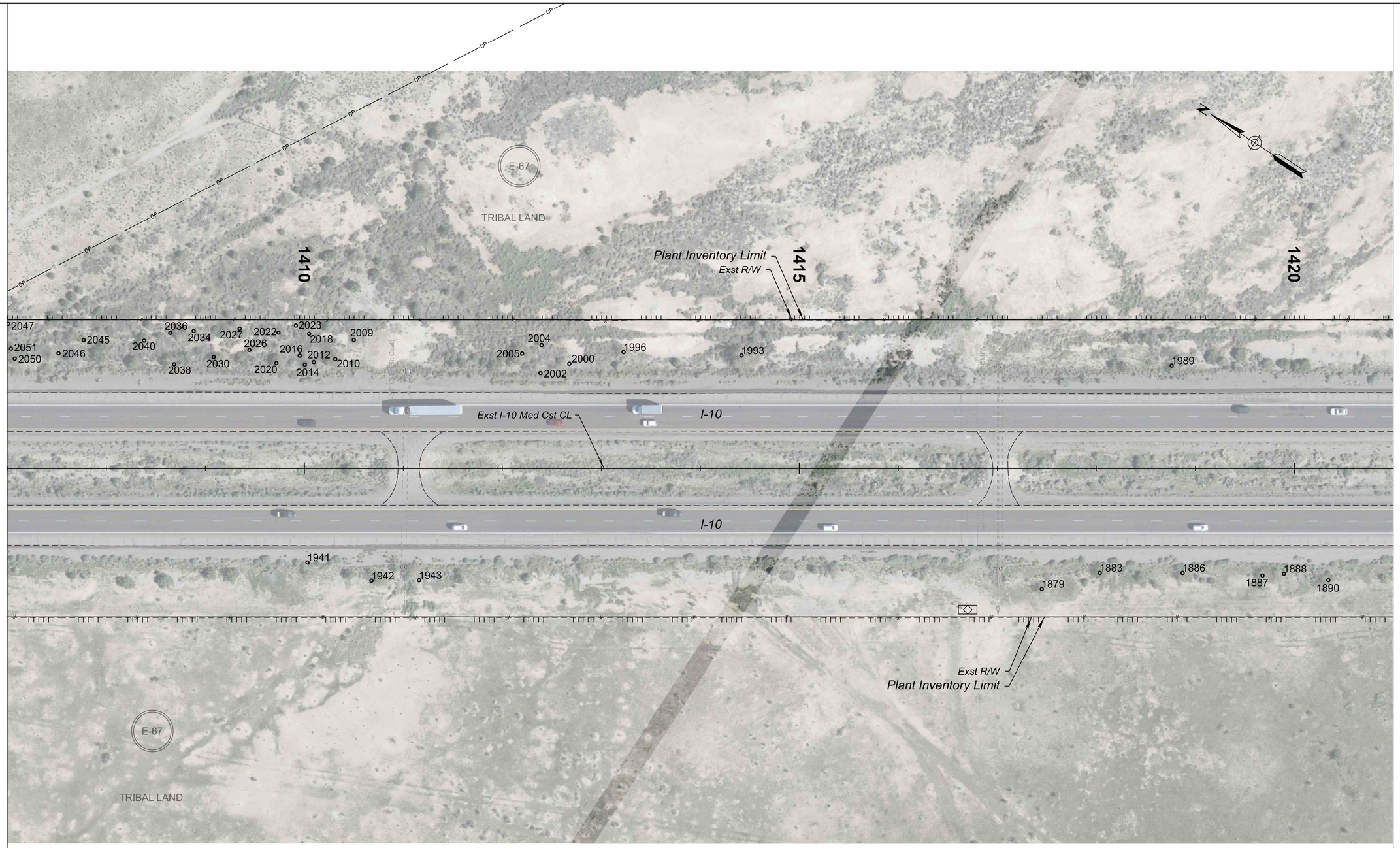
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.36

TRACS NO. F0721 01C

ADOT

____ OF____



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO. 27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1407+00 TO STA 1421+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	53	64	

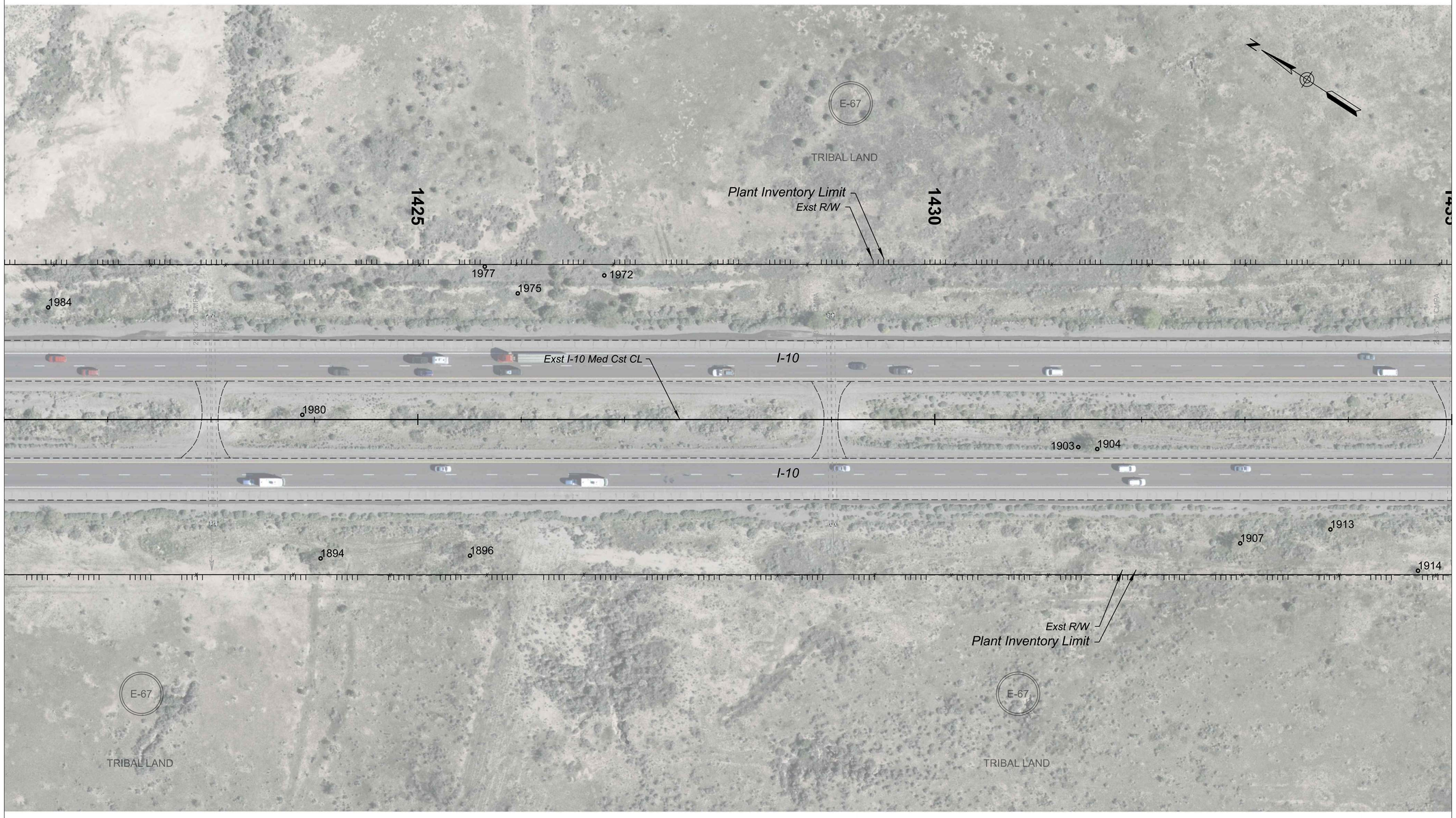
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.37

TRACS NO. F0721 01C

ADOT

____ OF ____



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1421+00 TO STA 1435+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	54	64	

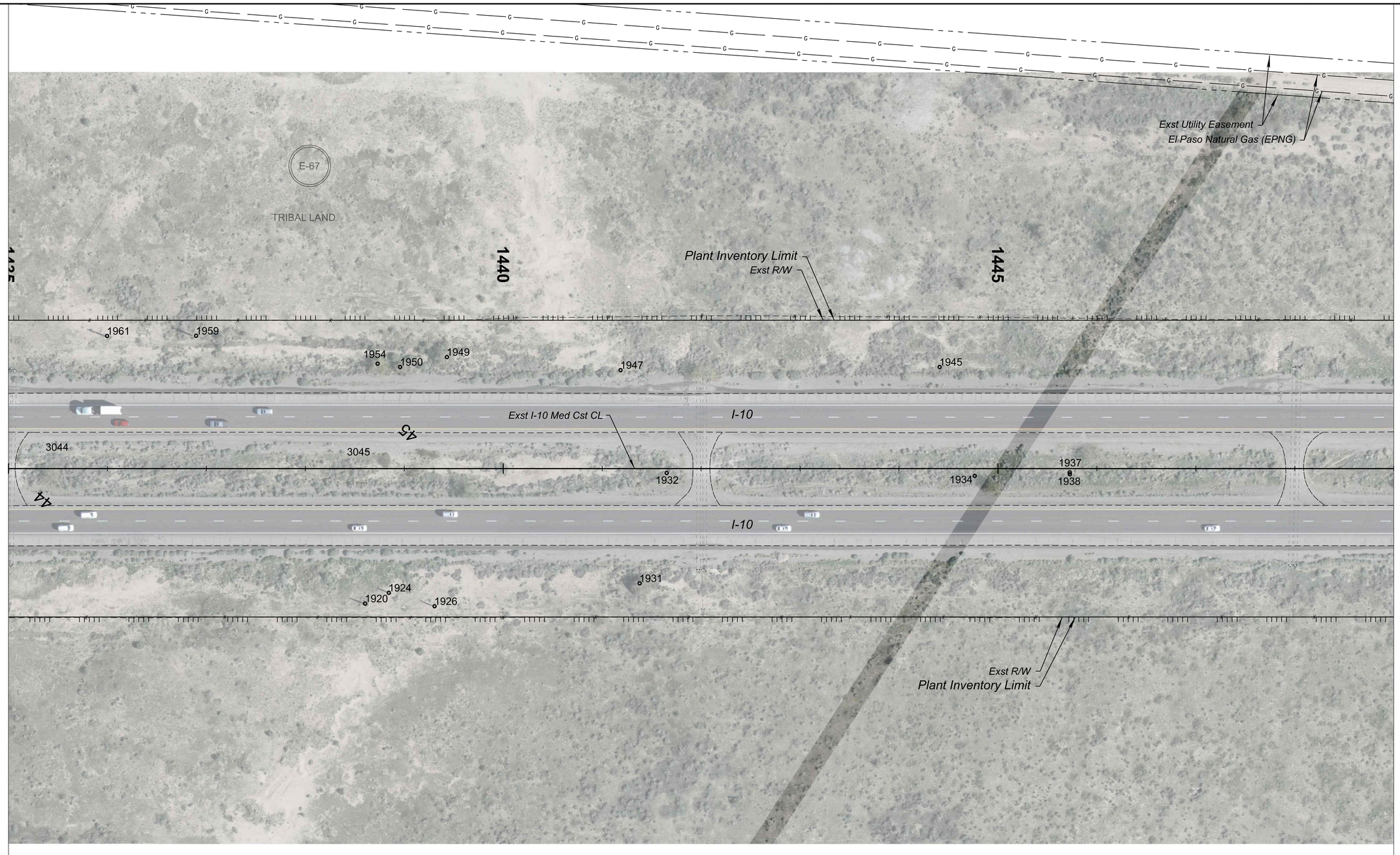
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.38

TRACS NO. F0721 01C

ADOT

___ OF ___



REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1435+00 TO STA 1449+00

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	55	64	

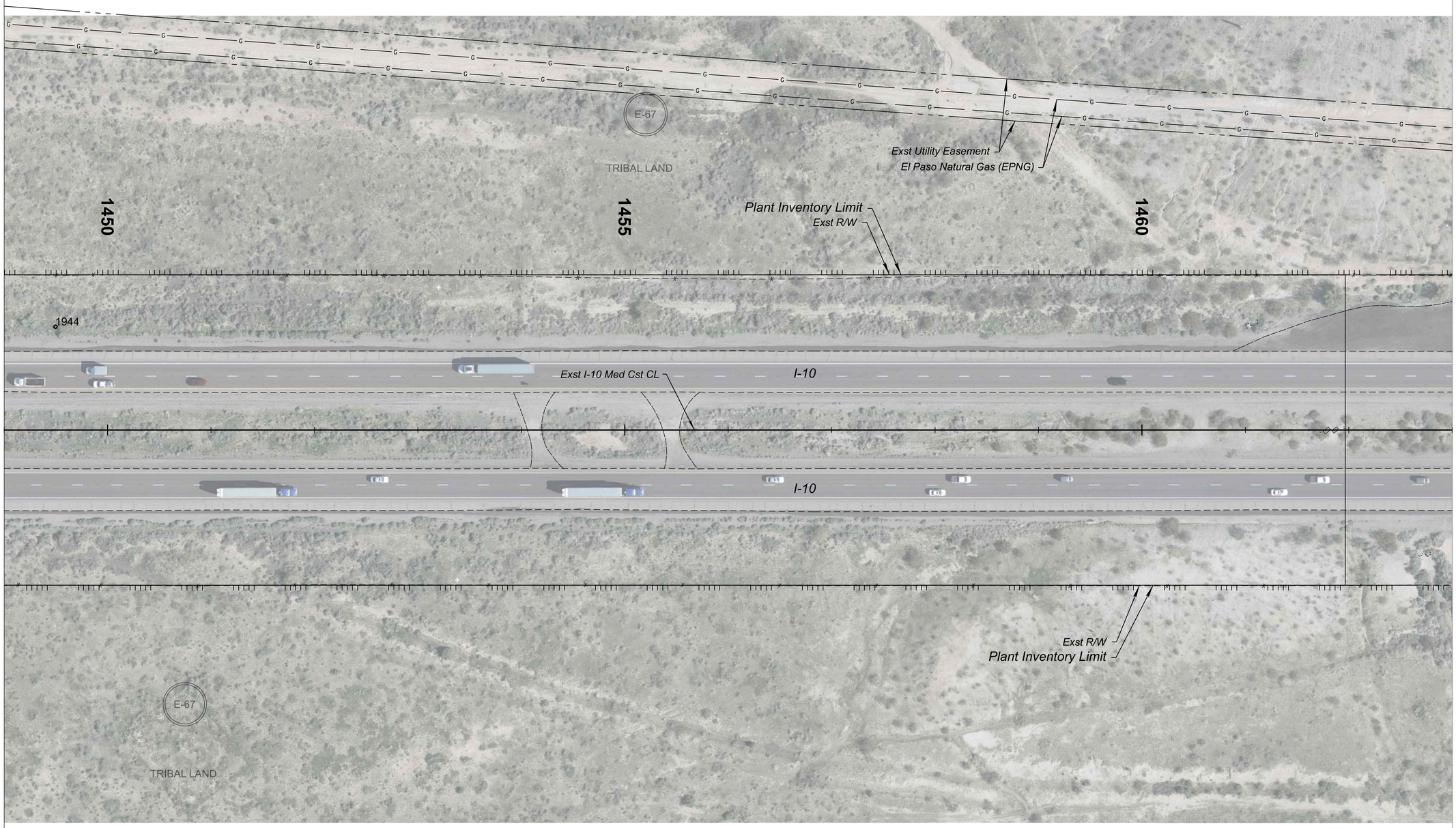
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.39

TRACS NO. F0721 01C

ADOT

___ OF ___



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT — CERTIFICATE NO. 27437 — STEVEN E. LOHIDE — Date Signed 06/11/2024 — ARIZONA U.S.A.

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ROADSIDE DEVELOPMENT SERVICES

I-10 MAINLINE
PLANT INVENTORY PLAN
STA 1449+00 TO STA 1462+00

ROUTE	MILEPOST	STRUCTURE NO.
I-10		

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	56	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

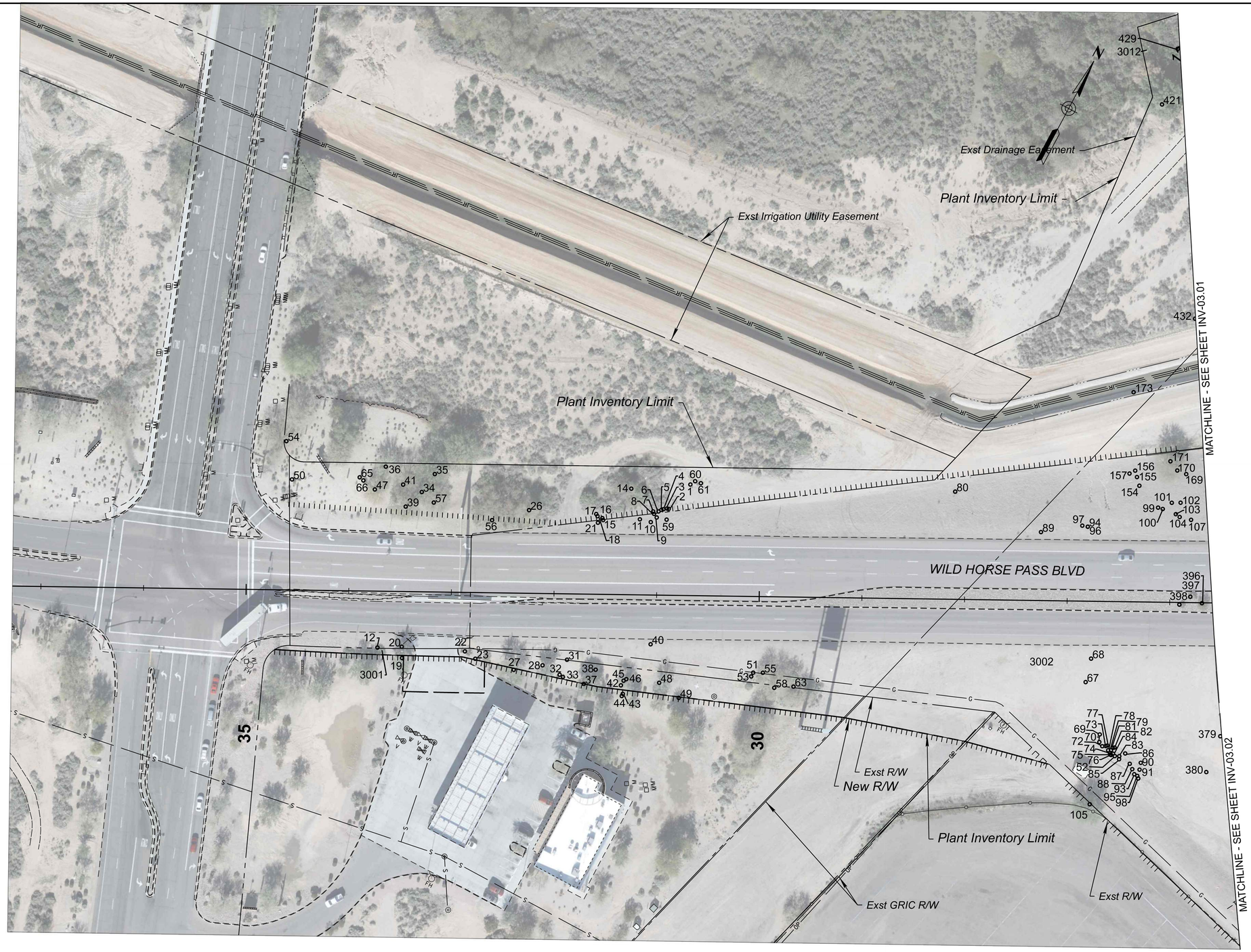
DWG NO. INV-03.40

TRACS NO. F0721 01C

ADOT

____ OF ____

KANTILL 6/10/2024 6:16:45 PM c:\pw_working\pw_prod\kantill\dms73998\r0252inv40.dgn \ Model Name: PlantInventory - INV40



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO. 27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

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ROADSIDE DEVELOPMENT SERVICES

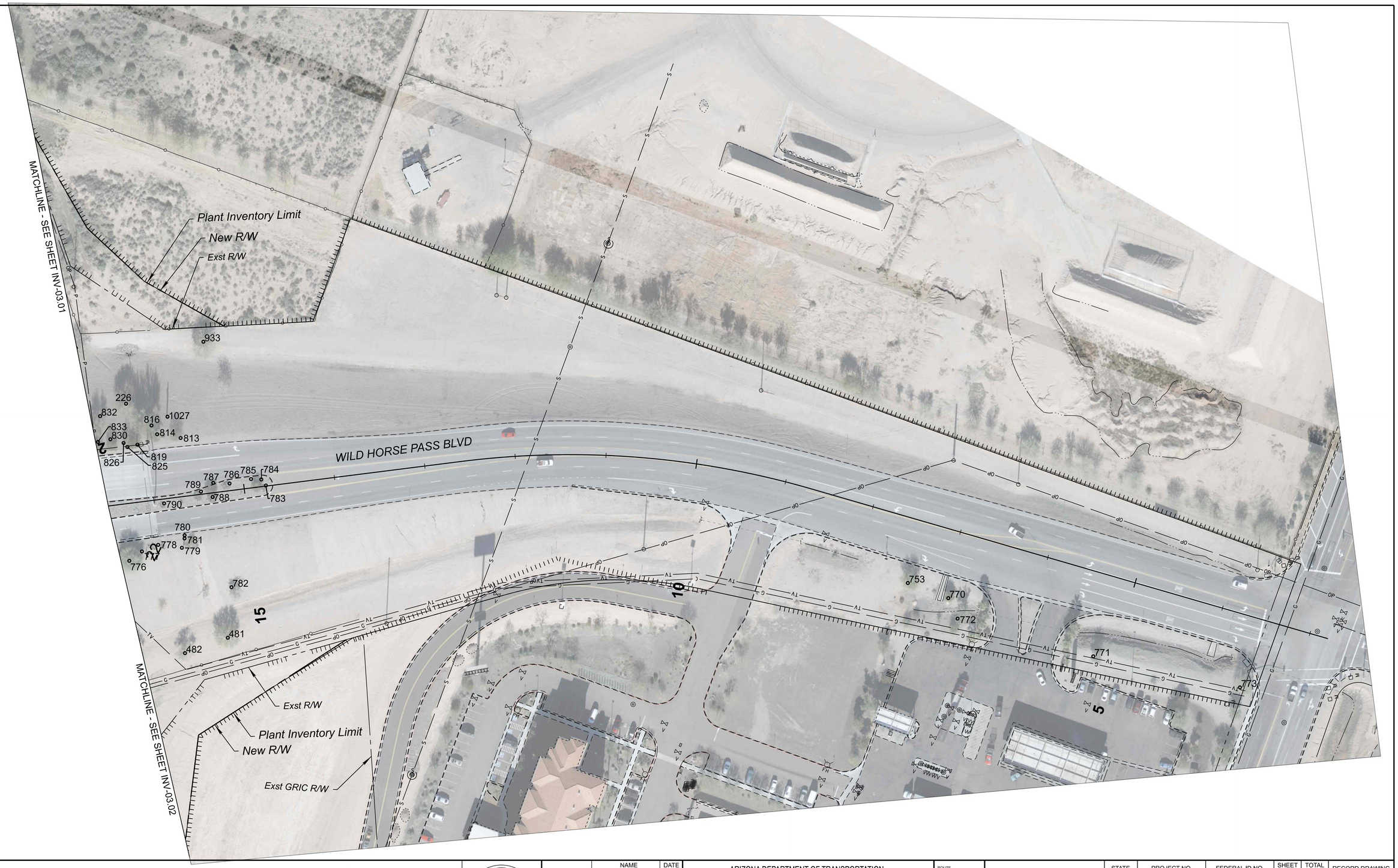
WILD HORSE PASS BLVD
PLANT INVENTORY PLAN

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	57	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387
DWG NO. INV-03.41
TRACS NO. F0721 01C
ADOT
____ OF ____

KANTILL 6/10/2024 4:48:13 PM c:\pw_working\pw_prod\kantill\dms73998\r0252inv41.dgn \ Model Name: PlantInventory - INV41



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO
27437
STEVEN E.
LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

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ROADSIDE DEVELOPMENT SERVICES
WILD HORSE PASS BLVD
PLANT INVENTORY PLAN

ROUTE	I-10
MILEPOST	
STRUCTURE NO.	

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	58	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387

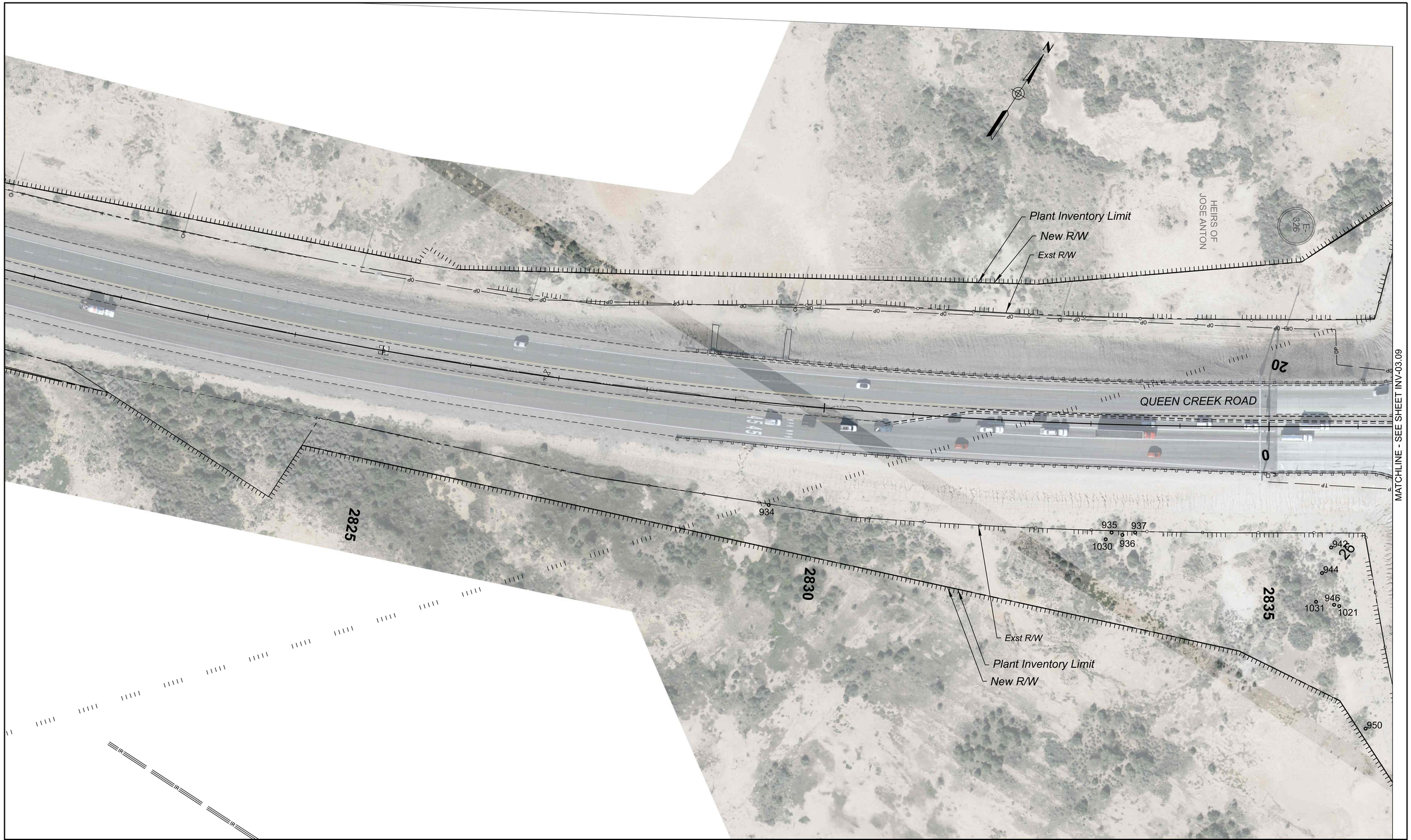
DWG NO. INV-03.42

TRACS NO. F0721 01C

ADOT

____ OF ____

KANTILL 6/10/2024 4:47:51 PM c:\pw_working\pw_prod\kantill\dms73998\r0252inv42.dgn \ Model Name: PlantInventory - INV42



REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
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STEVEN E.
LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

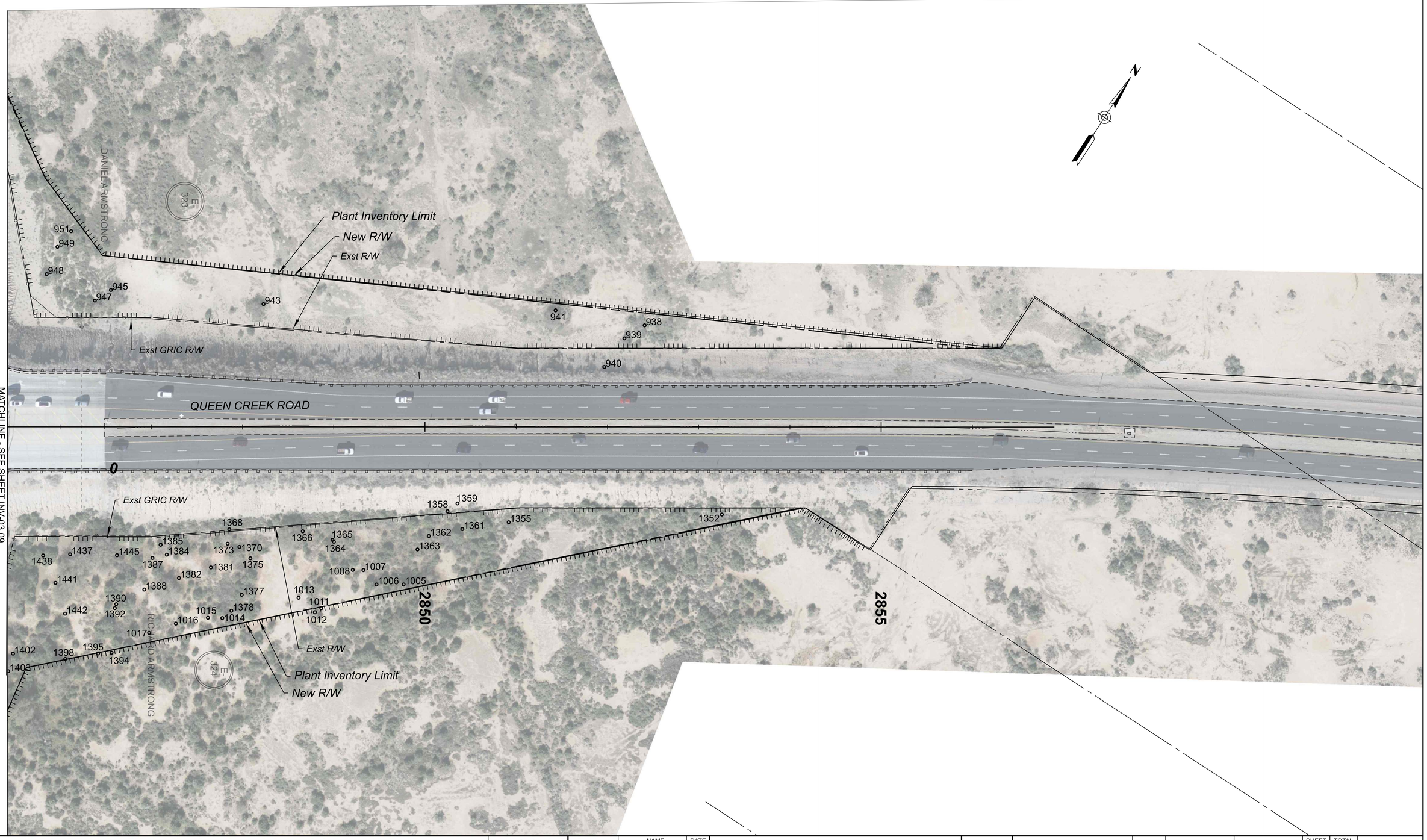
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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES
QUEEN CREEK ROAD
PLANT INVENTORY PLAN

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	59	64	

LOCATION I-10 CORRIDOR: 202L TO SR 387
DWG NO. INV-03.43
TRACS NO. F0721 01C
ADOT
___ OF ___



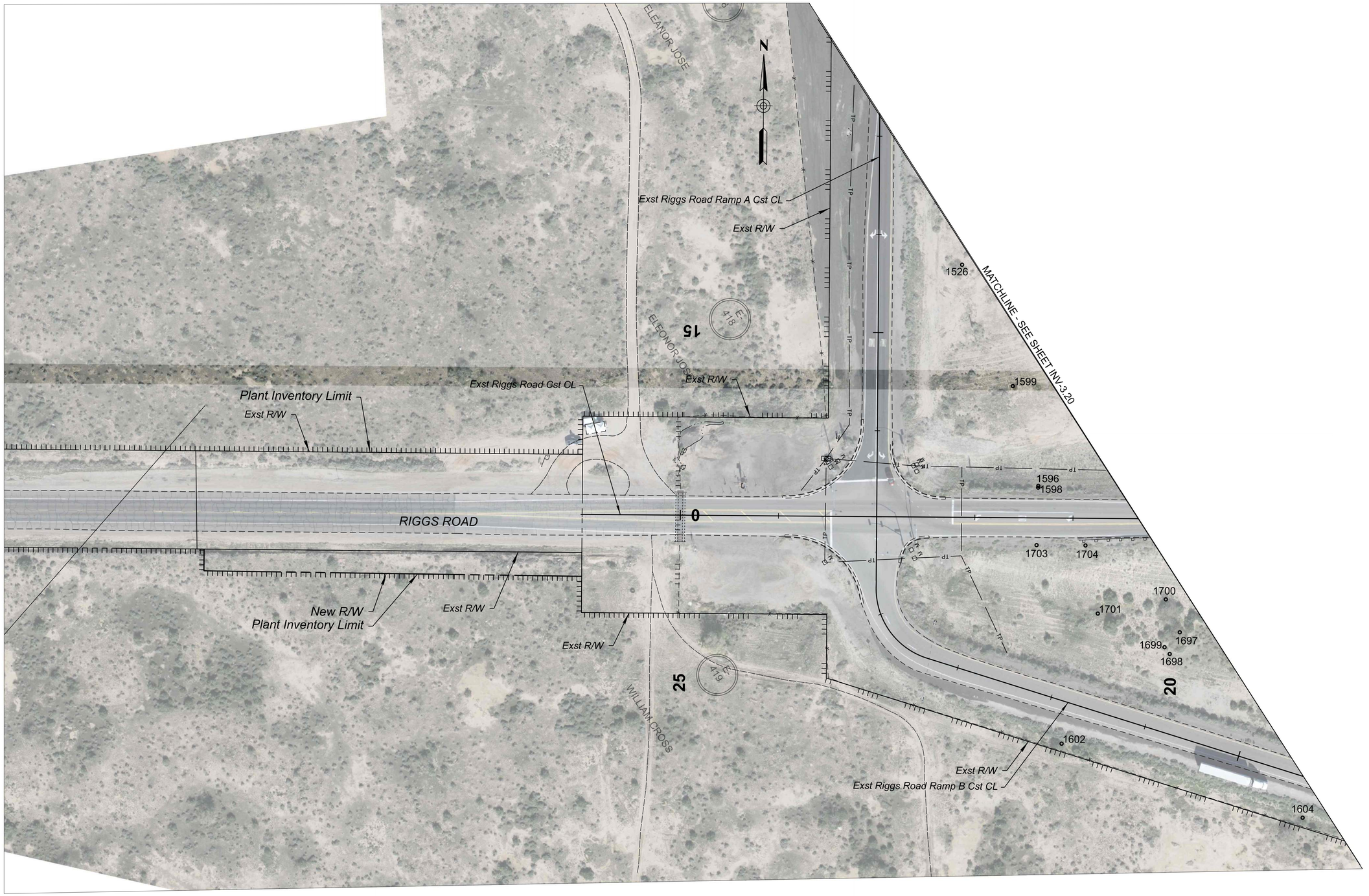
	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO. 27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

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ROADSIDE DEVELOPMENT SERVICES
QUEEN CREEK ROAD
PLANT INVENTORY PLAN

ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 MA 161	010-C(NFA)	60	64	
MILEPOST	LOCATION I-10 CORRIDOR: 202L TO SR 387						DWG NO. INV-03.44
STRUCTURE NO.	TRACS NO. F0721 01C		ADOT				____ OF ____



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

AZTEC TYPSA
501 N 44th St, Suite 300
Phoenix, AZ 85008-4505
Tel (602) 454-0402
Fax (480) 499-5565
www.aztec.us

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES
RIGGS ROAD
PLANT INVENTORY PLAN

ROUTE	I-10
MILEPOST	
STRUCTURE NO.	

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	010 MA 161	010-C(NFA)	61	64	

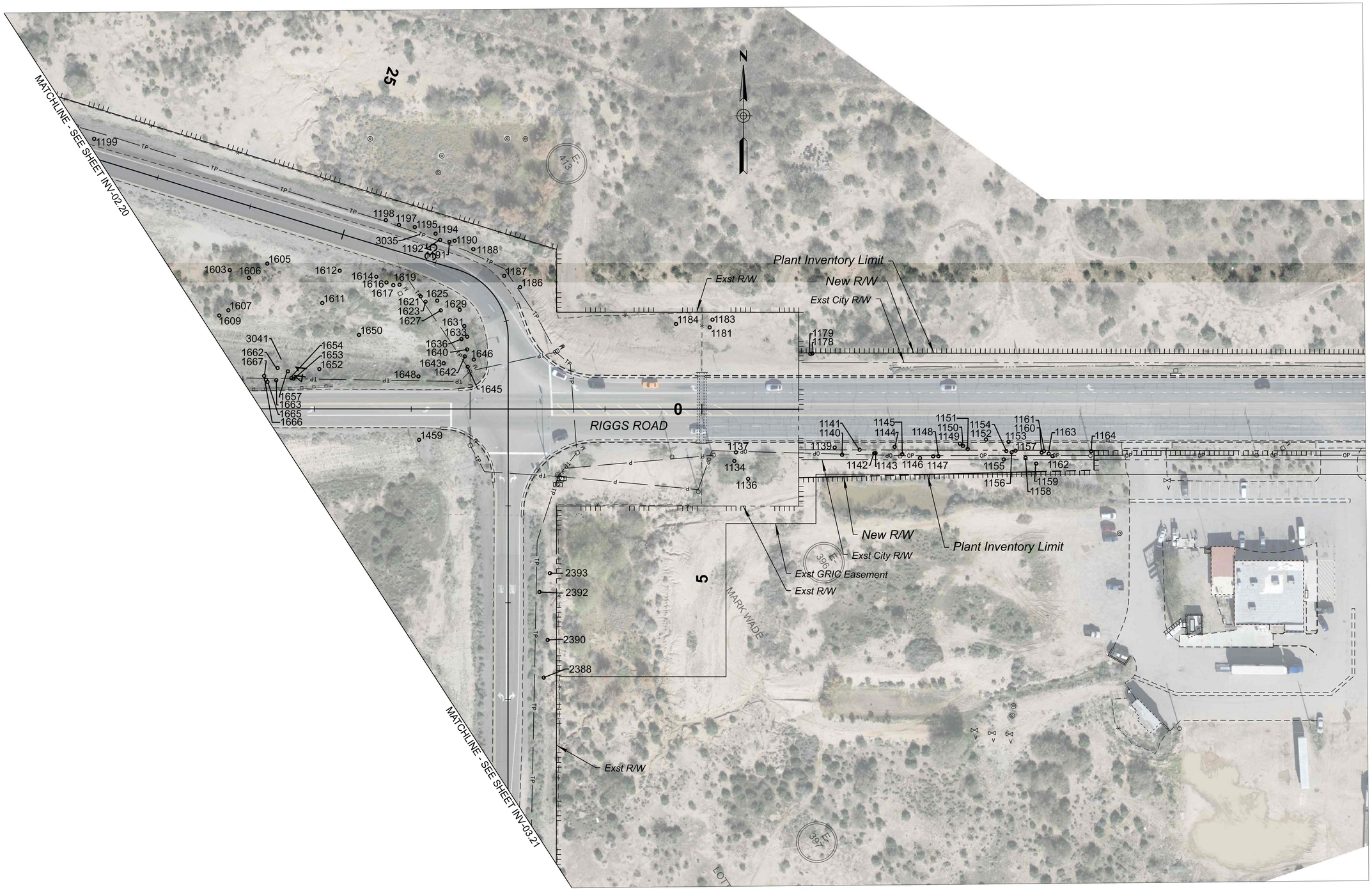
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.45

TRACS NO. F0721 01C

ADOT

____ OF ____



	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT — CERTIFICATE NO. 27437 — STEVEN E. LOHIDE — Date Signed 06/11/2024 — ARIZONA U.S.A.

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ROADSIDE DEVELOPMENT SERVICES

RIGGS ROAD
PLANT INVENTORY PLAN

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	62	64	

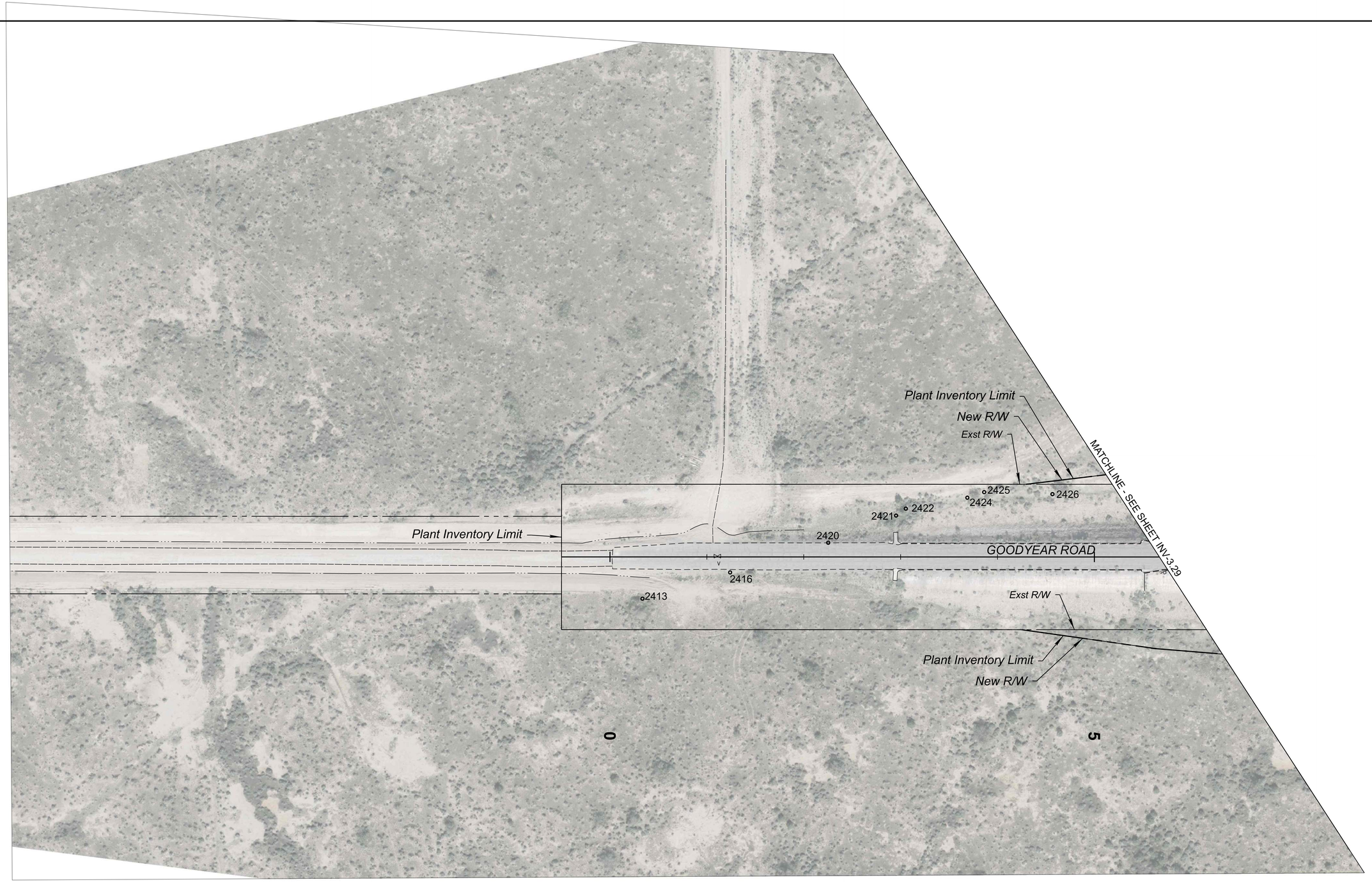
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.46

TRACS NO. F0721 01C

ADOT

____ OF ____



REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
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	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

GOODYEAR ROAD
PLANT INVENTORY PLAN

ROUTE I-10
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	010 MA 161	010-C(NFA)	63	64	

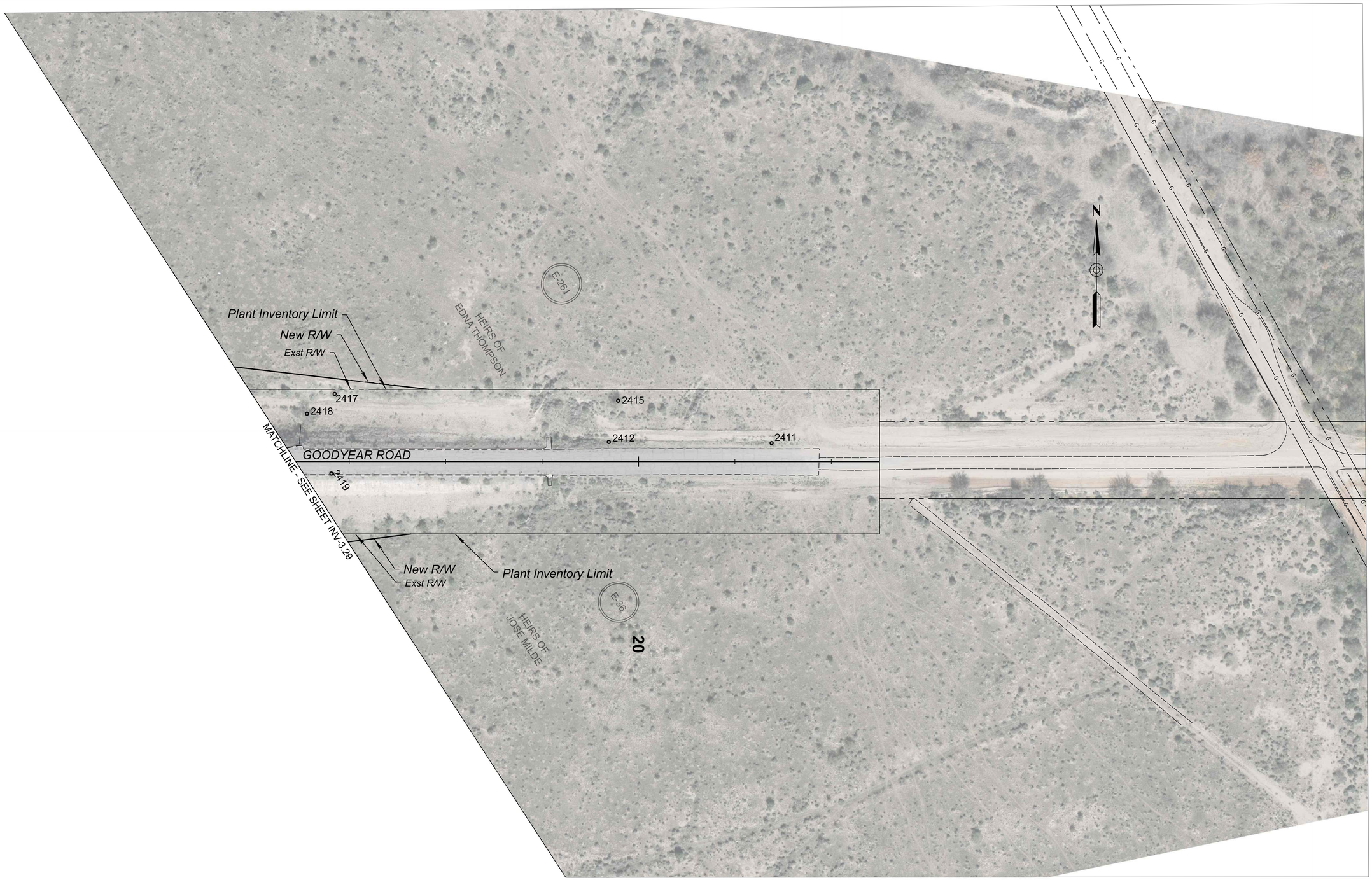
LOCATION I-10 CORRIDOR: 202L TO SR 387

DWG NO. INV-03.47

TRACS NO. F0721 01C

ADOT

____ OF ____



REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 06/11/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	06/24
DRAWN	JKP	06/24
CHECKED	SEL	06/24

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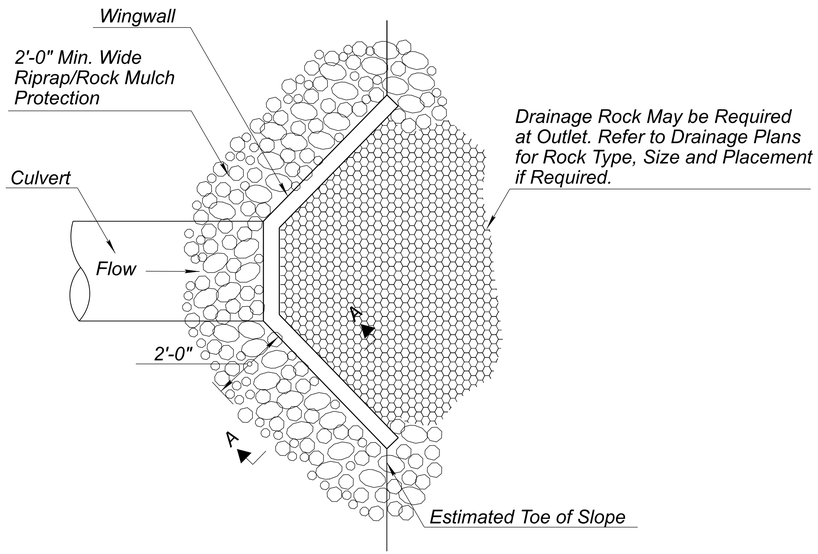
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

GOODYEAR ROAD
PLANT INVENTORY PLAN

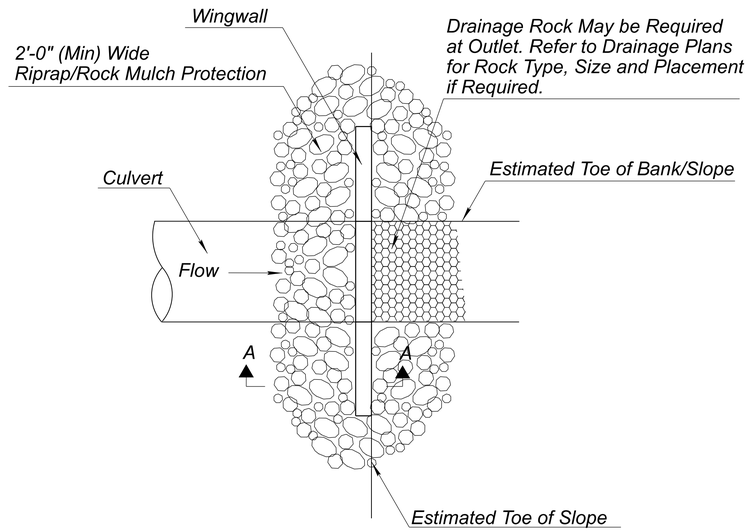
ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 MA 161	010-C(NFA)	64	64	
MILEPOST	LOCATION I-10 CORRIDOR: 202L TO SR 387						DWG NO. INV-03.48
STRUCTURE NO.	TRACS NO. F0721 01C		ADOT				___ OF ___

TPA 810-1 Rock Mulch Protection

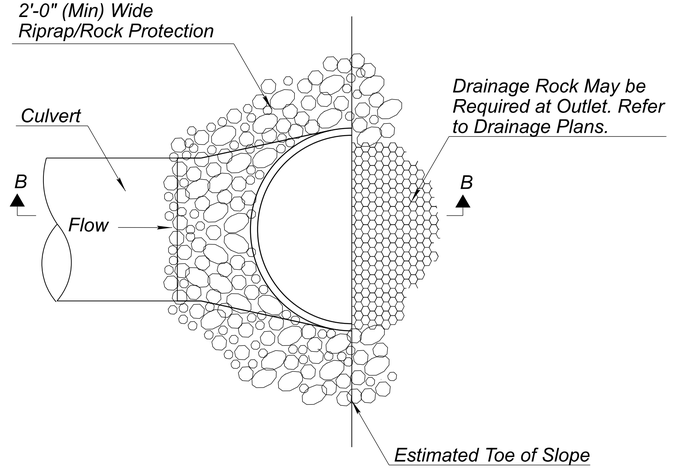
See attached



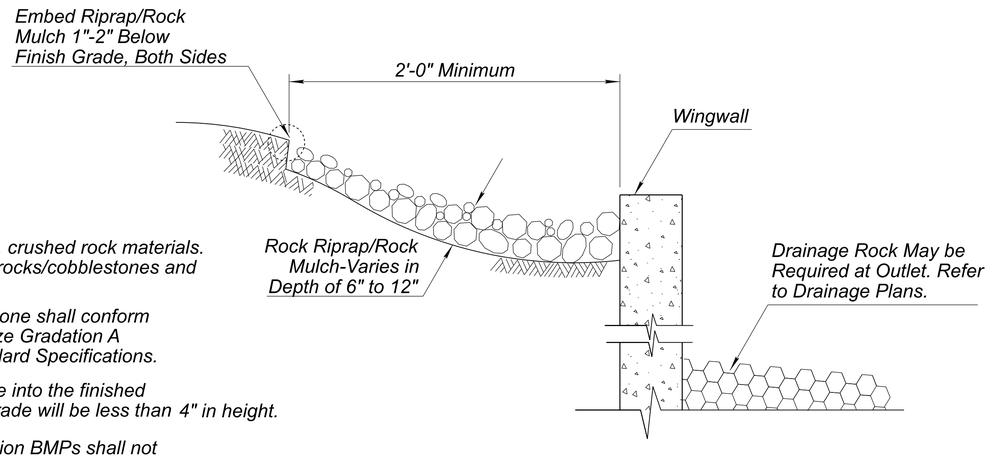
ANGLED HEADWALL
PLAN VIEW (NTS)



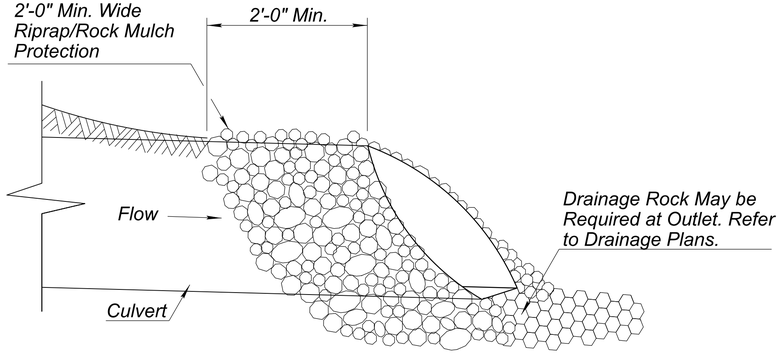
FLUSH HEADWALL
PLAN VIEW (NTS)



FLARED END
PLAN VIEW (NTS)



WINGWALL
SECTION A-A (NTS)



FLARED END
SECTION B-B (NTS)

NOTES:

1. Rock Riprap/Rock Much shall be angular shaped, crushed rock materials. Natural river-run materials such as rounded river rocks/cobblestones and pebbles are NOT acceptable.
2. Rock Riprap/Rock Mulch within the traffic Clear Zone shall conform to the requirements of Section 810-2.03 Sieve Size Gradation A and/or Gradation C, and Section 913 of the Standard Specifications.
3. Embed rock within traffic recovery area/clear zone into the finished grade so that any portion of the rock above the grade will be less than 4" in height.
4. The installation and maintenance of Rock Protection BMPs shall not negatively impact traffic safety, nor the designed function of roadway or bridge drainage facilities. Rock Protection BMPs shall be installed and maintained to carry the stormwater of at least 2-year, 24-hour events.
5. Make field adjustments and corrections of Rock Protection BMP immediately if it is causing flooding, erosion, and/or affecting roadway safety.
6. Make field adjustments and corrections to ensure NO sensitive biological resources (native species / habitats) will be adversely impacted.

DETAIL ES1 NTS

ROCK PROTECTION FOR INLETS, OUTLETS AND HEADWALL TRANSITION

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 07/30/2024
ARIZONA U.S.A.

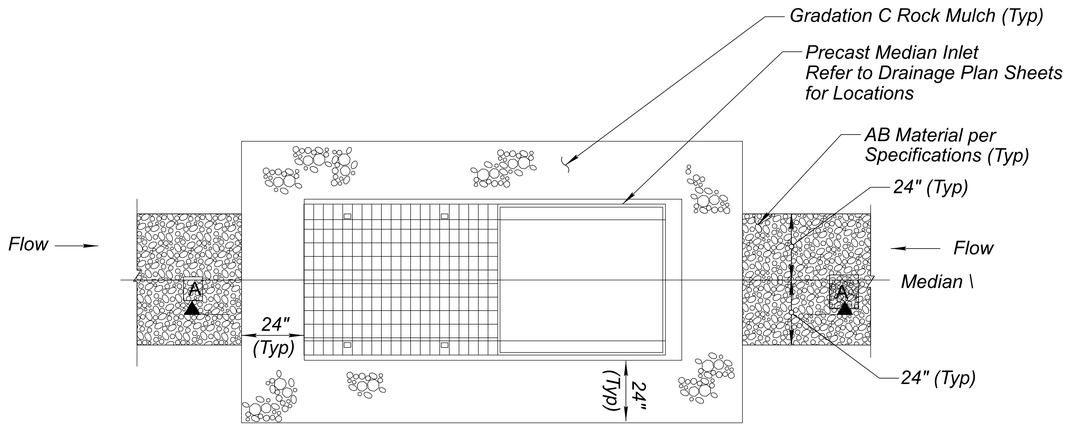
	NAME	DATE
DESIGN	SEL	07/24
DRAWN	JKP	07/24
CHECKED	SEL	07/24

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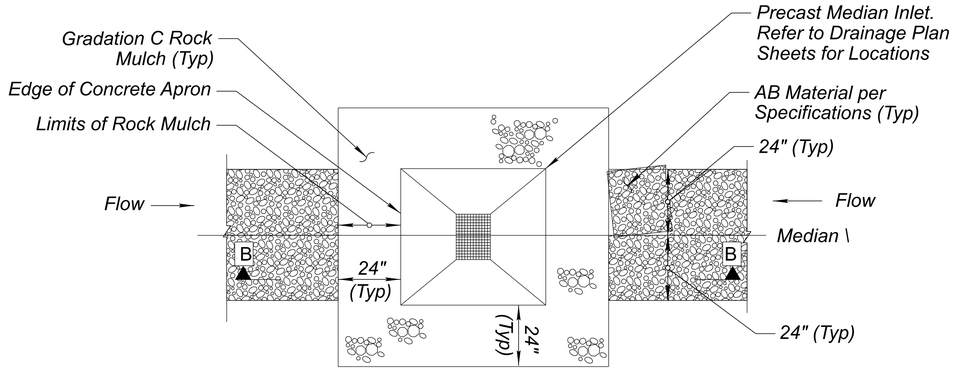
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADSIDE DEVELOPMENT SERVICES

ROCK MULCH PROTECTION DETAIL

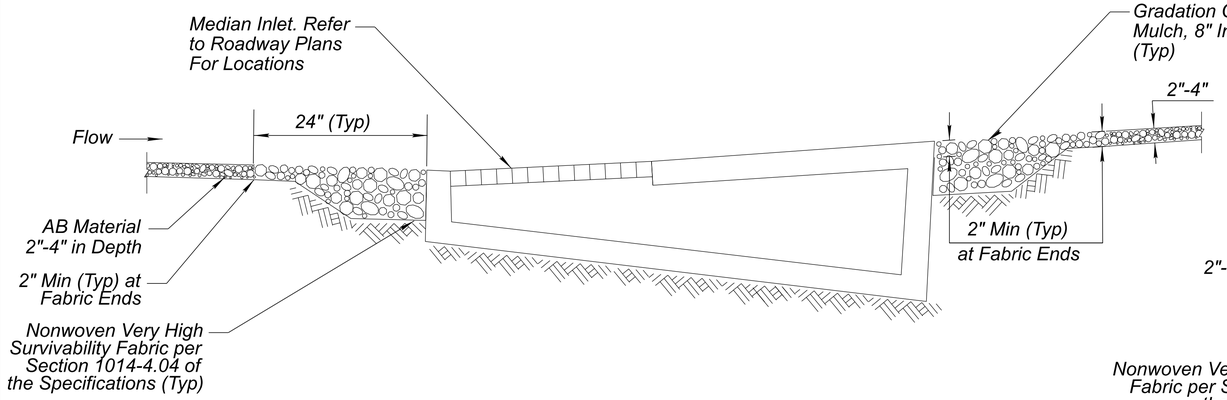
ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 MA 161	010-C-NFA			
MILEPOST	LOCATION I-10, SR 202L (SANTAN/SOUTH MOUNTAIN) TO GILA RIVER BRIDGE						DWG NO. L-01.03
STRUCTURE NO.	TRACS NO. F0721 01C		ADOT				____ OF____



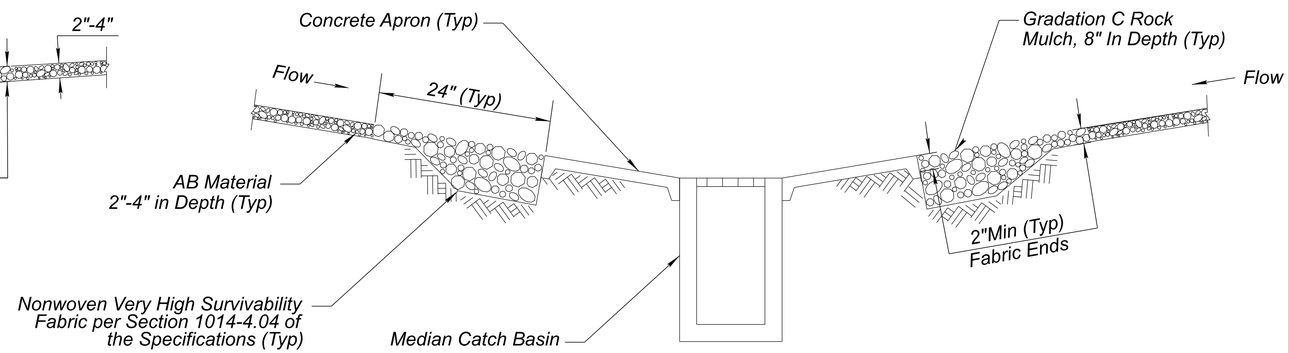
PLAN (NTS)



PLAN (NTS)



SECTION A-A (NTS)



SECTION B-B (NTS)

NOTES:

1. *The depth of AB may be adjusted at the direction of the Engineer.*
2. *Refer to Roadway and Drainage Plans and Details for locations of Inlets and Catch Basins.*
3. *Nonwoven Very High Survivability Fabric shall conform to the standards of Section 1014-4.04 of the Specifications.*
4. *Place Gradation C Rock Mulch and shape as shown on the Detail. Rock Mulch materials shall be fractured/crushed rocks in angular shape as defined in the sub-section 810-2.03 of Specifications and project special provisions. Natural river-run materials such as rounded river rocks/cobblestones and pebbles are NOT acceptable.*
5. *Make field adjustments and corrections of Median Inlet Protection CM/BMP immediately if it is causing flooding erosion and/or affecting roadway safety.*
6. *Make field adjustments and corrections to ensure NO sensitive biological resources (native species / habitats) will be adversely impacted.*

DETAIL ES2 NTS

MEDIAN INLET PROTECTION

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
CERTIFICATE NO.
27437
STEVEN E. LOHIDE
Date Signed 07/30/2024
ARIZONA U.S.A.

	NAME	DATE
DESIGN	SEL	07/24
DRAWN	JKP	07/24
CHECKED	SEL	07/24

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ROADSIDE DEVELOPMENT SERVICES

MEDIAN INLET PROTECTION DETAIL

ROUTE	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
I-10		ARIZ.	010 MA 161	010-C-NFA			
MILEPOST	LOCATION I-10, SR 202L (SANTAN/SOUTH MOUNTAIN) TO GILA RIVER BRIDGE					DWG NO.	L-01.04
STRUCTURE NO.	TRACS NO. F0721 01C		ADOT			____ OF____	