STATEWIDE STORMWATER & EROSION CONTROL STUDY

Final Report

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ADOT

Prepared For:
Arizona Department of Transportation
Multimodal Planning Division

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TABLE OF CONTENTS

List of Tables

List of Figures

APPENDICES (UNDER SEPARATE COVER)

I. INTRODUCTION

A. STATEMENT OF NEED

As expressed by ADOT, the Statewide Stormwater & Erosion Control Study has been identified as a need to:

- Conduct a planning study that identifies and prioritizes statewide stormwater management and erosion control needs delivered as a data model that operates with a defined project prioritization framework.
- Develop a model whose output will create a prioritized list of stormwater construction projects to be addressed on an annual program basis.
- Ensure that the model is quantitative, comprehensive, replicable, and systematic to inform /augment stormwater management activities and compete in the annual ADOT P2P process and programming.

B. PROJECT OBJECTIVES

The Technical Advisory Committee (TAC) for the Statewide Stormwater & Erosion Control Study has developed, reviewed and confirmed the following project objectives:

1. Develop a prioritization model with scoring criteria and weighting to analyze potential projects on an ongoing basis.
2. Stakeholder coordination to identify statewide stormwater and erosion control needs and required mitigation for roadway and right of way drainage.
3. Analysis of identified needs through the prioritization model using established scoring criteria.
4. Determine project scoping elements and develop planning level cost estimates for the top 20 prioritized projects.

Though not a formal project objective, an important work task that ADOT hoped this project would assist in achieving was to further define data points of relevance to ADOT's Municipal Separate Storm Sewer System (MS4) and stormwater permit. As part of data collection efforts for prioritization model development, datasets were collected that provide a repository of information to assist ADOT in defining statewide MS4 boundaries and outfall locations adjacent to ADOT State Highway System (SHS) facilities. Examples of data included GIS data layers shared by ADOT internal departments, ADEQ, other MS4s and other data sources as identified by the TAC.

As was acknowledged early in the process, this task had mixed results due to limited data. The Arizona Department of Environmental Quality (ADEQ) for example does not require MS4s to share their MS4 maps with them unless requested to do so. Even if ADEQ had this data, state statutes limit what information can be shared with the public. The greatest chance for success was to obtain data directly from other MS4s, but only if they were willing to share this information. A data request by ADOT to adjacent MS4 permittees provided very limited results. Another data request by the consultant team to MS4s located in urbanized areas resulted in few additional results.

C. STUDY AREA

The ADOT Statewide Stormwater & Erosion Control study area generally encompasses the entire state of Arizona and the seven ADOT Districts that are responsible for the entire ADOT SHS. See **Figure 1** for illustration of the ADOT SHS and the ADOT District boundaries that serve the SHS. See **Figure 2** that identifies the current locations of all statewide USACE Section 404 current permittees.

More specific to this project, the study area focused upon specific Mile Post (MP) locations along the ADOT SHS where ADOT District employees have identified existing stormwater challenges or conflicts that adversely impact (or have the potential to adversely impact) ADOT rights-of-way (ROW). Please see **Section III.A** for a detailed overview of each potential stormwater construction project by District.

Figure 1: Arizona's State Highway System and District Boundaries

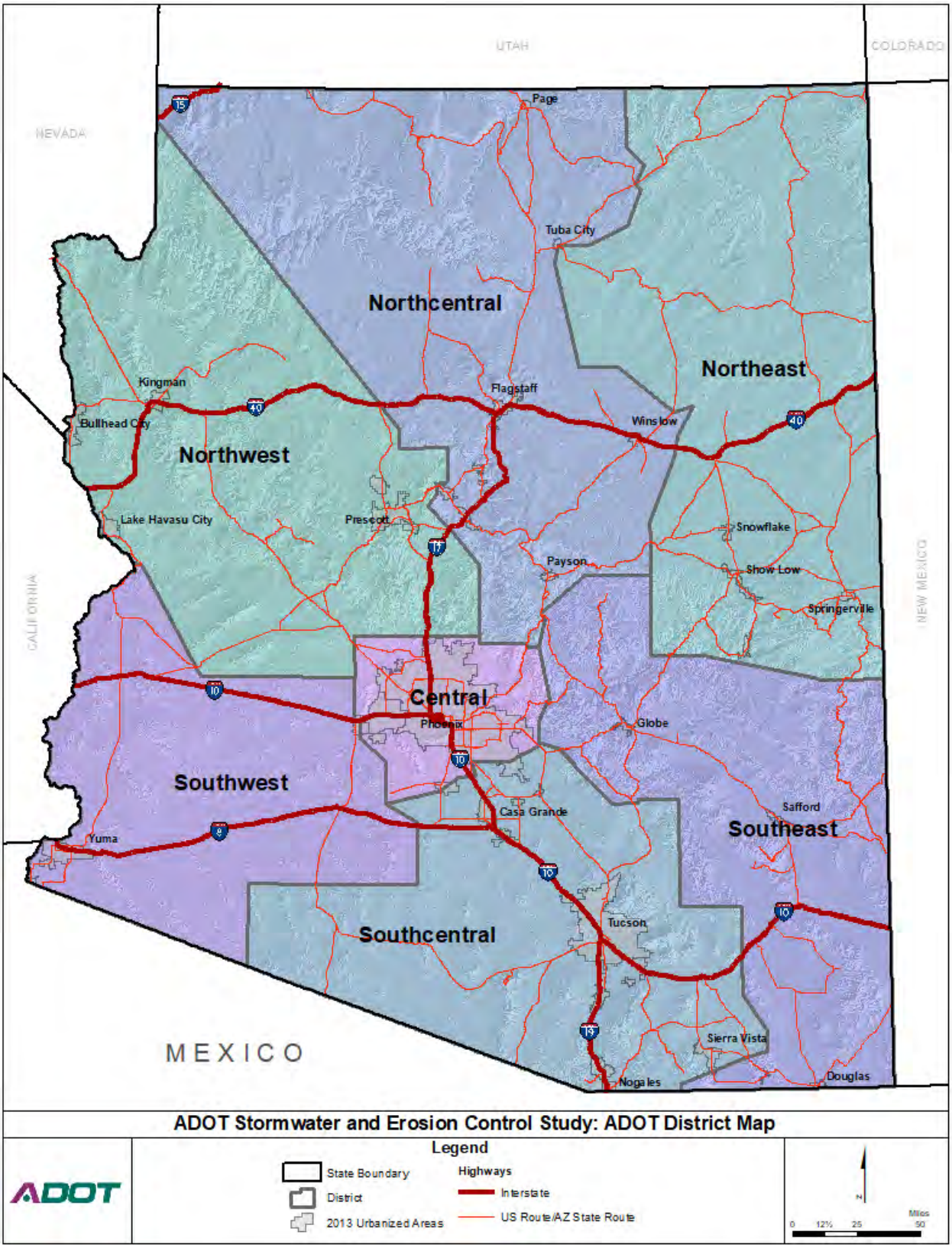
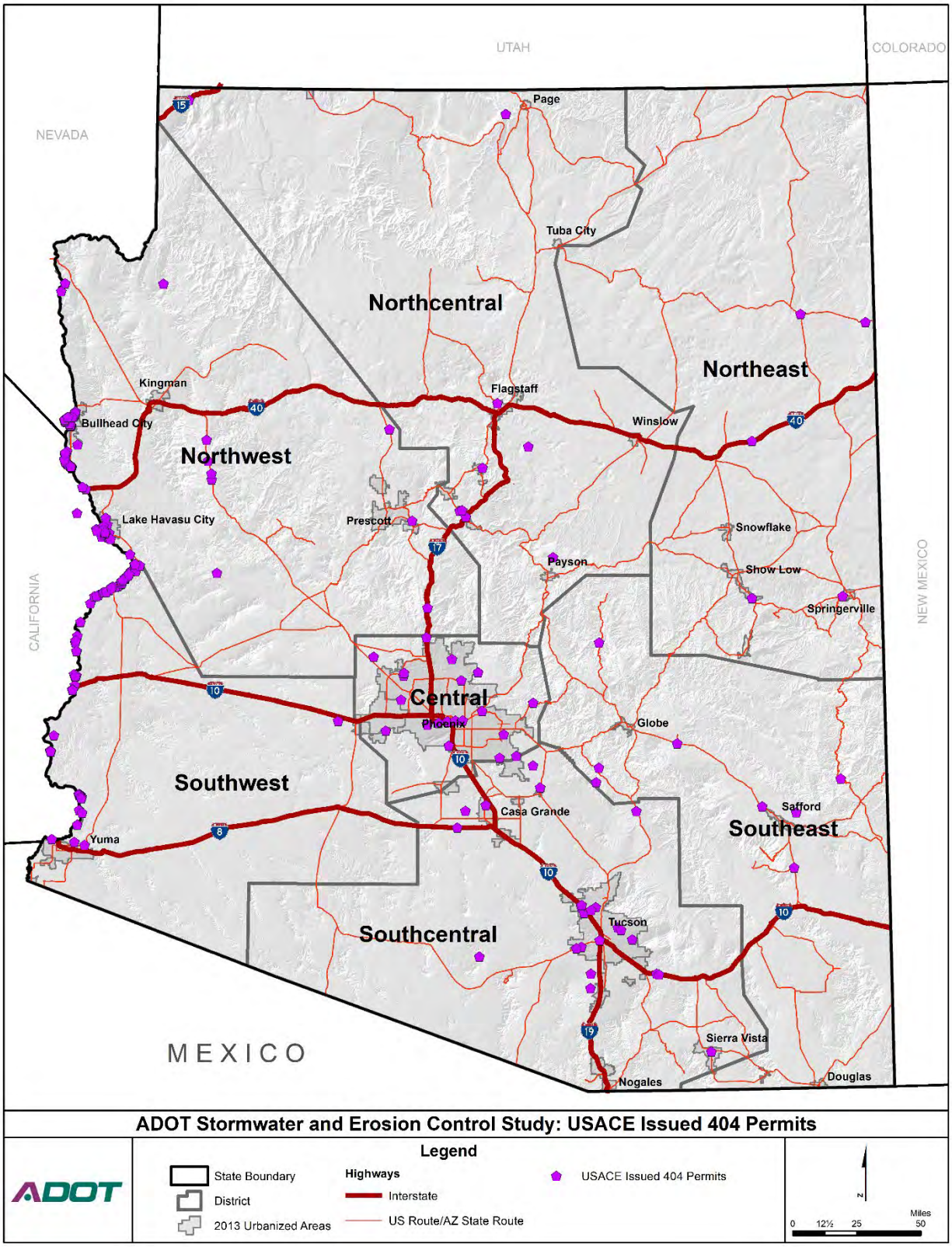


Figure 2: Statewide USACE 404 Permits



D. ADOT PLANNING-TO-PROGRAMMING (P2P) PROCESS

The ADOT P2P process is a performance-based process resulting in the development of ADOT's draft five-year facilities construction program. The P2P process is conducted annually by ADOT's Multimodal Planning Division (MPD) to prioritize all prospective statewide facility improvements, and the result is a statewide prioritized project list. Although stormwater and erosion control projects are not currently being evaluated through the P2P process, **Section VII** *SWSWECS PPM Implementation Guidance* explains the development of the project prioritization process exclusively for stormwater and erosion control projects to compete and integrate with other statewide prioritized projects in the P2P process.

Moving forward, as ADOT incorporates stormwater projects into the P2P process, projects derived from this study into the P2P process are intended to compete with other projects in the P2P "modernization" projects category across the state. Stormwater projects will not compete against other projects in the preservation or expansion category.

Stormwater projects identified in this study to include the ones that did not make the statewide top 20 have an opportunity to be bundled with other District pavement preservation or expansion projects (located at the same milepost) should they be separately identified and prioritized.

In future years moving forward, it is anticipated that ADOT Environmental will do an annual call for projects to the ADOT Districts. Projects may consist of stormwater projects already identified from this study, modified projects identified in this study, or newly introduced stormwater projects altogether. The ADOT Environmental Group will then inventory the stormwater project list, acquire additional background data on each project (relative to information needed to apply the evaluation criteria), put the information into the prioritization model tool, run the tool, evaluate each project using the evaluation criteria and weights, and rank each stormwater project statewide.

E. STUDY PROCESS

The following represents a brief description and sequence of each task included as a part of the ADOT Statewide Stormwater & Erosion Control Study.

TASK 1: Kick off Meeting

– Project team meeting to finalize work plan and budget

TASK 2: Finalize Work Plan/TAC Meeting #1

– Introduce the project work plan to the TAC; obtain their feedback on key issues, concerns and objectives

TASK 3: Develop Prioritization Model

– Data Collection – FIS, PECOS, Photolog, Interviews, list of projects by District

– Mapping MS4's – ADOT and adjacent MS4's; boundaries, overlap areas, discharge location and elevation as available, FIS environmental datasets and other info TAC desires

– Working Paper #1 – Needs Identification, Inventory and Analysis; determine project type - construction vs. maintenance, construction moves forward

– TAC Meeting #2 – TAC review and feedback of WP#1

–Evaluation Criteria/Weighting – TAC consensus driven process

TASK 4: Needs Identification/Project Scoring

– Working Paper #2 – apply model; analyze results

– TAC Meeting #3 – review and discuss model results, identify changes if needed, consensus on top 20

TASK 5: Working Paper #3 – implementation guidance

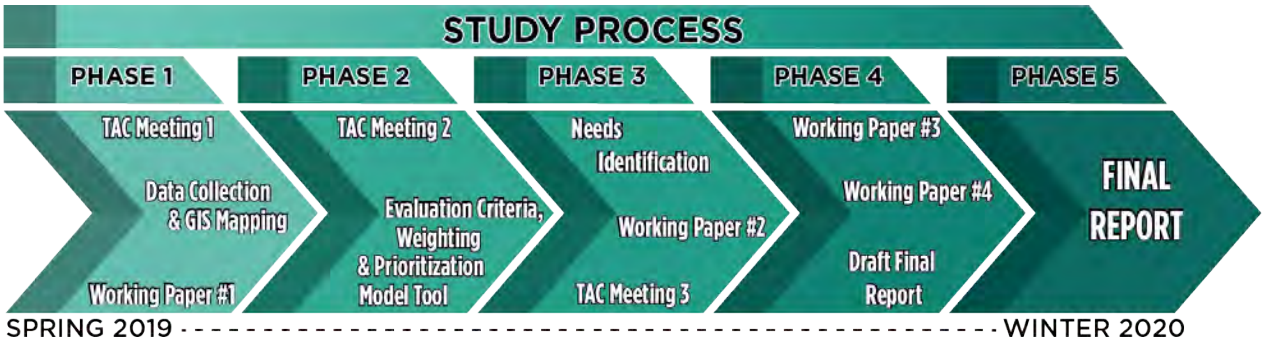
TASK 6: Working Paper #4 – TAC review of WP#4

TASK 7: Draft Final Report

TASK 8: Final Report

TASK 9: Project Closeout/GIS Files

Figure 3: Project Process



II. DATA COLLECTION EFFORTS

A. DATA NEEDS IDENTIFICATION

The consultant team, in consultation with the ADOT TAC, identified data sources to contribute to the Prioritization Model's development. Considerations of data for model development included data that addressed public safety, roadway safety, regulatory mandates, permit requirements, strategic value for the Department, environmental benefits, cost (capital improvement, maintenance and life cycle costs), District priority, ease of implementation, public support, resource impacts, reduction of flooding or hazards, and/ or increased system resiliency. Available known ADOT data sources considered included: FIS, GIS, PECOS, ADOT Photo Log, and District interviews. Other datasets included ADEQ, adjacent MS4s, Maricopa County Flood Control District, and County records. In addition to these datasets, ideas brought up by the diverse membership of the TAC identified other data sources that could be factored into the Prioritization Model development.

B. MS4 BOUNDARIES AND OUTFALL LOCATIONS

A municipal separate storm sewer system (MS4) is a publicly owned means of conveyance, individually or in a system, (e.g. roads with drainage systems, streets, catch basins, curbs, gutters, ditches, man-made channels, storm drains, etc.) for stormwater and discharges to local surface waters determined to be Waters of the United States (WOTUS) as defined by the Clean Water Act (CWA) 33 U.S.C. §1251 et seq. (1972). ADOT's MS4 Stormwater Discharge Permit only regulates non-Indian Land discharges. Indian Lands are regulated by the USEPA and Tribal Government requirements, which are not addressed in this study specifically. In the context of ADOT, the MS4 is basically the state highway system including ROW and the system's associated drainage. In Arizona, there are over 60 regulated MS4s. Since ADOT's system covers the entire state, it intersects and overlaps with the other regulated entities (typically municipalities) throughout the State of Arizona. MS4 boundaries are typically represented by municipal boundaries within the urbanized areas as defined by the 1990 United States census for ADOT.

The data collection effort assisted in refining ADOT's understanding of MS4 conveyance system's capabilities which is a regulatory requirement of the State issued stormwater discharge permit. The data further delineated the system's potential loads, discharges, physical pathways, and interconnections with neighboring regulated entities and the surrounding terrain. The Permit requires ADOT to identify all discharge or outfall locations to which drainage is conveyed into WOTUS. These are considered priority focus areas. In the event that a serious erosion and sediment control problem occurs near an outfall, then ADOT is directed by the Permit to minimize or eliminate pollutants from entering WOTUS in these locations with increased priority.

There are some challenges in identifying outfall locations and inlets/outlets into adjacent systems. These challenges include limited data sets, large amounts of data to filter through that may have been collected for other purposes, and data sharing amongst the regulated entities is not always optimal because although entities are encouraged to share data, they are not obligated to do so. Finally, when the data was collected for this project, not all Permittees had completed mapping their systems.

For many agencies including ADOT, data collection efforts focused on drainage systems is a lengthy process. Data collection was an ongoing and iterative process over the course of this project. Over time, as more and more data is input into the Prioritization Model, ADOT will be able to continue to refine and improve its MS4 data repository.

C. ADOT DISTRICT STORMWATER NEEDS IDENTIFICATION

The ADOT MPD Project Manager initially reached out to representatives from each ADOT District with a request to develop a list of potential stormwater or erosion control project needs that either; 1) represent constant or redundant maintenance concerns and/or projects that may need construction project mitigation to rectify the problem, or 2) stormwater or erosion control projects that likely represent a more resource-intensive level of mitigation which would warrant a construction level of activity.

Once the initial list of potential projects was provided by each ADOT District, the consultant conducted follow up phone interviews with representatives from each ADOT District. The phone interviews were conducted over a three-week period in July. The District phone interviews were utilized to further define and clarify the characteristics of the initial projects identified. A series of questions and talking points were used to further clarify the existing conditions of each project location, as well as to explore the characteristics of the stormwater or erosion control condition.

The resulting discussions were used to ascertain if these projects would be considered as “construction” or “maintenance”. **Figure 4** represents the questions and talking points utilized for each District phone interview. The discussion points and questions utilized in the ADOT District phone interviews were used to gain a more in depth understanding of the nature of each potential stormwater/erosion control project and ascertain if the project would likely be considered “construction” or “maintenance”. Only projects that were deemed “construction”, and therefore eligible for Federal funding assistance, are considered for further consideration for this project.

Figure 4: Phone Interview Questions

1. Do you have any comments, concerns or questions about the nature or objectives of this project?

2. For each stormwater related project identified in your District, we wish to explore each project in a little more detail. Also, are there any additional needs not already identified.

3. An overarching project objective is to try and make a determination if these projects should be considered a "construction" activity/project or a "maintenance" activity/project. The TAC will generally define these terms but have not done so at this time.

4. Recognizing that there often times is not a precise answer to determining what activities/ projects are considered "construction" versus what is "maintenance", we want to explore the following questions.

5. For each District project you identified, please clarify the following (as needed):
   - **a.** Precise location and approximate extents of the project/activity.
   - **b.** Can this project/activity readily be labeled as "construction" or "maintenance" in nature?
   - **c.** How long has this project/activity been identified as an issue/problem?
   - **d.** Has there been ongoing maintenance activities? If so, how long?
   - **e.** If yes to **d.**, how much of your annual maintenance budget (as a percentage) does this ongoing maintenance activity consume (generally speaking)?

6. Which of the following would you say is the most applicable in describing the nature of each of the activities/projects you identified?
   - **a.** Failed stabilization/erosion control
   - **b.** Facility overtopping or embankment protection
   - **c.** Slope washout
   - **d.** Poor soil conditions
   - **e.** Undersized infrastructure
   - **f.** Improper construction/installation
   - **g.** Additional negative impacts downstream
   - **h.** Other

7. Respond to this question for each of the projects identified **(Scale 1 to 5, 5 = most)**:
   If the identified project/activity were to be successfully completed, which of the following considerations would the activity/project best address?
   - **a.** Public safety
   - **b.** Regulatory mandate
   - **c.** Environmental benefit
   - **d.** Relief to District budget and/or resources
   - **e.** Meets District or ADOT strategic objective
   - **f.** Reduction/mitigation in flooding or hazard
   - **g.** Extend facility life span

D. DEFINITIONS OF "CONSTRUCTION", "PREVENTATIVE MAINTENANCE" AND "ROUTINE MAINTENANCE"

A key objective of the ADOT Stormwater & Erosion Control Study is to identify and prioritize statewide stormwater and/or erosion control projects. As previously explained, this project is seeking to prioritize stormwater projects that can be characterized as "construction" or "preventative maintenance" in order to be eligible for Federal funding assistance under the Federal Surface Transportation Block Grant Program. Projects characterized as "routine maintenance" are not considered eligible for Federal funding and thus are not being identified for further consideration.

Utilizing guidance obtained from the Title 23 of the United States Code, Federal Highway Administration Guidance Memos, and discussions with the ADOT Federal Aid Program Manager, definitions for each term are as follows:

CONSTRUCTION

The term "construction" means the supervising, inspecting, actual building, and incurrence of all costs incidental to the construction or reconstruction of a highway or any project eligible for assistance under this title, including bond costs and other costs relating to the issuance in accordance with section 122 of bonds or other debt financing instruments and costs incurred by the State in performing Federal-Aid project related audits that directly benefit the Federal-Aid highway program. Such term includes:

A. preliminary engineering, engineering, and design-related services directly relating to the construction of a highway project, including engineering, design, project development and management, construction project management and inspection, surveying, mapping (including the establishment of temporary and permanent geodetic control in accordance with specifications of the National Oceanic and Atmospheric Administration) and architectural-related services;
B. reconstruction, resurfacing, restoration, rehabilitation and preservation;
C. acquisition of rights-of-way;
D. relocation assistance, acquisition of replacement housing sites, and acquisition and rehabilitation, relocation and construction of replacement housing;
E. elimination of hazards of railway-highway grade crossings;
F. elimination of roadside hazards;
G. improvements that directly facilitate and control traffic flow, such as grade separation of intersections, widening of lanes, channelization of traffic, traffic control systems and passenger loading and unloading areas; and
H. capital improvements that directly facilitate an effective vehicle weight enforcement program, such as scales (fixed and portable), scale pits, scale installation and scale houses.

PREVENTATIVE MAINTENANCE

Preventative maintenance is a cost-effective means of extending the useful life of the Federal-Aid highway program. In the practical application of these terms there is a bit of uncertainty if projects deemed "preventative maintenance" can include project types that may have components of their respective "construction project solutions" outside of the Federal-aid highway right-of-way. It was determined that if this project identifies prioritized projects whose mitigation measures are a "systems approach" that

extend outside of the ADOT right-of-way, a more detailed evaluation with FHWA representatives will be conducted to seek their guidance on a case by case basis.

ROUTINE MAINTENANCE

Routine maintenance encompasses work that is performed in reaction to an event, season, or over all deterioration of the transportation asset. This work requires regular reoccurring attention.

III. PROPOSED ADOT DISTRICT STORMWATER CONSTRUCTION PROJECTS

A. PRELIMINARY STORMWATER CONSTRUCTION PROJECTS BY DISTRICT

ADOT District phone interviews were used to further explore the characteristics of each identified project and help determine, at least preliminarily, if the project could be classified as "construction" or "maintenance", either routine or preventative.

For consistency, this section will introduce and describe the preliminary listing of likely construction and/or preventative maintenance stormwater and erosion projects for each ADOT District. Information presented for each District will generally be described in the following manner:

1. Table listing all stormwater and erosion control projects
2. Project overview- a description of the existing SHS stormwater problem/characteristics, map depicting existing ADOT stormwater facilities in the area, project location, area photographs, nature of the problem and perceived benefits.

NORTHWEST DISTRICT

Table 1 identifies the initial listing of potential stormwater projects identified by representatives of the Northwest District.

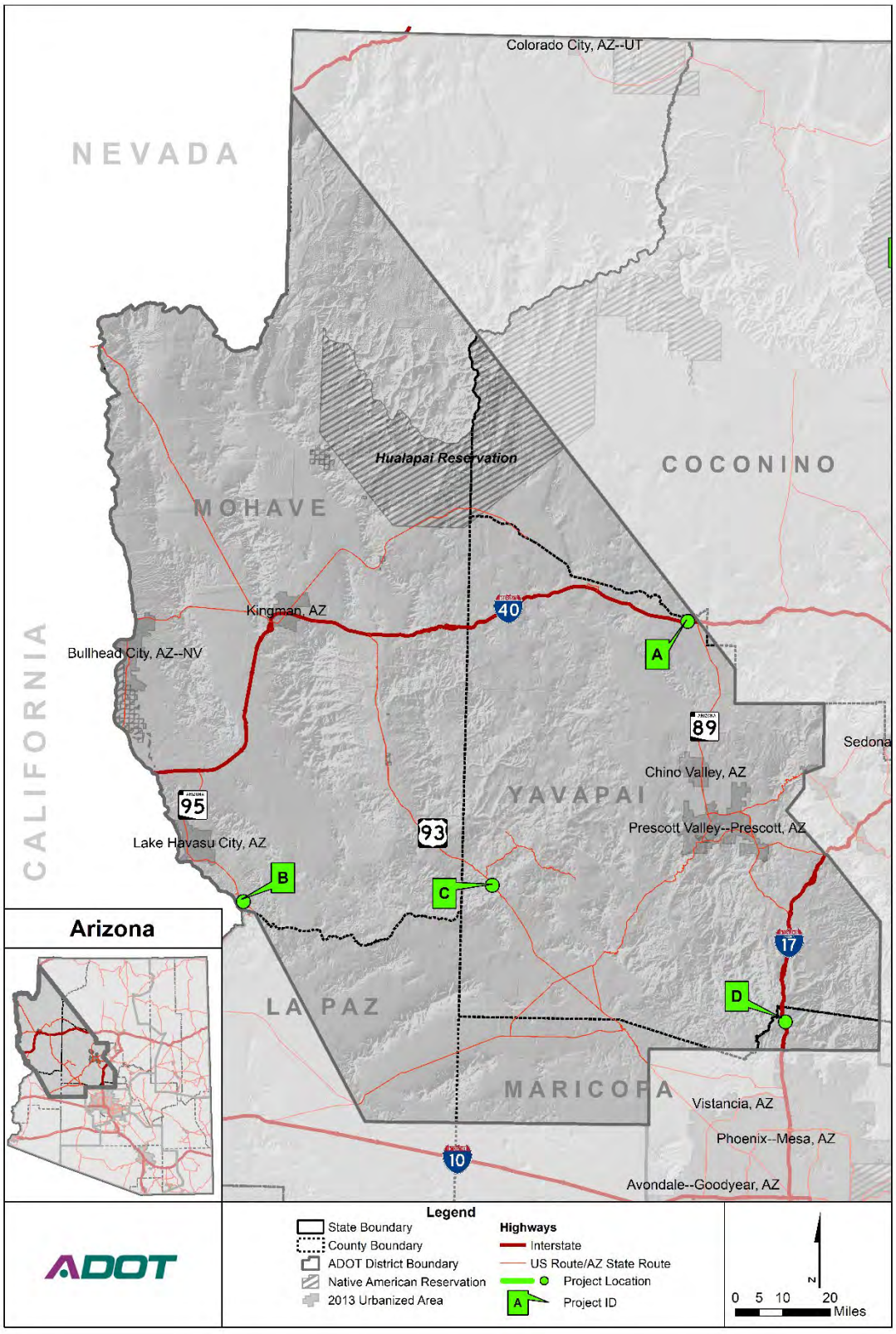
Table 1: Northwest District Stormwater Projects

Project Identifier	Route	MP	Issue	Construction/ Maintenance[1]
A	I-40	144.0 WB	Sediment clogging box culvert causing flows to overtop the roadway resulting in roadway closures and lane restrictions.	Construction
B	SR 95	165.3-.4 SB/NB	The roadway is being compromised from the clogging of two culverts and overtopping of flows.	Construction
C	SR 93	157.6 SB, Cottonwood Canyon	There is no support for slope except the strength of rock underlying fill and overhanging the scoured section.	Construction
D	I-17	237, SE corner of NB Bridge over Moore's Gulch	Scour occurring along the abutment embankment of the corner of the bridge.	Construction
–	I-17	239, Little Squaw Bridge	Severe erosion due to ditch failure.	Maintenance

1 For this column, the term "Construction" applies to both construction and preventative maintenance, therefore these projects qualify for this study. The term "Maintenance" applies to routine maintenance only, therefore these projects do not qualify for this study and no further details are provided.

As **Table 1** indicates, the Northwest District submitted a total of five (5) potential stormwater projects. After the District phone interview, the Northwest District feels that four (4) of the five (5) submitted projects meet the definition of a "construction" or "preventative maintenance" project. These construction projects are described below.

Figure 5: Northwest District & Project Locations



PROJECT A- INTERSTATE 40 @ MP 144

Project Description: Erosion occurring on the north slope of the fill section between BNSF Bridge and concrete box culvert to west. Erosion and sedimentation occurring at the toe of fill slope. Sedimentation occurring in box culvert. No curb on the highway to properly channel flows. During heavy rains (about once or twice a year) water flows from drainage basin north of I-40 towards the highway and overtops at this location. Flow is concentrated through a breach in a berm used to channel water to an old ranch cattle tank no longer in existence. This flow is concentrated at the concrete box to the west of MP 144. Due to the sedimentation in the box culvert, capacity has been significantly reduced. Saturation of the toe of the slope is causing the fill slope to slough into the cut ditch in the ADOT ROW which is now filled in with sediment.

How long has this been a concern? At least 5 years

Has the problem led to road closures? Yes, several times in last five years.

District Priority (if identified): #3

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. **Slope washout**
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. **Additional negative impacts downstream**
h. Other

Possible Mitigation/Solution: Construct asphalt berm at top of fill slope between bridge and culvert; Reestablish ROW drainage ditch; Use excavated material as a berm at the ROW or push it up and compact it at the toe of the fill slope between bridge and culvert; Excavate sediment from culvert and re-establish grade for flow. It seems all activity can occur within ROW. Temporary construction easement may be necessary.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. Environmental benefit
d. **Relief to District budget and/or resources**
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 6: Northwest Project A

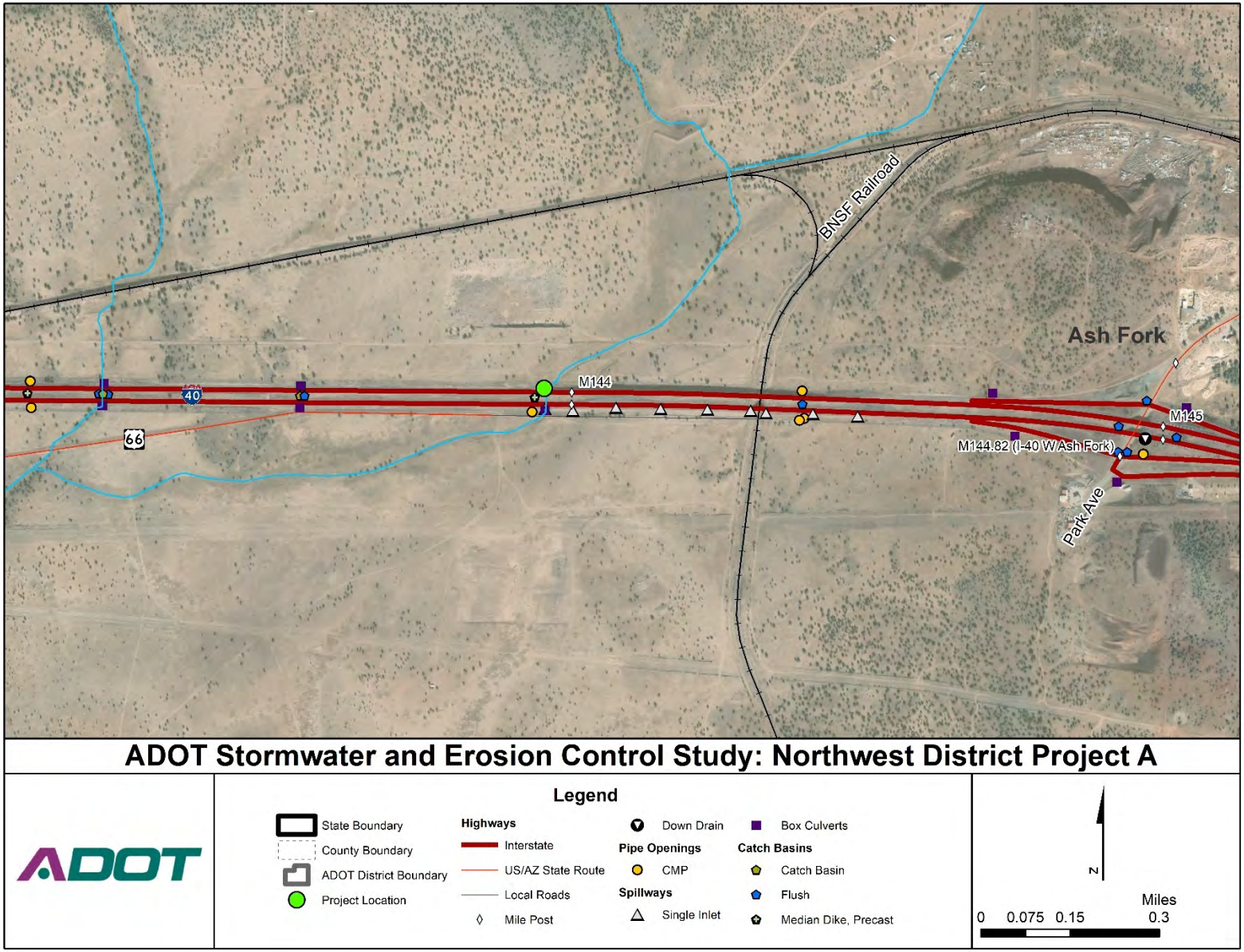


Figure 7: Westbound, Northern View

Figure 8: Eastbound, Rear View

Figure 9: Aerial

PROJECT B- STATE ROUTE 95 @ MP 165.3 – 165.4 NB AND SB

Project Description: Water draining from undeveloped RV camping spot on State Land to the east of SR 95 causing severe sedimentation of area around CMP Culverts in this location. Water pooling around culverts is saturating the roadway causing sloughing of the fill above the culverts. The roadway is being compromised from the clogging of the two culverts. Erosion caused by water flowing is undercutting roadway fill and causing sedimentation of the culvert inlets preventing stormwater from flowing through them.

How long has this been a concern? 5 + years

Has the problem led to road closures? No

District Priority (if identified): #2

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. **Facility overtopping or embankment protection**
c. **Slope washout**
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Install rock gabion baskets above and around the culvert inlets. Re-direct drainage from the road to a nearby cut ditch. Re-shape the cut ditch. Berm the drainage basin receiving stormwater from State Land RV Park and install corrugated piping at special locations within the berm. Permission from State Land will be required to complete project on their property. District is currently in discussion with State Land for easement to perform berm-building.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. Environmental benefit
d. **Relief to District budget and/or resources**
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 10: Northwest District Project B

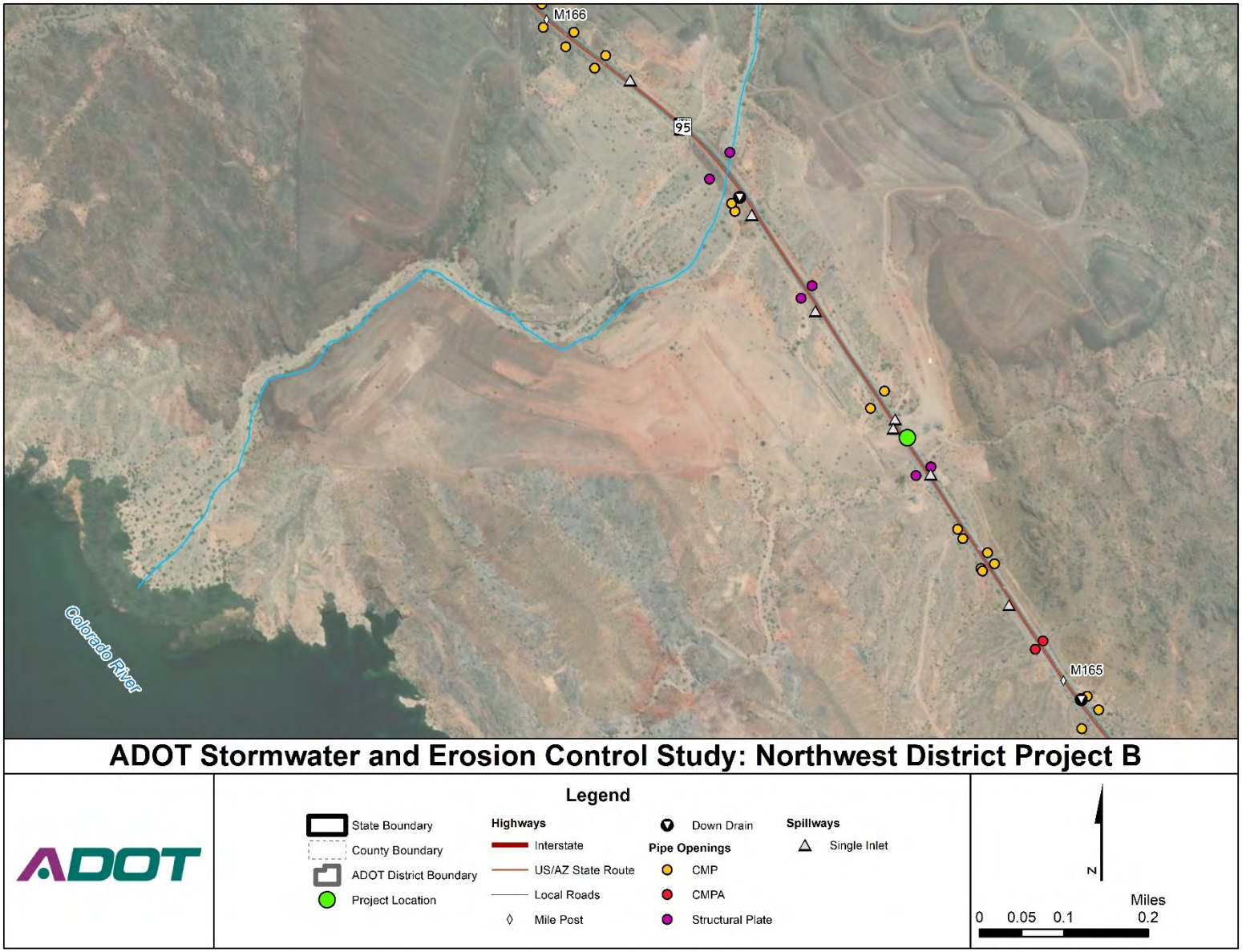


Figure 11: Southbound, Western View

Figure 12: Southbound, Rear View

Figure 13: Aerial

PROJECT C- STATE ROUTE 93 @ MP 157.6 SB – COTTONWOOD CANYON

Project Description: Cottonwood Canyon Wash is eroding the bedrock underlying fill slope supporting the southbound lane. A full-sized adult can stand under the overhang of the scoured bedrock. There is no support for the slope except the strength of rock underlying fill and overhanging the scoured section.

How long has this been a concern? 3 years +

Has the problem led to road closures? No

District Priority (if identified): #1

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. **Slope washout**
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Solution requires full system assessment, possible installation of a cut channel with concrete wall to reinforce redirection of flows to minimize flow surge from 5-square-mile watershed impacting this location. Need to incorporate structural support under bedrock of fill slope for south bound lane.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. **Environmental benefit**
d. **Relief to District budget and/or resources**
e. **Meets District or ADOT strategic objective**
f. Reduction/mitigation in flooding or hazard
g. **Extend facility life span**

Figure 14: Northwest District Project C

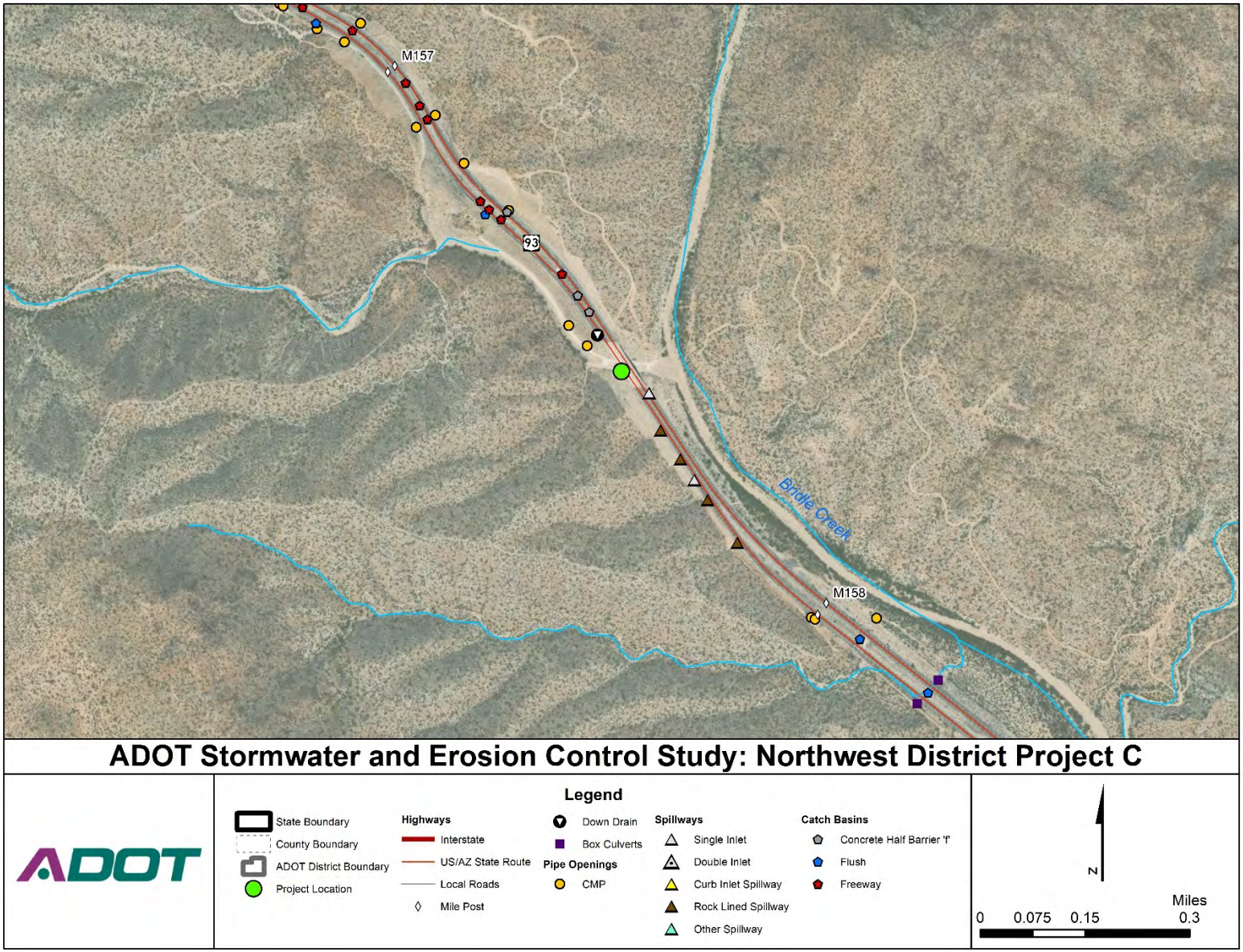


Figure 15: Downstream View (Picture Provided by ADOT)

Figure 16: Upstream View (Picture Provided by ADOT)

Figure 17: Aerial

PROJECT D- INTERSTATE 17 @ MP 237, SE CORNER OF NB BRIDGE OVER MOORE'S GULCH

Project Description: Scour occurring along the abutment embankment of the southeast corner of the northbound bridge. It appears that Moore's Gulch is continually migrating toward the bridge abutment, so there is potential for more erosion to occur over time. This location is very difficult to access. ADOT is currently working on a roadway design to widen I-17 from Anthem to Sunset Point, which includes Moore's Gulch, but there does not appear to be any consideration for this scour/erosion issue in the current design plans.

How long has this been a concern? At least 3 years +

Has the problem led to road closures? No

District Priority (if identified): #4

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. **Slope washout**
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Repair/construction possibly using gabion baskets to shore up the eroded embankment on the bridge abutment. Likely place gabion baskets subgrade to prevent future scouring. May need to re-grade BLM road to provide adequate access to the wash (Moore's Gulch).

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. **Environmental benefit**
d. **Relief to District budget and/or resources**
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 18: Northwest District Project D

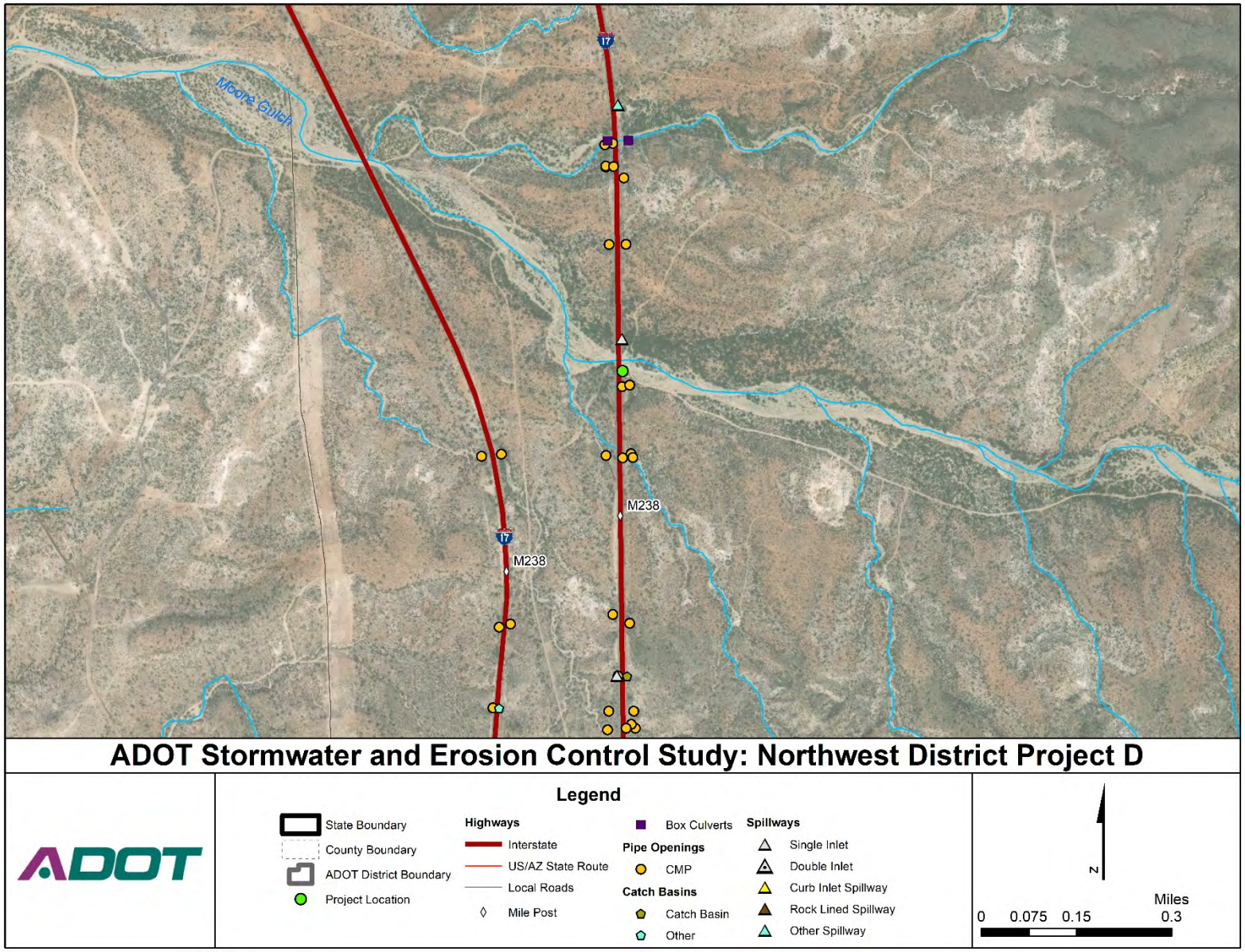


Figure 19: Northbound, Eastern View

Figure 20: Northbound, Rear View

Figure 21: Aerial

NORTHCENTRAL DISTRICT

Table 2 identifies the initial listing of potential stormwater projects identified by representatives of the Northcentral District.

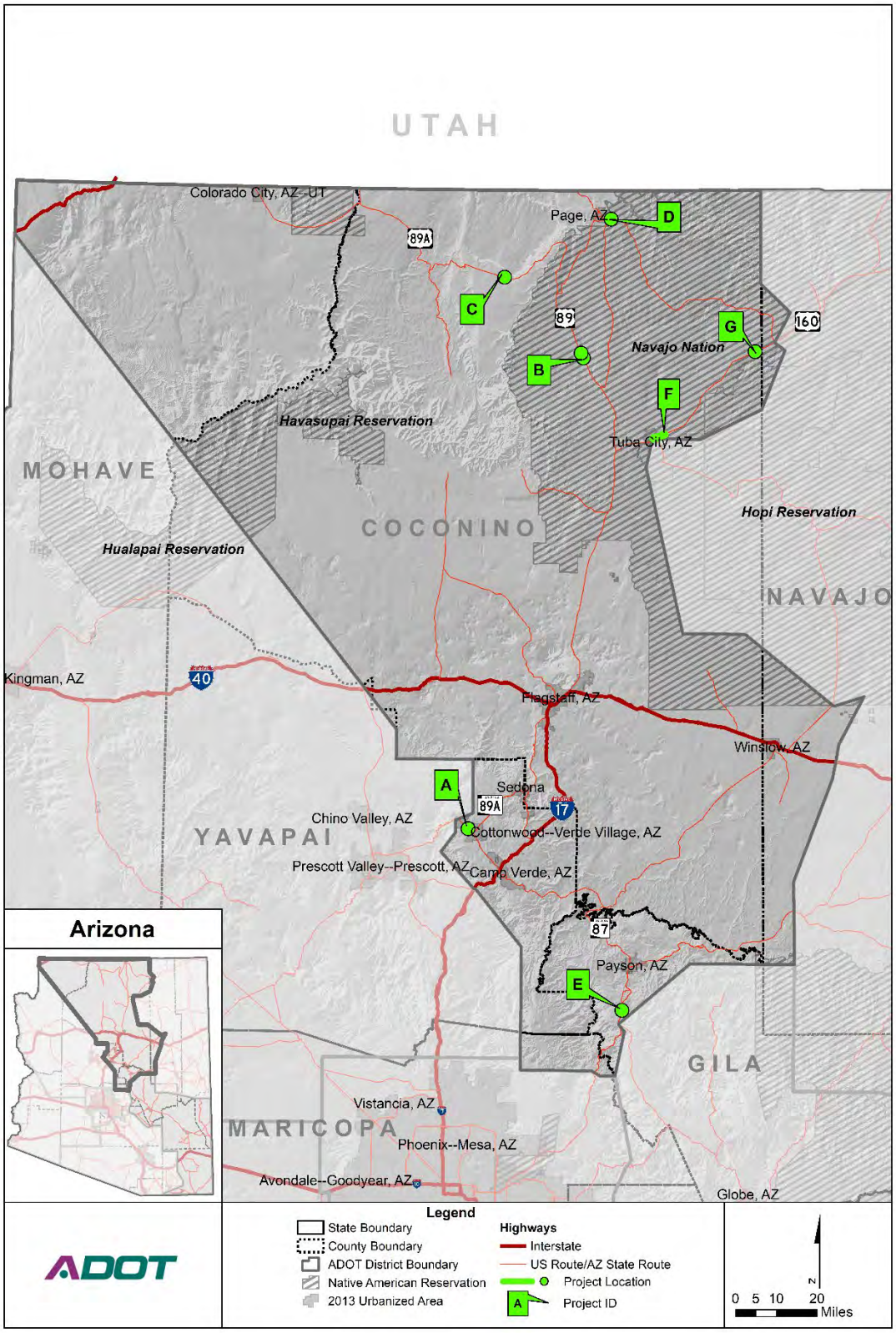
Table 2: Northcentral District Stormwater Projects

Project Identifier	Route	MP	Issue	Construction/ Maintenance[1]
A	SR 89A	352.45	Sediment upstream and downstream needs to be removed. Standard maintenance equipment will not fit in the 5-foot high box culverts.	Construction
B	US 89	506.3 & 507.3 (Tanner Wash)	Tanner Wash getting closer to US 89, potential for highway failure.	Construction
C	US 89A	556	Wash on the north side of US 89A at MP 556 is within 5-feet of highway.	Construction
D	SR 98	299	Pipes are 15 to 20-feet below grade at inlet causing highway to act as dam.	Construction
E	SR 87	239.5 (Hog Wash)	Private citizen dumps construction material upstream clogging culvert and causing sediment build up.	Construction
F	US 160	322-325 (Tuba City)	Flowing water and mud/debris overtops roadway.	Construction
G	US 160	356	Pipe issues results in culvert plugged with sediment and flows overtop roadway.	Construction

1 For this column, the term "Construction" applies to both construction and preventative maintenance, therefore these projects qualify for this study. The term "Maintenance" applies to routine maintenance only, therefore these projects do not qualify for this study and no further details are provided.

As **Table 2** indicates, the Northcentral District submitted a total of seven (7) potential stormwater projects. After the District phone interview, the Northcentral District feels that all seven (7) of the submitted projects meet the definition of a "construction" or "preventative maintenance" project. These construction projects are described below.

Figure 22: Northcentral District & Project Locations



PROJECT A- SR 89A @ MP 352.45

Project Description: Location consists of built-up sediment, limiting capacity of flow in the wash. Four of the five barrels are 80% clogged, however the box culverts are likely properly sized. The ADOT Drainage Group looked at this location and determined that sediment upstream and downstream needs to be removed to alleviate the condition. Forest vegetation has built up over the years, impacting the sediment deposition at this location. Survey shows approximately 1300 CY of material needs to be removed from upstream, downstream and in the box culvert. This effort is larger than a typical maintenance project and specialized equipment will be needed due to forest, boulders, box height and sediment. Standard maintenance equipment will not fit in the 5-foot high box culverts. 700 CY of sediment is estimated to be inside the box culvert. If not mitigated, there is concern that the box culverts will overtop, and water will flow into the businesses downstream.

How long has this been a concern? 3 to 4 years and sediment continually building up.

Has the problem led to road closures? No

District Priority (if identified): #2

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other – increased vegetative growth is causing the flow pattern to change and increase in sediment disposition.

Possible Mitigation/Solution: Excavation/specialized equipment to remove sediment from inside the box culvert and additional excavation at the inlet and outlet to create adequate flow.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate – by keeping the flow moving in the manner it should without adverse impact downstream
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 23: Northcentral District Project A

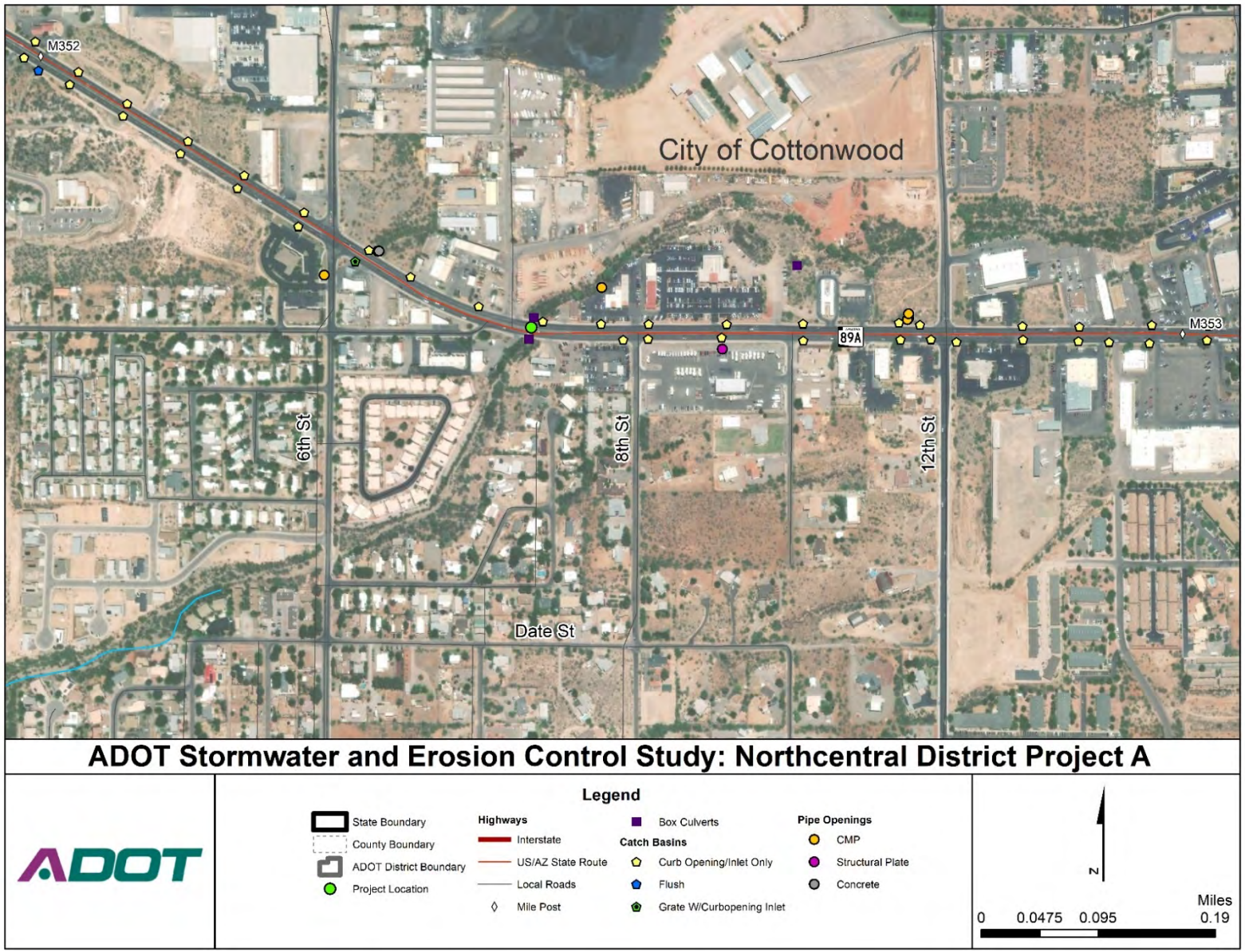


Figure 24: Eastbound, Rear View

Figure 25: Eastbound, Northern View

Figure 26: Westbound, Southern View

PROJECT B- US 89 @ MP 506.3 & 507.3

Project Description: Tanner Wash adjacent to the highway (south) is continually meandering towards the highway at two locations: MP 506.3 and MP 507.3. Historical google satellite images show the continued trend of the stream getting closer to US 89 and there is a potential for highway failure if it reaches the highway. Each year severe monsoon flows bring Tanner Wash closer to the highway. Wash exhibits large flow and high velocity characteristics. The wash migration seems to be occurring naturally and not the result of any upstream activities. The roadway embankment is continually eroding into the channel, leading to the collapse of the ADOT fence on multiple occasions. Fine sandy soil conditions exacerbate the problem. ADOT maintenance has installed weirs to mitigate, but that did not prove to be effective. ADOT successfully mitigated a similar issue upstream at MP 510-518 in conjunction with a passing lane installation project, and that seemed to be effective. Recommend emulating that solution at these two locations.

How long has this been a concern? 15 to 20 years; last 5 to 6 years of continued ADOT maintenance since the wash has migrated into ADOT ROW.

Has the problem led to road closures? No

District Priority (if identified): #1

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. Slope washout
d. **Poor soil conditions**
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Consider mitigation measures to armor the bank of the wash, possibly railbank protection.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. Environmental benefit
d. **Relief to District budget and/or resources**
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. **Extend facility life span - roadway will wash out if the problem is not properly mitigated**

Figure 27: Northcentral District Project B

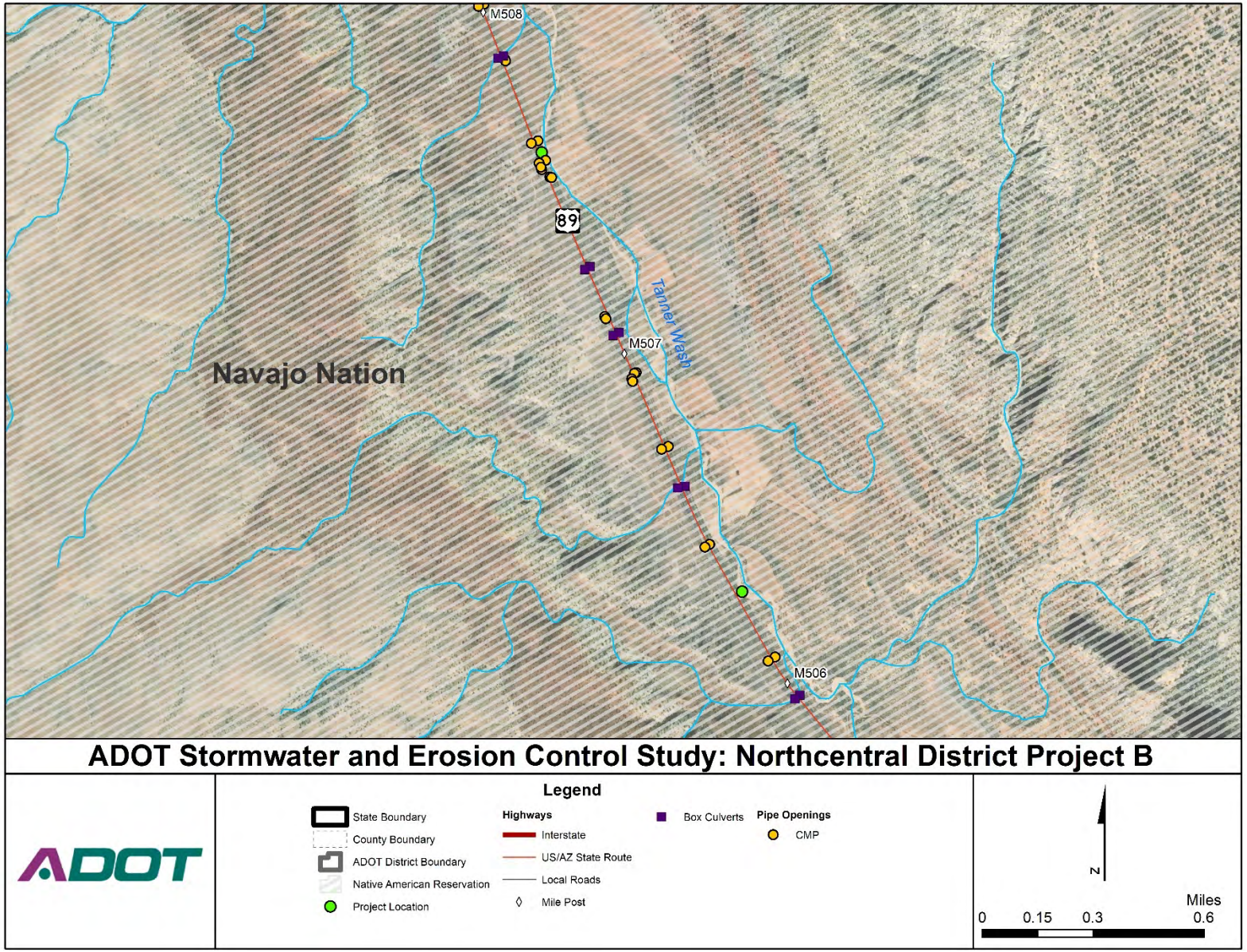


Figure 28: Northbound, Eastern View

Figure 29: Northbound, Rear View

Figure 30: Aerial

PROJECT C- US 89A @ MP 556

Project Description: Wash on the north side of US 89A at MP 556 is within 5-feet of highway. Over the years, the flow of the channel has changed (the natural channel bank breached) and now runs parallel to the highway instead of the historic perpendicular flow. Rip rap has been placed on the shoulder, but this is now being undermined. It is preferred that the channel be restored to its historical location approximately 50-yards away, but the existing channel is 5-inches to 10-inches lower than the historical channel location. Fine sandy soil conditions complicate potential mitigation measures.

How long has this been a concern? 10 years

Has the problem led to road closures? No

District Priority (if identified): #3

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection (natural channel bank)
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: 1) Wash can be re-aligned into its historical channel (outside of ADOT ROW) on BLM land to create flow straight into the pipe culvert. 2) Railbank /armor shoulder and embankment for permanent stabilization to protect highway.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 31: Northcentral District Project C

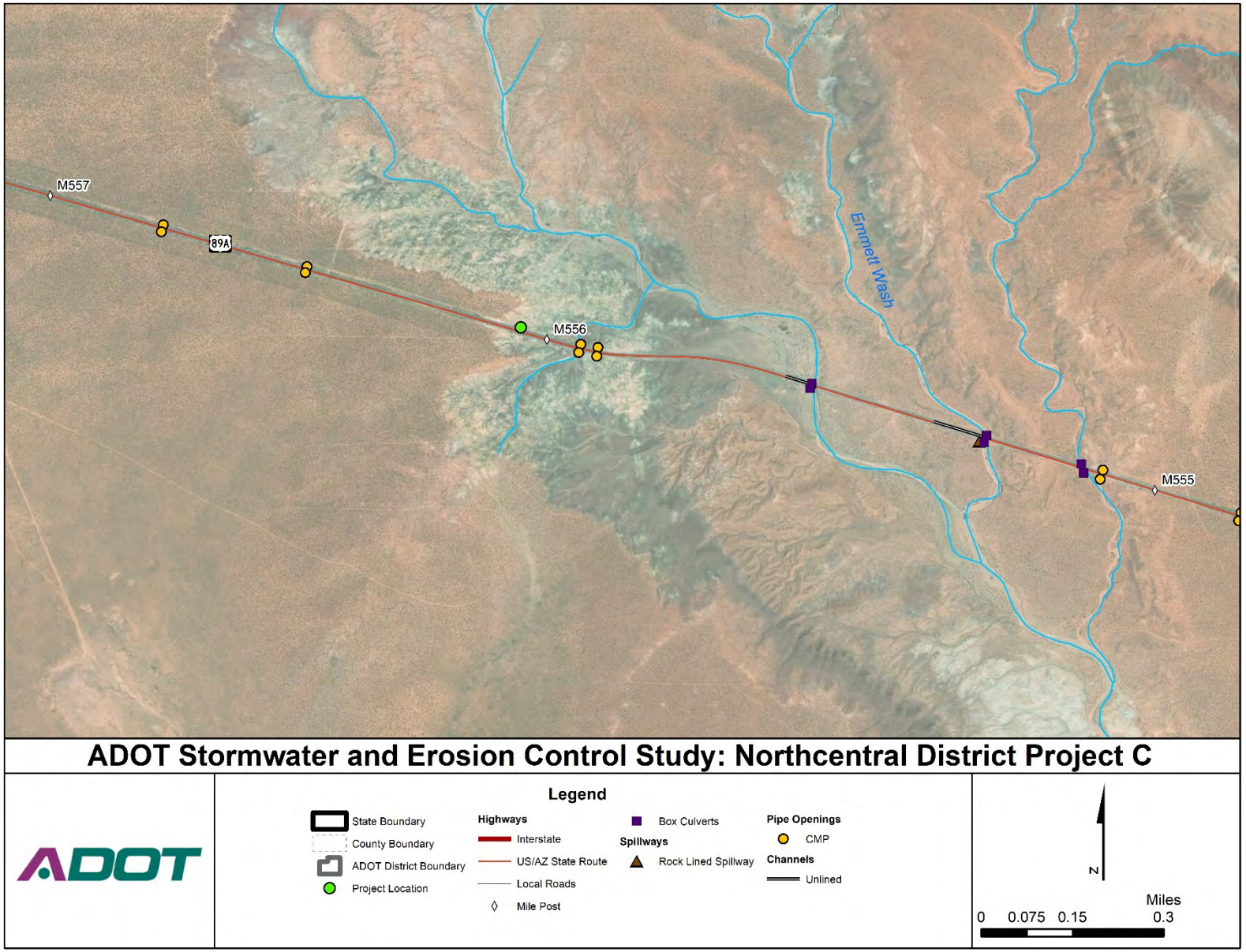


Figure 32: Northside of Roadway, Western Facing (Picture Provided by ADOT)

Figure 33: Northside of Roadway, Southern Facing (Picture Provided by ADOT)

Figure 34: Northside of Roadway, Eastern Facing (Picture Provided by ADOT)

PROJECT D- SR 98 @ MP 299

Project Description: Pipes were buried when the Lachee Waste Water Treatment Plant (WWTP) failed approximately 10 to 12 years ago. Sediment deposition as a result now has existing CMPs about 15 to 20-feet below grade at the inlet. The highway is acting as a dam, and sediment now is approximately 10-feet from the highway.

How long has this been a concern? Since the WWTP failed 10 to 12 years ago. No ADOT maintenance activities have been conducted.

Has the problem led to road closures? No

District Priority (if identified): #5

Characteristics of the Problem:

i. **Failed stabilization/erosion control (outside of ADOT ROW)**
j. Facility overtopping or embankment protection
k. Slope washout
l. Poor soil conditions
m. **Undersized infrastructure**
n. Improper construction/installation
o. Additional negative impacts downstream
p. Other

Possible Mitigation/Solution: Potential mitigation measures should either evaluate; 1) Excavate down to the original grade to allow existing culverts to function; or, 2) Install new culverts at the current grade. Perhaps one 36-inch or 48-inch culvert would suffice.

Likely Project Benefits:

h. **Public safety**
i. Regulatory mandate
j. **Environmental benefit (concern/question about WWTP sludge mixed with sediment disposition)**
k. Relief to District budget and/or resources
l. Meets District or ADOT strategic objective
m. **Reduction/mitigation in flooding or hazard**
n. **Extend facility life span**

Figure 35: Northcentral District Project D

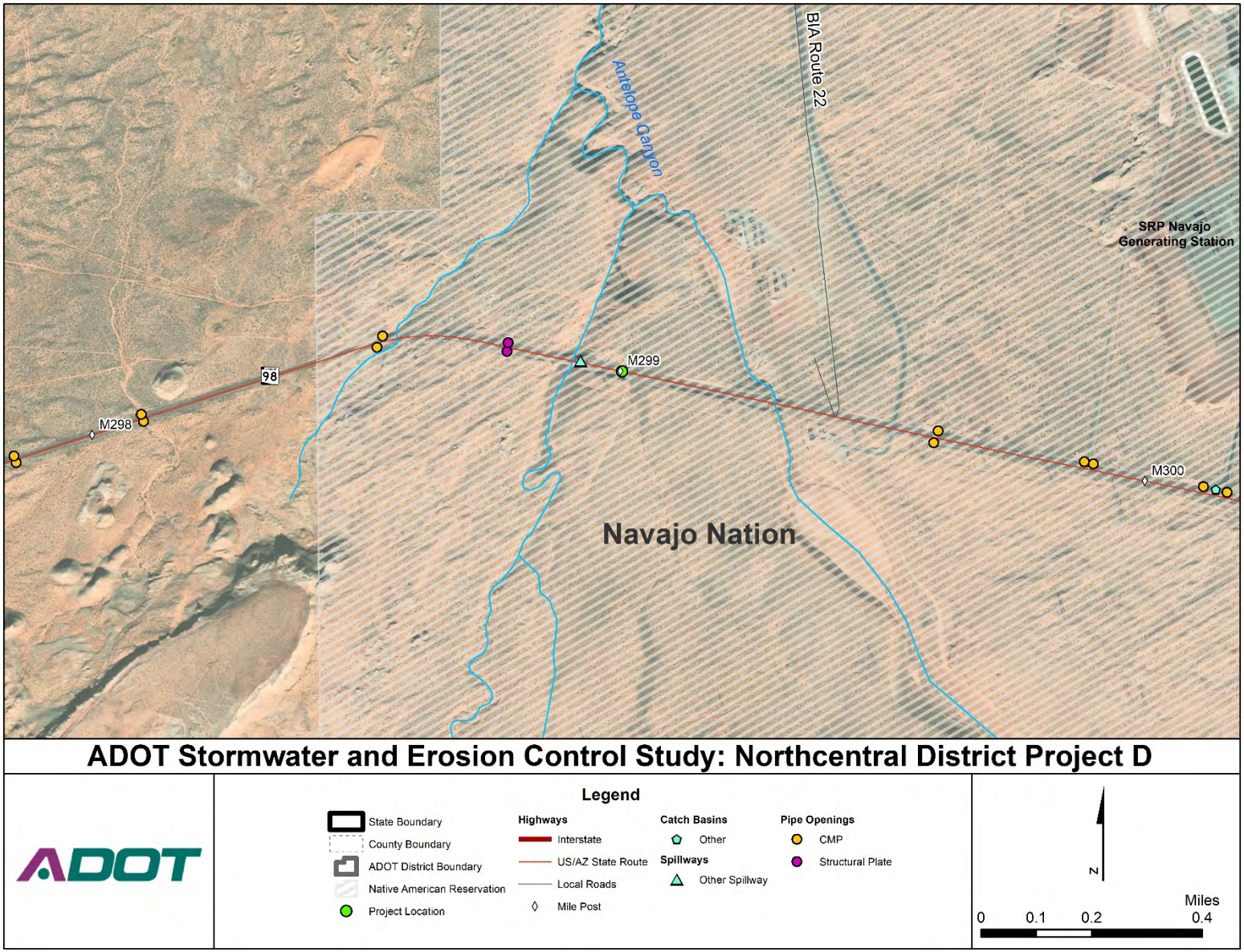


Figure 36: Westbound, Rear View

Figure 37: Westbound, Southern View

Figure 38: Westbound, Southern View

PROJECT E- SR 87 @ MP 239.5

Project Description: A private citizen is dumping construction material (wood, concrete) in Hog Wash upstream, causing the channel to redirect its flows towards the roadway (and box culverts) instead of its historical flow pattern that is perpendicular to the roadway. The material is causing congestion in three of the five existing barrels of the box culvert. The dumping of sediment is pushing the flow away from our inlet and is cutting into the bank and around the current rip rap blankets.

How long has this been a concern? One year or less due to sudden upstream dumping of materials.

Has the problem led to road closures? No

District Priority (if identified): #4

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other – Channel redirection causing sediment buildup, potential for overtopping.

Possible Mitigation/Solution: Large excavation effort needed; beyond that of what ADOT maintenance can accommodate. Excavate approximately 1000 CY of sediment in culvert and downstream to create better flow and extend gabion baskets or grouted rip rap blanket on the inlet side of culvert.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 39: Northcentral District Project E

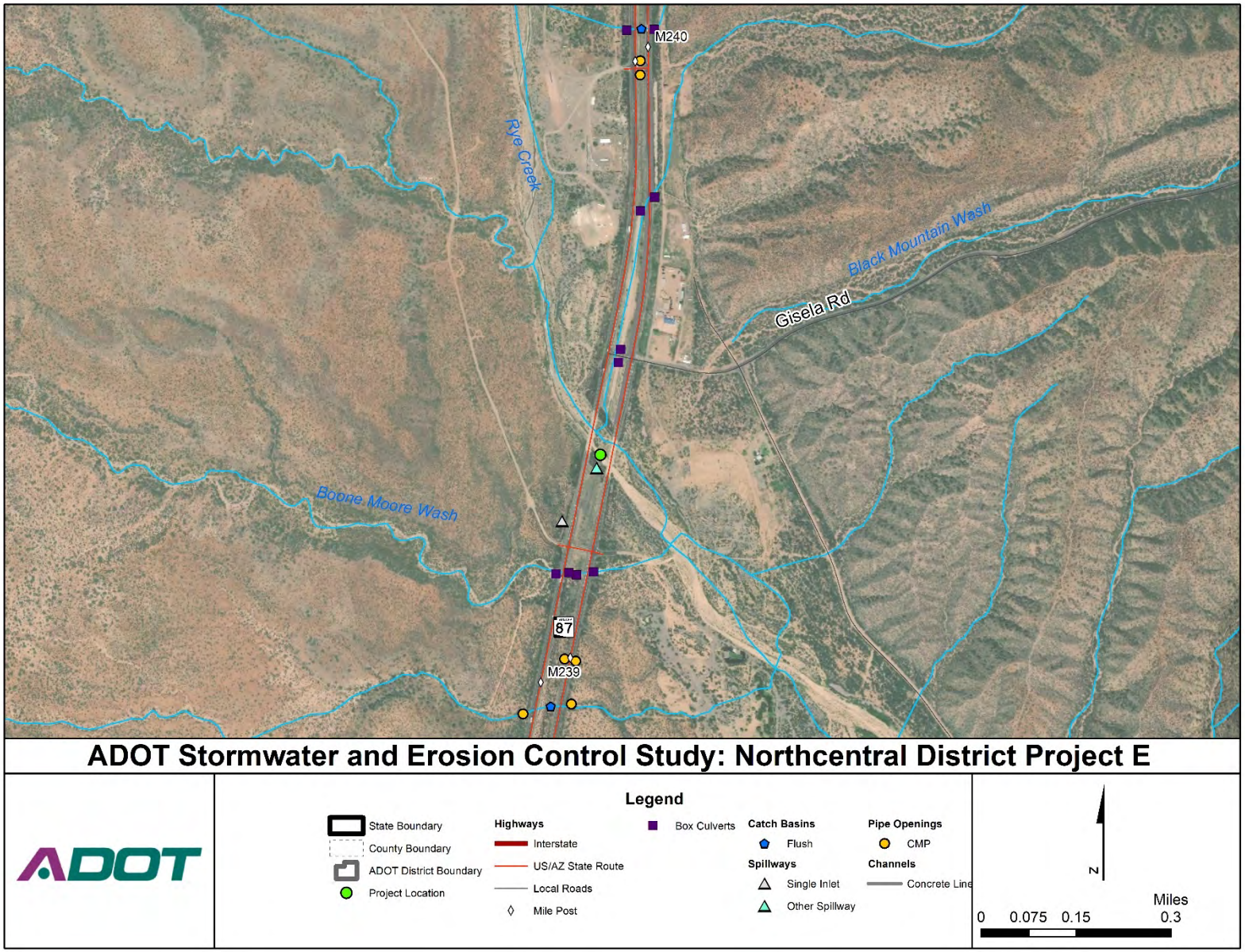


Figure 40: Hog Wash Downstream (Picture Provided by ADOT)

Figure 41: Hog Wash Inlet (Picture Provided by ADOT)

Figure 42: Hog Wash Upstream Debris (Picture Provided by ADOT)

PROJECT F- US 160 @ MP 322 - 325

Project Description: During monsoon rains, water runs off the city streets on the north side of US 160 and flows over the highway leaving sediment deposits. There are no existing culverts in the ADOT ROW. Flowing water and mud/debris are common for this two-lane highway through Tuba City. It appears that city drop down drains are not functioning properly, causing water to bypass the city infrastructure and thereby discharging into the ADOT ROW overtopping US 160.

How long has this been a concern? 5 years +

Has the problem led to road closures? Yes

District Priority (if identified): #6

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure (city infrastructure)
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Tuba City infrastructure needs to be evaluated for needed enhancements adjacent to the highway and larger culverts are needed crossing the highway.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 43: Northcentral District Project F

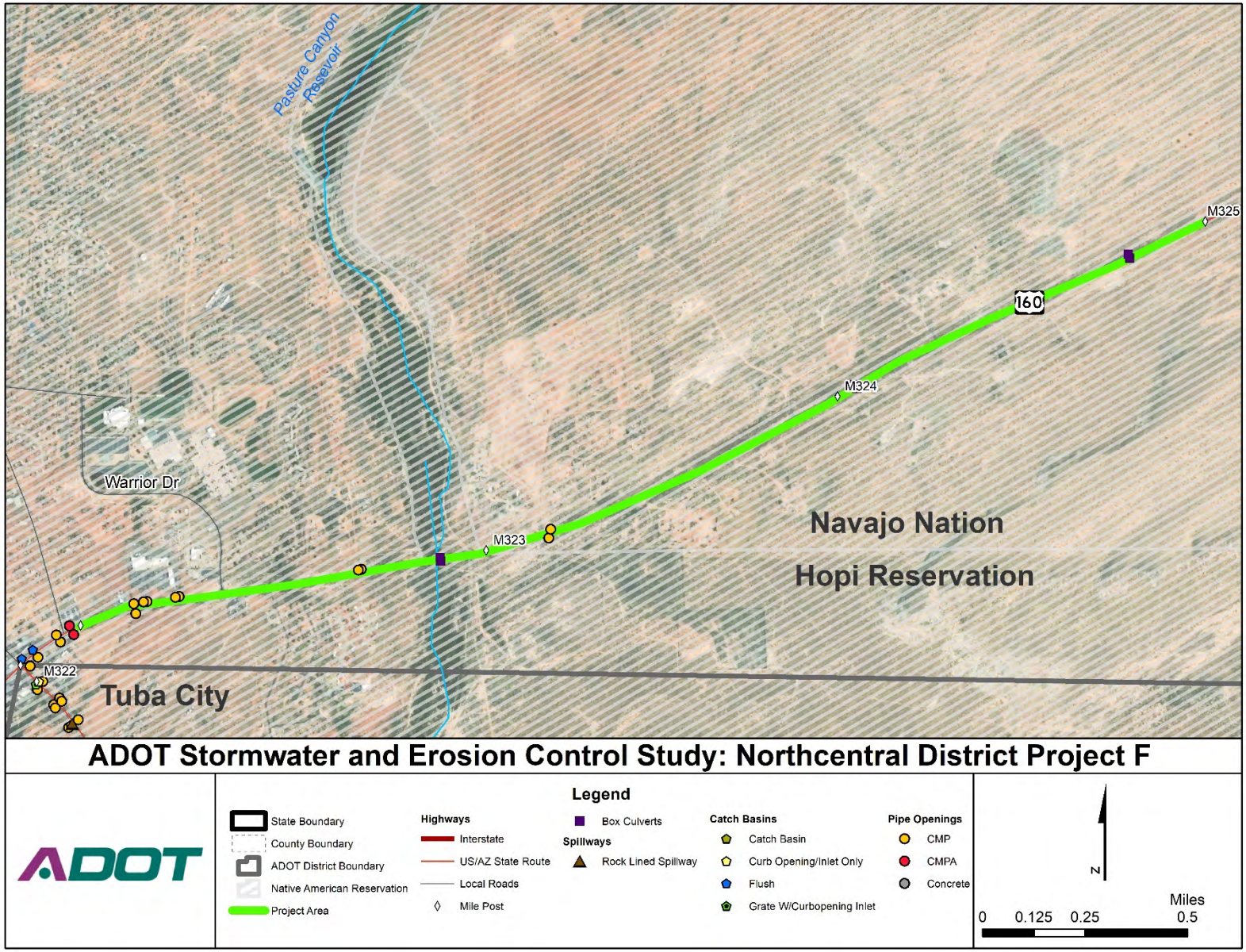


Figure 44: Southbound View (Picture Provided by ADOT)

Figure 45: Eastern View, from Peshlakai Avenue (Picture Provided by ADOT)

Figure 46: Southbound View (Picture Provided by ADOT)

PROJECT G- US 160 @ MP 356

Project Description: The wash flows south to north under the highway and bends west, running approximately 200-yards within the ADOT ROW, then takes a 90-degree turn. The pipe under the railroad tracks downstream is at a higher grade than the culvert under the highway. This backs up water onto the roadway and plugs the culvert with sediment. Overtopping of the highway has occurred at this location.

How long has this been a concern? 5 years +

Has the problem led to road closures? Yes

District Priority (if identified): #7

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation (in the railroad ROW)
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Either the roadway profile and culverts need to be raised or the railroad needs to lower their culvert.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 47: Northcentral District Project G

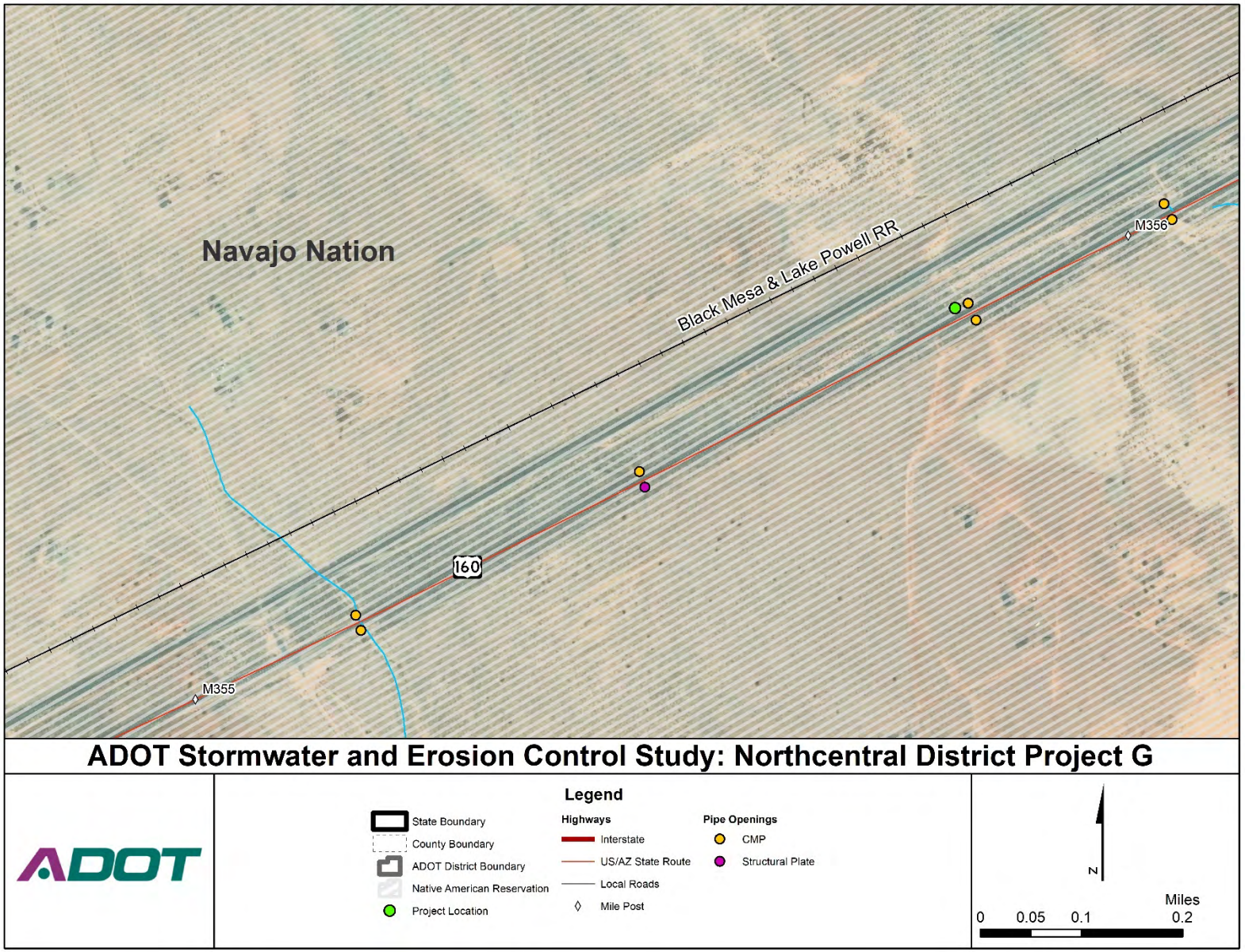


Figure 48: Box Culverts (Picture Provided by ADOT)

Figure 49: Northern View at Railroad Tracks (Picture Provided by ADOT)

Figure 50: Aerial

NORTHEAST DISTRICT

Table 3 identifies the initial listing of potential stormwater projects identified by representatives of the Northeast District.

Table 3: Northeast District Stormwater Projects

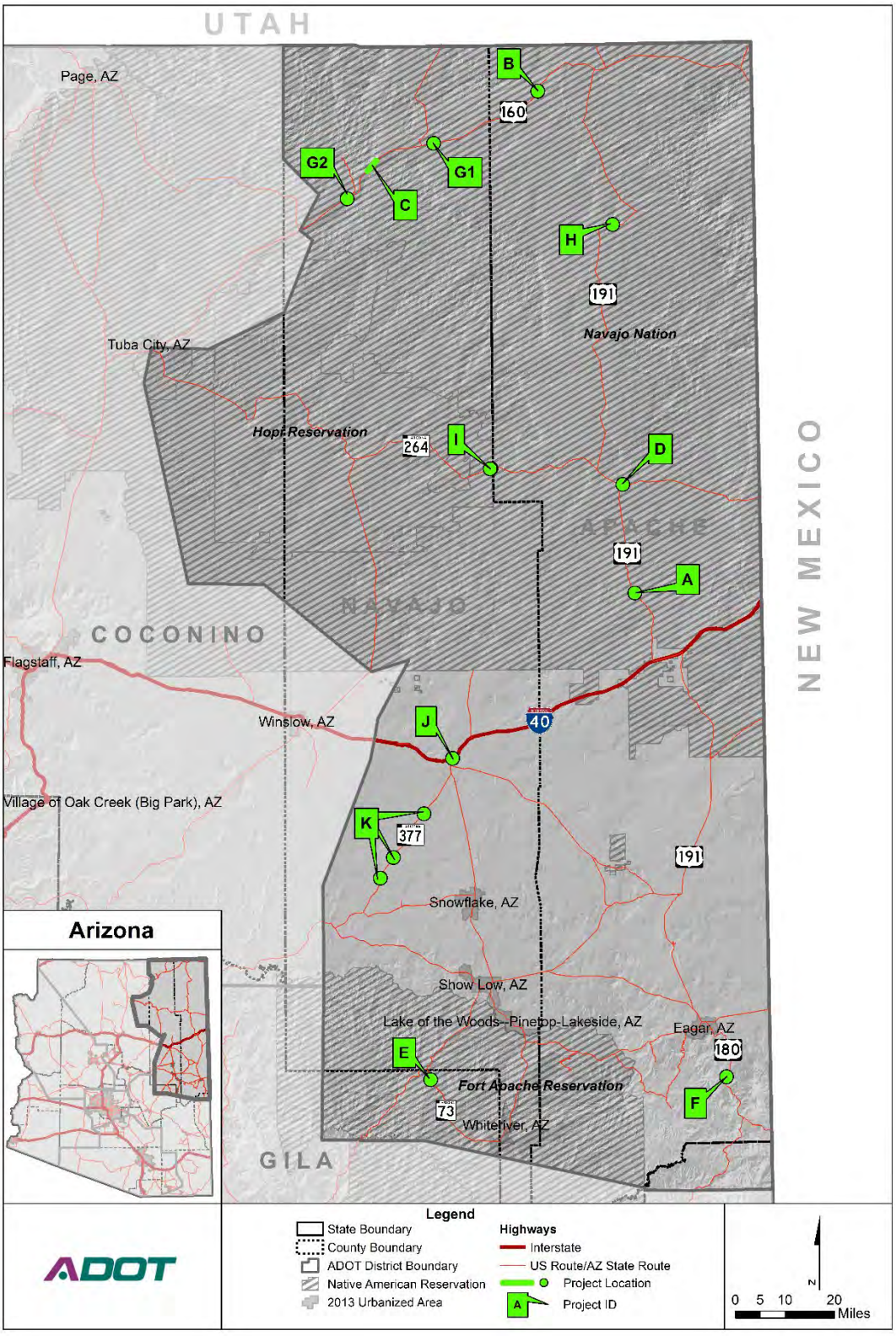
Project Identifier	Route	MP	Issue	Construction/ Maintenance[1]
A	US 191	389.3	Area floods regularly and completely fills drainage.	Construction
B	US 160	420	Erosion threatening roadway.	Construction
C	US 160	380.7-363.6	PA for pipe erosion.	Construction
D	SR 264	447.3	Flooding issues of a local school track and field.	Construction
E	SR 73	313	Slope erosion.	Construction
F	US 180	415.6-415.7	Stormwater erosion and roadway scour issues.	Construction
G	US 160	373.3, 396	Severe deposition of material after each storm.	Construction
H	US191	472	Significant down-cutting in ditch.	Construction
I	SR 264	417+/-	Severe erosion in cut ditches.	Construction
J	I-40	287 EB	Slow lane and onramp shoulders wash out.	Construction
K	SR 377	8,13,24	During large rain storms the water overtops the road requiring a traffic detour.	Construction

1 For this column, the term "Construction" applies to both construction and preventative maintenance, therefore these projects qualify for this study. The term "Maintenance" applies to routine maintenance only, therefore these projects do not qualify for this study and no further details are provided.

As **Table 3** indicates, the Northeast District submitted a total of eleven (11) potential stormwater projects. After the District phone interview, the Northeast District feels that all eleven (11) of the submitted projects meet the definition of a "construction" or "preventative maintenance" project. These construction projects are described below.

Overall District Footnote: The Northeast District feels that erosion issues take higher priority than road closures.

Figure 51: Northeast District & Project Locations



PROJECT A- US 191 @ MP 389.3

Project Description: Existing 24-inch CMP is too small to handle existing flows. Large drainage area outside ADOT ROW drains into this undersized ADOT CMP, causing sediment to fill in and around the CMP and overtopping the roadway at times. Area floods regularly and completely fills drainage at this location. There is approximately 10-feet of sediment at pipe opening.

How long has this been a concern? 10 years +, Continued hydrovac maintenance is not effective.

Has the problem led to road closures? Yes, approximately once per year during monsoon season.

District Priority (if identified): #2

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure – biggest problem
f. Improper construction/installation - maybe
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Need to enlarge the drainage structure, perhaps with a box culvert.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 52: Northeast District Project A

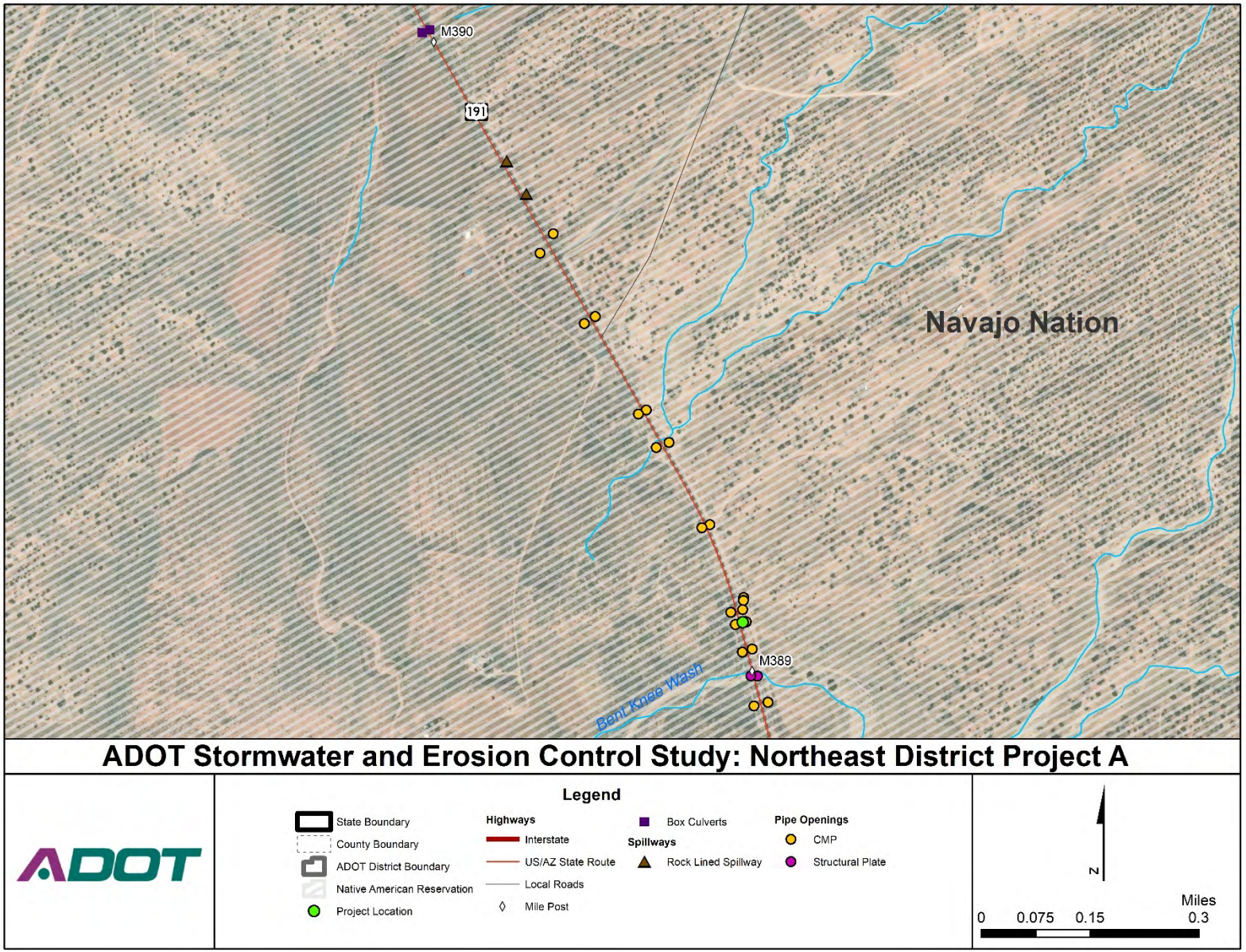


Figure 53: US 191, MP 389.3

Figure 54: US 191, MP 389.3

Figure 55: US 191, MP 389.3

PROJECT B- US 160 @ MP 420

Project Description: Erosion is threatening the roadway. Maintenance cannot perform work to counteract it because it is out of the ROW. Major event runoff measurably erodes ox-bow, while minor events continue to erode ox-bow. At some point a full earthwork re-channelization would be triggered. Unfortunately, there is also an arch site between the ox-bow and the newly graded overbank. A re-channelization would trigger an arch recovery and a costlier Army Corp of Engineers Individual Permit.

How long has this been a concern? 7-8 years

Has the problem led to road closures? Not to date. When the time comes that it does close the roadway it will not be a short closure. It will require re-channelizing to the bottom of the wash likely 30-feet below and will be beyond what maintenance forces can be expected to accomplish.

District Priority (if identified): #1

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Remediate now with Tribal ROW/RGP. Cost-effective wash control structures could be implemented heading off the costlier earthwork channelization, arch recovery, and the Army Corp of Engineers Individual Permit.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 56: Northeast District Project B

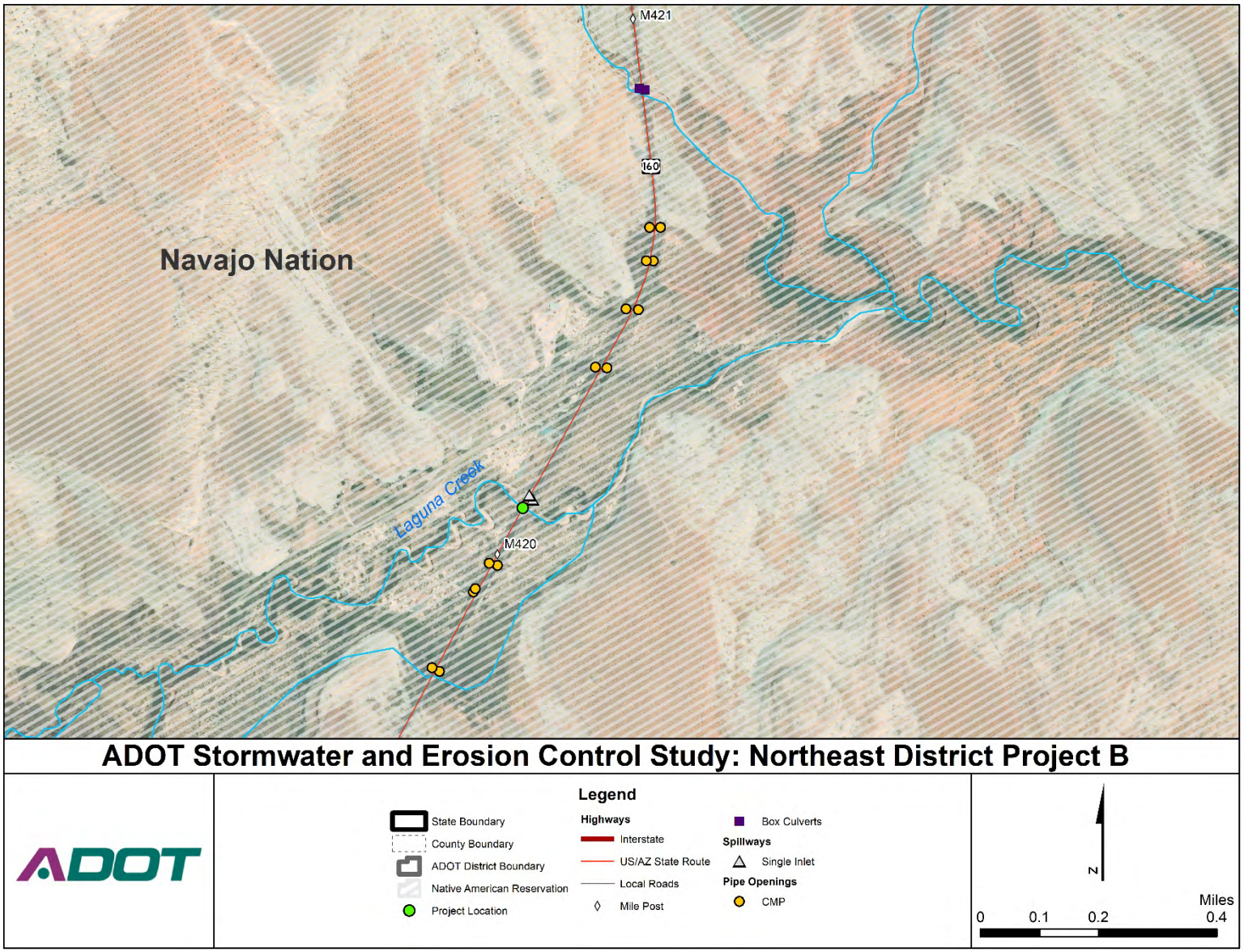


Figure 57: Aerial (Picture Provided by ADOT)

Figure 58: Aerial (Picture Provided by ADOT)

PROJECT C- US 160 @ MP 380.7 – 383.6

Project Description: There are three (3), 48-inch, 96-foot long CMPS that are experiencing significant scour and erosion on the downstream side. Poor soil conditions in the area (sandy) make it difficult to stabilize the embankment. This condition is not threatening to the roadway. This project had a Project Assessment (PA) prepared in 2007 (H-69101C) which estimated $1.5 million in new construction to mitigate the existing condition. Please refer to PA for additional details.

How long has this been a concern? 12 years +

Has the problem led to road closures? No

District Priority (if identified): #3

Characteristics of the Problem:

a. **Failed stabilization/erosion control – primary issue**
b. Facility overtopping or embankment protection
c. Slope washout
d. **Poor soil conditions**
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Stair step gabion baskets, armor embankment, add energy dissipater to reduce the flow velocity. Refer to PA for more details.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. **Environmental benefit**
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 59: Northeast District Project C

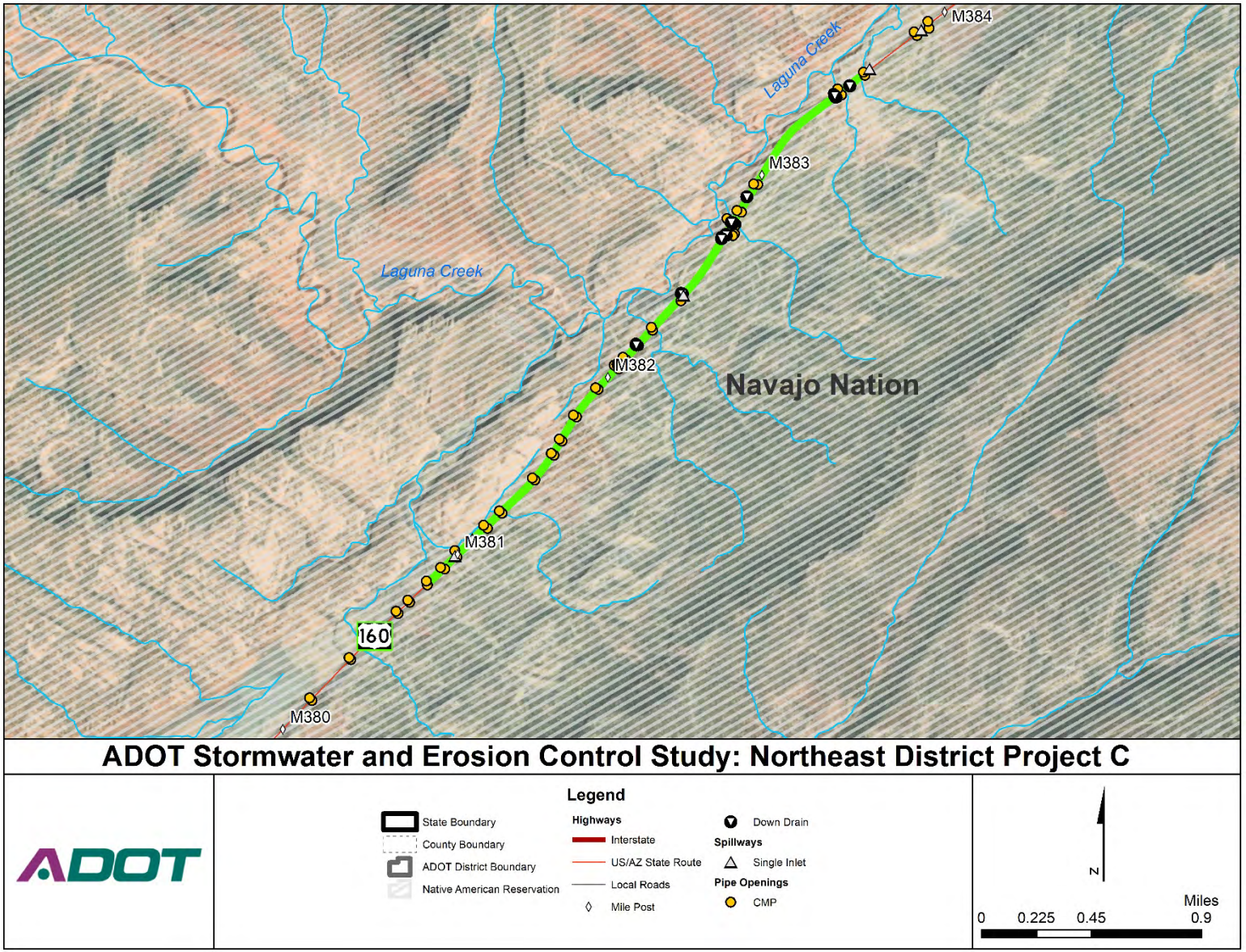


Figure 60: US 160 MP 369

Figure 61: US 160 MP 369

Figure 62: US 160 MP 369

PROJECT D- SR 264 @ MP 447.3

Project Description: Since a recent ADOT construction project approximately two years ago, erosion from the ADOT ROW is causing flooding and sediment disposition issues downstream at the Ganado Middle School track and field facility at least once or twice a year. A microburst storm event during construction activities complicated the situation. A ditch was regraded that perhaps should not be there. This problem did not exist prior to the construction project being completed.

How long has this been a concern? Approximately 2 years, since the construction project was completed.

Has the problem led to road closures? No

District Priority (if identified): #4

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. Slope washout
d. **Poor soil conditions**
e. Undersized infrastructure
f. **Improper construction/installation**
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Evaluate and recommend a location where the drainage should be discharged from the ADOT ROW and develop a new design to discharge the flows downstream.

Likely Project Benefits:

a. **Public safety – school facility, not roadway**
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard – to middle school**
g. Extend facility life span

Figure 63: Northeast District Project D

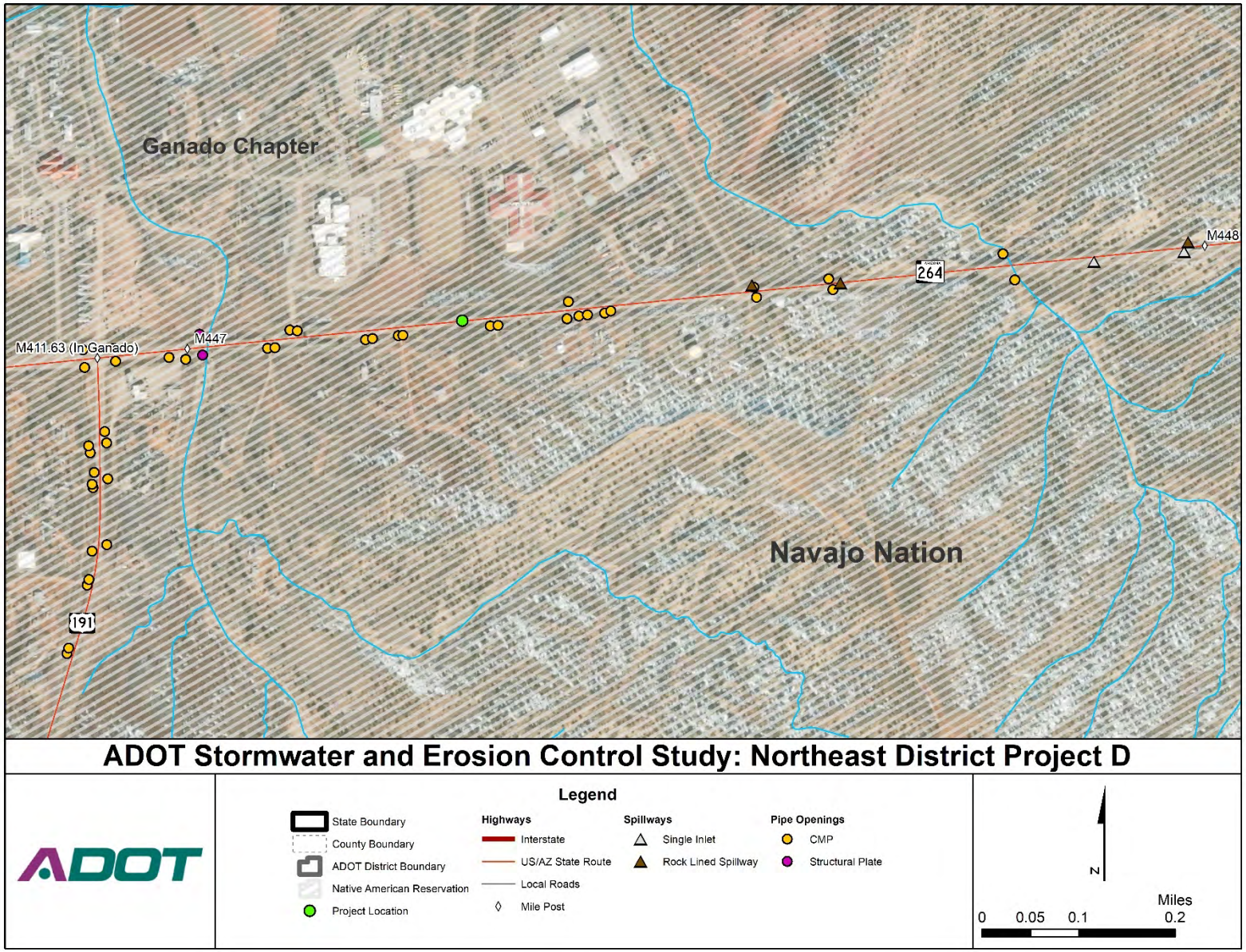


Figure 64: Eastbound, Southern View (MP 447)

Figure 65: Eastbound, Rear View

Figure 66: Westbound, Northern View

PROJECT E- SR 73 @ MP 313

Project Description: Roadway embankment is not stabilized and has been continually eroding. Sediment from the slope erosion is filling in ditch along the top of slope, burying the ADOT fence at the bottom. Slope erosion is not compromising the integrity of the roadway. Sandy soil type increasing difficulty for stabilization of the slope.

How long has this been a concern? 10 years +

Has the problem led to road closures? No

District Priority (if identified): #5

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. Slope washout
d. **Poor soil conditions**
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Stabilize and armor the embankment. Cleanup slope and ditch. Reseed area. Possibly add a crown ditch.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. **Environmental benefit**
d. **Relief to District budget and/or resources**
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 67: Northeast District Project E

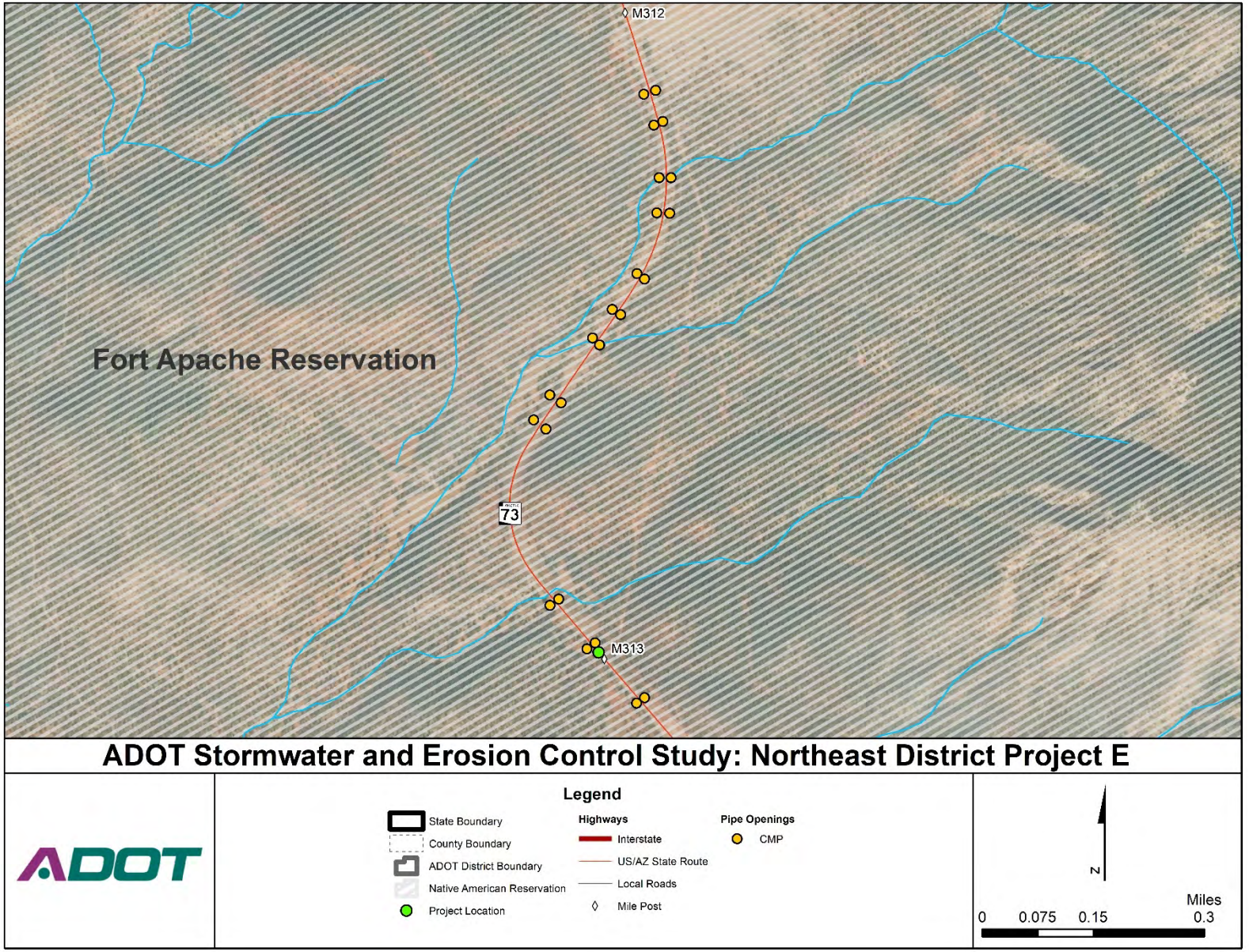


Figure 68: SR 73 at MP 313

Figure 69: SR 73 at MP 313

PROJECT F- US 180 @MP 415.6 - 415.7

Project Description: Increased flow via Wallow Fire scars has led to stormwater, erosion and roadway scour issues, where an existing culvert can no longer handle the increased flows and sediment disposition. Even with a structure built upstream designed to catch debris, outside ADOT ROW sediment clogs the pipe and fills up roadway ditch, sometimes causing overtopping of the roadway. The impacted ditch measures 472feet. Existing pipe is 24-inches by 75-feet long.

How long has this been a concern? Since Wallow Fire in 2011, ADOT maintenance performs maintenance activities at least 3-4 times each year.

Has the problem led to road closures? Yes, about once per year.

District Priority (if identified): #6

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. **Facility overtopping or embankment protection**
c. **Slope washout**
d. **Poor soil conditions**
e. **Undersized infrastructure**
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Enlarge drainage pipe/structure and line approximately 400-feet of existing ditch with concrete to the inlet so that it can be easily maintained.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. **Environmental benefit**
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard**
g. Extend facility life span

Figure 70: Northeast District Project F

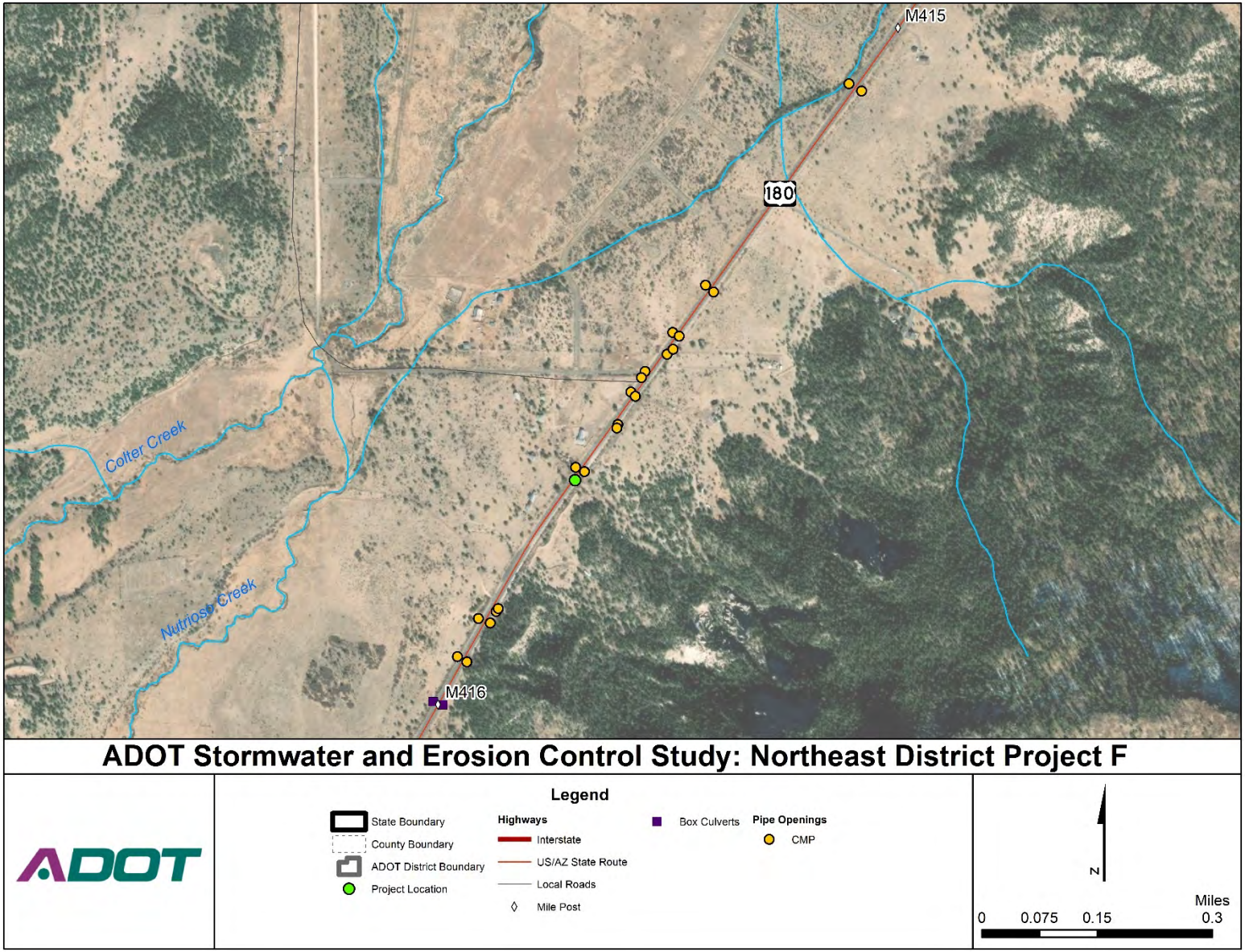


Figure 71: US 180 at MP 415

Figure 72: US 180 at MP 415

Figure 73: US 180 at MP 415

Figure 74: US 180 at MP 415

PROJECT G- US 160 @ MP 369 & 377.3

Project Description: Fine grain sandy soil blows along with severe sediment disposition from outside of ADOT ROW is occurring for most rain events, small to large. Sediment overtops CMP inlets. Culvert size is likely too small. The problem is compounded by the adjacent railroad facility. This extent of this project is depicted in **Figure 75** and **Figure 76**.

How long has this been a concern? 10 years +

Has the problem led to road closures? Yes, 3-4 times per year. ADOT needs to use a front loader to remove the debris that accumulates on roadway.

District Priority (if identified): #7

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. **Facility overtopping or embankment protection**
c. Slope washout
d. **Poor soil conditions**
e. **Undersized infrastructure**
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Consider an increase in the sizing of the drainage structure (CMP or box culvert) and/or raise the profile of the roadway.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. Environmental benefit
d. **Relief to District budget and/or resources**
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard**
g. Extend facility life span

Figure 75: Northeast District Project G1

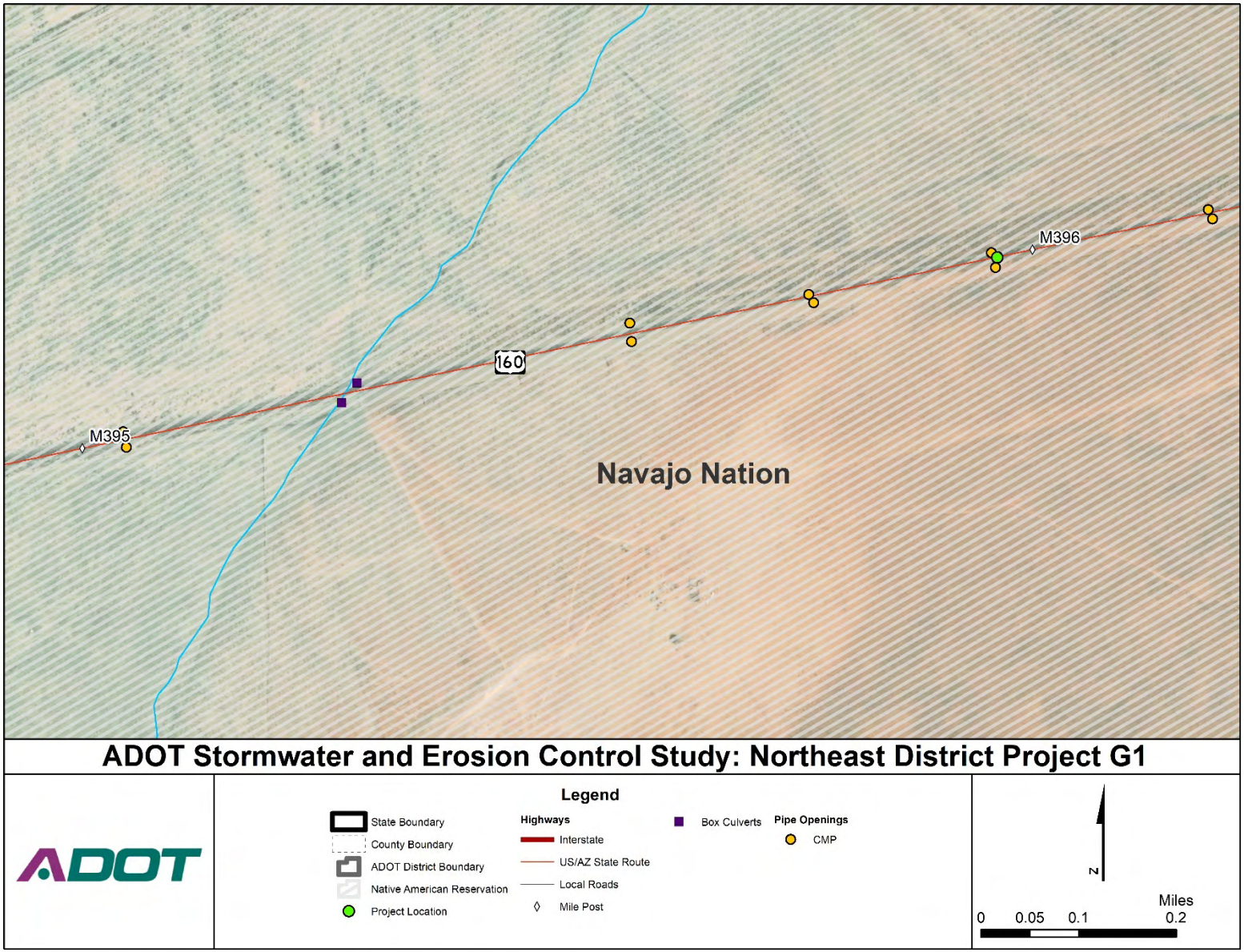


Figure 76: Northeast District Project G2

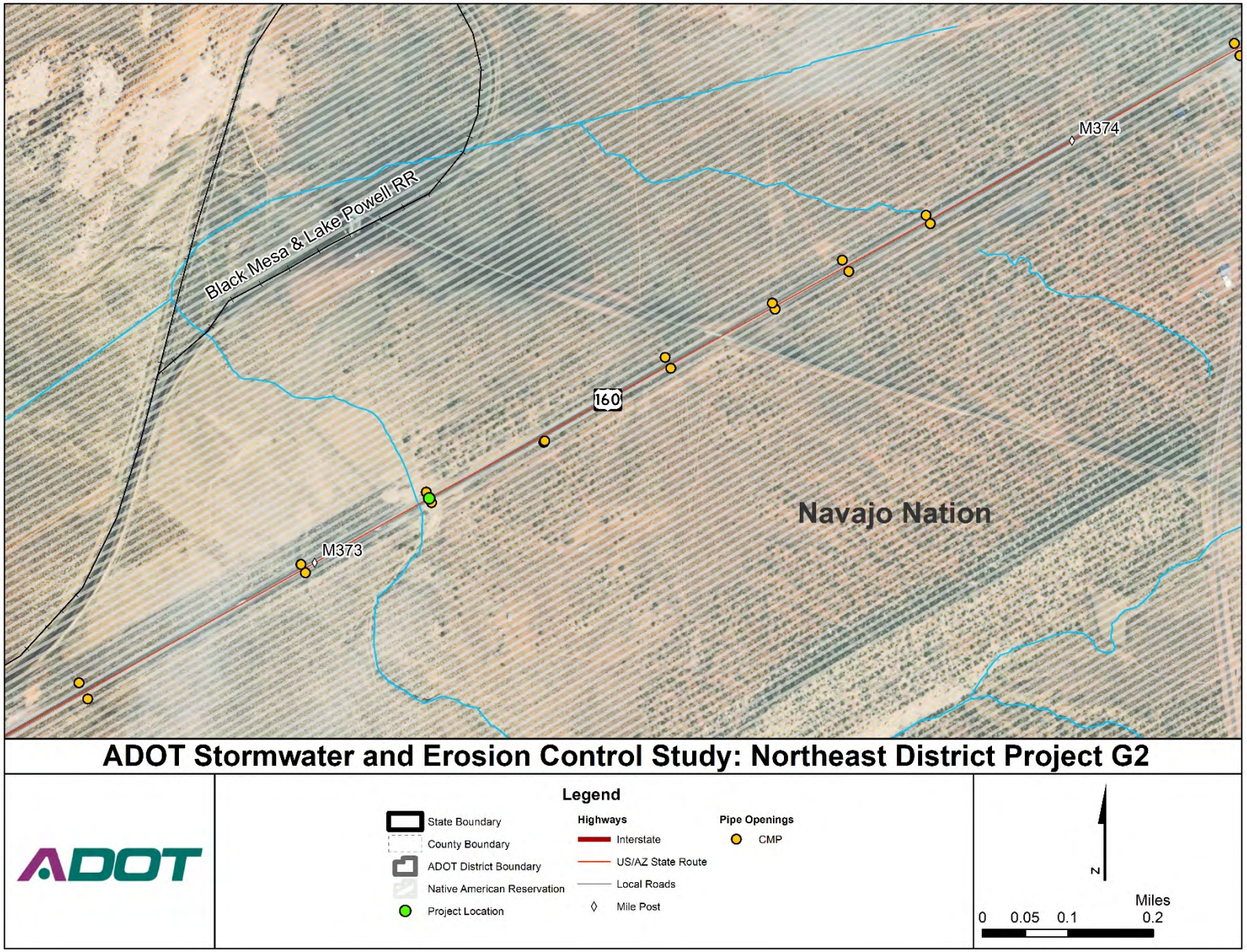


Figure 77: Northbound, Eastern View (MP 377)

Figure 78: Northbound, Rear View (MP 370)

Figure 79: Northbound, Eastern View (MP 369)

PROJECT H- US 191 @ MP 472

Project Description: Located along a segment of roadway with a 6% grade uphill, the northbound roadside ditch is steep and is experiencing significant down-cutting. Slope has down-cut to the point where it is like a crevasse. Sediment from slope is depositing into the ditch that is more than 30-feet below the roadway. Sediment is building in the ditch, impacting the ADOT fence at this location. Erosion is not impacting the side slope of the roadway itself. Past efforts to remedy with check dams has failed.

How long has this been a concern? 10 years +. Limited ADOT maintenance at this location due to other priorities, not impacting roadway itself and difficulty of access.

Has the problem led to road closures? No

District Priority (if identified): #8

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. **Slope washout**
d. **Poor soil conditions**
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Armor the slope to minimize erosion, remove the sediment buildup in ditch and repair the ditch.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. **Environmental benefit**
d. **Relief to District budget and/or resources**
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 80: Northeast District Project H

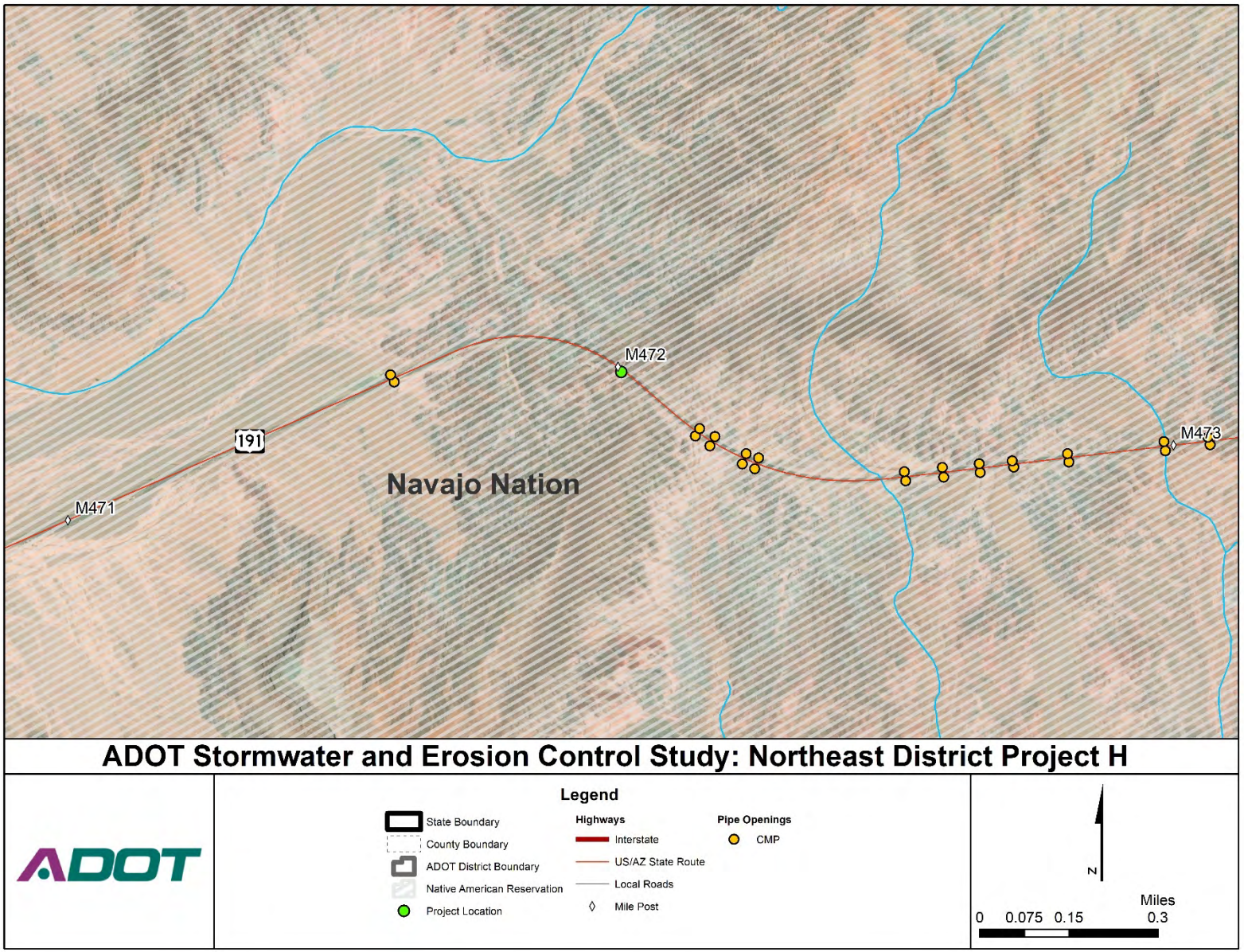


Figure 81: US 191 MP 472

Figure 82: US 191 MP 472

Figure 83: US 191 MP 472

Figure 84: US 191 MP 472

PROJECT I- SR 264 @ MP 417

Project Description: For approximately 500-foot length along each side of the roadway, the roadway embankment has a steep slope. This area has sandy soil characteristics and is experiencing significant erosion between the cut and fill slopes, some of which is behind the guardrail causing safety concerns. Sediment from slope is depositing into the ditch that is 15 to 20-feet below the roadway.

How long has this been a concern? 4-5 years

Has the problem led to road closures? No

District Priority (if identified): #9

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. Slope washout
d. **Poor soil conditions**
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Armor the slope to minimize erosion, remove the sediment buildup in ditch and repair the ditch. Perhaps add grouted rip rap for energy dissipater of flow velocities.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. **Environmental benefit**
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard**
g. Extend facility life span

Figure 85: Northeast District Project I

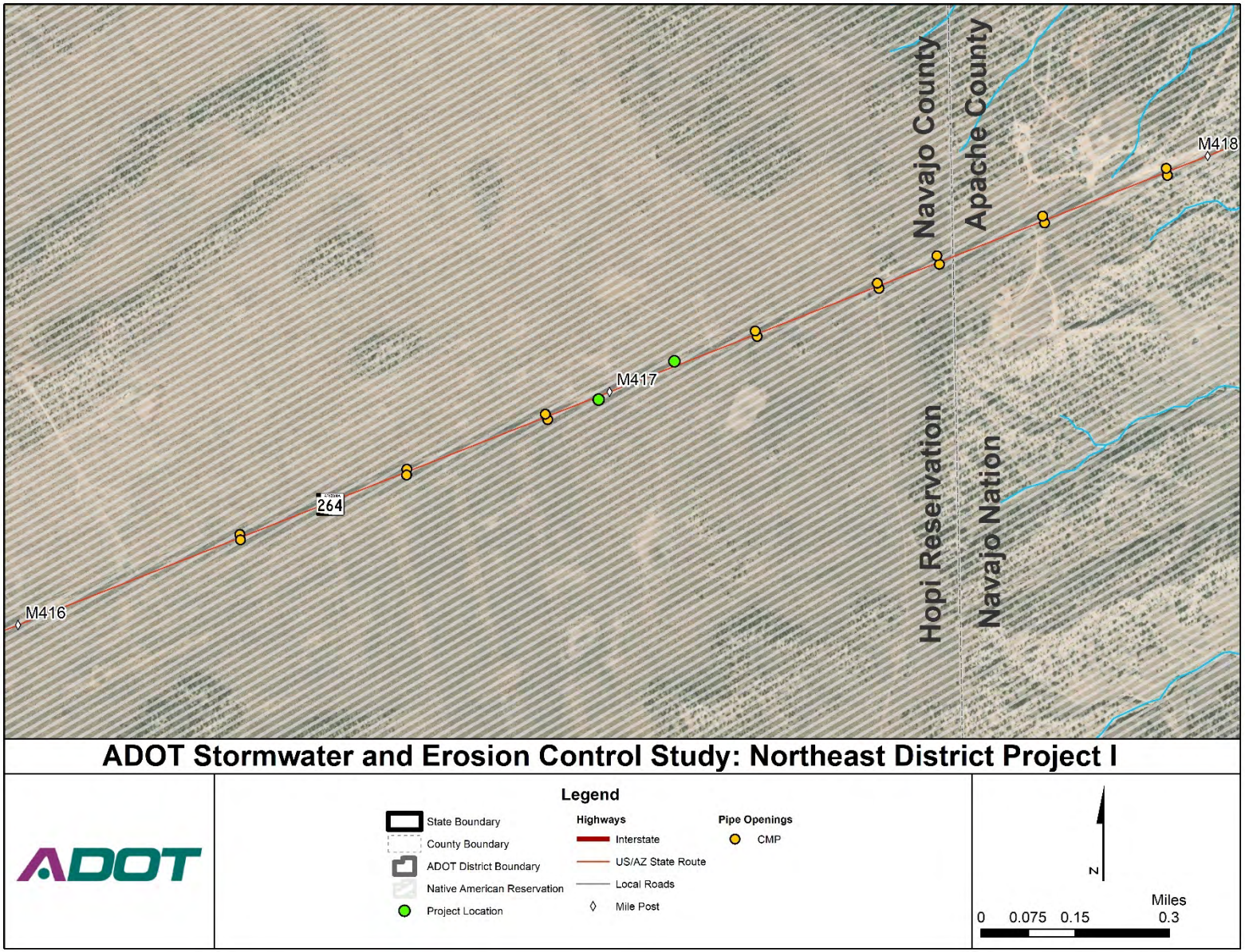


Figure 86: SR 264 at MP 417

Figure 87: SR 264 at MP 417

Figure 88: SR 264 at MP 417

PROJECT J- INTERSTATE 40 @ MP 287 EB

Project Description: Slow lane and on-ramp shoulders along I40 East Bound wash out. The down drains between the I40 west bound and west bound shoulder are clogged with sediment, which backs up debris and water, causing overtopping of Business I-40 and then discharging into the City of Holbrook. The area has been a maintenance problem for years with a lot of man-hours to keep drains open to move water after large rainstorms.

How long has this been a concern? 25 years + since the freeway was constructed.

Has the problem led to road closures? Yes, 1 time per year on average. Usually during a monsoon storm event.

District Priority (if identified): #10

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. **Facility overtopping or embankment protection**
c. Slope washout
d. **Poor soil conditions – sandy soils**
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Armor the roadway shoulder embankment with gabion baskets or similar reinforcement of slope and ditch. Consider additional check dams and increase the number of inlets into the catch basins.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. **Environmental benefit**
d. **Relief to District budget and/or resources**
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard**
g. Extend facility life span

Figure 89: Northeast District Project J

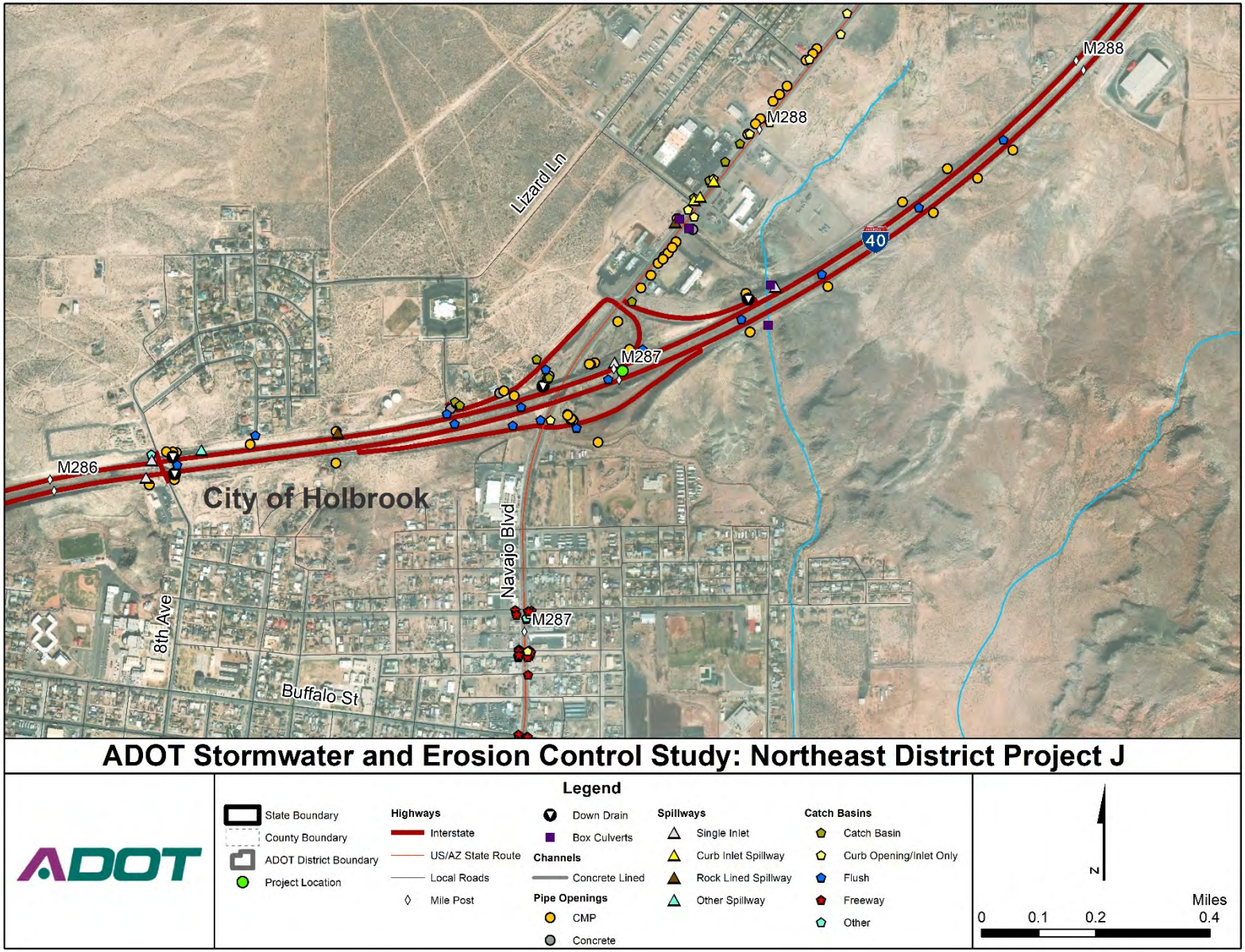


Figure 90: Westbound, Rear View (MP 287)

Figure 91: Westbound, Northern View

Figure 92: Westbound, Northern View

PROJECT K- SR 377 @ MP 8, 13 AND 24

Project Description: During large rain storms the water overtops the roadway (one to 1.5-feet) and a traffic detour is required around the area. At MP 8 and 13, four (4) existing 36-inch CMP's cannot handle the volume of water hitting these locations (being impacted by the same wash). At MP 24, two 24-inch CMP's cannot handle the water volume causing roadway overtopping. Infrastructure is undersized at all three locations. MP 24 could also be experiencing an alignment issue. There is not much sediment overtopping, only water. There is significant vegetation in the area and there is little to no scour nor erosion being experienced. Structurally, the CMPs are sound and not jeopardized.

How long has this been a concern? 20-30 years

Has the problem led to road closures? Yes, 2-4 times a year for a duration of approximately 2 hours each. Lower priority because this maintenance requires fewer man hours.

District Priority (if identified): #11

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Evaluate existing infrastructure sizing for likely need to upsize the existing CMPs to accommodate volume of flows at this location.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 93: Northeast District Project K

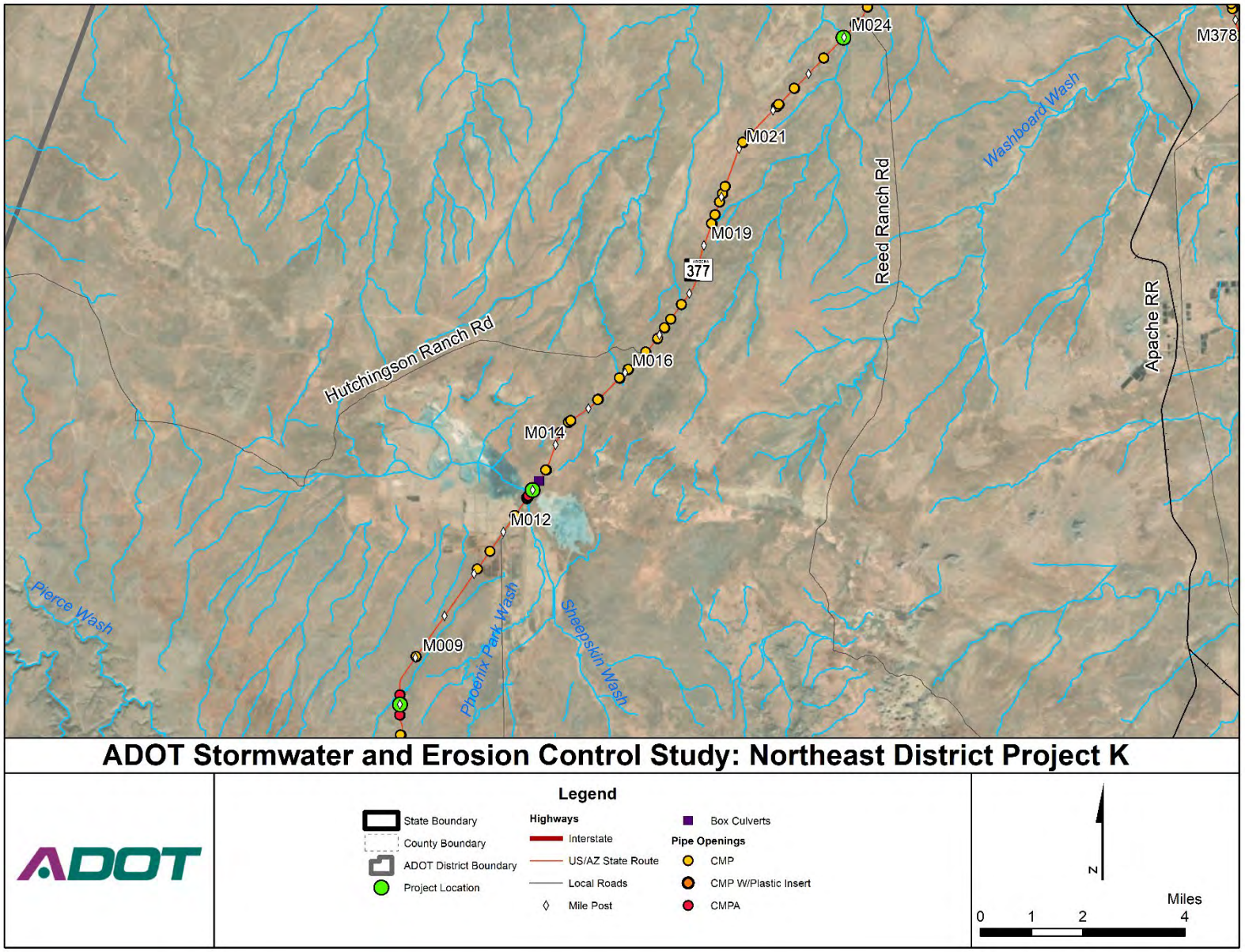


Figure 94: SR 377 at MP 8

Figure 95: SR 377 at MP 8

Figure 96: SR 377 at MP 8

CENTRAL DISTRICT

Error! Reference source not found. identifies the initial listing of potential stormwater projects identified by representatives of the Central District.

Table 4: Central District Stormwater Projects

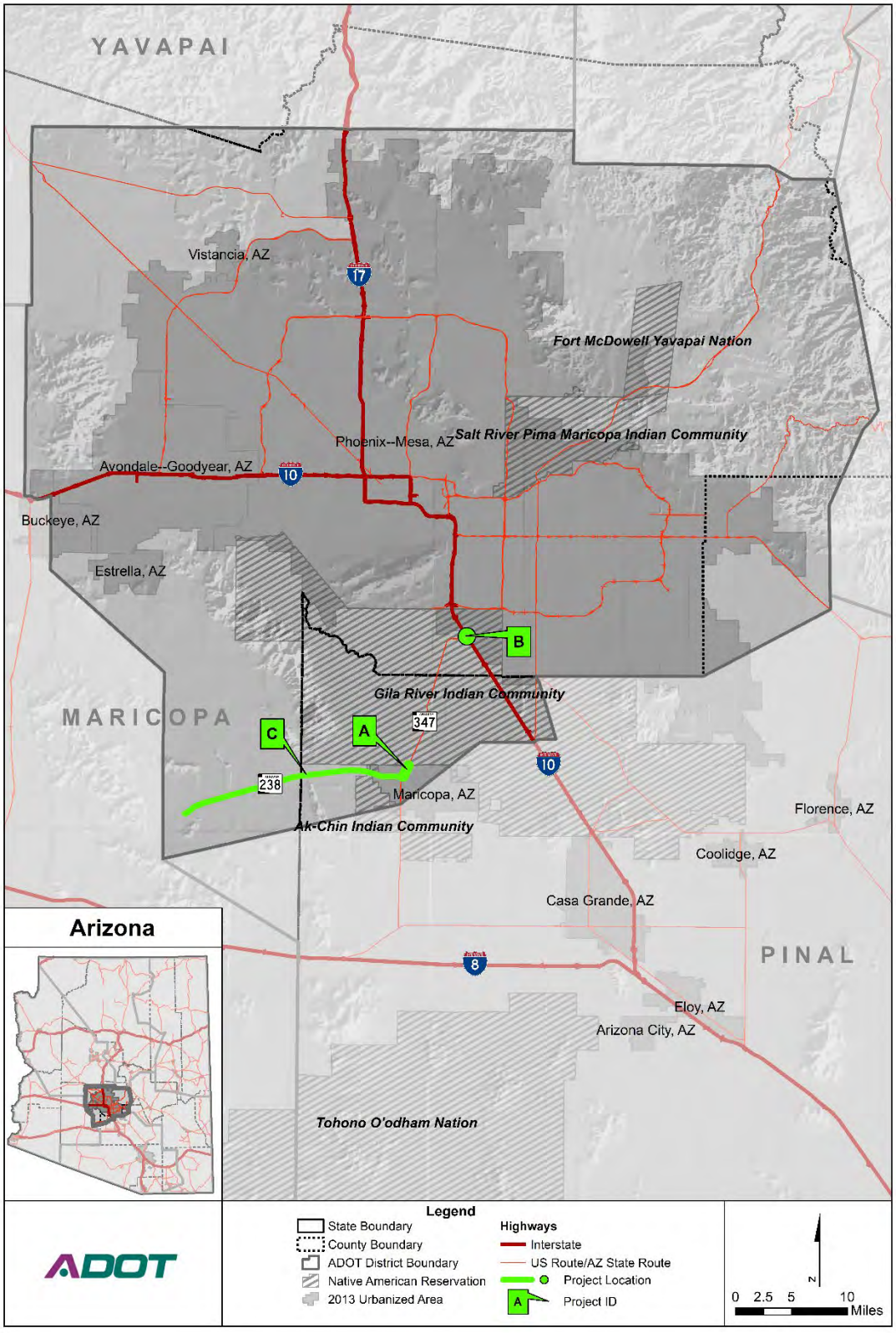
Project Identifier	Route	MP	Issue	Construction/ Maintenance[1]
A	SR 347	SR 238 to GRIC boundary	Erosion, bank protection and/or curb and gutter needed.	Construction
B	I-10	163.9 - Queen Creek TI	Unstable slopes, extreme rutting and pole foundations exposed.	Construction
C	SR 238	24.00 – 44.24	Highway experiences frequent flooding at low points, often causing roadway closures.	Construction
–	SR 101 AF	McDowell to Bethany Home	Numerous tons of agricultural sediment removed every year.	Maintenance
–	SR 303	Camelback and Northern	Offsite agricultural tail water erodes ADOT roadsides.	Maintenance
–	US 60	North side of US 60, NB Meridian Rd and channel on east side	Floods and scours slopes just north of and in recent project area.	Maintenance
–	US 60	South side at end of project area on NB Meridian east side	Erosion from bridge washes out slope.	Maintenance
–	I-10	EB to SR 202 WB Ramp, East side of 48th St. Slope	Rill and Gulley failure.	Maintenance
–	SR 101 AF	I-10 and McDowell	Various erosion around bridges and drain inlets (as noted).	Maintenance
–		Flyover abutments for I-10 W to L 101 N and L 101 S to I-10 W	Erosion features failing.	Maintenance
–		McDowell on-ramp to L 101 N	Excessive stormwater runoff causing erosion.	Maintenance
–	SR 101 AF	Northern off ramp gore point	Excessive stormwater runoff causing erosion.	Maintenance

Project Identifier	Route	MP	Issue	Construction/ Maintenance[1]
–	SR202	RM Spook Hill Levee	Erosion of the levee.	Maintenance
–	SR303	Beardsley Canal	Offsite flows erode westside slopes above channel.	Maintenance
–	SR303	SR303 at Lake Pleasant Parkway, northside	Offsite flows erode northside slopes.	Maintenance

1 For this column, the term "Construction" applies to both construction and preventative maintenance, therefore these projects qualify for this study. The term "Maintenance" applies to routine maintenance only, therefore these projects do not qualify for this study and no further details are provided.

As **Table 4** indicates, the Central District submitted a total of fifteen (15) potential stormwater projects. After the District phone interview, the Central District feels that three (3) of the submitted projects meet the definition of a "construction" or "preventative maintenance" project. These construction projects are described below.

Figure 97: Central District & Project Locations



PROJECT A- SR 347 – @ SR 238 TO MP 175.8 (GRIC BOUNDARY)

Project Description: Existing slopes lacking stabilization with riling/rutting up to 24-inches deep. Decomposed granite is discharged into the channel. Water from the roadway is not channeled into scuppers on the edge of the roadway, but rather a sheet flow draining of edges occurs in between scupper causing erosion along the bank. The roadway itself is not degrading, but access control fence poles are exposed as sediment leaves the site to the north eventually entering the Gila River drainage area. The southbound side of the road was improved by the City of Maricopa and its developers implementing drainage improvements as part of their development. The northbound side is not improved where erosion stormwater problem exists.

How long has this been a concern? Not sure, Central District inherited this condition when ADOT reconfigured Districts in 2015.

Has the problem led to road closures? Yes, at least three times recalled.

District Priority (if identified): #2

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Stabilize bank with liner and add curb and gutter to direct flows to scupper locations.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 98: Central District Project A

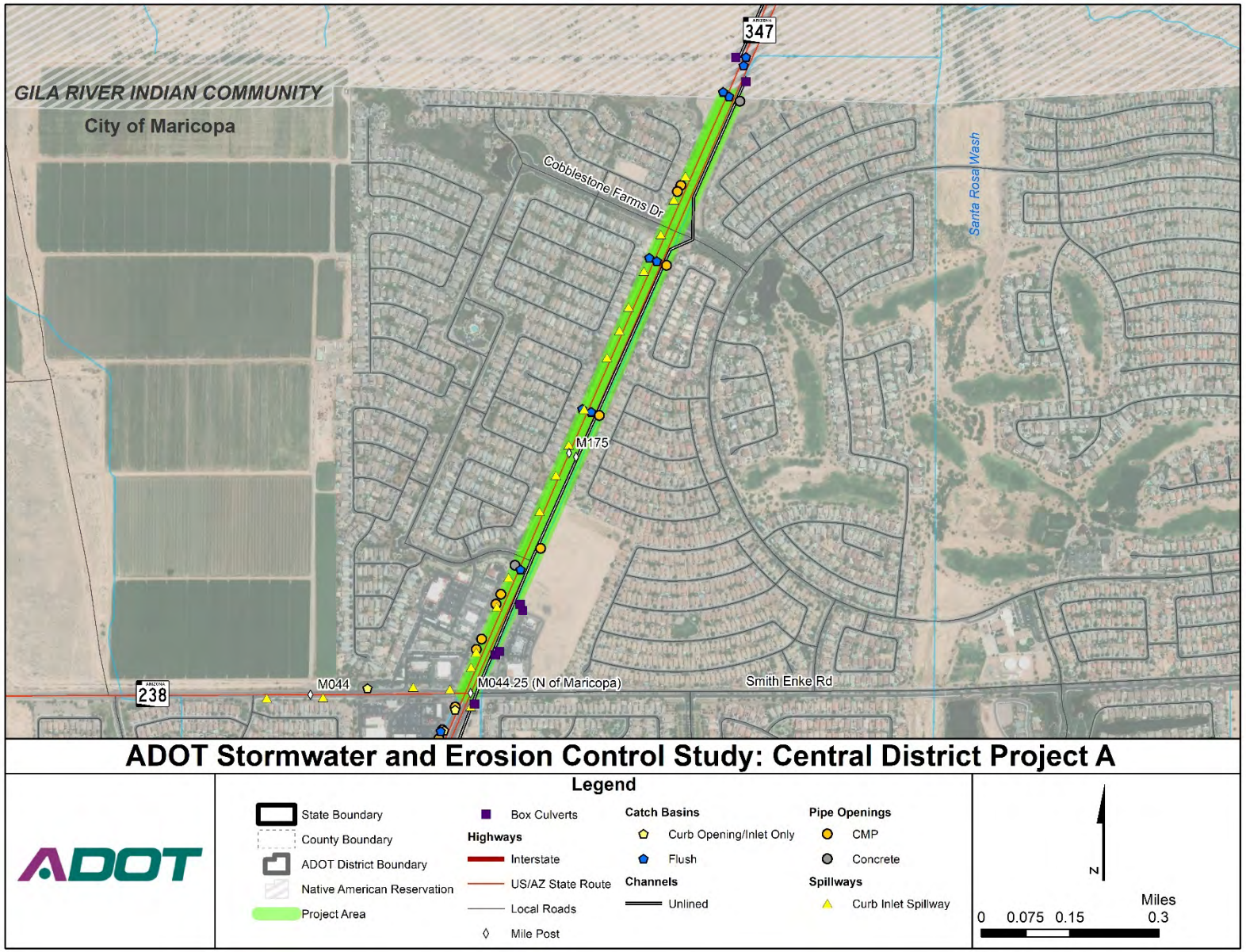


Figure 99: Northbound, Eastern View

Figure 100: Northbound, Rear View

Figure 101: Southbound, Western View

PROJECT B- INTERSTATE 10 @ MP 163.9/ QUEEN CREEK TRAFFIC INTERCHANGE

Project Description: Significant erosion occurring on the slopes of the traffic interchange. This lack of slope stabilization has also led to sediment collecting in the retention/detention basin below. Continuous runoff from roadway has led to extreme rutting causing pole foundations of the ADOT access control fence, and light pole foundations, to become exposed.

How long has this been a concern? More than 10 years.

Has the problem led to road closures? No

District Priority (if identified): #3

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. **Facility overtopping or embankment protection**
c. **Slope washout**
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Bank stabilization with either temporary fix of hydroseeding or long-term fix with filter matting. Repair of fence, and removal of sediment in catch basin are all necessary. Adding a combination of 1-inch to 3-inch (gradation C) fractured rock mulch on the slopes and possibly adding Reno Mattressing product or equivalent is the desired alternative to filter matting. There is some uncertainty if the possible construction fix could already be identified/included in an upcoming I-10 corridor project beginning at I-10 & WHP and ending at Casa Grande.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. **Environmental benefit**
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 102: Central District Project B

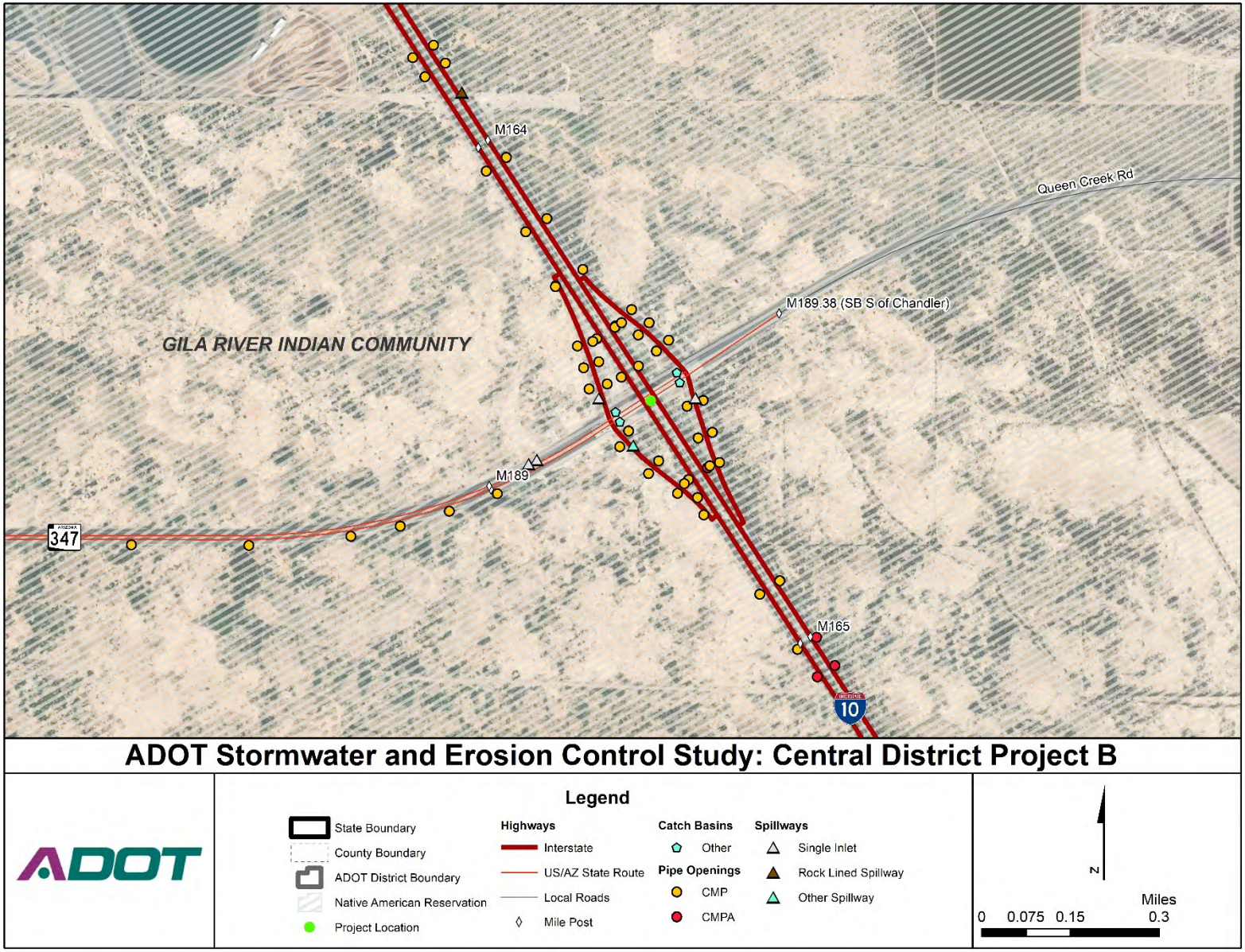


Figure 103: Northbound, Rear View

Figure 104: Southbound, Rear View

Figure 105: Northbound, Eastern View

PROJECT C- SR 238 @ MP 24 TO 44.24

Project Description: SR 238 along this 20-mile segment of roadway experiences flooding during heavy rain events, frequently causing roadway closures and restrictions, resulting in detours of local traffic. Water and debris frequently overtop the roadway at multiple dip section locations during larger rain events, triggering ADOT maintenance crews to conduct removal. The study area is parallel to an existing Union Pacific Railroad (UPRR) alignment located to the south of SR 238. The Railroad has constructed ditches and berms to direct water through drainage structures at various locations. Water discharged from these locations often overtops the roadway. ADOT has completed a Draft Initial Project Assessment for this project (Project 238 MA 24 P130309P) in June 2019 and has identified a preliminary construction budget of $15,832,000 for this project.

How long has this been a concern? Over ten years.

Has the problem led to road closures? Yes, seven times annually.

District Priority (if identified): #1

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: The vast majority of the proposed improvements found within the Draft Initial Project Assessment consist of raising the roadway profile and adding culverts to the multiple dip section locations.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 106: Central District Project C

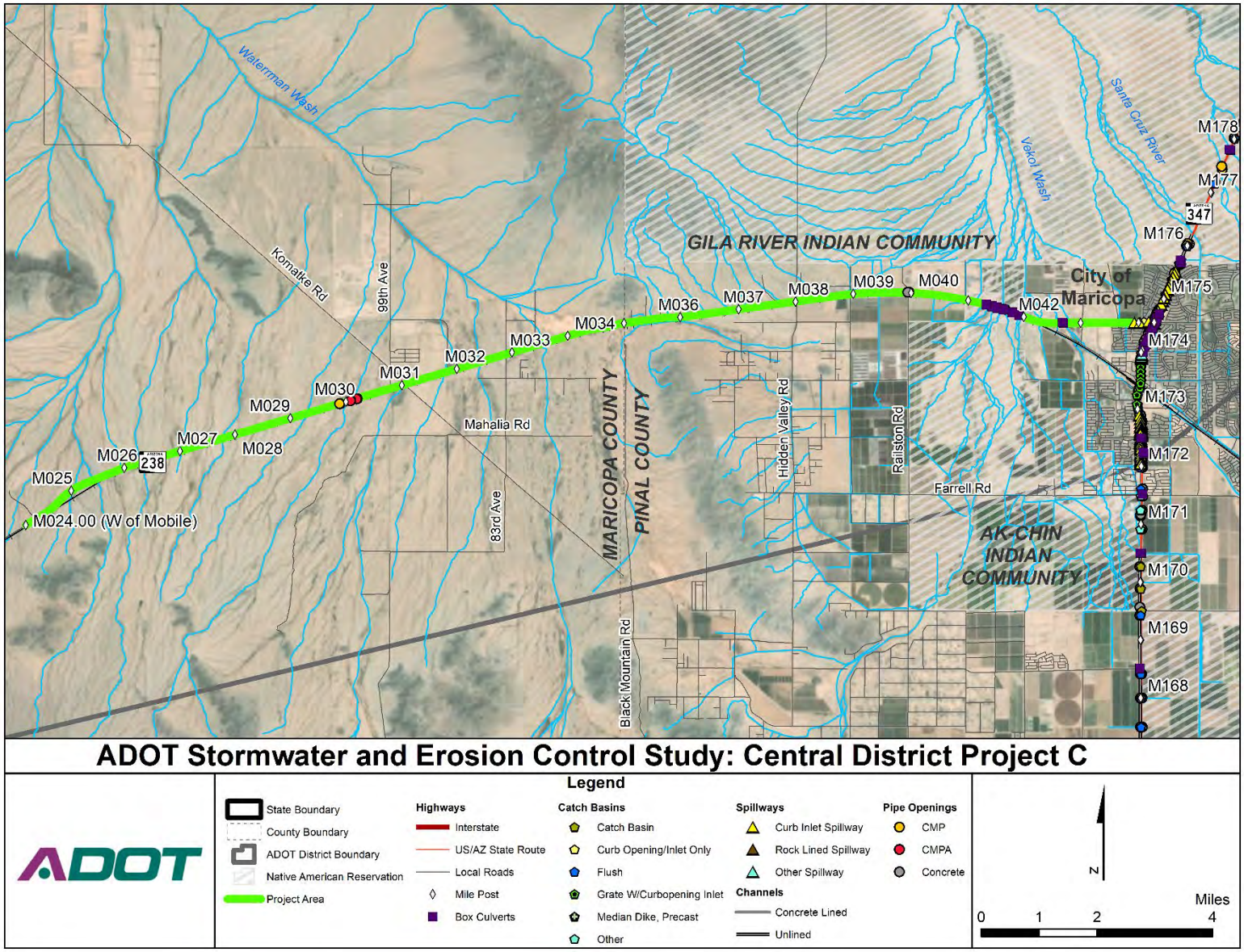


Figure 107: MP 43.58 Roadway Flooding and Closure 2018 (Picture Provided by ADOT)

Figure 108: MP 25 Box Culverts (Picture Provided by ADOT)

Figure 109: MP 34 Aerial (Picture Provided by ADOT)

SOUTHWEST DISTRICT

Table 5 identifies the initial listing of potential stormwater projects identified by representatives of the Southwest District.

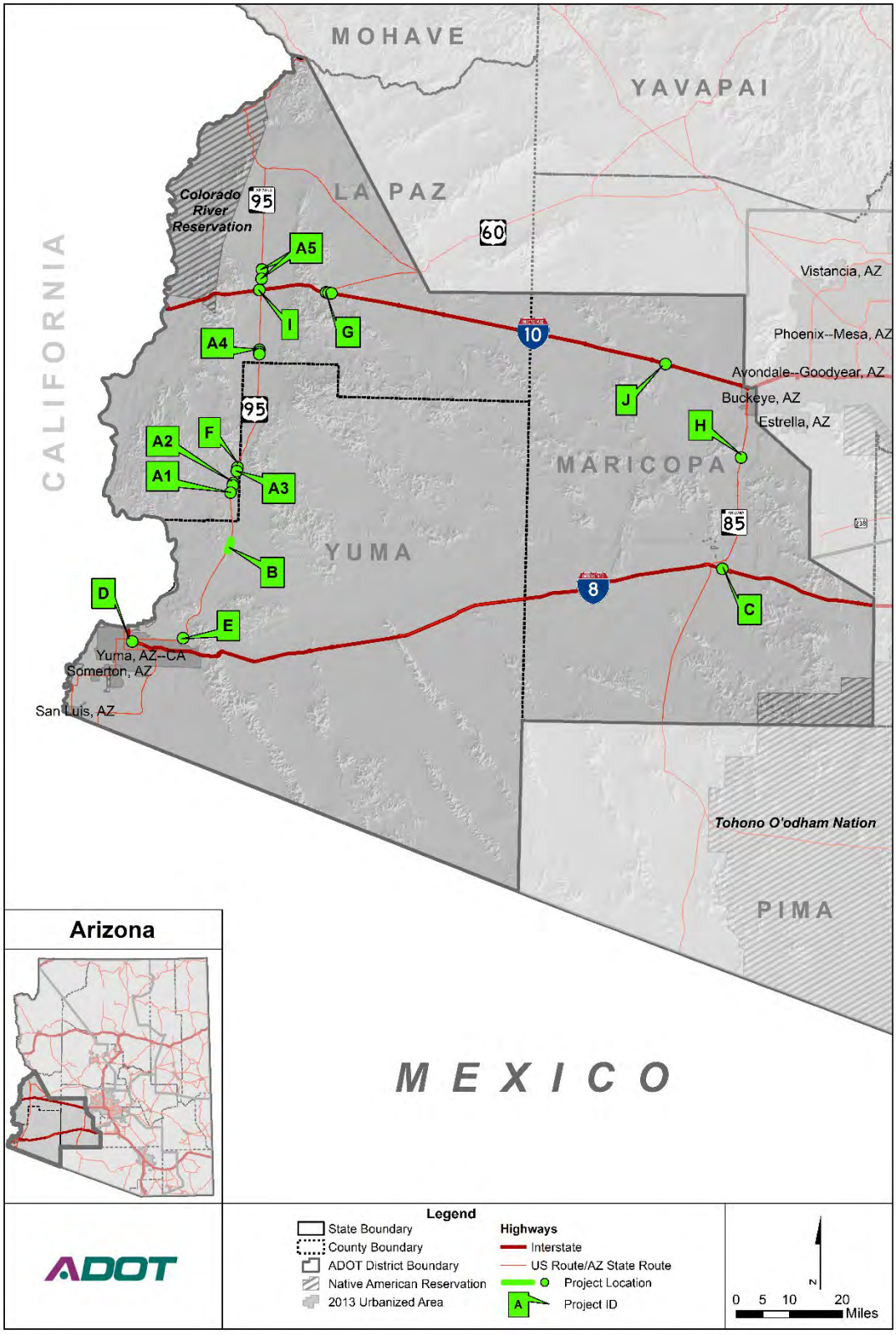
Table 5: Southwest District Stormwater Projects

Project Identifier	Route	MP	Issue	Construction/ Maintenance[1]
A	US 95	65.2, 66.5, 66.9, 69.3, 92.1, 92.5, 92.9, 110.8, & 112.5	Nine low water crossings causing pavement erosion.	Construction
B	US 95	54-56	Stormwater run-off eroding shoulders.	Construction
C	I-8	WB 117.95	Flowing through box culvert flooding residential property.	Construction
D	Pacific Ave	Ave 2E Underpass Structure #1381	Stormwater flows damaging residential subdivision.	Construction
E	US 95	Fortuna Wash	Stormwater flows erosion threatening flooding of adjacent properties.	Construction
F	US 95	69.83-70.04	Wash cutting into roadway during storm events causing pavement undermining.	Construction
G	I-10	31.5-32.5	Roadway overtopping occurs during large storm events.	Construction
H	SR 85	139.81-141.11	Water overtopping bank of the wash into the median eroding the roadway shoulders.	Construction
I	I-10	18.89	Flooding occurs in southeast quadrant of structure threatening mobile businesses.	Construction
J	I-10	WB 95.8-97.5	Agricultural run-off compromising pavement section.	Construction

1 For this column, the term "Construction" applies to both construction and preventative maintenance, therefore these projects qualify for this study. The term "Maintenance" applies to routine maintenance only, therefore these projects do not qualify for this study and no further details are provided.

As **Table 5** indicates, the Southwest District submitted a total of ten (10) potential stormwater projects. After the District phone interview, the Southwest District feels that all ten (10) of the submitted projects meet the definition of a "construction" or "preventative maintenance" project. These construction projects are described below.

Figure 110: Southwest District & Project Locations



PROJECT A- US 95 @ MP 65.2, 66.5, 66.9, 69.3, 92.1, 92.5, 92.9, 110.8, & 112.5

Project Description: There are nine (9) low water crossings on US 95 where erosion occurs, typically after monsoon storm events. Water flows undercut the material along the edge of pavement causing drop-offs and undermining the highway pavement structural section. The nine locations are included as one project since the likely mitigation measures for erosion at low water crossings would likely be similar in application along US 95. These locations have been persistent and continuous maintenance activities that have consumed a considerable portion of the District maintenance budget. As a persistent maintenance problem, a new construction project(s) is needed to resolve this condition. A District project request for construction mitigation was submitted in 2018. The extent of this project is depicted in **Figure 111**, **Figure 112**, **Figure 113**, **Figure 114**, and **Figure 115**.

How long has this been a concern? 14 years +

Has the problem led to road closures? Yes, once annually during monsoon season.

District Priority (if identified): #1

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. **Undersized infrastructure**
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Each location will likely need some combination of installation of concrete or rock ford walls, gabion baskets and/or grouted rip rap to successfully mitigate erosion of roadway subgrade.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. **Environmental benefit**
d. **Relief to District budget and/or resources**
e. **Meets District or ADOT strategic objective**
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 111: Southwest District Project A1

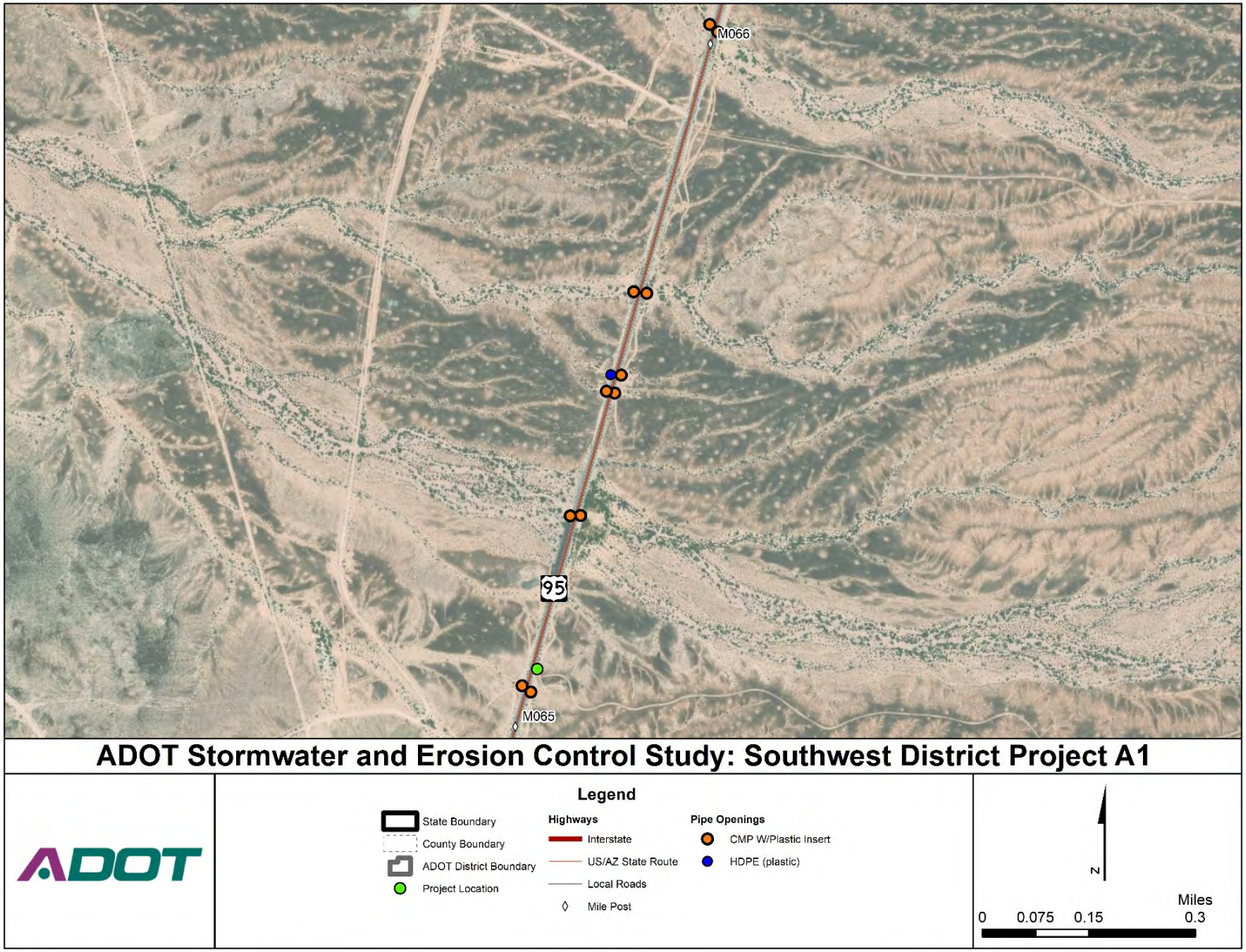
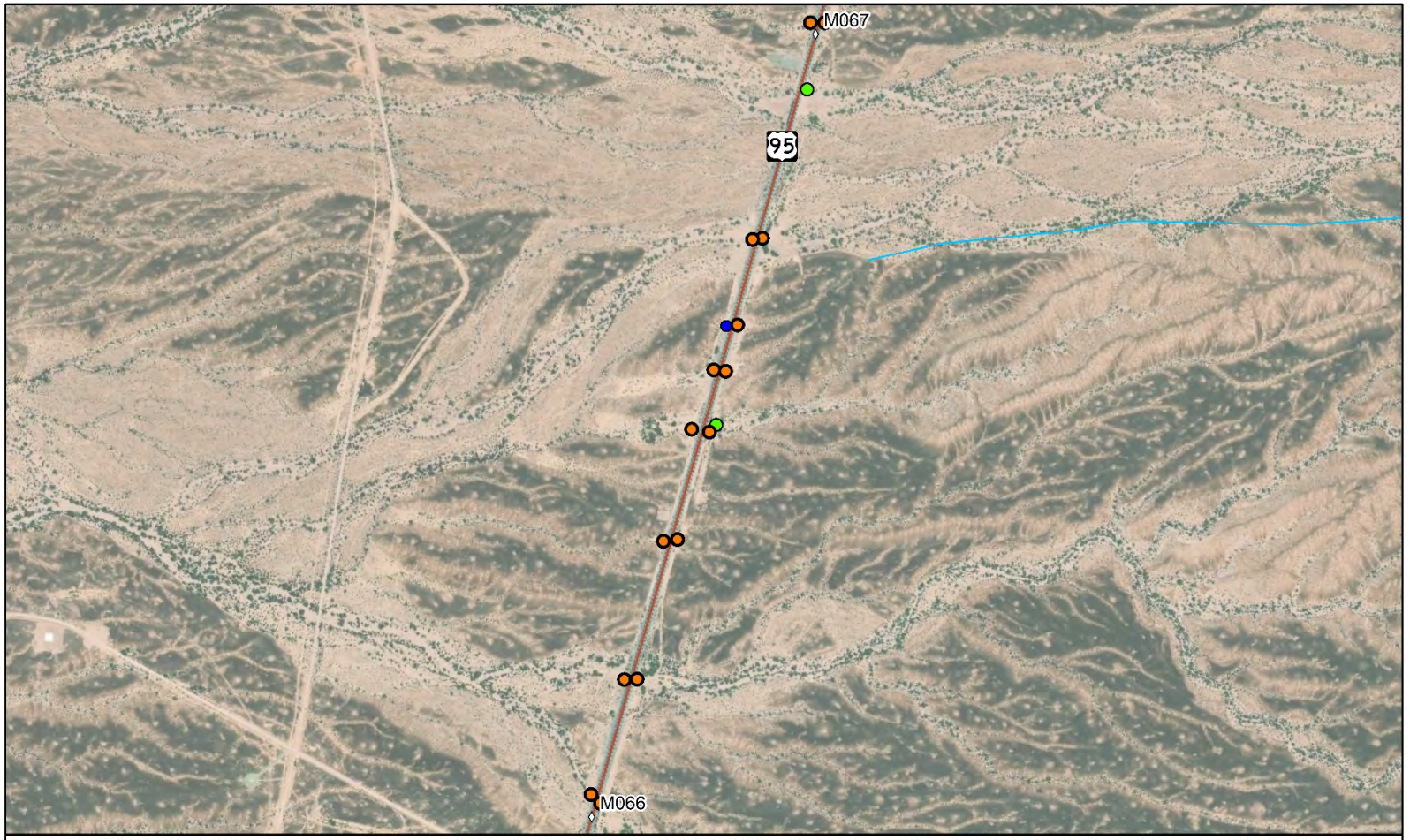


Figure 112: Southwest District Project A2



ADOT Stormwater and Erosion Control Study: Southwest District Project A2

Legend

- State Boundary
- County Boundary
- ADOT District Boundary
- Project Location

Highways

- Interstate
- US/AZ State Route
- Local Roads
- Mile Post

Pipe Openings

- CMP W/Plastic Insert
- HDPE (plastic)

N

0 0.075 0.15 0.3 Miles

Figure 113: Southwest District Project A3

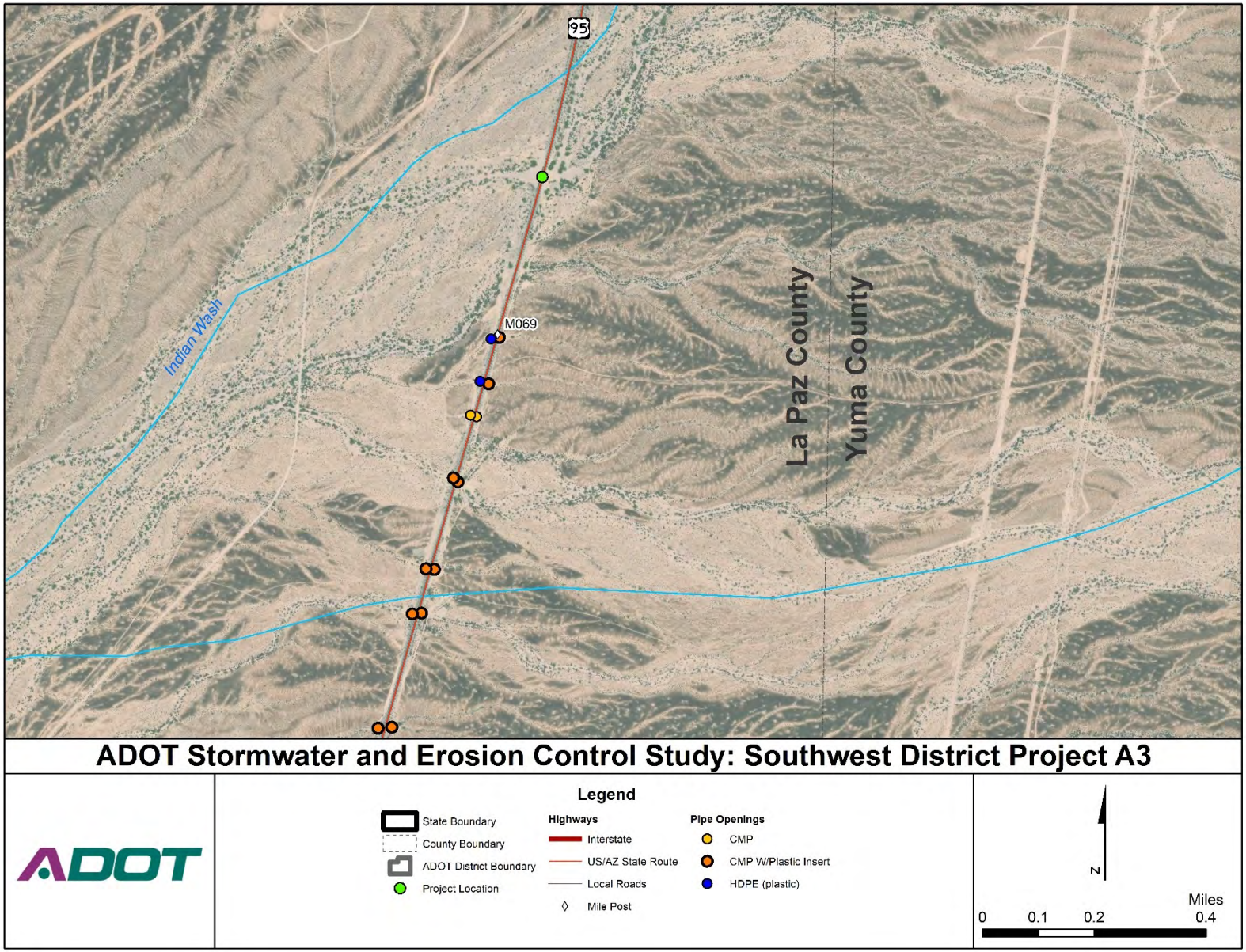


Figure 114: Southwest District Project A4

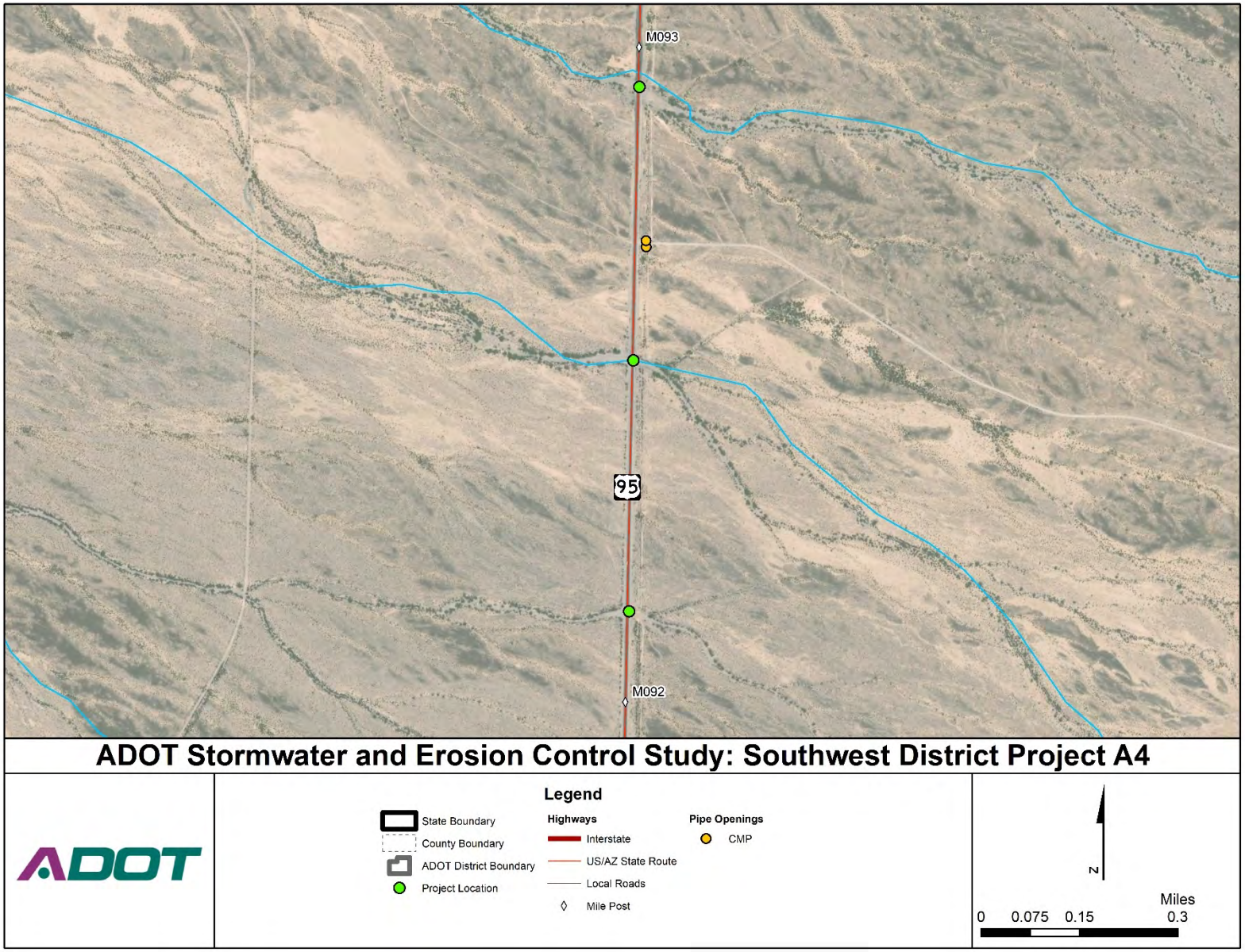


Figure 115: Southwest District Project A5

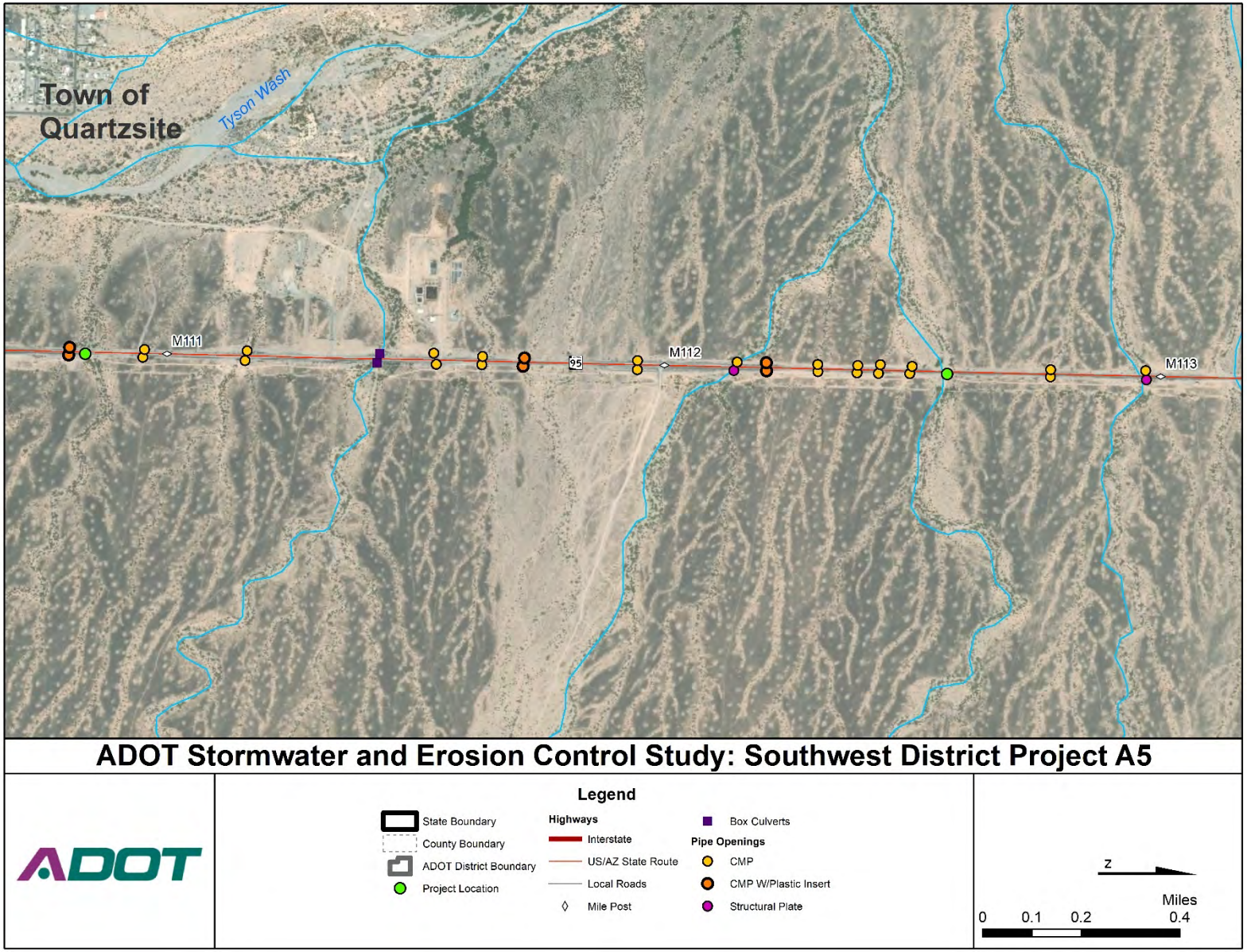


Figure 116: US 95 at MP 65.2

Figure 117: US 95 at MP 92.5

Figure 118: US 95 at MP 69.3

Figure 119: US 95 at MP 92.5

PROJECT B- US 95 @ MP 54 - 56

Project Description: Stormwater run-off running parallel to the roadway washes out the shoulders along US 95 within these limits. The existing CMPs under the roadway get blocked, reducing the capacity of the pipes, and eroding the shoulders at the edge of roadway pavement. Maintenance has fixed this area multiple times, however this results in up to 7-foot drop-offs from the roadway edge in places. The entrance to the General Motors test track has been washed out, rendering the facility inaccessible. Fill materials must be imported to address the problem. The maintenance activities take 3-4 weeks each year and the problem has yet to be resolved.

How long has this been a concern? Ongoing maintenance activities for 7 years +

Has the problem led to road closures? Yes, at least once annually during monsoon season.

District Priority (if identified): #2

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. **Facility overtopping or embankment protection**
c. **Slope washout**
d. **Poor soil conditions**
e. **Undersized infrastructure**
f. Improper construction/installation
g. **Additional negative impacts downstream**
h. Other

Possible Mitigation/Solution: Needs further examination, but embankment protection possibilities include soil cement along shoulders, gabion baskets, grouted rip rap, channel cutting, concrete and/or rock ford walls.

Likely Project Benefits:

a. **Public safety**
b. **Regulatory mandate**
c. **Environmental benefit**
d. **Relief to District budget and/or resources**
e. **Meets District or ADOT strategic objective**
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 120: Southwest District Project B

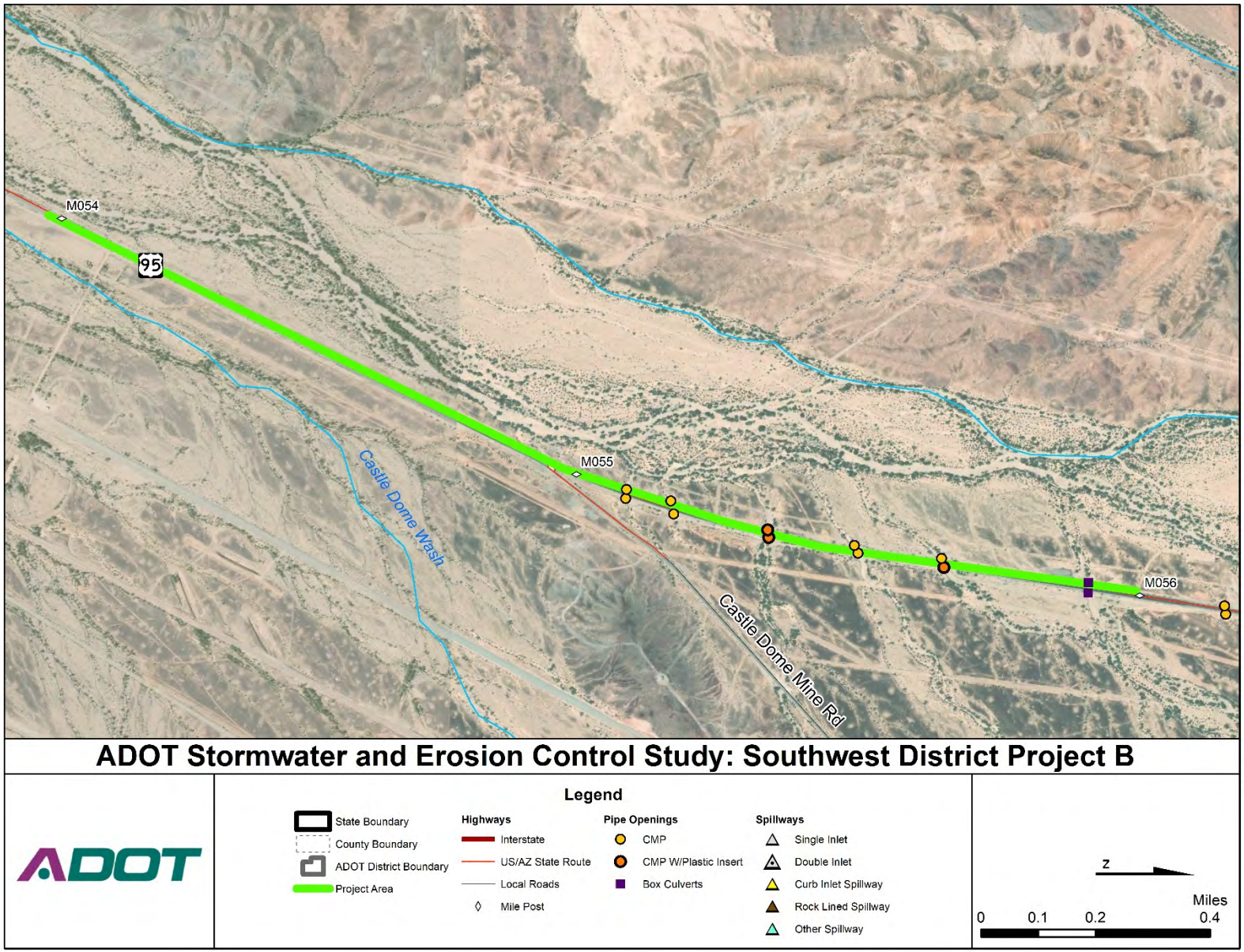


Figure 121: Northbound, Eastern View

Figure 122: Southbound, Western View

Figure 123: Northbound, Rear View

PROJECT C- INTERSTATE 8, MP 117.95 WB

Project Description: Two washes in this area converge, diverting north to a bend, but water travels straight onto private property. Flows typically are high volume and high velocity. The water flowing through the box culvert is overtopping at this location, eroding the earthen banks/slopes within the was causing flooding onto a residential property located adjacent to the wash. Box culverts seem to be sized properly, but the velocity of the water is too fast. Maintenance has repaired the banks multiple times. Private property owner has escalated this issue to the Director.

How long has this been a concern? 9 years +

Has the problem led to road closures? None to date.

District Priority (if identified): #3

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Armoring the banks with soil cement, gabion baskets, grouted rip rap and consider an energy dissipator structure at the outlet of the box culverts.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 124: Southwest District Project C

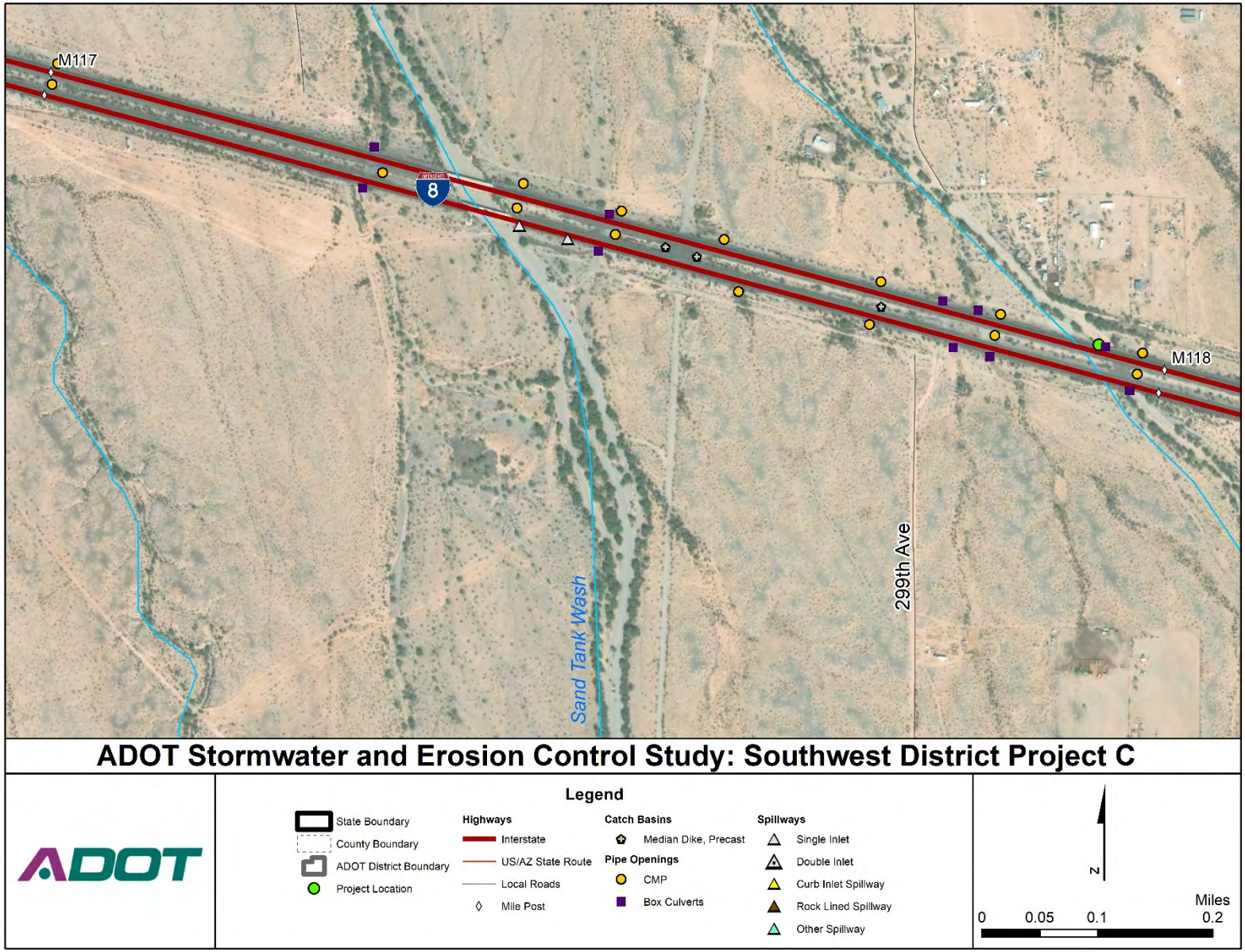


Figure 125: Sand Tank Wash Near I-8

Figure 126: Debris in Sand Tank Wash

Figure 127: Sand Tank Wash

PROJECT D- PACIFIC AVENUE @ AVE 2E UNDERPASS, STRUCTURE # 1381

Project Description: Stormwater flows being conveyed from east to west along the toe of slope of the I-8 north embankment, flooding into a residential subdivision below. Slopes are sufficient, but water travels at high velocity. Water overtops the 90-dgree bend in the wash in multiple locations, permeating the CMU subdivision wall, and impacting the back yards of residential properties (approximately 10 properties).

How long has this been a concern? At least 3 years or more.

Has the problem led to road closures? None to date.

District Priority (if identified): #4

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Possible re-cutting of the v-ditch and armoring with rip rap or similar.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 128: Southwest District Project D

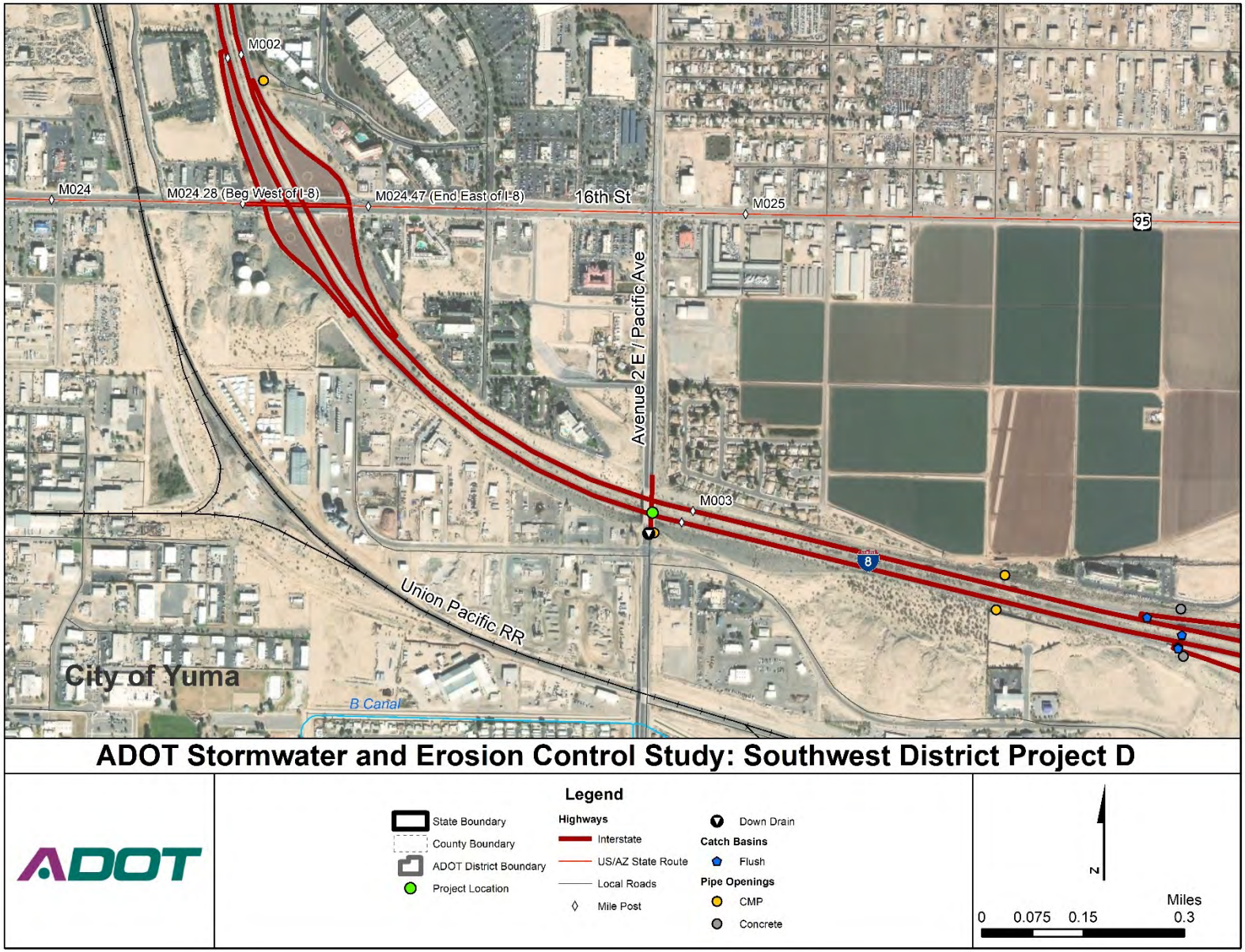


Figure 129: Residential Property Backyard (Picture Provided by ADOT)

Figure 130: Pacific Avenue Bridge from the North (Picture Provided by ADOT)

Figure 131: Aerial View (Picture Provided by ADOT)

PROJECT E- US 95 @ FORTUNA WASH

Project Description: This location was converted from a previous low water crossing to a newer bridge structure. There is a drop structure on the north side to slow the water velocity, then the wash veers to the right, but some of the flows continue straight, flooding adjacent ASLD property. Storm water flowing on the southside of the Fortuna Wash Bridge is eroding the earthen banks. The Fortuna Wash Bridge structure was recently constructed and could have possibly changed the water flow thereby negatively affecting (eroding) a slope/bank on the ASLD property, which did not seem to occur prior to the bridge construction.

How long has this been a concern? Since the new bridge was built, approximately 2 years.

Has the problem led to road closures? None to date.

District Priority (if identified): #5

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Consider armoring of the banks with soil cement or rip rap.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 132: Southwest District Project E

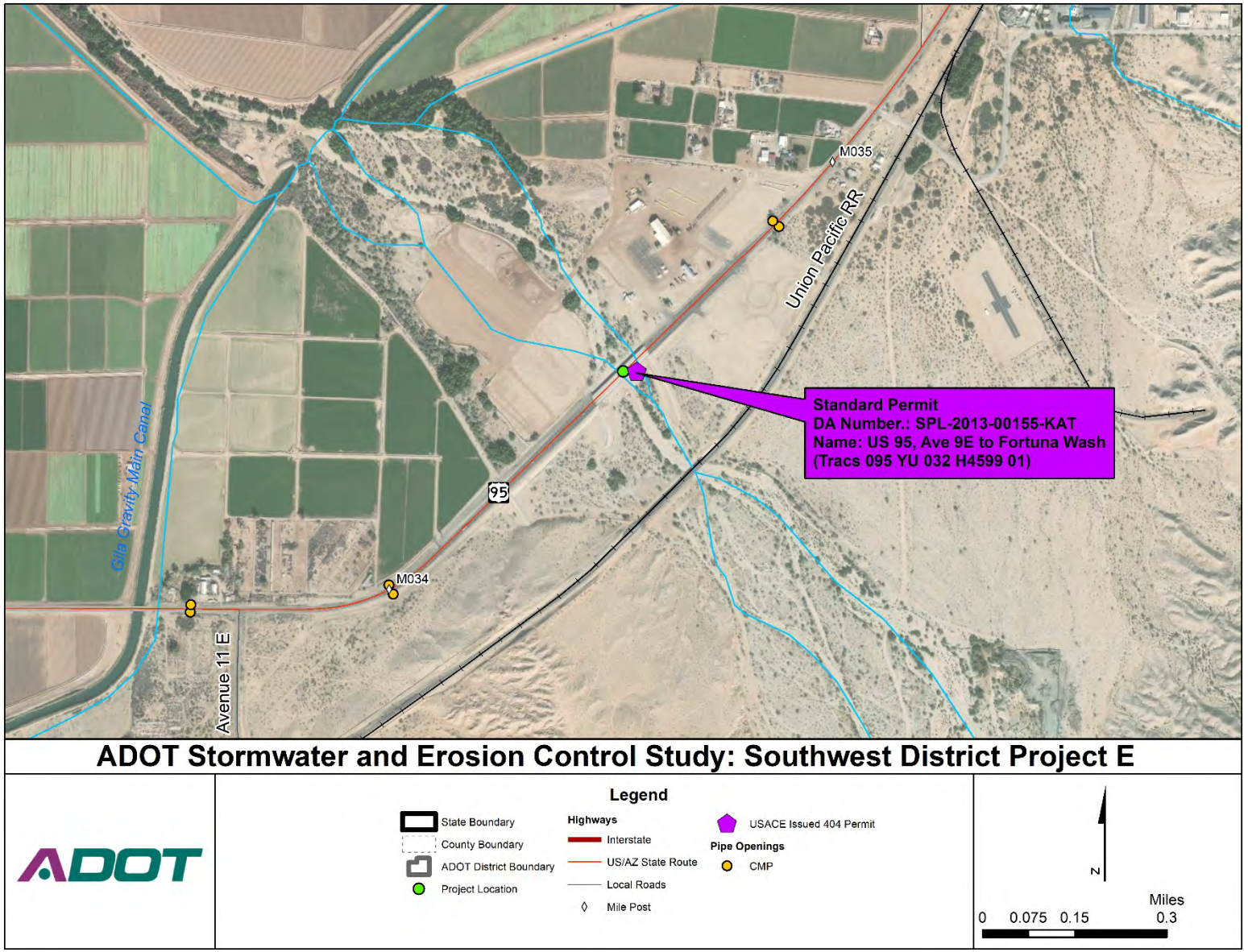


Figure 133: Fortuna Wash Bank

Figure 134: Fortuna Wash from Roadway

Figure 135: Fortuna Wash

PROJECT F- US 95 @ MP 69.83 – 70.04

Project Description: Stormwater run-off running in wash parallel to the roadway washes out the shoulders along US 95 within these limits. Causes steep drop-off's and pavement undermining. The existing CMPs under the roadway get blocked, reducing the capacity of the pipes and eroding the shoulders at the edge of roadway pavement. Maintenance has fixed this area multiple times. Fill materials must be imported, and the maintenance activities are time consuming and ultimately ineffective.

How long has this been a concern? 9 years +

Has the problem led to road closures? Yes, at least once annually during monsoon season.

District Priority (if identified): #6

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. **Facility overtopping or embankment protection**
c. **Slope washout**
d. **Poor soil conditions**
e. **Undersized infrastructure**
f. Improper construction/installation
g. **Additional negative impacts downstream**
h. Other

Possible Mitigation/Solution: Realign the wash and or recontour banks and armor the bank walls.

Likely Project Benefits:

a. **Public safety**
b. **Regulatory mandate**
c. **Environmental benefit**
d. **Relief to District budget and/or resources**
e. **Meets District or ADOT strategic objective**
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 136: Southwest District Project F

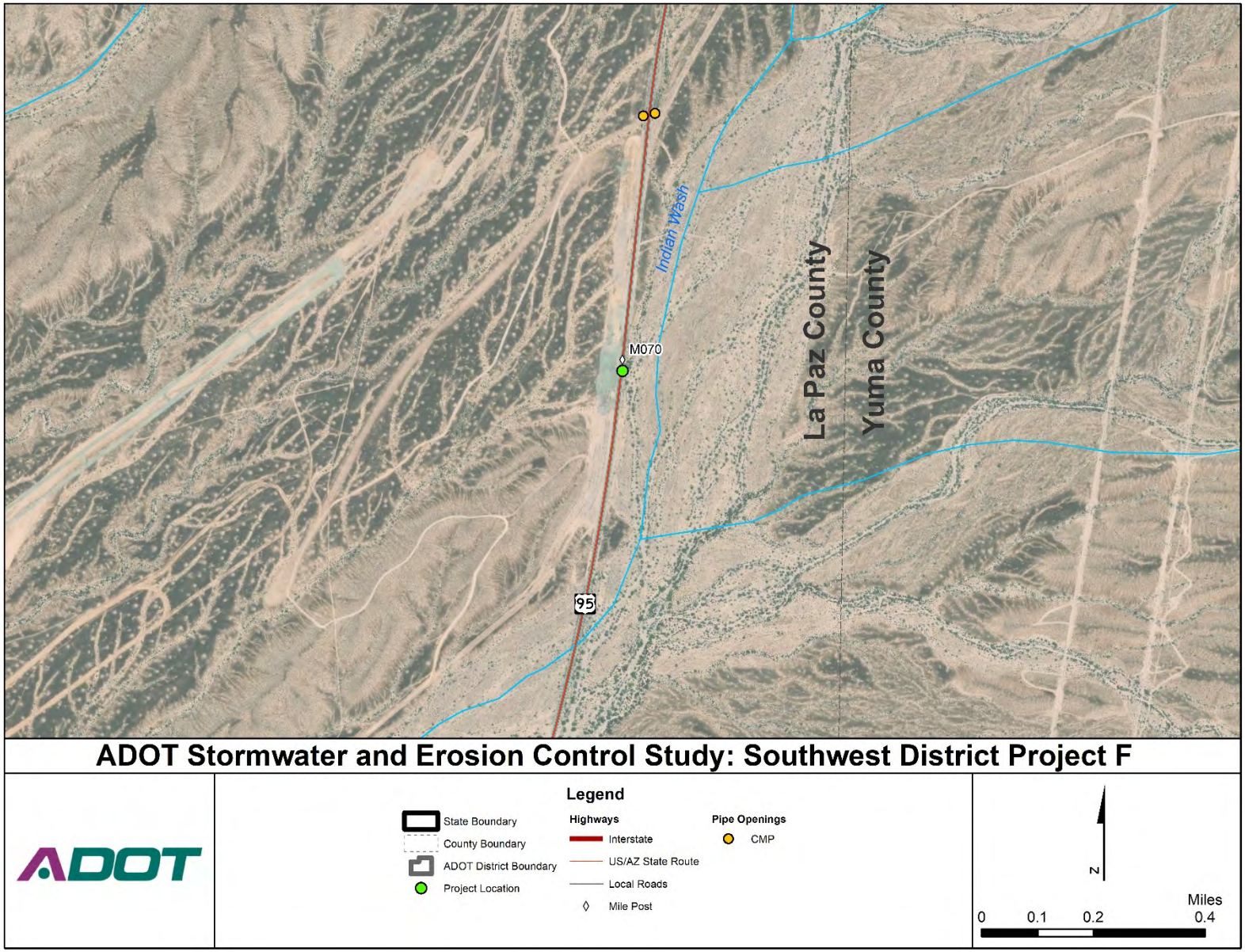


Figure 137: Southbound, Western View (MP 69)

Figure 138: Northbound, Eastern View

Figure 139: Northbound, Rear View

PROJECT G- INTERSTATE 10 @MP 31.5 – 32.5

Project Description: Roadway overtopping occurs within these milepost limits during large storm events, usually during monsoon season. Significant scour is occurring at MP 32.5 culvert outlets. There has been a previous drainage study prepared in 2004 to describe the existing condition and recommend a design concept to mitigate the existing condition.

How long has this been a concern? At least 15 years

Has the problem led to road closures? No

District Priority (if identified): #7

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure (upstream and outside of ADOT ROW)
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Reduce the scour condition by possible use of grouted rip rap and evaluate energy dissipater to slow the velocity of the water.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 140: Southwest District Project G

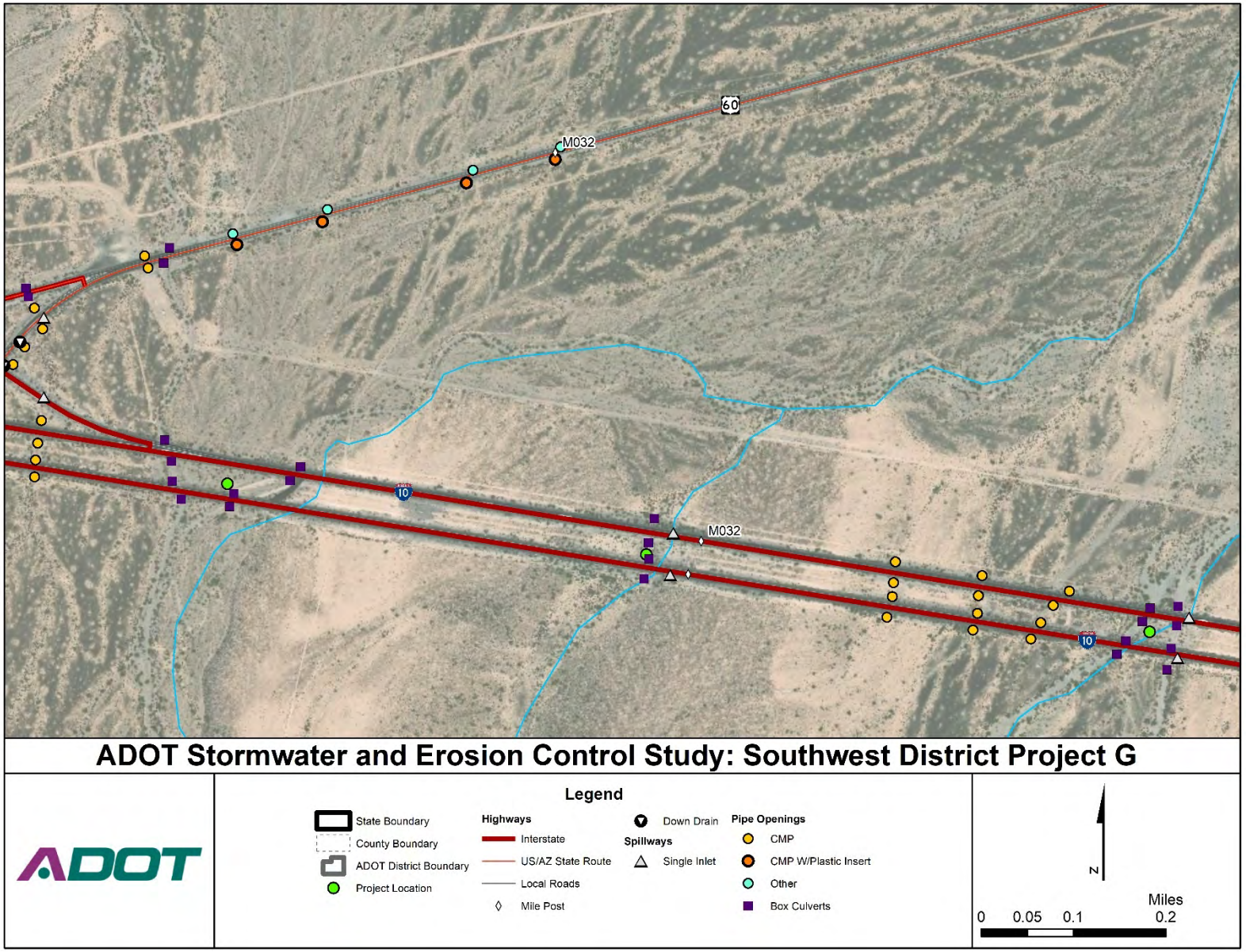


Figure 141: Westbound, Northern View (MP 32)

Figure 142: Eastbound, Southern View (MP31)

Figure 143: Eastbound, Southern View (MP32)

PROJECT H- SR 85 @ MP 139.81 – 141.11

Project Description: Water flowing over the banks of Rainbow Wash (MP 141.08) breaching onto SR 85 causing water over topping and shoulder erosion during rain events. Roadway was reconstructed into a divided highway with a large, at-grade median. An embankment between the two bridges, water runs down the median area and erodes the slope.

How long has this been a concern? Since the road was reconstructed approximately 10 to 12 years ago.

Has the problem led to road closures? None to date, potential for future road closures.

District Priority (if identified): #8

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Perhaps the wash embankment is too shallow; consider lowering the profile of the wash, realign the wash embankment and armor the banks.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 144: Southwest District Project H

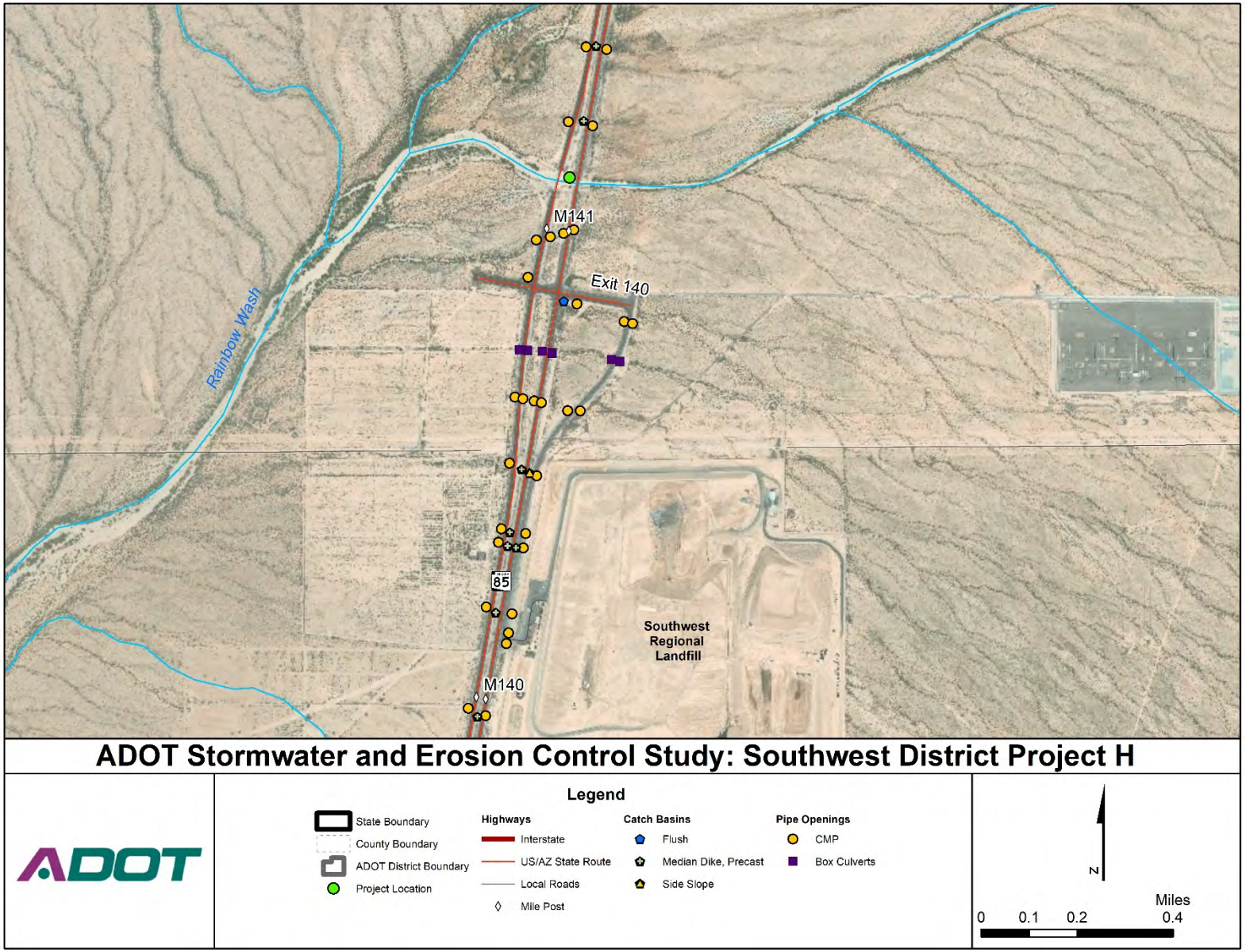


Figure 145: Aerial View (MP 141) (Picture Provided by ADOT)

Figure 146: Southbound, Eastern View (Picture Provided by ADOT)

PROJECT I- INTERSTATE 10 @ MP 18.89

Project Description: Water draining from three different sources (I-10, US 95 and tailwater ditch from adjacent farms) converge at the SEC and divert under US 95 through a box culvert eroding the shoulder slopes and compromising the pavement structural section. The wash makes a number of turns and gets blocked, likely due to a capacity issue.

How long has this been a concern? 5 years +

Has the problem led to road closures? Roadway has overtopped, not closed, but potential is there.

District Priority (if identified): #9

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Evaluate the existing box culvert and possibly construct another box culvert to capture flows from I-10.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 147: Southwest District Project I

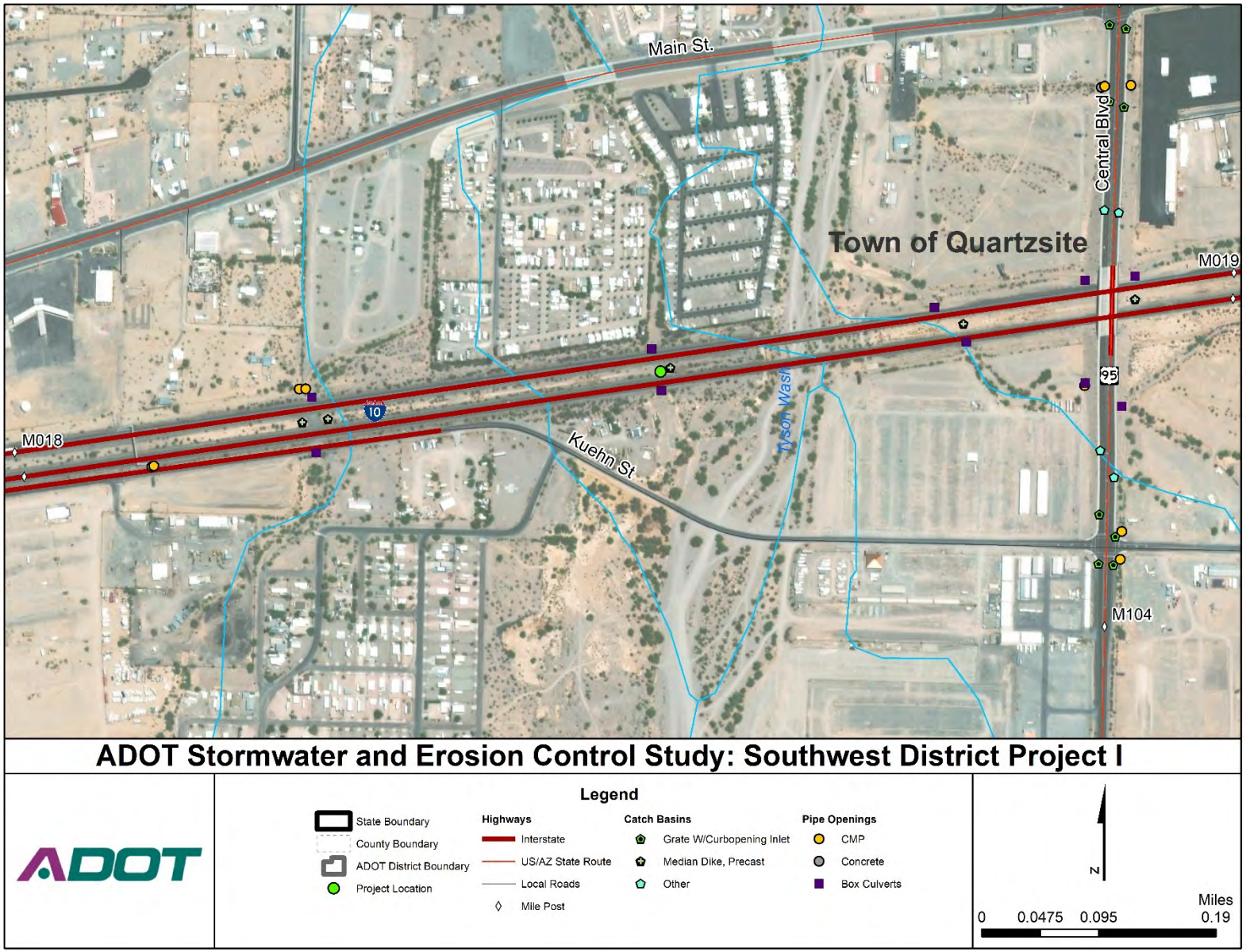


Figure 148: Eastbound, Southern View (MP 18)

Figure 149: Eastbound, Rear View (Picture Provided by ADOT)

PROJECT J- INTERSTATE 10 @ WB MP 95.8 – 97.5

Project Description: Agricultural tailwater is draining from adjacent farm fields north of I-10. The water tends to converge and stagnate around a box culvert eroding the shoulder slopes by saturating the sub-structure thereby compromising the pavement structural section.

How long has this been a concern? 1 year +

Has the problem led to road closures? None to date.

District Priority (if identified): #10

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. **Other - upstream activities outside of ADOT ROW negatively impacting ADOT facilities. Extensive vegetation growth.**

Possible Mitigation/Solution: Possibly consider cut ditch to divert water from road structure and armor the slopes to protect roadway shoulder.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. **Environmental benefit**
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 150: Southwest District Project J

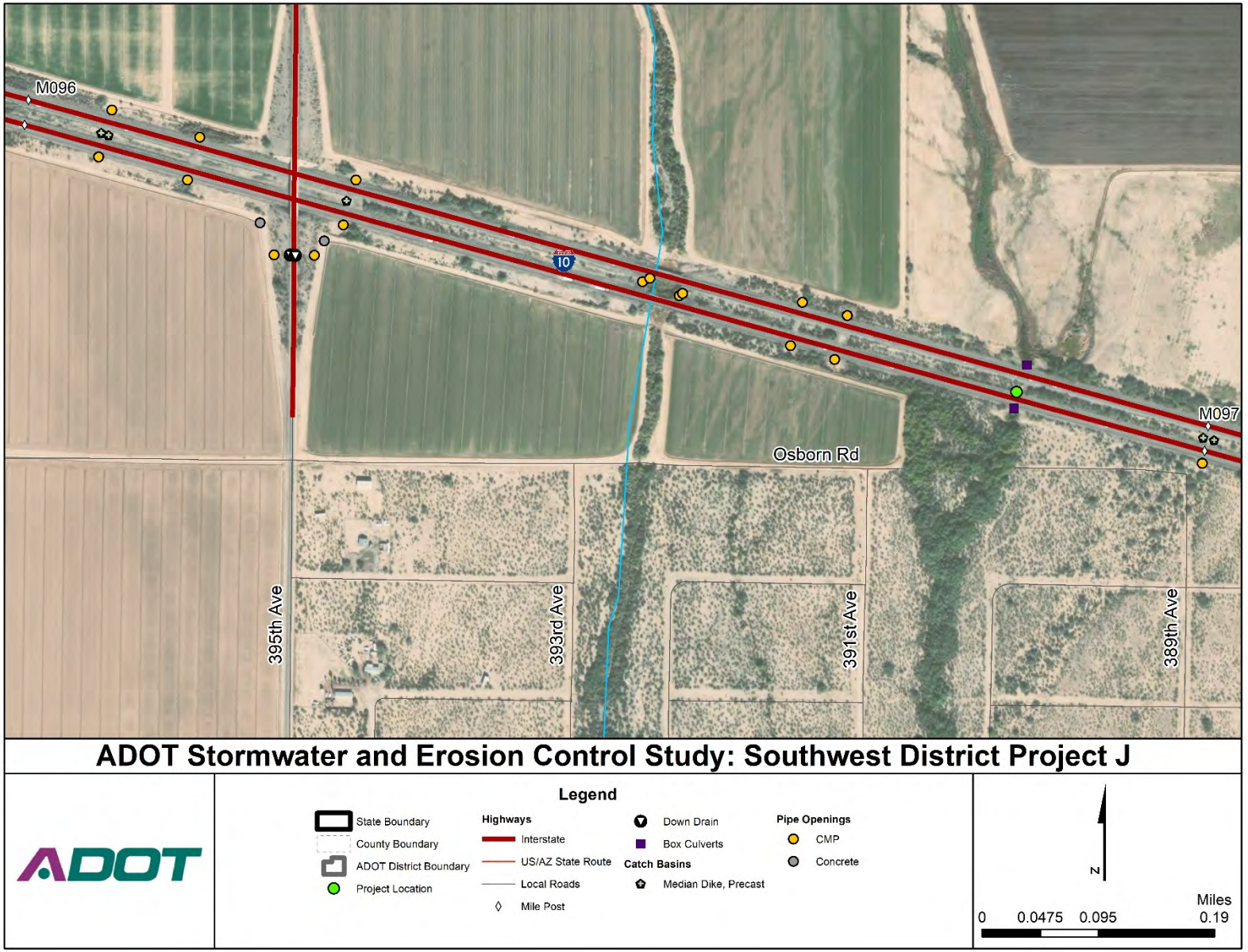


Figure 151: Westbound, Northern View (MP 96)

Figure 152: Eastbound, Southern View

Figure 153: Eastbound, Rear View

SOUTHCENTRAL DISTRICT

Table 6 identifies the initial listing of potential stormwater projects identified by representatives of the Southcentral District.

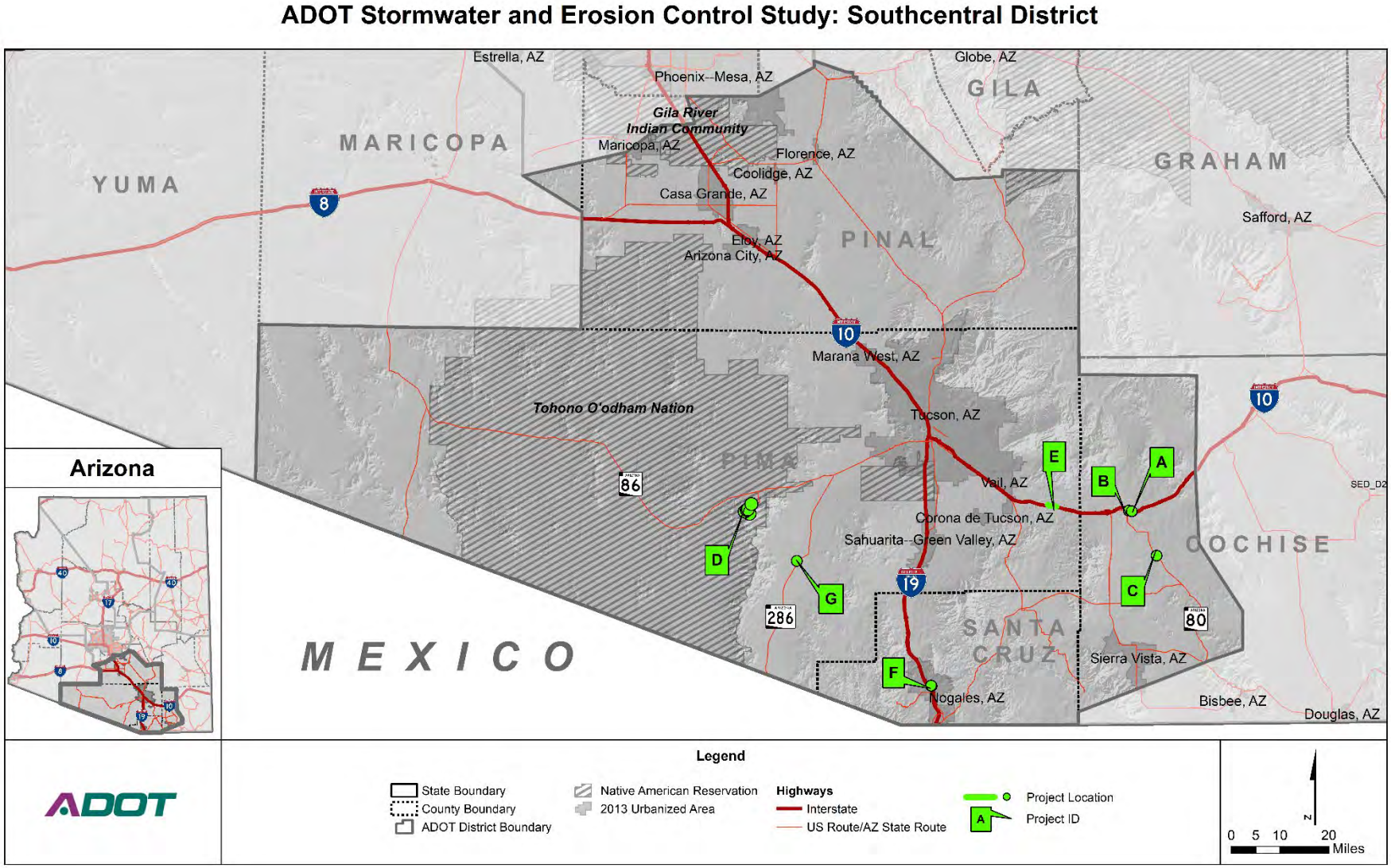
Table 6: Southcentral District Stormwater Projects

Project Identifier	Route	MP	Issue	Construction/ Maintenance[1]
A	WB I-10-Frontage Rd. (Pomerene Rd & Ramsey Rd)	306 & 306.917 (Benson)	Flows overtopping box culverts resulting in erosion.	Construction
B	WB I-10	306.9 (Benson-San Pedro River Bridge)	Drainage pipe exposed; sandy soil/scour protection needed.	Construction
C	SB SR 80	306.079 (St David)	Erosion near box culvert and wingwalls.	Construction
D	SR 386	4.37, 6.05, 6.58, 7.5, 11.1 - Three Points	Flows overtopping the road eroding shoulders. Pipe and outlets require protection.	Construction
E	EB/WB I-10, Marsh Station Rd., UPRR, Ramps	289.41-291.70 (Marsh Station)	Scour slopes eroding.	Construction
F	I-19	8.9-9.1 (Nogales)	Scour slopes eroding.	Construction
G	SR 286	24.957	Flows overtopping CMP pipes at wash crossing resulting in erosion.	Construction
–	NB SR 79	134.53 - 134.63 (Florence)	Erosion on shoulder threatening private property.	Maintenance
–	SR 289	3.32, 4.03, 10.27, 10.58	Low water crossings.	Maintenance
–	SR 286	0-12.6	Low water crossings.	Maintenance

1 For this column, the term "Construction" applies to both construction and preventative maintenance, therefore these projects qualify for this study. The term "Maintenance" applies to routine maintenance only, therefore these projects do not qualify for this study and no further details are provided.

As **Table 6** indicates, the Southcentral District submitted a total of nine (9) potential stormwater projects. After the District phone interviews, the Southcentral District feels that six (6) of the nine (9) submitted projects meet the definition of a "construction" project. These construction projects are described below.

Figure 154: Southcentral District & Project Locations



PROJECT A- INTERSTATE 10 WB FRONTAGE RD @ MP 306 AND 306.917

Project Description: High velocity water flows are being conveyed from a wash running along the ADOT ROW resulting in erosion. A concrete, grade control dike into box culvert has failed resulting in water overtopping the aged box culvert. At MP 306.917 - Pomerene Rd. and Frontage Rd. the box culvert is overtopping when it rains (FIS Asset ID – 2081271).

How long has this been a concern? At least five years. Problem worsens during monsoon rains.

Has the problem led to road closures? No

District Priority (if identified): #2

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. **Facility overtopping or embankment protection**
c. Slope washout
d. Poor soil conditions
e. **Undersized infrastructure**
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Replace aged box culvert and grade control dike. At MP 306.917, consider removing the box as it seems to serve as an obstruction.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. Environmental benefit
d. **Relief to District budget and/or resources**
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard**
g. Extend facility life span

Figure 155: Southcentral District Project A

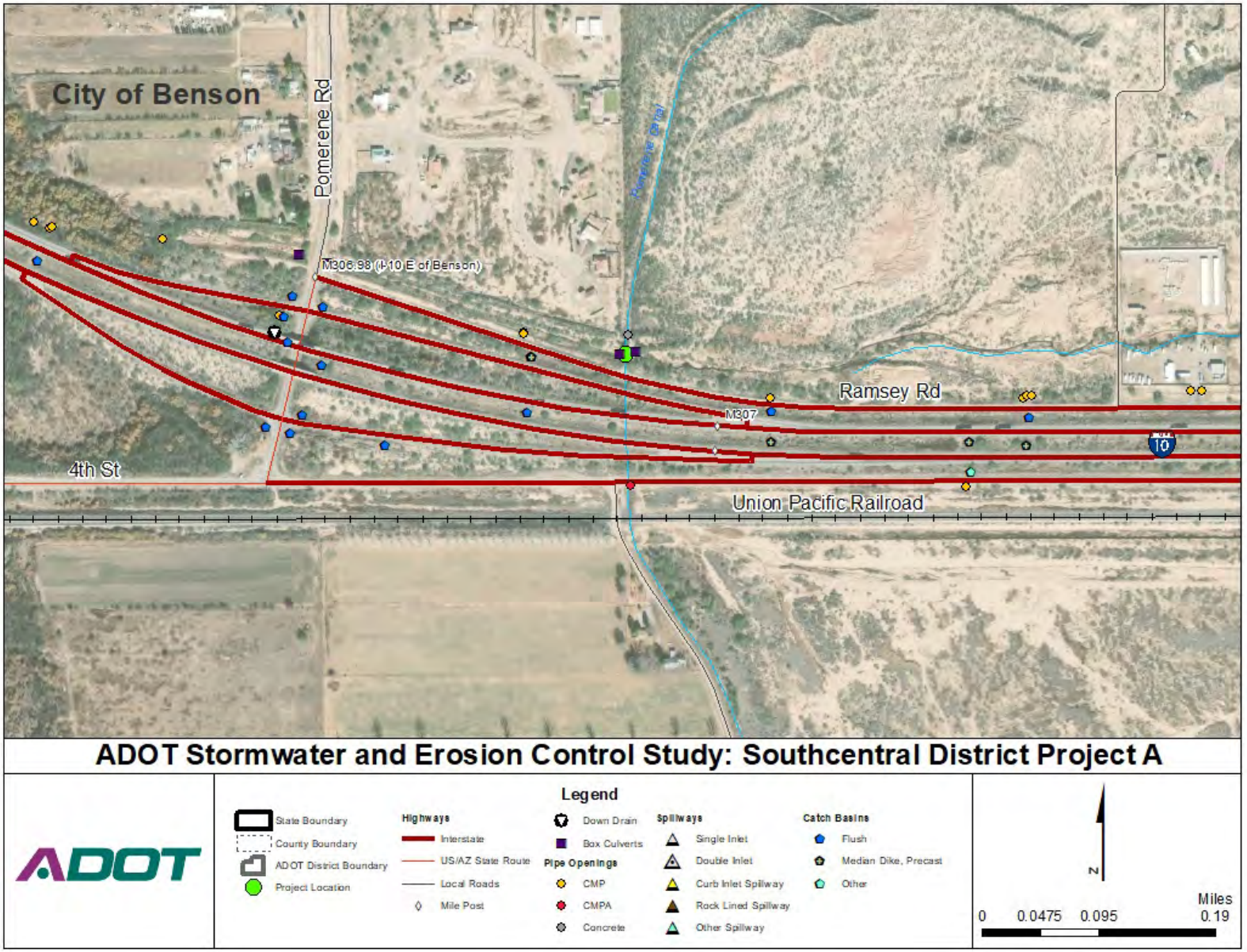


Figure 156: Ramsey Rd. Overflow of Sediment, Inlet Wingwall and Box Culvert

Figure 157: Ramsey Rd. Inlet Dike Failure, Box Culvert Too Small for Water Flow

Figure 158: Ramsey Rd. Outlet at Box Culvert, Annual Sediment Overflow

Figure 159: Pomerene Rd. Box Culvert and Dike Failure

Figure 160: Pomerene Rd. Box Culvert Inlet Overflow

Figure 161: Pomerene Rd. Grade Control Dike is Broken and Ready to Fall

Figure 162: Pomerene Rd. Box Culvert is Broken at Both Edges of the Inlet

Figure 163: Pomerene Rd. Box Culvert is Broken at Both Edges of the Inlet

Figure 164: Pomerene Rd. Channel Wider than Box Culvert, Outlet Overflow

PROJECT B- INTERSTATE 10 WB @ MP 306.9 – SAN PEDRO RIVER BRIDGE

Project Description: Water flows running off from the median to the shoulder on a steep embankment slope where a 24-inch CMP drainage pipe is exposed and is suspended in air. There is an opportunity to combine this project with Project A.

How long has this been a concern? At least five years.

Has the problem led to road closures? No

District Priority (if identified): #2

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. **Facility overtopping or embankment protection**
c. Slope washout
d. Poor soil conditions
e. **Undersized infrastructure**
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Sandy soil/scour protection and embankment scour protection/outlet protection are needed, and the 24-inch CMP needs to be replaced with 36-inch CMP.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. Environmental benefit
d. **Relief to District budget and/or resources**
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard**
g. Extend facility life span

Figure 165: Southcentral District Project B

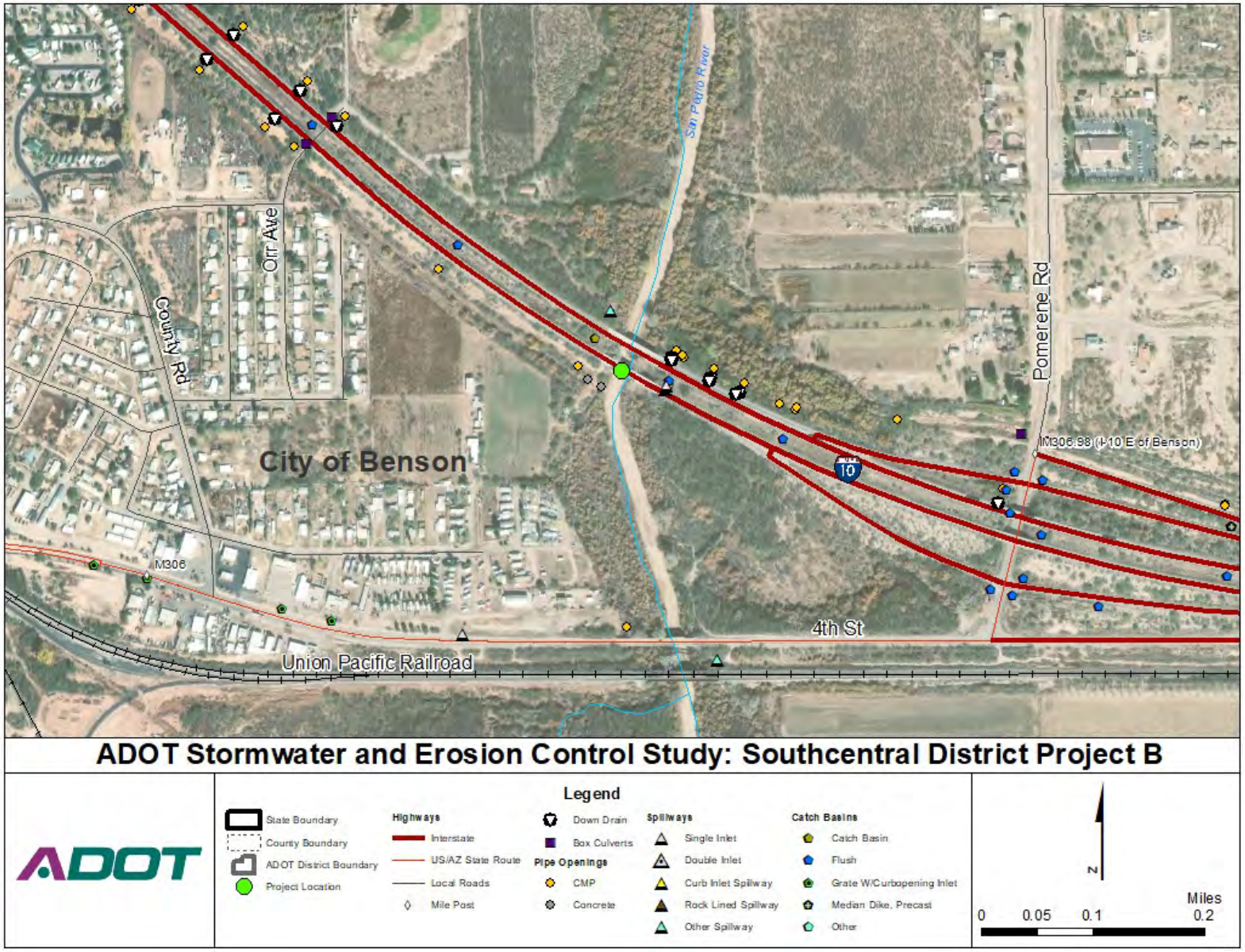


Figure 166: MP 306.87 –12" Drainage Pipe

Figure 167: MP 306.87 Erosion.

Figure 168: MP 306.9 24" Drainage Pipe

Figure 169: MP 306.9 Erosion

PROJECT C- SR 80 SB @ MP 306.079

Project Description: Erosion behind wingwall at box culvert left side wingwall at outlet is detaching. At inlet of box culvert there is erosion at slopes prior to wingwall. Issue is somewhat severe but has not caused water or debris to be on roadway (FIS Asset ID – 1560729).

How long has this been a concern? At least five years.

Has the problem led to road closures? No

District Priority (if identified): #1

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. Slope washout
d. **Poor soil conditions**
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Replace wingwall and regrade erosion. Add grouted rip rap at inlet and outlet side of box culvert. Consider adding gabions on inlet side of box culvert.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. **Environmental benefit**
d. **Relief to District budget and/or resources**
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard**
g. Extend facility life span

Figure 170: Southcentral District Project C

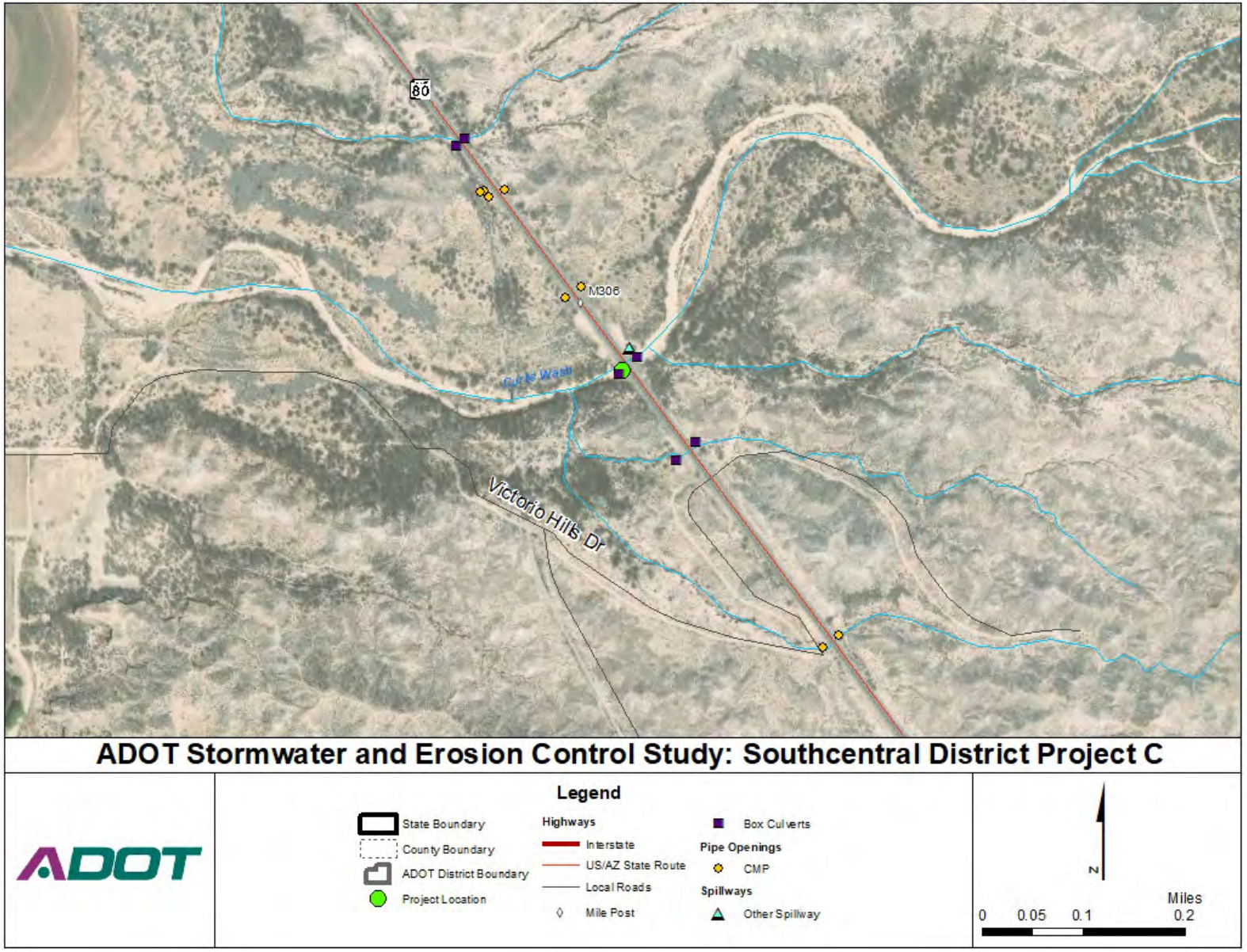


Figure 171: Outlet Box Culvert Wingwall Erosion

Figure 172: Outlet Box Culvert Wingwall Erosion

Figure 173: Outlet Box Culvert Wingwall Erosion

Figure 174: Outlet Box Culvert Wingwall Erosion

PROJECT D- SR 386 @ MP 4.37, 6.05, 6.58, 7.5 AND 11.1

Project Description: All locations can essentially be described as having catch basins plugged with debris and sediment and/or undersized pipes. Some locations are subject to falling rocks contribute to the problem. More specifically, at MP 7.5 the catchment has plugged in the past and overtopped the road eroding the opposite shoulder, at MP 11.1 the catchment has plugged in the past and overtopped the road eroding the opposite shoulder, at MP 4.37, 6.05, 6.58 the outlet is undiscoverable, possibly buried, at MP 6.05 the pipe requires hydrovacing. These stormwater issues were identified in the ADOT Low Volume Route Study in 2017.

How long has this been a concern? Not sure due to new maintenance staff not having a complete historical understanding of the problem.

Has the problem led to road closures? Yes, but unsure of frequency.

District Priority (if identified): #4

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: CMP's at all locations are undersized and need to be replaced with larger CMP's or box culverts. Persistent hydrovacing of the pipes does not improve the condition and a series of construction projects that include reconstruction with larger pipes is recommended. The inlets and outlets of the pipes need protection, perhaps with routed rip rap or gabions.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 175: Southcentral District Project D

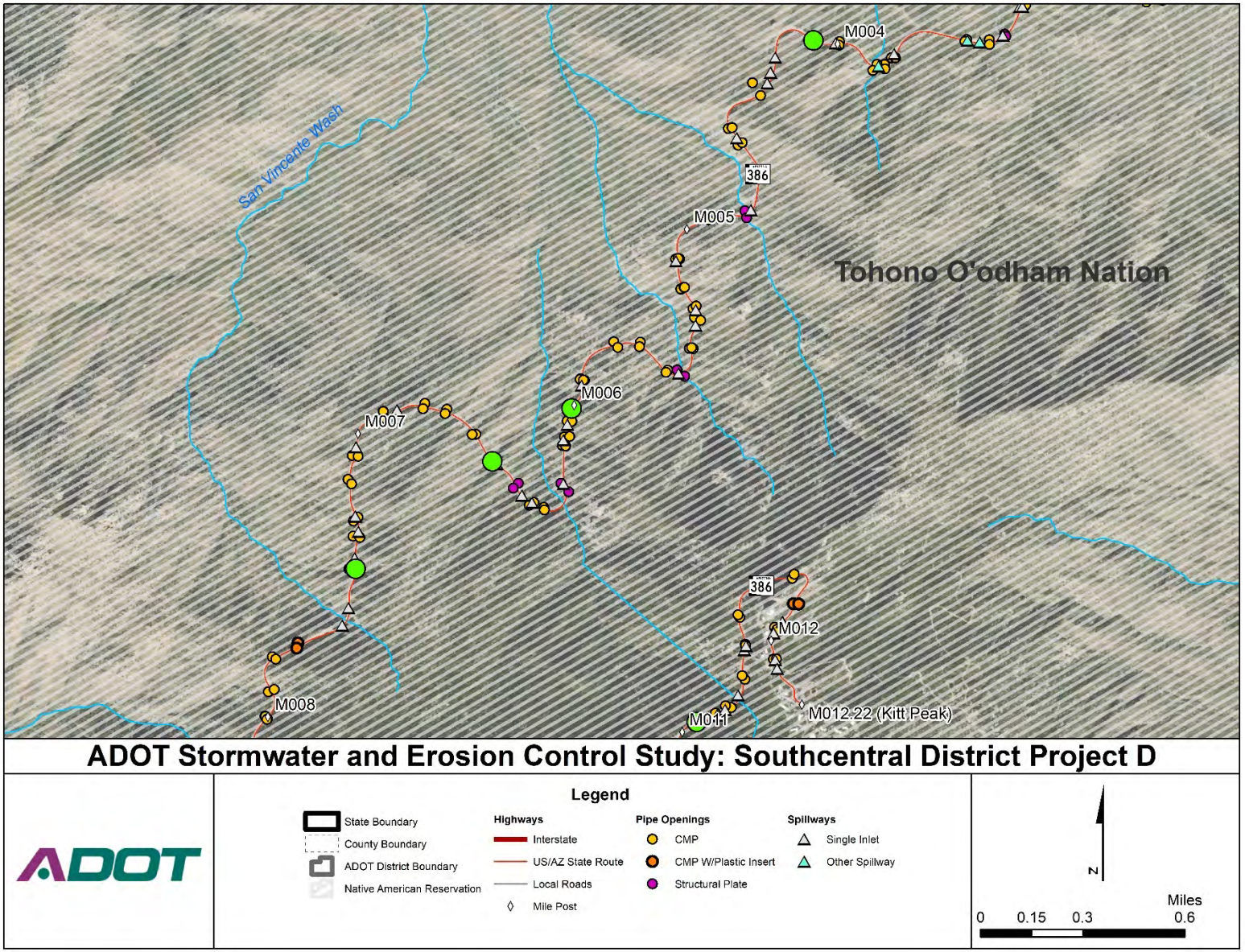


Figure 176: Southbound, Eastern View (MP 7)

Figure 177: Southbound, Rear View (MP 6)

Figure 178: Southbound, Eastern View (MP 4)

PROJECT E- INTERSTATE 10, EB AND WB @ MP 289.41 – 291.70

Project Description: Located at Marsh Station Rd. in proximity to an existing UPRR bridge, where the embankments of Marsh Station Rd. and the UPRR experience scour and erosion. There is significant erosion concern on the embankment slopes, but not at the piers of the bridge. Over $1 million was spent on a project completed in 2012 under H23901C, but now likely needs a second phase to address erosion problems on slopes for the ramps, Marsh Station Rd. and UPRR slopes.

How long has this been a concern? 7 years +

Has the problem led to road closures? No, but water has been found on the roadway and has the potential to worsen without proper mitigation.

District Priority (if identified): #5

Characteristics of the Problem:

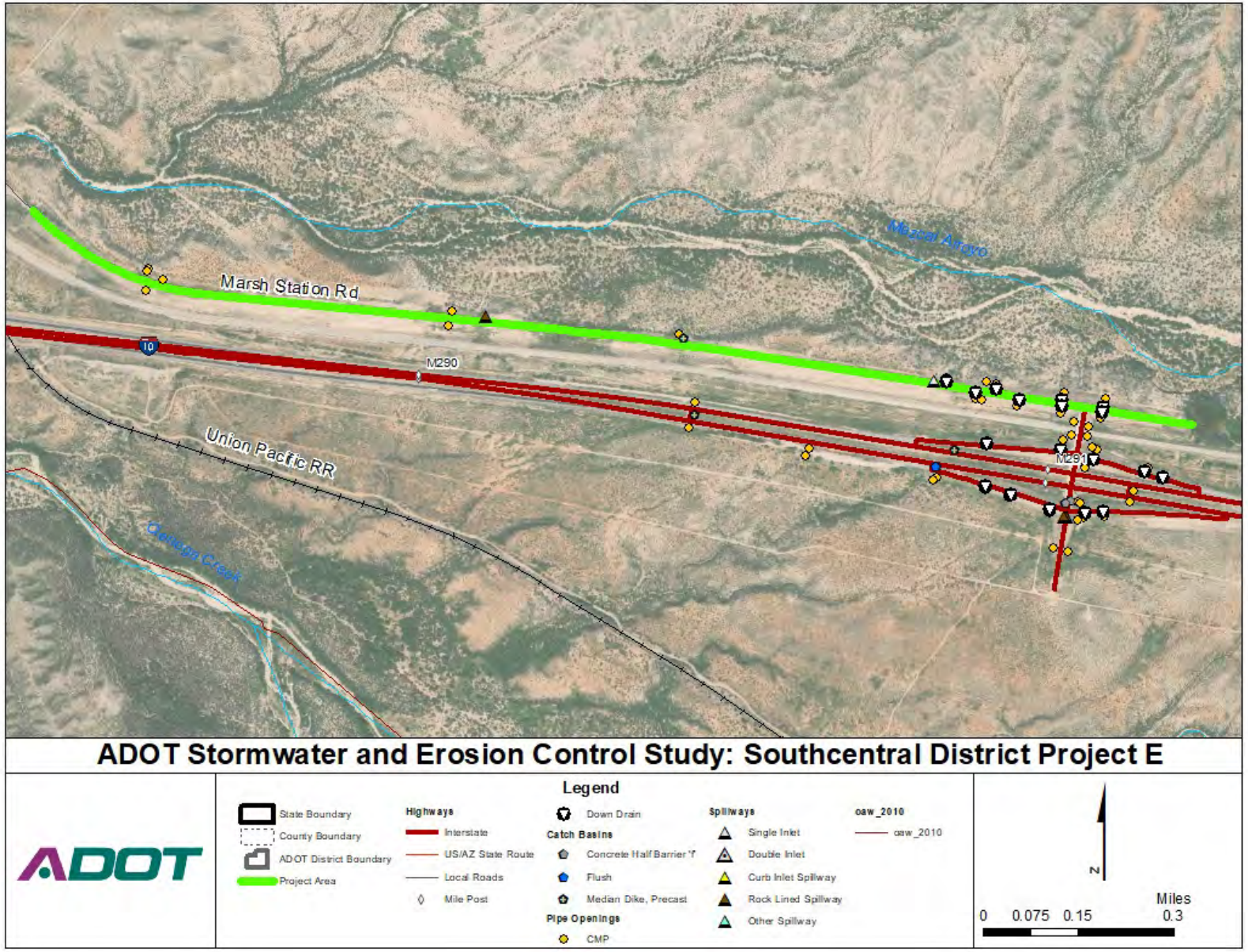
a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. **Slope washout**
d. **Poor soil conditions**
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: The slope needs to be stabilized. Evaluate the potential use of adding riprap, regrade slope, mini bench, and or wattles.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. Environmental benefit
d. **Relief to District budget and/or resources**
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 179: Southcentral District Project E



Michael Baker INTERNATIONAL

Figure 180: Westbound, Northern View (MP 290)

Figure 181: Westbound, Northern View (MP 289)

Figure 182: Westbound, Northern View (MP 289)

PROJECT F- INTERSTATE 19 @ MP 8.9 – 9.1

Project Description: There is erosion and scour on the slopes of both sides of I-19 and frontage road roadway embankment. These are steep slopes, and the erosion is severe enough that the guardrail and right-of-way fence is suspended in air.

How long has this been a concern? 10 to 15 years

Has the problem led to road closures? No

District Priority (if identified): #3

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. **Slope washout**
d. **Poor soil conditions**
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Potential mitigation to consider should include re-grading the slope, adding embankment curb to direct water to an added spillway and use grouted riprap for inlet and outlet support.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. Environmental benefit
d. **Relief to District budget and/or resources**
e. Meets District or ADOT strategic objective
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 183: Southcentral District Project F

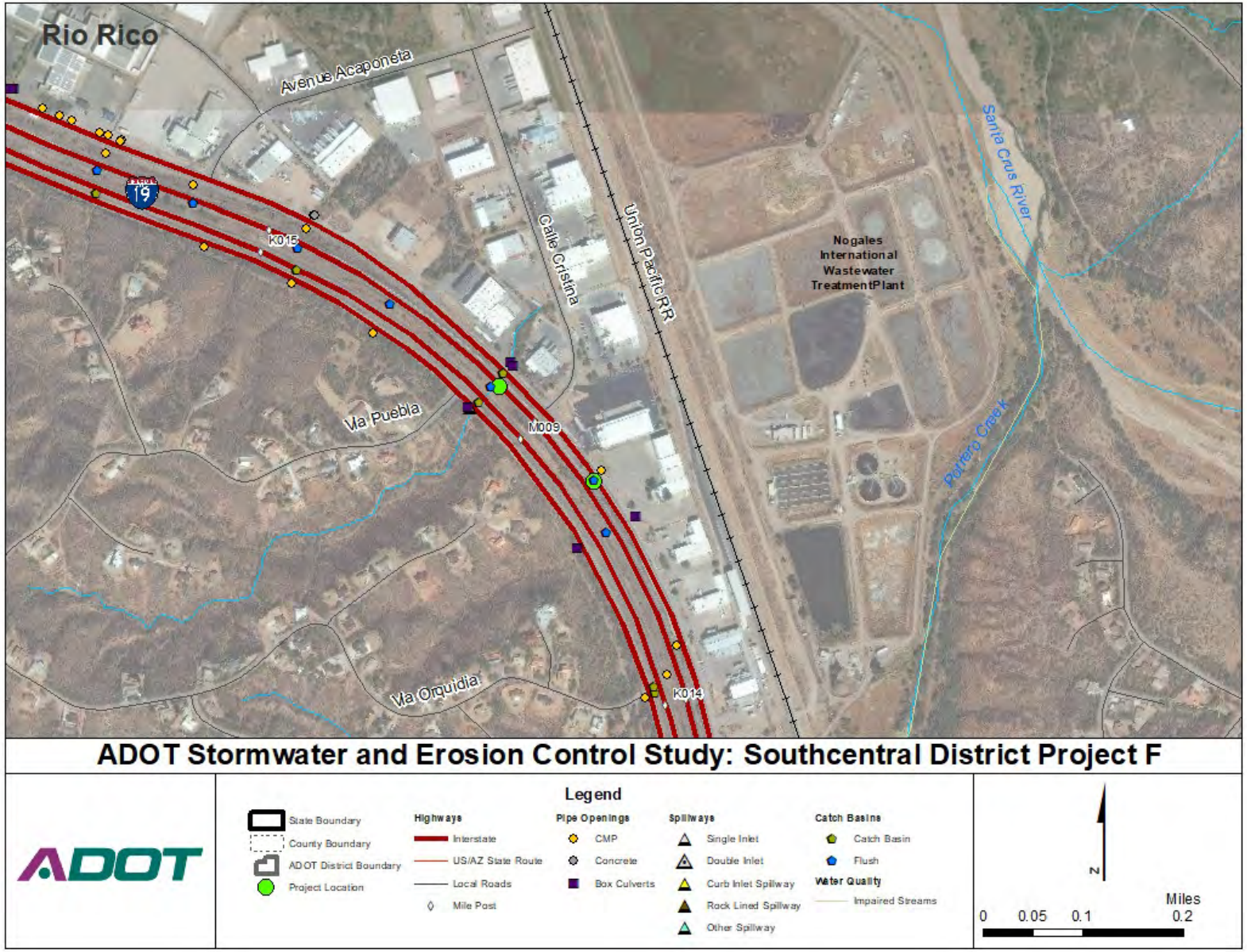


Figure 184: Slope Erosion at MP 8.9-9.1

Figure 185: Slope Erosion

Figure 186: Slope Erosion

PROJECT G- STATE ROUTE 286 @ MP 24.957

Project Description: CMP pipes at wash crossing is causing stormwater to overtop road and cause severe erosion on NB side. Erosion has extended laterally from the wash channel and is undermining ROW fence lines and has approached the roadway (FIS asset ID - 1501184 and 1509982).

How long has this been a concern? At least six years.

Has the problem led to road closures? Unknown

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation (in the railroad ROW)
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Remove 36" CMP pipes and existing concrete inlet/outlet protections and replace with box culvert(s) with wingwalls. Regrade/repair erosion damage. Add grouted riprap inlet/outlet protection.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 187: Southcentral District Project G

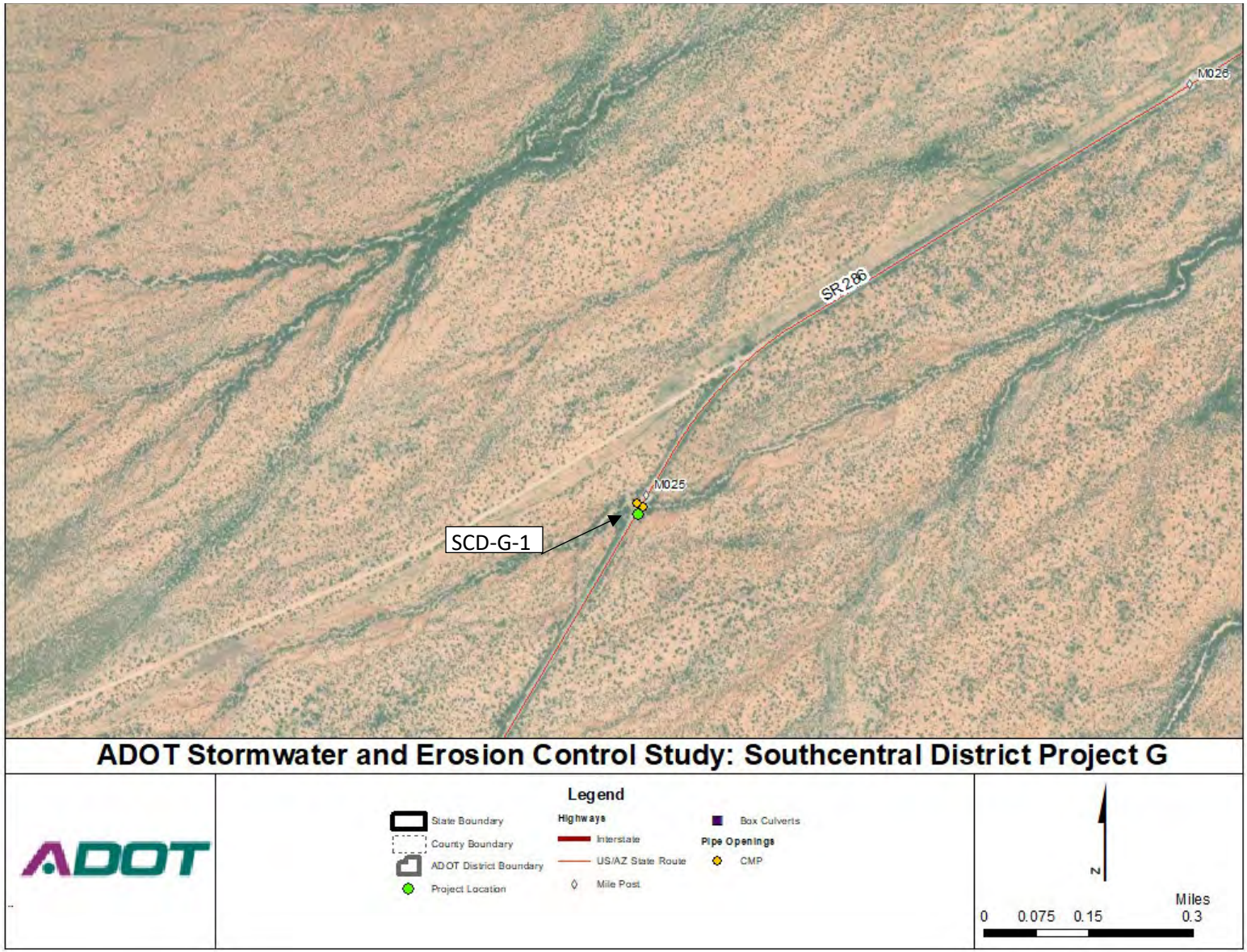


Figure 190: Northbound SR286 shoulder conditions (2020) facing south

Figure 189: CMP inlet with concrete wing protection facing northeast

Figure 188: CMP outlet with concrete protection facing northwest

Figure 191: Northbound SR286 shoulder conditions (2011) facing northeast

SOUTHEAST DISTRICT

Table 7 identifies the initial listing of potential stormwater projects identified by representatives of the Southeast District.

Table 7: Southeast District Stormwater Projects

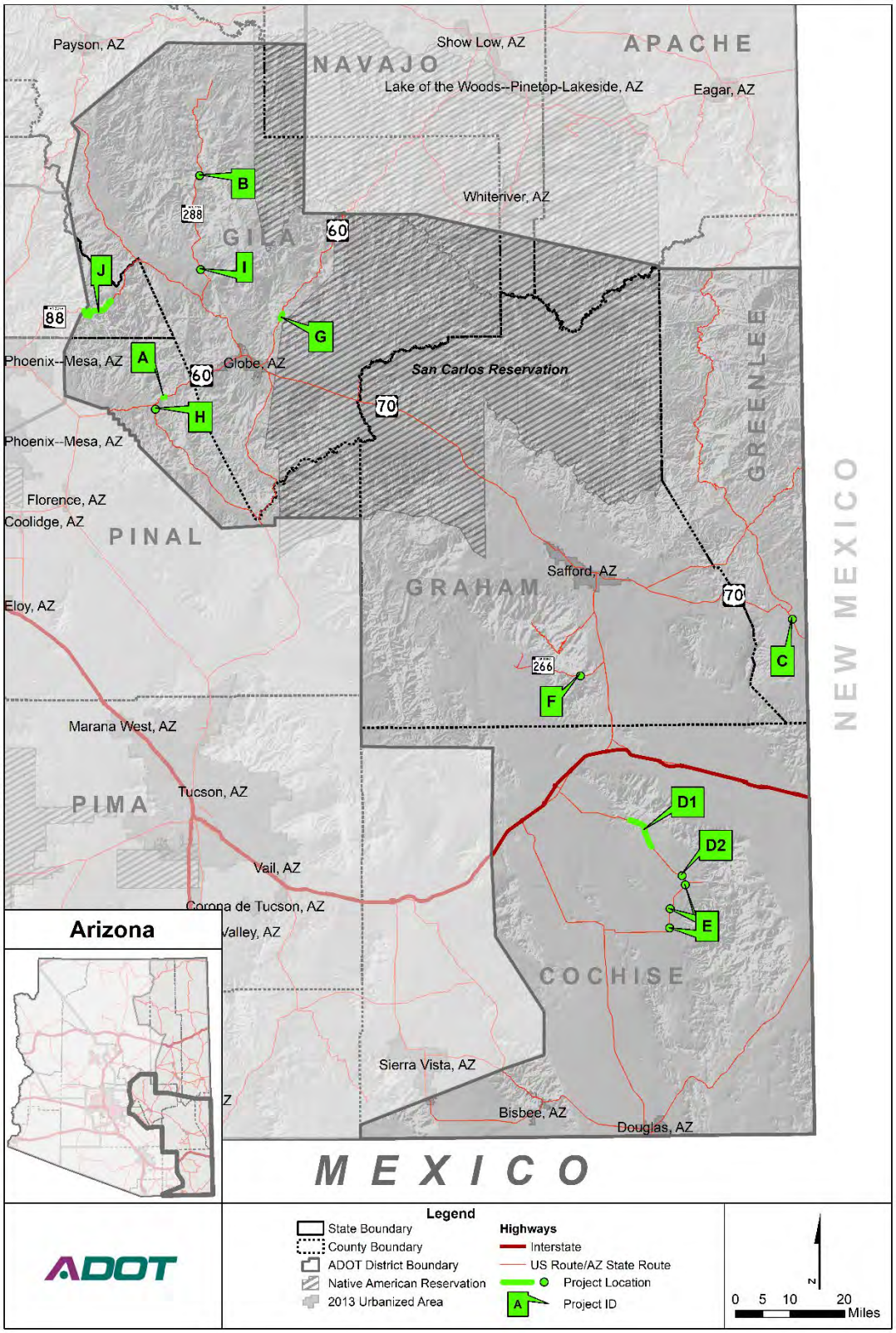
Project Identifier	Route	MP	Issue	Construction/ Maintenance[1]
A	US 60	229.2 to 229.45	Stormwater will not drain at bridge and overtops roadway resulting in erosion.	Construction
B	SR 288	289	Stormwater overtops roadway resulting in erosion.	Construction
C	US 70	380.46	Channel sedimentation, overtopping by railroad.	Construction
D	SR 186	343-350 & 358, Wilcox to Kansas Settlement	Low water crossings.	Construction
E	SR 181	51, 55 & 60	Low water crossings.	Construction
F	SR 266	210, Gillespie Wash	Outlet scour protection.	Construction
G	US 60	262-263	Embankment flumes scoured out needing reconstruction.	Construction
H	SR 177	166.7	Significant erosion on outlet side of 48-inch CMP.	Construction
I	SR 288	265.3	Culvert restoration of undersized aged structure.	Construction
J	SR 88	220.2 - 229.2	Culvert restoration.	Construction
–	I-10B	355 TI SE quadrant frontage & Page Ranch Road	Flooding and erosion.	Maintenance
–	SR 366	Above Shannon	Perennial overtopping and embankment scour.	Maintenance
–	US 60	Oak Flat to Truck Escape Ramp	Embankment scour protection, additional culverts and/or inlet/outlet protection.	Maintenance

Project Identifier	Route	MP	Issue	Construction/ Maintenance[1]
–	US 191	Cochise and Sunsites Areas	Overtopping.	Maintenance
–	SR 280	Washington Ave Intersection	Overtopping.	Maintenance

1 For this column, the term "Construction" applies to both construction and preventative maintenance, therefore these projects qualify for this study. The term "Maintenance" applies to routine maintenance only, therefore these projects do not qualify for this study and no further details are provided.

As **Table 7** indicates, the Southeast District submitted a total of fifteen (15) potential stormwater projects. After the District phone interviews, the Southeast District feels that ten (10) of the submitted projects meet the definition of a "construction" or "preventative maintenance" project. These construction projects are described below.

Figure 192: Southeast District & Project Locations



PROJECT A- US 60 @ MP 229.2 – 229.45

Project Description: During and after rain events the water runs to the west, the water will not drain into Waterfall Canyon at Waterfall Canyon Bridge on the northeast corner of the bridge. The rock slope is butted up next to the barrier wall (no channel to drain the flows) therefore the water runs across the bridge and back into the cut ditch instead of into the canyon under the bridge. At approximately MP 229.2 the water runs back across the road from north to south due to a super elevation in the road. As a result, the guard rail, edge of pavement and the slope along the south side of road wash out during heavier rain events.

How long has this been a concern? 5 years +; since the Waterfall Bridge was built.

Has the problem led to road closures? Yes, several times during the year, but mostly during large storm events. ADOT clears water and rocks off the roadway.

District Priority (if identified): #1

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. **Slope washout**
d. Poor soil conditions
e. Undersized infrastructure
f. **Improper construction/installation – bridge with no channel into canyon below. Plan to replace bridge is in ADOT 5-year plan; no TRACS number identified yet.**
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: The rock slope needs to be recessed or altered so that the water can drain into the canyon and under the bridge.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. **Environmental benefit**
d. **Relief to District budget and/or resources**
e. **Meets District or ADOT strategic objective**
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 193: Southeast District Project A

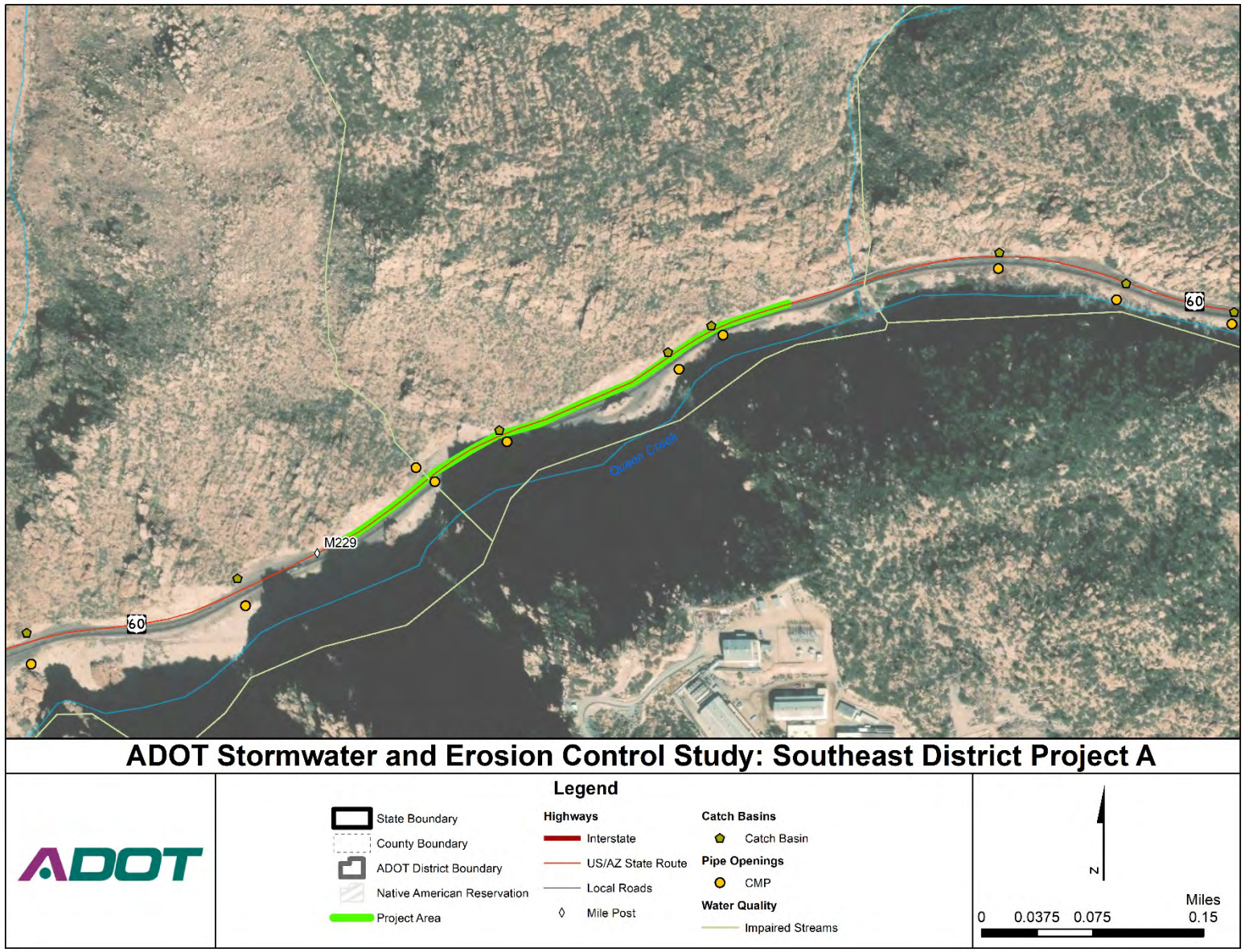


Figure 194: Westbound, Northern View (MP 229)

Figure 195: Eastbound, Southern View

Figure 196: Eastbound, Rear View

PROJECT B- SR 288 @ MP 289

Project Description: Experiencing severe head-cutting and erosion in this downhill grade, windy roadway area. It is suspected that additional stormwater flows are caused from an upgradient rock mitigation project in 2015 (laid the slope back, widened road, increased ditch size) that resulted in an increased impermeable catchment area (slope is made of rock). The additional stormwater volume has repeatedly overwhelmed the carrying capacity of the 3,000 linear feet of cut ditch leading to culvert that repeatably overtops and head cuts across road eroding fill slope of the cut ditch by approximately 20-feet (the invert of the culvert is higher than the cut ditch draining to it). ADOT has recently replaced the 24-inch culvert with a 36-inch culvert and is awaiting to see if that solution helps mitigate the problem. However, there are no headwalls to channel the water to the culvert and erosion is increasing the depth of the cut ditch.

How long has this been a concern? 4 to 5 years since the previous construction project. Exposed rock slope does not dissipate water and no percolation is occurring. Volume and velocity are increasing.

Has the problem led to road closures? No

District Priority (if identified): #5

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation – Not entirely, but "old facilities don't match new construction".
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Test depth to bedrock and strength to determine final location of inlet catch basin (needs to be hammered out): May need to install a squash CMP from head wall to 20' section in order to reduce bedrock excavation for adequate burial depth: Install two-24-inch CMPs (squashed) in two-20-foot sections: Build head wall apron with rock debris grate and install outfall scour protection grouted boulder apron to the toe of the fill slope.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 197: Southeast District Project B

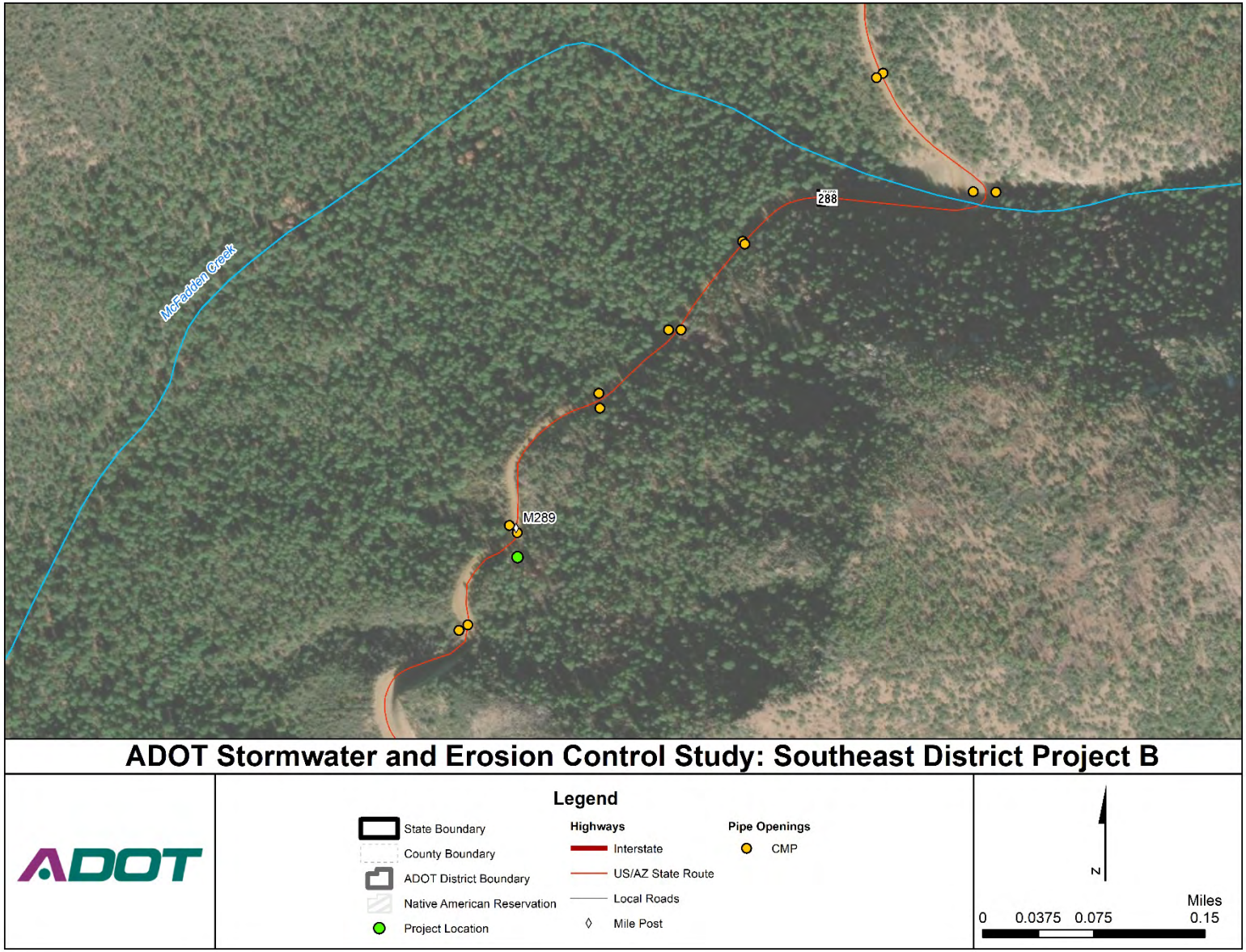
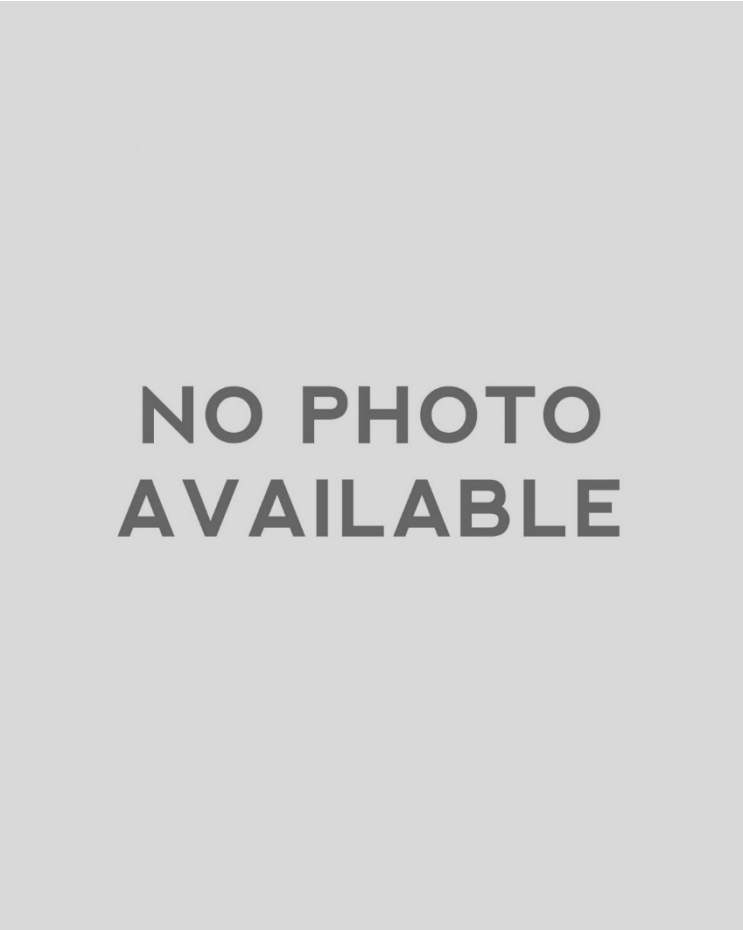


Figure 198: Images Pending (No ADOT imagery available)



PROJECT C- US 70 @ MP 380.46

Project Description: Existing box culverts are not sized to handle the volume of water that flows through this area. There is very limited space (perhaps only 2-feet) for water to get through the box culvert, as well as sedimentation of the existing channel. Approximately ¼-mile to the west, there is an above grade railroad crossing where the water is overtopping US 70, and nearby houses will flood at times.

How long has this been a concern? 14 years +

Has the problem led to road closures? Yes, multiple times, but not recently.

District Priority (if identified): #4

Characteristics of the Problem:

a. Failed stabilization/erosion control
b. Facility overtopping or embankment protection
c. Slope washout
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Each location will likely need some combination of installation of concrete or rock ford walls, gabion baskets and/or grouted rip rap to successfully mitigate erosion of roadway subgrade.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. Environmental benefit
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. Extend facility life span

Figure 199: Southeast District Project C

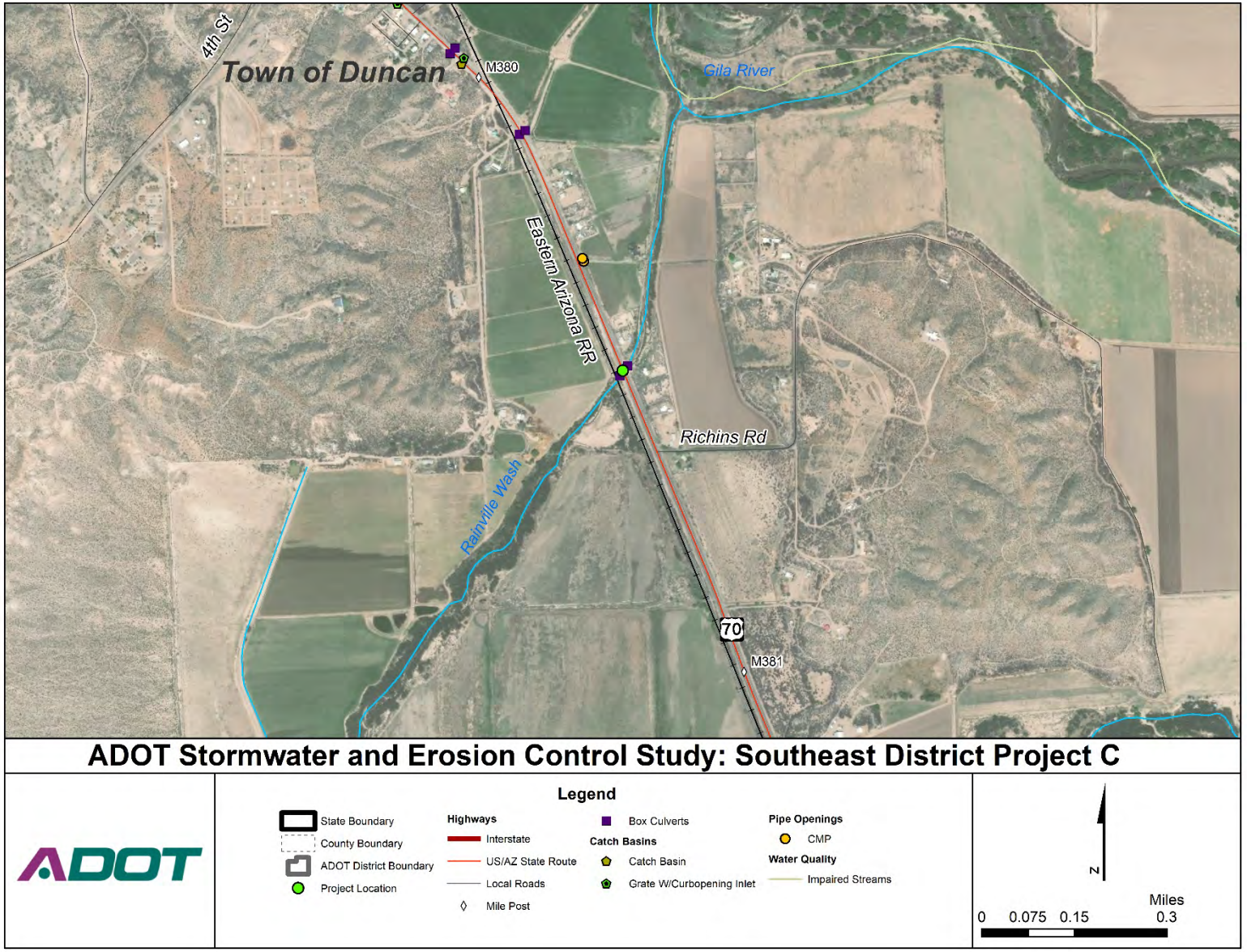


Figure 200: Existing Conditions of Box Culverts

Figure 201: Existing Conditions of Box Culverts

Figure 202: Existing Conditions of Box Culverts

Figure 203: Existing Conditions of Box Culverts

PROJECT D- SR 186 @ MP 343.83, 344.11, 344.60, 345.07, 345.46, 346.65, 347.87, 348.24, 348.96, 349.47

Project Description: This project consists of 11 low water crossings along SR 186 between Wilcox and Kansas Settlement. Each of these locations can be characterized as dip sections in the roadway where stormwater flows are designed to overtop the roadway and discharge to its natural drainage pattern. Each location is experiencing erosion and scour of the roadway embankment and structural degradation of the roadway shoulder, pavement, and pavement edge, particularly on the outlet side of the roadway. This extent of this project is depicted in **Figure 204** and **Figure 205**.

How long has this been a concern? 30 years +, since the road was constructed.

Has the problem led to road closures? Yes, closures are common during heavy events during monsoon season.

District Priority (if identified): #8

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. **Facility overtopping or embankment protection**
c. **Slope washout**
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Embankment protection needed to mitigate erosion. Mitigation measures to consider include; replace asphalt low water crossing with concrete for enhanced resiliency, use grouted rip rap on the outlet side of roadway, alter the road profile and add culverts at crossing locations.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. **Environmental benefit**
d. Relief to District budget and/or resources
e. **Meets District or ADOT strategic objective**
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 204: Southeast District Project D1

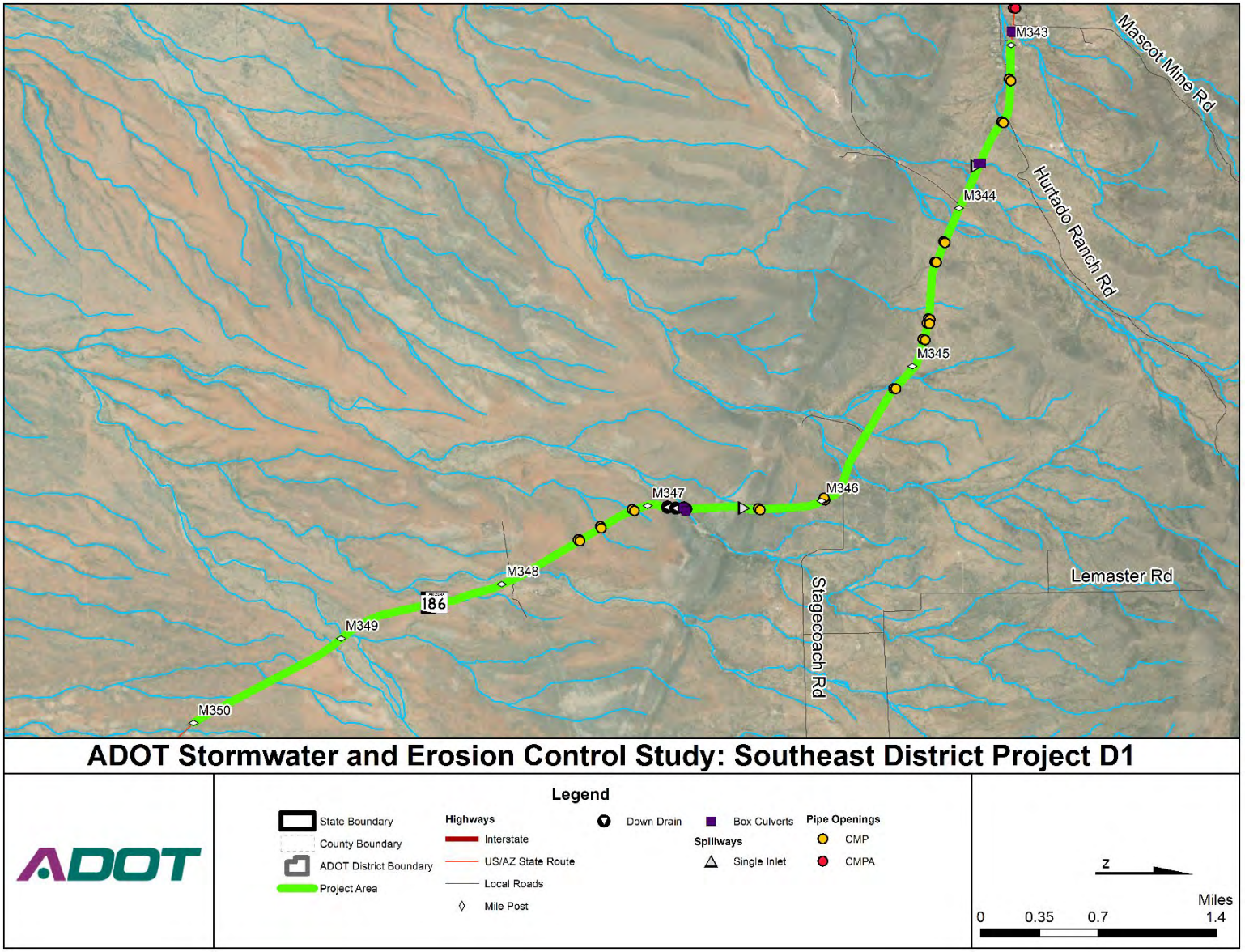


Figure 205: Southeast District Project D2

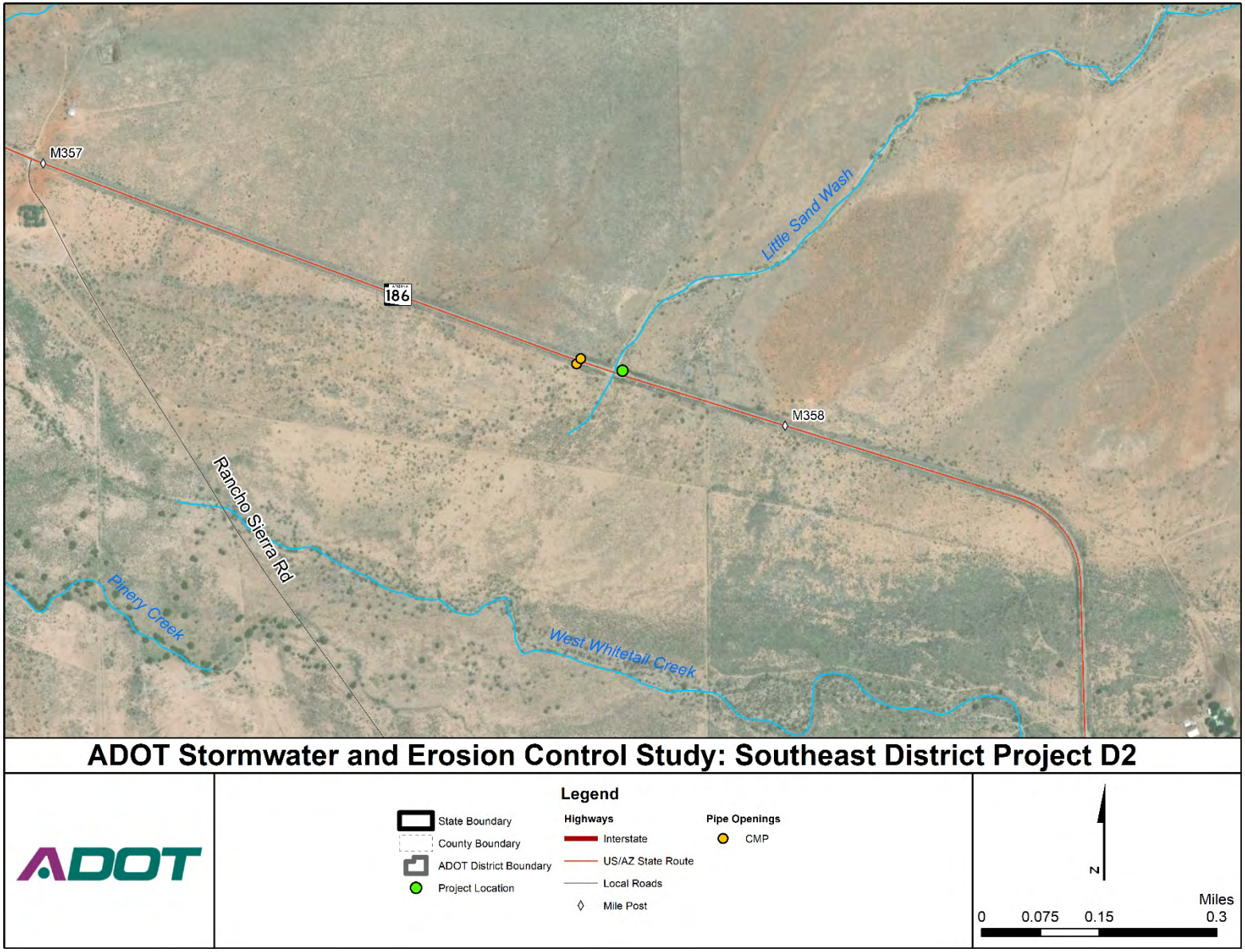


Figure 206: Northbound, Rear View (MP 343)

Figure 207: Southbound, Rear View (MP 343)

Figure 208: Northbound, Rear View (MP 358)

PROJECT E- SR 181 @ MP 51, 55 AND 60

Project Description: This project consists of 3 low water crossings along SR 181 where each of these locations has a dip section in the roadway where stormwater flows are designed to overtop the roadway and discharge to its natural drainage pattern. Each location is experiencing erosion and scour of the roadway embankment and structural degradation of the roadway shoulder, pavement and pavement edge, particularly on the outlet side of the roadway.

How long has this been a concern? 10 years +

Has the problem led to road closures? No

District Priority (if identified): #9

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. **Facility overtopping or embankment protection**
c. **Slope washout**
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Embankment protection is needed to mitigate erosion. Mitigation measures to consider include; replace asphalt low water crossing with concrete for enhanced resiliency, use grouted rip rap on the outlet side of roadway, alter the road profile and add culverts at crossing locations.

Likely Project Benefits:

a. **Public safety**
b. Regulatory mandate
c. **Environmental benefit**
d. Relief to District budget and/or resources
e. **Meets District or ADOT strategic objective**
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 209: Southeast District Project E

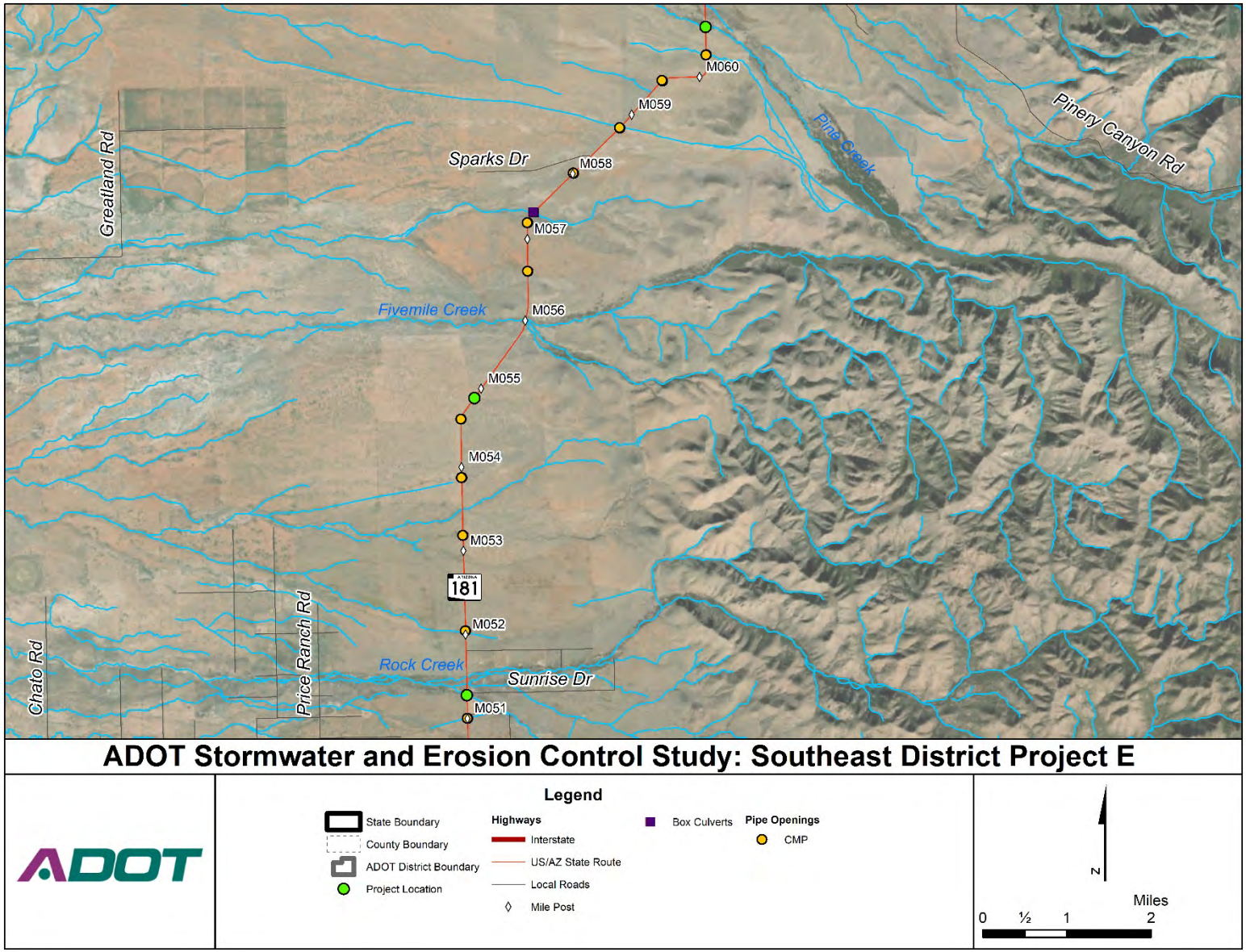


Figure 210: Northbound, Rear View (MP 51)

Figure 211: Northbound, Rear View (MP 55)

Figure 212: Southbound, Rear View (MP 60)

PROJECT F- SR 266 @ MP 210

Project Description: The existing 4 to 5 box culverts at this Gillespie Wash location have scour and erosion of the roadway embankment at the outlet side of the box culverts. The capacity of the box culverts appears to be sufficient as there is no overtopping or effects of scour at the inlet side of the box culverts. The velocity of the flows at the outlet side is causing a cutting/erosion effect on the west side (outlet side) of the roadway embankment.

How long has this been a concern? At least 3 years, but likely longer. Issue also identified in the ADOT Low Volume Route Study in 2016.

Has the problem led to road closures? No

District Priority (if identified): #10

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. **Slope washout**
d. Poor soil conditions
e. Undersized infrastructure
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Bank and scour protection on outlet side of the box culverts. Consider application of rail bank protection and/or grouted rip rap at culvert outlet.

Likely Project Benefits:

a. Public safety
b. Regulatory mandate
c. **Environmental benefit**
d. Relief to District budget and/or resources
e. Meets District or ADOT strategic objective
f. Reduction/mitigation in flooding or hazard
g. **Extend facility life span**

Figure 213: Southeast District Project F

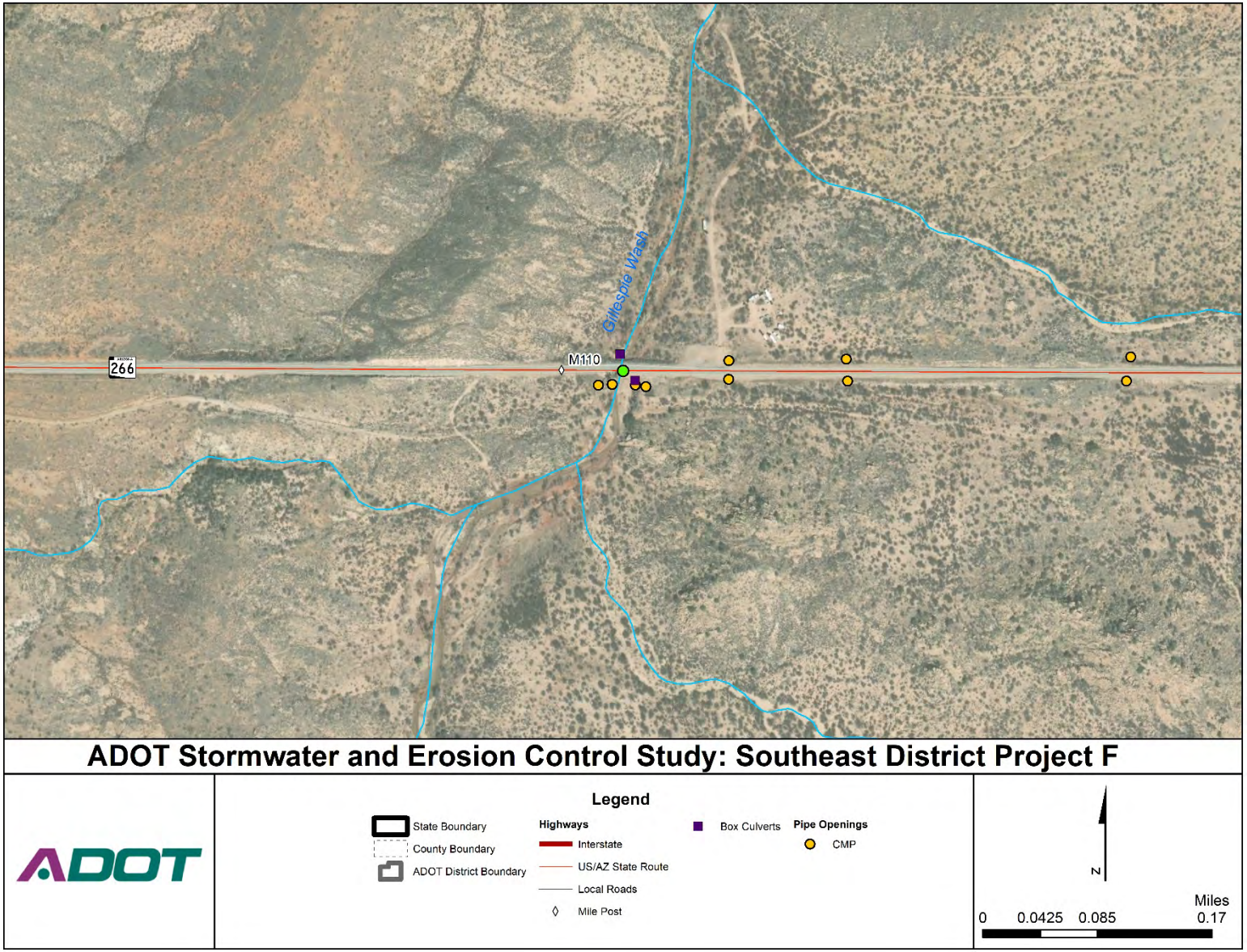


Figure 214: Westbound, Rear View (MP 110)

Figure 215: Eastbound, Rear View

Figure 216: Eastbound, Southern View

PROJECT G- US 60 @ MP 262 - 263

Project Description: This roadway segment contains a considerable fill area. There are a series of inlets, down drains and outlets at 4 to 5 locations in this mile-long road segment that are not functioning properly causing slope rutting/erosion of the roadway embankment. It appears that the inlets are either broken or eroded (or not constructed properly) causing water to not properly go to the down drains, spilling over onto the embankment where the erosion/rutting is occurring.

How long has this been a concern? 10 years +

Has the problem led to road closures? No

District Priority (if identified): #3

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. **Slope washout**
d. Poor soil conditions
e. Undersized infrastructure
f. **Improper construction/installation**
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Inlets need to be rebuilt and install grouted rip rap at outlets.

Likely Project Benefits:

a. Public safety
b. **Regulatory mandate**
c. **Environmental benefit**
d. **Relief to District budget and/or resources**
e. **Meets District or ADOT strategic objective**
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 217: Southeast District Project G

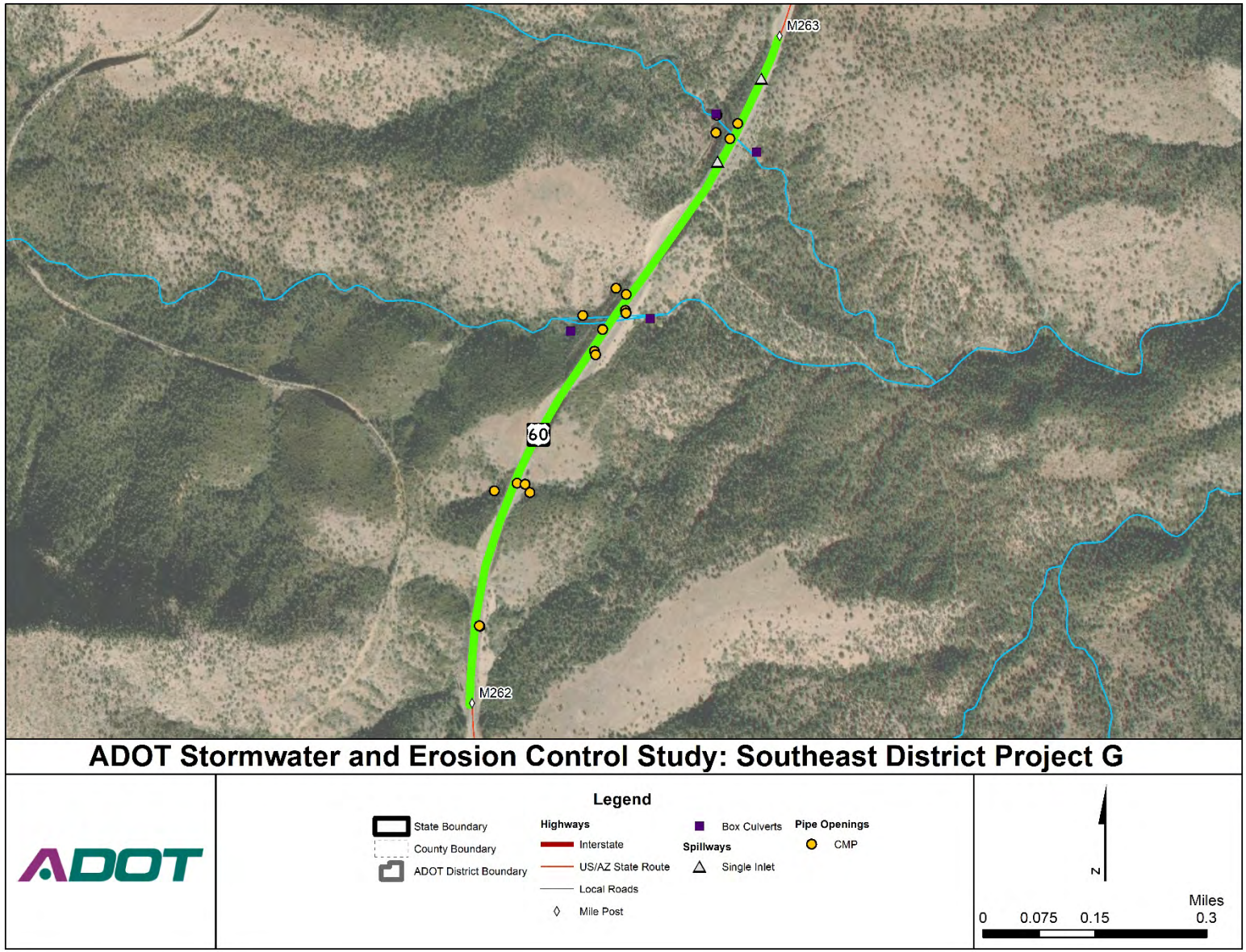


Figure 218: Field Photo 1 (Provided by ADOT)

Figure 219: Field Photo 2 (Provided by ADOT)

Figure 220: Field Photo 3 (Provided by ADOT)

PROJECT H- SR 177 @ MP 166.7

Project Description: This location has a 48-inch CMP that is experiencing significant erosion of the roadway embankment on the outlet side. There is no protection on the outlet side. The inlet side is difficult to access and is covered with dense vegetation.

How long has this been a concern? 10 years +

Has the problem led to road closures? No

District Priority (if identified): #6

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. Facility overtopping or embankment protection
c. **Slope washout**
d. Poor soil conditions
e. Undersized infrastructure
f. **Improper construction/installation**
g. **Additional negative impacts downstream**
h. Other

Possible Mitigation/Solution: Protect culvert and reduce erosion by installing an end section that could include grouted rip rap. Also consider an energy dissipater to reduce outlet velocities that could cause additional scour/erosion of the roadway embankment.

Likely Project Benefits:

a. Public safety
b. **Regulatory mandate**
c. **Environmental benefit**
d. Relief to District budget and/or resources
e. **Meets District or ADOT strategic objective**
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 221: Southeast District Project H

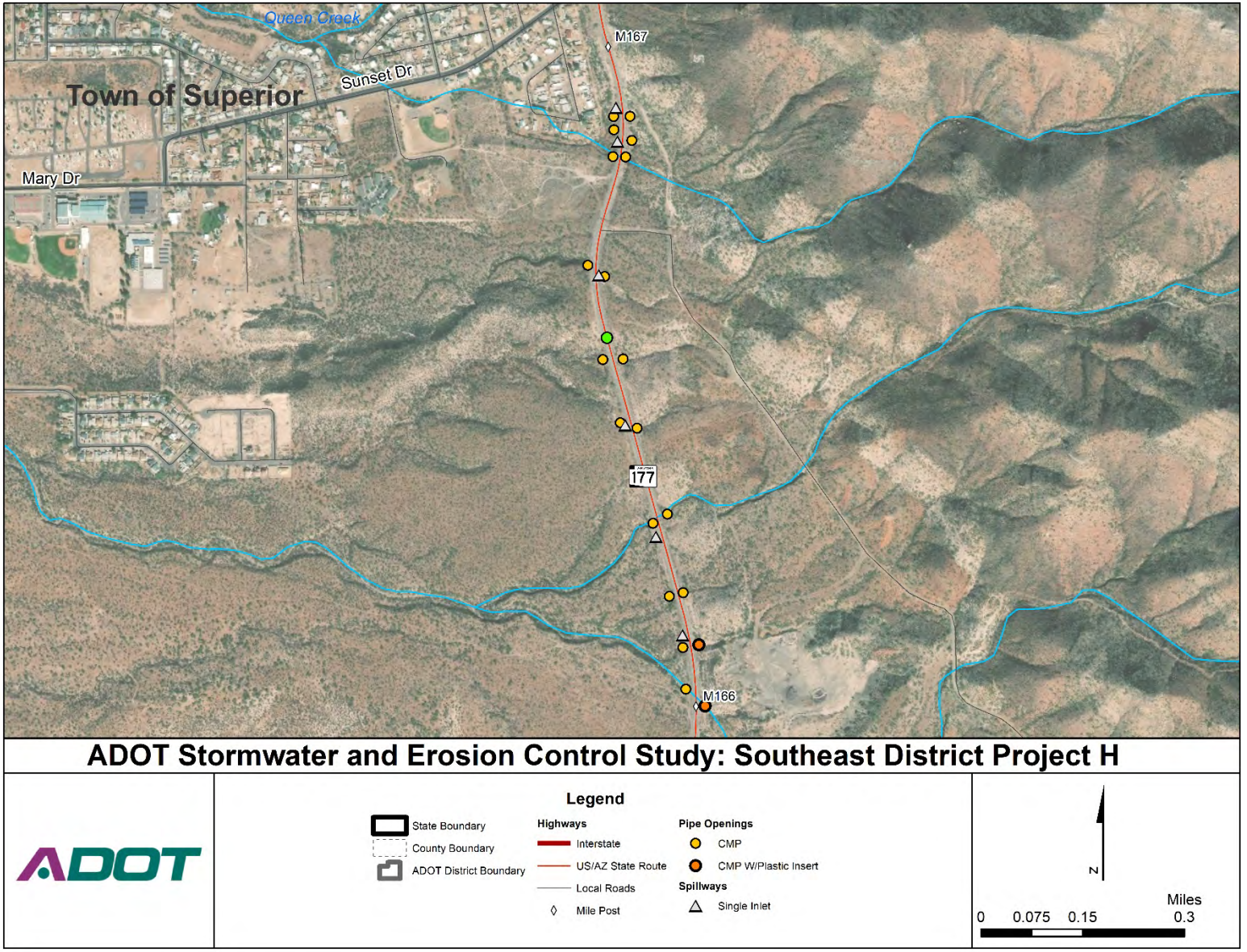


Figure 222: Field Photo (Provided by ADOT)

Figure 223: Southbound, Western View (MP 166)

Figure 224: Southbound, Rear View

PROJECT I- SR 288 @ MP 265.3

Project Description: The existing culvert at this location is undersized for receiving flows, causing the roadway to be overtopped and erosion of the roadway embankment.

How long has this been a concern? 10 years +

Has the problem led to road closures? Yes, but not recently.

District Priority (if identified): #7

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. **Facility overtopping or embankment protection**
c. **Slope washout**
d. Poor soil conditions
e. **Undersized infrastructure**
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Evaluate proper culvert sizing, install a larger culvert(s) and reinforce stability with grouted rip rap on inlet and outlet sides of the box culvert.

Likely Project Benefits:

a. **Public safety**
b. **Regulatory mandate**
c. **Environmental benefit**
d. **Relief to District budget and/or resources**
e. **Meets District or ADOT strategic objective**
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 225: Southeast District Project I

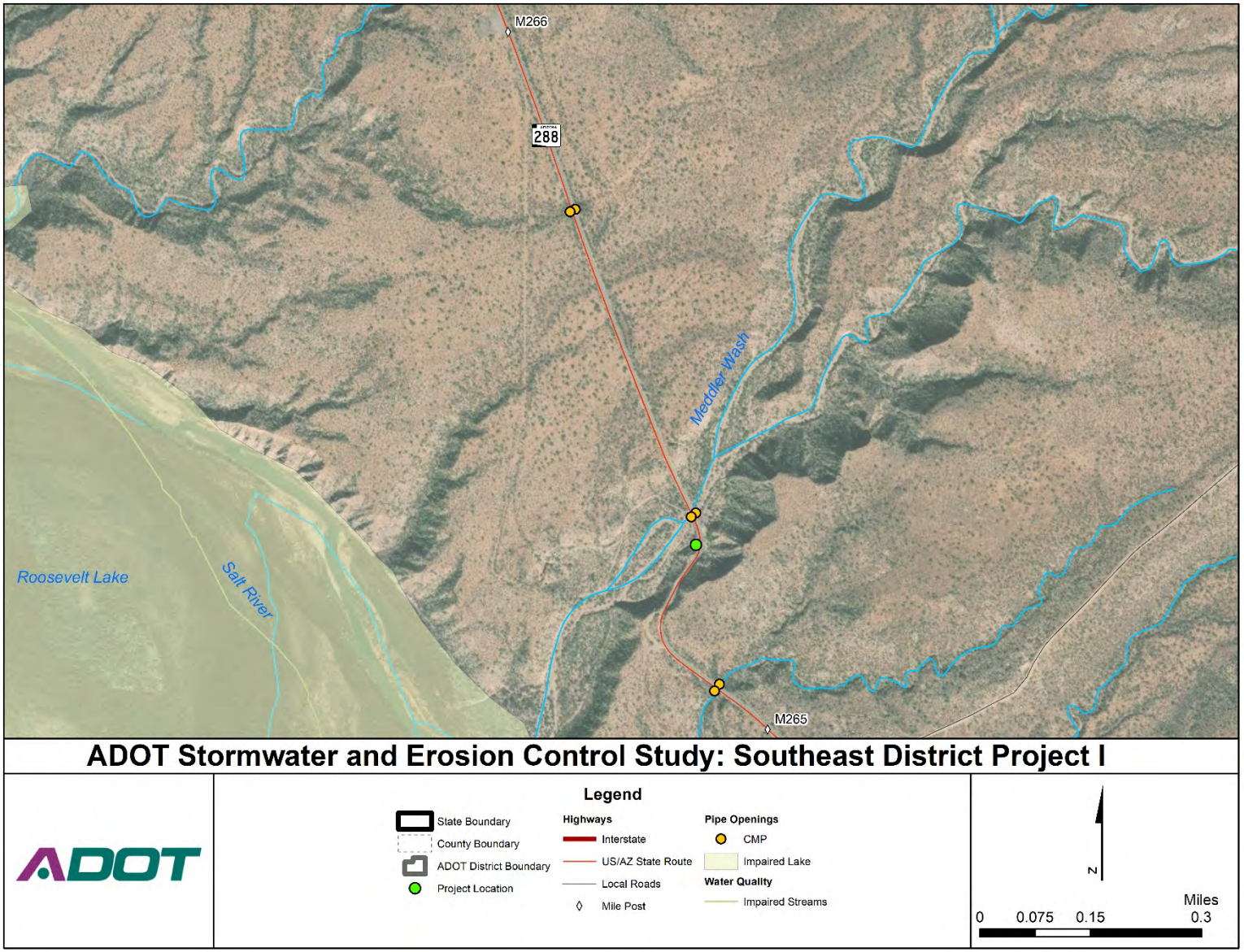


Figure 226: Field Photo (Provided by ADOT)

Figure 227: Southbound, Western View (MP 265)

Figure 228: Northbound, Rear View

PROJECT J- SR 88 @ MP 220.2 – 229.2

Project Description: Within this 9-mile segment of the roadway, multiple culvert locations are aged and undersized. These existing culverts cannot handle the volume and velocities of flows, thus causing overtopping of the roadway and embankment erosion/washout at multiple locations. This urgency of this historical condition is now exacerbated by the recent wildfire in the area and the anticipated flooding that will occur as a result. ADOT has this entire section of roadway currently closed due to critical safety concerns.

How long has this been a concern? 10 years +; ADOT maintenance staff historically uses a considerable amount of their resources at this location(s).

Has the problem led to road closures? Historically yes, many occasions. Road now closed to public due to anticipated flooding resulting from wildfire runoff.

District Priority (if identified): #2

Characteristics of the Problem:

a. **Failed stabilization/erosion control**
b. **Facility overtopping or embankment protection**
c. **Slope washout**
d. Poor soil conditions
e. **Undersized infrastructure**
f. Improper construction/installation
g. Additional negative impacts downstream
h. Other

Possible Mitigation/Solution: Evaluate proper culvert sizing, enlarge culvert sizing at all locations, install headwalls and grouted rip rap on outlet side of the culverts.

Likely Project Benefits:

a. **Public safety**
b. **Regulatory mandate**
c. **Environmental benefit**
d. **Relief to District budget and/or resources**
e. **Meets District or ADOT strategic objective**
f. **Reduction/mitigation in flooding or hazard**
g. **Extend facility life span**

Figure 229: Southeast District Project J

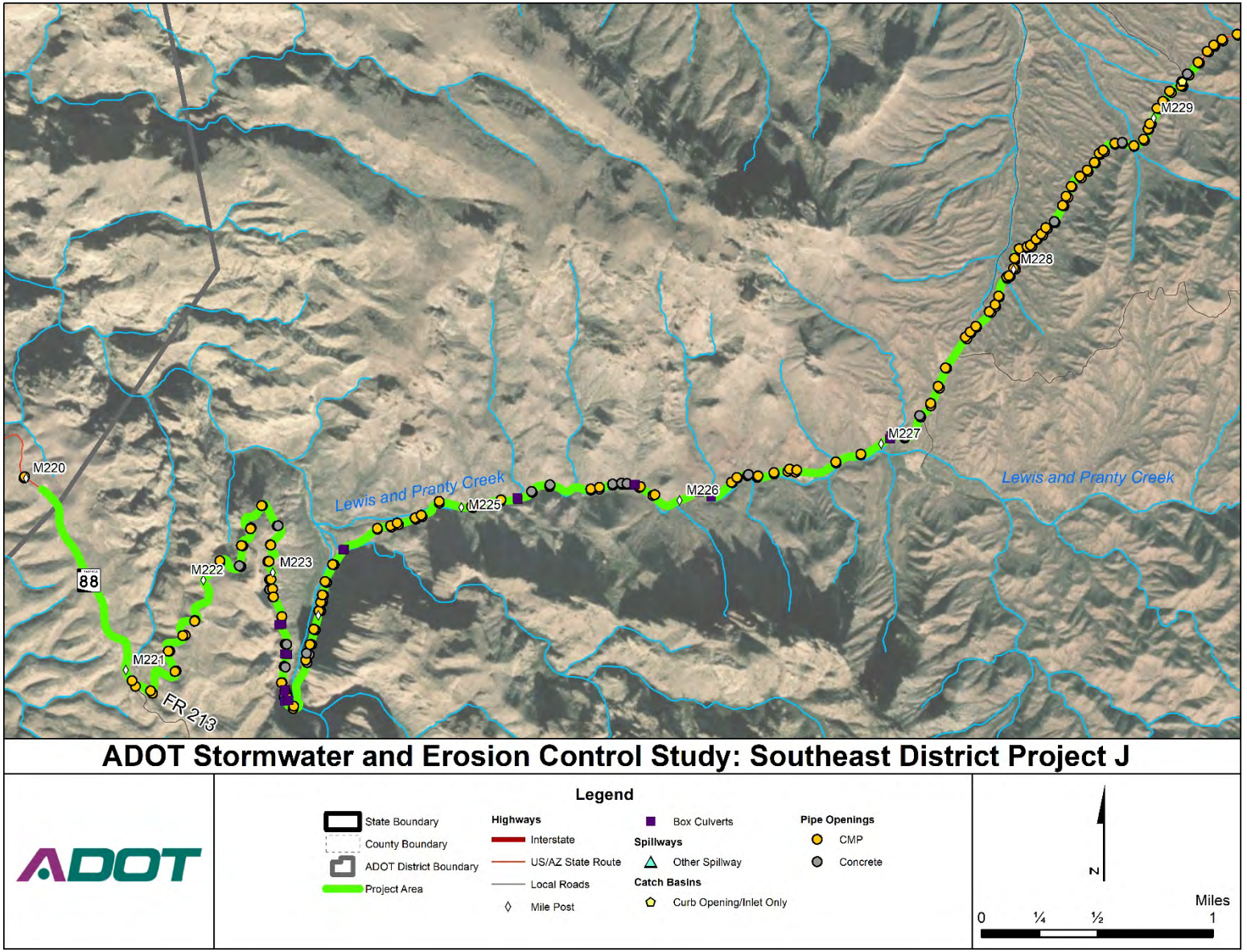


Figure 230: Westbound, Rear View (MP 220)

Figure 231: Eastbound, Southern View

Figure 232: Westbound, Northern View

IV. DEVELOPMENT OF THE PRIORITIZATION MODEL AND EVALUATION CRITERIA

The Project Team, in tandem with the ADOT SWSWECS TAC, worked to develop a series of evaluation criteria and weighting to evaluate the 52 statewide projects as part of the SWSWECS PPM to prioritize the stormwater projects submitted by the seven ADOT Districts. The evaluation criteria were crafted to be diverse in nature through the combination of quantitative perspectives - pulling data and information from Working Paper #1 - as well as qualitive characteristics identifying specific features of the projects that impact their importance, and impact to ADOT assets in the right-of-way and adjacent properties.

As part of ADOT's SWSWECS, a Project Prioritization Model (PPM) was developed to effectively evaluate and objectively and equitably rank the 52 statewide projects submitted and described in detail through the development of *SWSWECS Working Paper #1*. The objective of the SWSWECS PPM is to have the highest performing stormwater-based erosion and control projects compete with the other projects evaluated through ADOT's P2P Process – a performance-based project evaluation and prioritization.

Similar to ADOT's P2P processes, the SWSWECS PPM is complex and comprehensive, yet a straightforward excel-based model, which provides a method to sort the diverse set of projects in order of importance based on the set of predetermined criteria that were chosen to address the detrimental effects to the roadway system created by the negative effects of stormwater runoff. The PPM was calibrated to identify each individual project's relative importance by deriving a numerical value of priority for each project.

The Project Team has carefully crafted and applied the PPM that successfully addresses this project's statement of need to; 1) develop a model whose output will create a prioritized list of stormwater construction projects to be addressed on an annual program basis, and 2) ensure that model is quantitative, comprehensive, replicable and systematic to inform/augment stormwater management activities and compete in the annual ADOT P2P process.

The ADOT SWSWECS PPM consists of three elements that work together to construct an equation that calculates a resulting numerical score for each project. This process is illustrated in **Figure 233** below. The three elements of the PPM include:

1. **The Evaluating Criteria & Scoring Thresholds** are the set of standards used to quantify the characteristics of a project from both quantitative and qualitative measures;
2. **The Evaluation Criteria Weighting** is a numerical value assigned to each evaluation criteria that signifies the level of importance of each criteria; and
3. **The Scoring Methodology** is the framework around how the Evaluation Criteria, Scoring Thresholds, and the Evaluation Criteria Weighting work together to reach a calculated score.

Figure 233: SWSWECS PPM Process Flowchart

The Project Team worked incrementally with the Technical Advisory Committee (TAC) to develop each of these three elements of the SWSWECS PPM. The TAC reviewed and approved the set of evaluation criteria. The following sections of this report will describe how these three elements of the SWSWECS PPM were developed, calibrated, refined and finalized through a TAC consensus-based progression, which resulted in a prioritized list of statewide stormwater projects.

A. PROJECT TEAM DRAFTING AND VETTING

The first step in developing the evaluation criteria was to identify four essential categories to measure the 52 projects. The Project Team combined previous experiences from Arizona and other states with industry best practices in stormwater and transportation project evaluation to reach the following four categories to assess the statewide projects:

1. Protect Public Health/Safety of Adjacent Property
2. Environmental Benefits/ Regulatory Mandates
3. Economic/ Operational/ Asset Management Benefits
4. Implementation Complexity

Once the evaluation criteria categories were selected, the Project Team created a preliminary list of evaluation criteria for each category. The process included researching regulatory mandates across the state and with ADOT; understanding what issues were of highest importance for the ADOT Districts; communicating with ADOT to understand strategic initiatives of the highest value within the agency; investigating measures to evaluate the level of difficulty of implementation; assessment of the costs to construct a stormwater project (i.e. capital improvement, maintenance, and life cycle costs); and discussing the impact to resources, reduction of flooding, and hazard mitigation in association of the project. The Project Team also worked with ADOT to collect a wide range of data, and through data analytics and interpretation, the Project Team used FIS, PECOS, ADOTS Photo Log, ADOT District phone interviews, and data collected from the Arizona Department of Environmental Quality (ADEQ) including water of the US, the impaired waters and outstanding water lists to evaluate the environmental considerations and create a comprehensive list of datasets to include as inputs in the SWSWECS PPM.

As a result, 13 different evaluation criteria were initially developed within the four categories to use in the SWSWECS PPM. **Table 8** on the following page describes the different evaluation criteria for each category.

Table 8: SWSWECS PPM Evaluation Criteria & Scoring Thresholds

Category		Evaluation Criteria	Scoring Threshold	Score
Protect Public Health/Safety of Adjacent Property	1	Project eliminates or reduces flooding or property damage of adjacent property.	Yes	Positive Score
			No	Neutral Score
	2	Existing frequency in which stormwater causes roadway closures and/or restrictions.	Yes	Positive Score
			No	Neutral Score
	3	Existing frequency of which stormwater negatively impacts roadway or adjacent property.	N/A**	Positive Score
			N/A**	Neutral Score
Environmental Benefits/ Regulatory Mandates	4	Existing condition is located in proximity to Jurisdictional Water of the US (WOTUS).	< 1 mile	Positive Score
			> 1 mile	Neutral Score
	5	Existing condition is located in proximity to Impaired and/or Outstanding Arizona Waters.	< ¼ mile	Positive Score
			> ¼ mile	Neutral Score
	6	Project location has a TMDL already in place.	Yes	Positive Score
			No	Neutral Score
Economic/ Operational/ Asset Management Benefits	7	Is the project location located on an ADOT corridor of strategic significance as defined by a completed Corridor Profile Study?	Yes	Positive Score
			No	Neutral Score
	8	Percentage of freight flow movement (T-Factor) reported on the ADOT corridor? *	>15%	Positive Impact
			10% - 15%	Partial Positive Impact
			5% - 10%	Partial Positive Impact
			<5%	Neutral Impact
	9	Impact to the structural integrity of existing ADOT assets in the ROW.	Roadway	Positive Impact
			Side slopes	Partial Positive Impact
			Conveyance Channels, Catch Basin, Etc.	Partial Positive Impact
			None	Neutral Impact
	10	Project is identified by the ADOT District as a priority.	Priority 1-3	Positive Impact
			Priority 4-6	Partial Positive Impact
			Priority 7+	Neutral Impact
Implementation Complexity	11	Project can be completed entirely within the existing ADOT ROW.	Yes	Positive Score
			No	Neutral Score
	12	Project is located within ADOT ROW or an easement upon public lands.	ADOT ROW	Positive Score
			Public Easement	Neutral Score
	13	Opportunity to leverage financial partner participation.	Yes	Positive Score
			No	Neutral Score

Corresponds to ADOT P2P Modernization technical evaluation criteria* * Not Applicable as this criterion was eliminated for further consideration prior to the determination of scoring thresholds*

B. DEVELOPMENT OF EVALUATION CRITERIA & SCORING THRESHOLDS

Once the initial draft list of evaluation criteria was finalized, the next step was to formulate and assign a weighting value to each criterion. The weight of the criterion is a numeric value that represents the level of importance of each criterion. The weights are then used to calculate the results of the evaluation of each criterion – the higher the weight results in a higher score for that criterion.

In order to reach a weight for each criterion, the Project Team developed an excel-based survey to distribute to the seven different ADOT Districts, ADOT Environmental Planning, and the ADOT MPD to populate their perceived importance of each criterion. The survey included in-depth instructions on how to populate the excel-based tool. The ADOT Districts, Environmental Planning, and MPD were asked to assign each criterion a numeric value on a scale of 100 based on their perceived level of importance. For example, the survey included the revised 1 criterion, so a completely balanced weight among the criterion would be 7.69 – the value of equilibrium.

100	**/**	**13**	**=**	**7.69**
Weighted total		*# of Criterion*		*Value of Equilibrium*

The Project Team asked in the survey to adjust the value of equilibrium, by increasing or decreasing the number, based on their perception of importance of each criterion among each other. The provided responses from each of the ADOT Districts, ADOT Environmental Planning, and ADOT MPD were averaged to arrive at a final weight for each evaluation criteria.

The results of the criteria weighting survey show that the seven ADOT Districts, the ADOT Environmental Planning, and ADOT MPD shared some commonalities in their perceptions of which criterion are the most important, while also some groups assigned a large portion of the points to the criteria that specifically align with their goals and objectives of their group. For instance, the ADOT Environmental Planning dedicated nearly two-thirds of the total overall weight to just two criterion – *Criterion 1: Existing frequency in which stormwater causes roadway closures and/or restrictions,* and *Criterion 9: Project would eliminate the negative impact to the structural integrity of existing ADOT assets in the ROW* – significantly increasing the weight to these two criterion compared to the other evaluation criteria.

All of the respondents assigned higher values than the value of equilibrium to:

- *Criterion 1: Project eliminates or reduces flooding or property damage of adjacent property;*
- *Criterion 2: Existing frequency in which stormwater causes roadway closures and/or restrictions; and*
- *Criterion 3: Existing frequency of which stormwater negatively impacts roadway or adjacent property.*

On the other hand, all respondents assigned lower values than the value of equilibrium to:

- *Criterion 6: Project location has a TMDL already in place*;
- *Criterion 8: Percentage of freight flow movement (T-Factor) reported on the ADOT corridor*; and
- *Criterion 13: Opportunity to leverage financial partner participation.*

The remaining four criteria had a range of values assigned to them by the stakeholders which were both above and below the value of equilibrium.

Table 9 shows the original thirteen evaluation criteria and their respective weights assigned to each criterion based on the results of the ADOT District survey and refinement of the evaluation criteria.

C. REFINEMENT OF THE EVALUATION CRITERIA

As the Project Team began to apply the results of the survey to weight the criteria, compared to the draft evaluation criteria developed, it became evident that the Project Team did not have sufficient or consistent information/feedback from all ADOT Districts to accurately assess the previously identified "existing frequency in which stormwater negatively impacts the roadway or adjacent property" criterion. As a result, this criterion was eliminated. Another important consideration in eliminating this criterion was the fact that this item would also be a challenge for ADOT to apply internally when evaluating stormwater projects in future years after this project is completed.

In this analysis, it was felt by the Project Team that three other evaluation criteria - #1, #2 and #8, are very much related and capture the intent of the evaluation criterion that was eliminated. In fact, it was felt that a couple of these likely overlap and/or are redundant, so eliminating a criterion was not felt to be an omission and/or negative impact to the intent or outcome of this exercise.

Since the ADOT District survey responses included the evaluation criterion that is now eliminated, the value/points assigned to this previous evaluation criterion were equally distributed amongst evaluation criteria #1, #2 and #8 since they are similar in their intent – i.e., describing direct impacts to the ADOT ROW or adjacent property.

Table 10 illustrates the application of the ADOT District survey results and application of the weighting to each of the 12 evaluation criteria.

In order to confirm the evaluation criteria to be used in the prioritization model, the refined evaluation criteria and assigned weights were distributed to the TAC for review and comment. No comments were received.

Table 9: SWSWECS TAC Evaluation Criteria Weighting Survey Results

Category		Evaluation Criteria	ADOT District and Stakeholder Response									Average Weight	Criterion Rank
			Northcentral District	Northeast District	Northwest District	Central District	Southcentral District	Southeast District	Southwest District	ADOT Environmental	ADOT MPD		
Protect Public Health/Safety of Adjacent Property	1	Project eliminates or reduces flooding or property damage of adjacent property.	16	10	*NR*	6	11	10	10	0	10	9.13	**5**
	2	Existing frequency in which stormwater causes roadway closures and/or restrictions.	13	12	*NR*	8	8	10	10	25	15	12.63	**1**
	3	Existing frequency of which stormwater negatively impacts roadway or adjacent property.	14	11	*NR*	8	10	10	10	25	10	12.25	**2**
Environmental Benefits/ Regulatory Mandates	4	Existing condition is located in proximity to Jurisdictional Water of the US (WOTUS).	4	2	*NR*	6	8	6	8	10	10	6.75	**7**
	5	Existing condition is located in proximity to Impaired and/or Outstanding Arizona Waters.	6	3	*NR*	6	7	5	10	10	10	7.13	**6**
	6	Project location has a TMDL already in place.	5	1	*NR*	6	6	7	7	5	5	5.25	**10**
Economic/ Operational/ Asset Management Benefits	7	Is the project location located on an ADOT corridor of strategic significance as defined by a completed Corridor Profile Study?	8	7	*NR*	8	9	8	5	0	3	6.00	**9**
	8	Percentage of freight flow movement (T-Factor) reported on the ADOT corridor. *	7	5	*NR*	9	4	7	5	0	5	5.25	**11**
	9	Project would eliminate the negative impact to the structural integrity of existing ADOT assets in the ROW.	9	16	*NR*	10	11	10	5	25	7	11.63	**3**
	10	Project is identified by the ADOT District as a priority.	12	13	*NR*	10	10	9	10	0	10	9.25	**4**
Implementation Complexity	11	Project can be completed entirely within the existing ADOT ROW.	2	7	*NR*	8	7	8	10	0	8	6.25	**8**
	12	Project is located within ADOT ROW or an easement upon public lands.	1	9	*NR*	8	4	6	5	0	5	4.75	**12**
	13	Opportunity to leverage financial partner participation.	3	4	*NR*	7	5	4	5	0	2	3.75	**13**
		Total	**100**	**100**	**0**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	

**Corresponds to ADOT P2P Modernization technical evaluation criteria*
NR = no response

Table 10: Final Set of 12 SWSWECS PPM Evaluation Criteria and Weighting

Category		Evaluation Criteria	Scoring Threshold	Score	Weight
Protect Public Health/Safety of Adjacent Property	1	Project eliminates or reduces flooding or property damage of adjacent property.	Yes	Positive Score (13.21)	**13.21**
			No	Neutral Score (0)	
	2	Existing frequency in which stormwater causes roadway closures and/or restrictions.	Yes	Positive Score (16.71)	**16.71**
			No	Neutral Score (0)	
Environmental Benefits/ Regulatory Mandates	3	Existing condition is located in proximity to Jurisdictional Water of the US (WOTUS).	< 1 mile	Positive Score (6.75)	**6.75**
			> 1 mile	Neutral Score (0)	
	4	Existing condition is located in proximity to Impaired and/or Outstanding Arizona Waters.	< ¼ mile	Positive Score (7.13)	**7.13**
			> ¼ mile	Neutral Score (0)	
	5	Project location has a TMDL already in place.	Yes	Positive Score (5.25)	**5.25**
			No	Neutral Score (0)	
Economic/ Operational/ Asset Management Benefits	6	Is the project location located on an ADOT corridor of strategic significance as defined by a completed Corridor Profile Study?	Yes	Positive Score (6.00)	**6.00**
			No	Neutral Score (0)	
	7	Percentage of freight flow movement (T-Factor) reported on the ADOT corridor? *	>15%	Positive Score (5.25)	**5.25**
			10% - 15%	Partial Score (3.50)	
			5% - 10%	Partial Score (1.75)	
			<5%	Neutral Score (0)	
	8	Impact to the structural integrity of existing ADOT assets in the ROW.	Roadway	Positive Score (15.71)	**15.71**
			Side slopes	Partial Score (10.47)	
			Conveyance Channels, Catch Basin, Etc.	Partial Score (5.24)	
			None	Neutral Score (0)	
	9	Project is identified by the ADOT District as a priority.	Priority 1-3	Positive Score (9.25)	**9.25**
			Priority 4-6	Partial Score (6.17)	
			Priority 7+	Neutral Score (0)	
Implementation Complexity	10	Project can be completed entirely within the existing ADOT ROW.	Yes	Positive Score (6.25)	**6.25**
			No	Neutral Score (0)	
	11	Project is located within ADOT ROW or an easement upon public lands.	ADOT ROW	Positive Score (4.75)	**4.75**
			Public Easement	Neutral Score (0)	
	12	Opportunity to leverage financial partner participation.	Yes	Positive Score (3.75)	**3.75**
			No	Neutral Score (0)	

**Corresponds to ADOT P2P Modernization technical evaluation criteria*

D. DEVELOPMENT OF THE THREE POTENTIAL SCORING METHODOLOGIES

After the weights of the evaluation criteria were developed and confirmed by the TAC, the Project Team developed three different scoring methodologies for possible consideration for the PPM. The scoring methodology is the element of the PPM that measures each of the projects within the scoring threshold of each evaluation criteria.

For example, *Criterion 1: Project eliminates or reduces flooding or property damage of adjacent property*, has a positive impact or neutral impact whether a project will eliminate or reduce flooding or property damage as a result if implementation. The scoring methodologies define what the magnitude or measurement of the positive impact or neutral impact to be applied. **Table 11** below describes the three scoring methodologies developed and each methodology is described in more detail in the following three sections.

Table 11: The Three Potential Scoring Methodologies

Scoring Threshold Result	Scoring Methodology 1	Scoring Methodology 2	Scoring Methodology 3
Positive Score	Full Weighted Points	3 * Weight	2 * Weight Value
Partial Positive Score*	One-half of the Weight Value Two-thirds of the Weight Value	2 * Weight Value	1 * Weight Value
Partial Positive Score*	One-third of the Weight Value	1 * Weight Value	0.5 * Weight
Neutral Score	Zero Points	Zero Points	Zero Points

**Partial scores applied only on an as needed basis.*

SCORING METHODOLOGY 1

Unlike the other two scoring methodologies, Scoring Methodology 1 uses the weighted value as the directly applied scoring value. The highest possible points is awarded the full weighted value while the lowest possible point value is zero points. As previously noted, some evaluation criteria contain more than two scoring thresholds, and a simple equation is applied in Scoring Methodology 1 to arrive at a partial positive value stemming from the weighted value. For instance, evaluation criteria with two thresholds arrive at the partial positive score by using half of the weighted score; while the evaluation criteria with four thresholds use two-thirds and one-third of the weighted value to arrive at the two partial positive scores.

SCORING METHODOLOGY 2

Scoring Methodology 2 is different from Scoring Methodology 1 in that the approach uses a scale of numbers based on the Scoring Thresholds multiplied by the weight value. As displayed in **Table 11**, the highest possible points a project can receive is a score of three (3) multiplied by the weight value, and similar to Scoring Methodology 1, the lowest possible point value a project can receive is zero. Evaluation criteria with more than two scoring thresholds, a project receives a score of two or one multiplied by the weight value to arrive at the partial positive scores.

SCORING METHODOLOGY 3

Scoring Methodology 3 is similar to Scoring Methodology 2 in that the approach uses a scale of numbers based on the Scoring Thresholds multiplied by the weight value. As displayed in **Table 11**, the highest possible points a project can receive is a score of 2 multiplied by the weight value, and similar to Scoring Methodology 1 and 2, the lowest possible point value a project can receive is zero. Evaluation criteria with more than two scoring thresholds, a project receives a score of either one or one-half multiplied by the weight value to arrive at the partial positive scores.

E. CHOOSING A SCORING METHODOLOGY

The Project Team worked together to determine a preferred Scoring Methodology by running the PPM with all three different scoring methodologies for comparison purposes. Once each of the three PPMs were successfully calibrated, the Project Team compared the prioritized results of the 52 submitted projects for each of the three iterations. The Project Team evaluated the results to identify if there was any variation (outliers or unusual results) in the ranking order of the 52 projects among the three iterations of the PPM using the three different scoring methodologies.

The group concluded that there was no significant variation in the ranking between the three methodologies and decided to select Scoring Methodology 1 as the preferred methodology for a few different reasons. First, this methodology minimized the potential for subjectivity into the equation since the weighted values for the evaluation criteria were developed essentially through the TAC as part of the Evaluation Criteria Weighting Survey. Also, the group thought the scale of 100 points linked to the weighting values and the smaller value outputs created an easy to understand score that can be replicated for ADOT's future internal use in future years. Third, this methodology was found to be most preferred by ADOT since it has the strongest correlation to the ADOT methods used in ranking projects in the P2P process.

Another element to note is that some projects resulted in identical score once the PPM was fully calibrated with Scoring Methodology 1. For example, two projects scored 59.67 points resulting in each project to have the 15th highest score – or in other words – both projects ranked 15th (NED – K and NED – A). For the purposes of this project and to avoid adding any additional level of subjectivity on how to determine precedence between projects with identical scores or ranks, the two projects will be awarded the same rank. As per the example noted above, both NED – K and NED – A were assigned a Rank 15.5 to assimilate equal importance or precedence. As a result, there would be no 16th ranked project and the next ranked project in descending order would be the 17th ranked project. Out of the entire 52 submitted projects, there are three pairs of projects that have identical scores or ranks:

- Rank 15.5: NED – K and NED – A (59.67 points);
- Rank 29.5: NED – B and NWD – B (44.96 points); and
- Rank 51.5: NED – H and NED – I (13.97 points).

As these projects move through the ADOT P2P process and evolve towards implementation, ADOT will need to do another level of qualitative evaluation if there is a need to determine precedence between any two projects with an identical score or rank.

V. PRIORITIZATION MODEL RESULTS OVERVIEW

This section describes the result the SWSWECS PPM which evaluates and ranks the 52 stormwater projects submitted by the ADOT Districts using the Evaluation Criteria, Scoring Thresholds and Scoring Methodology 1 discussed in the previous sections.

A. STATEWIDE RESULTS SUMMARY

A total of 52 projects were submitted by the seven ADOT Districts which were run through the SWSWECS PPM. The breakdown of the number of projects submitted by District are as follows:

- Northeast District – 11 projects
- Northcentral District – 6 projects
- Northwest District – 4 projects
- Central District – 3 projects
- Southeast District – 10 projects
- Southcentral District – 8 projects
- Southwest District – 10 projects

A total of two projects were added by the Southcentral District since the *SWSWECS Working Paper #1* was completed. This brought the total projects from 50 projects to 52 projects. The Project Team worked with the Southcentral District to collect all the necessary data and recalibrate the SWSWECS PPM to include the two newly added projects.

The highest score a project could potentially receive through Scoring Methodology 1 would be 100 points. Meaning that project would receive the full weighted value for each evaluation criterion, or in other words, the project would fall in the top scoring threshold for all evaluation criteria. There were no projects that received a perfect score and the results ranged with the highest scoring project receiving 83.88 points out of 100 possible points, meanwhile, the lowest scoring project receiving 13.97 points out of 100 possible points. The average score across all fifty-two projects is just under half the possible points at 48.92 points. Refer to **Table 12** for the list of all projects with their corresponding score and ranks.

STATEWIDE TOP 20 PROJECTS

ADOT advised the Project Team that the Agency would first like to evaluate the Top 20 projects as potential candidate projects to be considered for scoping and consideration for funding under the P2P process. Thus, the Project Team has highlighted the Statewide Top 20 ranked projects in **Table 13**.

The difference between the first ranked project and the twentieth ranked project was approximately 28 points. The average score within the Top 20 Projects is 64.27 points. The spread between ranks is typically between one and three points with the exception of the spread between first and second ranked projects, and the second and third ranked projects, which had a spread of 7.83 point and 5.38 points respectively. This reflects the fact that there are no outliers among the Statewide Top 20 Projects as they are closely grouped together even with a range of approximately 28 points between the first and twentieth ranked projects.

All seven ADOT Districts have at least one project in the Statewide Top 20 Projects and are fairly evenly distributed amongst the Districts, with the exception of the Southeast and Southwest Districts, which both

have five Top 20 Projects. The distribution of the Top 20 Projects amongst the ADOT Districts are as follows:

- Northeast District – 3 Top 20 Projects
- Northcentral District – 2 Top 20 Projects
- Northwest District – 2 Top 20 Projects
- Central District – 2 Top 20 Projects
- Southeast District – 5 Top 20 Projects
- Southcentral District – 1 Top 20 Project
- Southwest District – 5 Top 20 Projects

Table 12: Statewide Project Ranking Summary

Project Information					Top 20 Project	
District	Project ID	Route	MP	Issue	Sum	Rank
NED	NED - A	US 191	389.3	Area floods regularly and completely fills drainage.	59.67	15.5
NED	NED - B	US 160	420	Erosion threatening roadway.	44.96	29.5
NED	NED - C	US 160	380.7-363.6	PA for pipe erosion.	41.21	38
NED	NED - D	SR 264	447.3	Flooding issues of a local school track and field.	33.11	44
NED	NED - E	SR 73	313	Slope erosion.	27.13	50
NED	NED - F	US 180	415.6-415.7	Stormwater erosion and roadway scour issues.	54.09	21
NED	NED - G	US 160	373.3, 396	Severe deposition of material after each storm.	45.67	28
NED	NED - H	US191	472	Significant down-cutting in ditch.	13.97	51.5
NED	NED - I	SR 264	417+/-	Severe erosion in cut ditches.	13.97	51.5
NED	NED - J	I-40	287 EB	Slow lane and onramp shoulders wash out.	58.42	17
NED	NED - K	SR 377	8,13,24	During large rain storms the water overtops the road requiring a traffic detour.	59.67	15.5
NCD	NCD - B	US 89	506.3 & 507.3 (Tanner Wash)	Tanner Wash getting closer to US 89, potential for highway failure.	42.96	36
NCD	NCD - C	US 89A	556	Wash on the north side of US 89A at MP 556 is within 5-feet of highway.	38.96	40
NCD	NCD - D	SR 98	299	Pipes are 15 to 20-feet below grade at inlet causing highway to act as dam.	27.38	49
NCD	NCD - E	SR 87	239.5 (Hog Wash)	Private citizen dumps construction material upstream clogging culvert and causing sediment build up.	32.40	46
NCD	NCD - F	US 160	322-325 (Tuba City)	Flowing water and mud/debris overtops roadway.	65.05	9
NCD	NCD - G	US 160	356	Pipe issues results in culvert plugged with sediment and flows overtop roadway.	65.63	8
NWD	NWD - A	I-40	144.0 WB	Flows from breach in berm of nearby drainage basin causing erosion and sedimentation of north slope and box culverts, resulting in roadway overtopping.	67.67	5
NWD	NWD - B	SR 95	165.3 - 165.4 SB/NB	The roadway is being compromised from the clogging of two culverts and overtopping of flows.	44.96	29.5
NWD	NWD - C	US 93	157.6 SB, Cotton Wood Canyon	There is no support for slope except the strength of rock underlying fill and overhanging the scoured section.	53.96	22
NWD	NWD - D	I-17	237, SE corner of NB Birdge over Moore's Gulch	Scour occurring along the abutment embankment of the corner of the bridge.	55.96	20
CD	CD - A	SR 347	SR 238 to GRIC Boundary	Erosion, bank protection and/or curb and gutter needed.	65.68	7
CD	CD - B	I-10	163.9 - Queen Creek TI	Unstable slopes, extreme rutting and pole foundations exposed.	32.97	45
CD	CD - C	SR 238	24.00 – 44.24	Highway experiences frequent flooding at low points, often causing roadway closures.	62.17	11

Project Information					Top 20 Project	
District	Project ID	Route	MP	Issue	Sum	Rank
SED	SED - A	US 60	229.2 to 229.45	Stormwater will not drain at bridge and overtops roadway resulting in erosion.	76.05	2
SED	SED - B	SR 288	289	Stormwater overtops roadway resulting in erosion.	43.13	35
SED	SED - C	US 70	380.46	Channel sedimentation, overtopping by railroad.	68.09	4
SED	SED - D	SR 186	343-350 & 358, Wilcox to Kansas Settlement	Low water crossings.	56.75	19
SED	SED - E	SR 181	51, 55 & 60	Low water crossings.	41.79	37
SED	SED - F	SR 266	210, Gillespie Wash	Outlet scour protection.	31.31	47
SED	SED - G	US 60	262-263	Embankment flumes scoured out needing reconstruction.	46.21	27
SED	SED - H	SR 177	166.7	Significant erosion on outlet side of 48-inch CMP.	37.89	42
SED	SED - I	SR 288	265.3	Culvert restoration of undersized aged structure.	62.00	12
SED	SED - J	SR 88	220.2 - 229.2	Culvert restoration.	61.17	14
SCD	SCD - A	WB I-10-Frontage Rd. (Pomerene Rd & Ramsey Rd)	306 & 306.917 (Benson)	Sediment upstream and downstream needs to be removed. Standard maintenance equipment will not fit in the 5-foot high box culverts.	43.47	34
SCD	SCD - B	WB I-10	306.9 (Benson-San Pedro River Bridge)	Tanner Wash getting closer to US 89, potential for highway failure.	44.10	33
SCD	SCD - C	SB SR 80	306.079 (St David)	Wash on the north side of US 89A at MP 556 is within 5-feet of highway.	39.46	39
SCD	SCD - D	SR 386	306.079 4.37, 6.05, 6.58, 7.5, 11.1 - Three Points	Pipes are 15 to 20-feet below grade at inlet causing highway to act as dam.	35.07	43
SCD	SCD - E	EB/WB I-10, Marsh Station Rd., UPRR, Ramps	289.41-291.70 (Marsh Station)	Scour slopes eroding.	37.99	41
SCD	SCD - F	I-19	8.9-9.1 (Nogales)	Scour slopes eroding.	44.36	32
SCD	SCD - G	SR 286	24.957	Roadway overtopping and sever erosion on NB side due to undersized CMP pipes at wash location.	63.67	10
SCD	SCD - H	SR 286	10.6	Considerable shoulder erosion and lateral migration of channel on downstream side of SR 286 crossing	46.92	26
SWD	SWD - A	US 95 / SR 95	65.2, 66.5, 66.9, 69.3, 92.1, 92.5, 92.9, 110.8, & 112.5	Nine low water crossings causing pavement erosion.	70.67	3
SWD	SWD - B	US 95	54-56	Stormwater run-off eroding shoulders.	83.88	1
SWD	SWD - C	I-8	WB 117.95	Flowing through box culvert flooding residential property.	61.93	13
SWD	SWD - D	Pacific Ave	Ave 2E Underpass Structure #1381	Stormwater flows damaging residential subdivision.	57.35	18
SWD	SWD - E	US 95	Fortuna Wash	Stormwater flows erosion threatening flooding of adjacent properties.	48.38	24
SWD	SWD - F	US 95	69.83-70.04	Wash cutting into roadway during storm events causing pavement undermining.	67.59	6
SWD	SWD - G	I-10	31.5-32.5	Roadway overtopping occurs during large storm events.	30.57	48
SWD	SWD - H	SR 85	139.81-141.11	Water overtopping bank of the wash into the median eroding the roadway shoulders.	47.79	25
SWD	SWD - I	I-10	18.89	Flooding occurs in southeast quadrant of structure threatening mobile businesses.	51.54	23
SWD	SWD - J	I-10	WB 95.8-97.5	Agricultural run-off compromising pavement section.	44.79	31

Table 13: Top 20 Ranked Projects

Project Information					Top 20 Project	
District	Project ID	Route	MP	Issue	Sum	Rank
SWD	SWD - B	US 95	54-56	Stormwater run-off eroding shoulders.	83.88	1
SED	SED - A	US 60	229.2 to 229.45	Stormwater will not drain at bridge and overtops roadway resulting in erosion.	76.05	2
SWD	SWD - A	US 95 / SR 95	65.2, 66.5, 66.9, 69.3, 92.1, 92.5, 92.9, 110.8, & 112.5	Nine low water crossings causing pavement erosion.	70.67	3
SED	SED - C	US 70	380.46	Channel sedimentation, overtopping by railroad.	68.09	4
NWD	NWD - A	I-40	144.0 WB	Flows from breach in berm of nearby drainage basin causing erosion and sedimentation of north slope and box culverts, resulting in roadway overtopping.	67.67	5
SWD	SWD - F	US 95	69.83-70.04	Wash cutting into roadway during storm events causing pavement undermining.	67.59	6
CD	CD - A	SR 347	SR 238 to GRIC Boundary	Erosion, bank protection and/or curb and gutter needed.	65.68	7
NCD	NCD - G	US 160	356	Pipe issues results in culvert plugged with sediment and flows overtop roadway.	65.63	8
NCD	NCD - F	US 160	322-325 (Tuba City)	Flowing water and mud/debris overtops roadway.	65.05	9
SCD	SCD - G	SR 286	24.957	Roadway overtopping and sever erosion on NB side due to undersized CMP pipes at wash location.	63.67	10
CD	CD - C	SR 238	24.00 – 44.24	Highway experiences frequent flooding at low points, often causing roadway closures.	62.17	11
SED	SED - I	SR 288	265.3	Culvert restoration of undersized aged structure.	62.00	12
SWD	SWD - C	I-8	WB 117.95	Flowing through box culvert flooding residential property.	61.93	13
SED	SED - J	SR 88	220.2 - 229.2	Culvert restoration.	61.17	14
NED	NED - A	US 191	389.3	Area floods regularly and completely fills drainage.	59.67	15.5
NED	NED - K	SR 377	8,13,24	During large rain storms the water overtops the road requiring a traffic detour.	59.67	15.5
NED	NED - J	I-40	287 EB	Slow lane and onramp shoulders wash out.	58.42	17
SWD	SWD - D	Pacific Ave	Ave 2E Underpass Structure #1381	Stormwater flows damaging residential subdivision.	57.35	18
SED	SED - D	SR 186	343-350 & 358, Wilcox to Kansas Settlement	Low water crossings.	56.75	19
NWD	NWD - D	I-17	237, SE corner of NB Birdge over Moore's Gulch	Scour occurring along the abutment embankment of the corner of the bridge.	55.96	20

B. SUMMARY OF FINDINGS AND TRENDS IN THE STATEWIDE TOP 20 PROJECT RESULTS

The results captured in the Statewide Top 20 Projects reflect a direct application of the criteria and assigned weights that were established through the District survey results/feedback. Typically, the projects that each District ranked as their own high priority were often also ranked higher in this statewide analysis and the overall results reflect a consistent and equitable application of the evaluation criteria across all statewide project types.

This scoring trend is directly related to the fact that these projects (like all the Statewide Top 20 ranked projects) scored high in the four (4) highest weighted evaluation criteria. Of the 12 criteria, the top four (4) weighted criteria contain 55% of the total possible points, yielding greater emphasis on these four criteria. These top four criteria are; #1 - "Existing frequency in which stormwater causes roadway closures and/or restrictions" (16.71 points), #2 – "Project would eliminate the negative impact to the structural integrity of existing ADOT assets in the ROW" (15.71 points), #3 – "Project eliminates or reduces flooding or property damage of adjacent property" (13.21 points), and #4 – "Project is identified by the ADOT District as a priority" (9.25 points).

There are a couple of Districts however where a few projects that were ranked lower by the District, actually ended up ranking higher on a statewide level. These include the Northeast District, Project's J and K and the Northcentral District Project's F and G. In these instances, not only did these projects score high in the top four criteria, but they also received a higher score due to the fact that they also received points for being located along an ADOT corridor of significance (Criteria #6), have a higher percentage of freight traffic (T-factor, Criteria #7) and that these projects can be completed within the existing ADOT ROW (Criteria #10).

C. DISTRICT BY DISTRICT RESULTS REVIEW/SUMMARY

The following sections include the overall score of each project with some basic project information. Please refer to **Appendix A** for detailed results of the SWSWECS PPM for each District

D. NORTHEAST DISTRICT (NED) RESULTS

The Northeast District submitted 11 projects for consideration. Three of them made it into the Statewide Top 20 Projects list while one of the District's projects fell just outside of the Top 20 ranking at 21st with 54.09 points.

The three projects that scored in the Top 20 Projects and the 21st ranked project score higher than the other remaining seven projects within the District because they either score in the top scoring threshold for all or some combination of the following evaluation criteria:

- *Criterion 1: Project eliminates or reduces flooding or property damage of adjacent property*;
- *Criterion 2: The stormwater issue(s) cause roadway closures and/or restrictions*.; and
- *Criterion 8: Project would eliminate the negative impact to the structural integrity of existing ADOT assets in the ROW*.

As previously noted, these three evaluation criteria significantly influence the results as these evaluation criteria represent the three highest weights of 13.21 points, 16.71 points, and 15.71 points.

However, another interesting observation about the results of the Northeast District projects is related to *Criterion 9: Project is identified by the ADOT District as a priority.* The District's highest priority project (NED – A) was one of their highest scoring projects, while on the other hand, their two lowest priority projects (NED-I and NED-K) were also one of their top scoring projects. This is because *Criterion 9: Project is identified by the ADOT District as a priority* has a much lower weight of 9.25 points – although the fourth highest weight – the Criterion does not have as much of an influence on the overall score as the top three evaluation criteria previously discussed.

Table 14 on the following page includes a summarized list of the Northeast District projects and their corresponding results from the ADOT SWSWECS PPM, while **Appendix A** has the detailed breakdown for all evaluation criteria.

Table 14: Northeast District Results

Project Information					Top 20 Project	
District	Project ID	Route	MP	Issue	Sum	Rank
NED	NED - A	US 191	389.3	Area floods regularly and completely fills drainage.	59.67	15.5
NED	NED - B	US 160	420	Erosion threatening roadway.	44.96	29.5
NED	NED - C	US 160	380.7-363.6	PA for pipe erosion.	41.21	38
NED	NED - D	SR 264	447.3	Flooding issues of a local school track and field.	33.11	44
NED	NED - E	SR 73	313	Slope erosion.	27.13	50
NED	NED - F	US 180	415.6-415.7	Stormwater erosion and roadway scour issues.	54.09	21
NED	NED - G	US 160	373.3, 396	Severe deposition of material after each storm.	45.67	28
NED	NED - H	US191	472	Significant down-cutting in ditch.	13.97	51.5
NED	NED - I	SR 264	417+/-	Severe erosion in cut ditches.	13.97	51.5
NED	NED - J	I-40	287 EB	Slow lane and onramp shoulders wash out.	58.42	17
NED	NED - K	SR 377	8,13,24	During large rain storms the water overtops the road requiring a traffic detour.	59.67	15.5

NORTHCENTRAL DISTRICT (NCD) RESULTS

The Northcentral District submitted six total projects and two of them scored in the Statewide Top 20 Projects. The District's top scoring projects were NCD – F and NCD – G scoring less than a point different between the two at 65.05 points and 65.63 points respectively.

Similar to the results for the Northeast District, the Northcentral District's top priority projects did not score as high, while their two lowest priority projects (NCD – F and NCD – G) scored the highest. The

reasoning for this is because NCD – F and NCD – G were the only two projects to score well in two of the top three weighted criterion, which include:

- *Criterion 1: Project eliminates or reduces flooding or property damage of adjacent property*; and
- *Criterion 2: The stormwater issue(s) cause roadway closures and/or restrictions*.

These two criteria have a weight of 13.21 points and 16.71 points, separating these two projects from the other four projects by nearly 30 total points, which is evident in the results. Refer to **Table 15** on the following page for a summarized list of the Northcentral District projects and their corresponding results from the ADOT SWSWECS PPM, while **Appendix A** has the detailed breakdown for all evaluation criteria.

Table 15: Northcentral District Results

Project Information					Top 20 Project	
District	Project ID	Route	MP	Issue	Sum	Rank
NCD	NCD - B	US 89	506.3 & 507.3 (Tanner Wash)	Tanner Wash getting closer to US 89, potential for highway failure.	42.96	36
NCD	NCD - C	US 89A	556	Wash on the north side of US 89A at MP 556 is within 5-feet of highway.	38.96	40
NCD	NCD - D	SR 98	299	Pipes are 15 to 20-feet below grade at inlet causing highway to act as dam.	27.38	49
NCD	NCD - E	SR 87	239.5 (Hog Wash)	Private citizen dumps construction material upstream clogging culvert and causing sediment build up.	32.40	46
NCD	NCD - F	US 160	322-325 (Tuba City)	Flowing water and mud/debris overtops roadway.	65.05	9
NCD	NCD - G	US 160	356	Pipe issues results in culvert plugged with sediment and flows overtop roadway.	65.63	8

NORTHWEST DISTRICT (NWD) RESULTS

The Northwest District submitted four total projects for consideration, with two of the projects scoring in the Statewide Top 20 Projects. The two projects are NWD – A ranking fifth and NWD – D ranking 20th scoring 67.67 points and 55.96 points respectively. The Northwest District also had one project (NWD – C) just fall out of the Top 20 Projects ranking 22nd and scoring only two points lower than NWD – D at 53.96 points.

Similar to Northcentral Districts top scoring projects, Northwest District's top scoring project NWD – A scored significantly higher than the rest of the District's projects because it's the only project that scored in two of the top three weighted criterion, which include:

- *Criterion 1: Project eliminates or reduces flooding or property damage of adjacent property*; and
- *Criterion 2: The stormwater issue(s) cause roadway closures and/or restrictions*.

These two criteria have a weight of 13.21 points and 16.71 points, significantly increasing the score of NWD – A compared to the other three projects. Another noteworthy observation is that NWD – D scored high in all other evaluation criteria to propel its ranking into the Statewide Top 20 Projects. Refer to **Table 16** on the following page for a summarized list of the Northwest District projects and their corresponding results from the ADOT SWSWECS PPM, while **Appendix A** has the detailed breakdown for all evaluation criteria.

Table 16: Northwest District Results

Project Information					Top 20 Project	
District	Project ID	Route	MP	Issue	Sum	Rank
NWD	*NWD - A*	*I-40*	*144.0 WB*	*Flows from breach in berm of nearby drainage basin causing erosion and sedimentation of north slope and box culverts, resulting in roadway overtopping.*	**67.67**	**5**
NWD	*NWD - B*	*SR 95*	*165.3 - 165.4 SB/NB*	*The roadway is being compromised from the clogging of two culverts and overtopping of flows.*	**44.96**	**29.5**
NWD	*NWD - C*	*US 93*	*157.6 SB, Cotton Wood Canyon*	*There is no support for slope except the strength of rock underlying fill and overhanging the scoured section.*	**53.96**	**22**
NWD	*NWD - D*	*I-17*	*237, SE corner of NB Birdge over Moore's Gulch*	*Scour occurring along the abutment embankment of the corner of the bridge.*	**55.96**	**20**

CENTRAL DISTRICT (CD) RESULTS

The Central District submitted the fewest number of projects compared to the other ADOT Districts, but two of the three submitted projects scored in the Statewide Top 20 Projects scoring very high at 65.68 points and 62.17 points respectively.

These two projects ranked in the Statewide Top 20 Projects largely because these projects scored well in all of the top three weighted criteria, which include:

- *Criterion 1: Project eliminates or reduces flooding or property damage of adjacent property*;
- *Criterion 2: The stormwater issue(s) cause roadway closures and/or restrictions*.; and
- *Criterion 8: Project would eliminate the negative impact to the structural integrity of existing ADOT assets in the ROW*.

These three criteria have a weight of 13.21 points, 16.71 points, and 15.71 points significantly increasing their score among the other projects submitted. These two top scoring projects also both scored high in the Implementation Complexity category as they are both located with ADOT right-of-way and have the potential to leverage financial partnership.

Refer to **Table 17** on the following page for a summarized list of the Central District projects and their corresponding results from the ADOT SWSWECS PPM, while **Appendix A** has the detailed breakdown for all evaluation criteria.

Table 17: Central District Results

Project Information					Top 20 Project	
District	Project ID	Route	MP	Issue	Sum	Rank
CD	*CD - A*	*SR 347*	*SR 238 to GRIC Boundary*	*Erosion, bank protection and/or curb and gutter needed.*	**65.68**	**7**
CD	*CD - B*	*I-10*	*163.9 - Queen Creek TI*	*Unstable slopes, extreme rutting and pole foundations exposed.*	**32.97**	**45**
CD	*CD - C*	*SR 238*	*24.00 – 44.24*	*Highway experiences frequent flooding at low points, often causing roadway closures.*	**62.17**	**11**

SOUTHEAST DISTRICT (SED) RESULTS

The Southeast District submitted 10 total projects for consideration, with five of them making it into the Statewide Top 20 Projects. In fact, two of their projects scored the second and fourth highest scores across all other projects at 76.05 points and 68.09 points respectively. All the Southeast District's projects that ranked in the Statewide Top 20 Projects scored well in all three of the top three weighted criteria, which include:

- *Criterion 1: Project eliminates or reduces flooding or property damage of adjacent property*;
- *Criterion 2: The stormwater issue(s) cause roadway closures and/or restrictions*.; and
- *Criterion 8: Project would eliminate the negative impact to the structural integrity of existing ADOT assets in the ROW*.

These three criteria have a weight of 13.21 points, 16.71 points, and 15.71 points significantly increasing their score among the other projects submitted.

Another noteworthy observation is that all 10 of the projects submitted by the Southeast District are located and can be implemented completely within ADOT right-of-way reducing the complexity of implementation. Also, all 10 projects are all located in close proximity to Jurisdictional Water of the US yielding higher scores among all District projects as compared to some projects considered from other ADOT Districts.

Please refer to **Table 18** on the following page for a summarized list of the Southeast District projects and their corresponding results from the ADOT SWSWECS PPM, while **Appendix A** has the detailed breakdown for all evaluation criteria.

Table 18: Southeast District Results

Project Information					Top 20 Project	
District	Project ID	Route	MP	Issue	Sum	Rank
SED	SED - A	US 60	229.2 to 229.45	Stormwater will not drain at bridge and overtops roadway resulting in erosion.	76.05	2
SED	SED - B	SR 288	289	Stormwater overtops roadway resulting in erosion.	43.13	35
SED	SED - C	US 70	380.46	Channel sedimentation, overtopping by railroad.	68.09	4
SED	SED - D	SR 186	343-350 & 358, Wilcox to Kansas Settlement	Low water crossings.	56.75	19
SED	SED - E	SR 181	51, 55 & 60	Low water crossings.	41.79	37
SED	SED - F	SR 266	210, Gillespie Wash	Outlet scour protection.	31.31	47
SED	SED - G	US 60	262-263	Embankment flumes scoured out needing reconstruction.	46.21	27
SED	SED - H	SR 177	166.7	Significant erosion on outlet side of 48-inch CMP.	37.89	42
SED	SED - I	SR 288	265.3	Culvert restoration of undersized aged structure.	62.00	12
SED	SED - J	SR 88	220.2 - 229.2	Culvert restoration.	61.17	14

SOUTHCENTRAL DISTRICT (SCD) RESULTS

The Southcentral District submitted eight total projects with one of them scoring in the Statewide Top 20 Projects. Southcentral District's top scoring project scored significantly higher than the rest of the District's projects because it's the only project that scored in two of the top three weighted criterion, which include:

- *Criterion 2: The stormwater issue(s) cause roadway closures and/or restrictions*.; and
- *Criterion 8: Project would eliminate the negative impact to the structural integrity of existing ADOT assets in the ROW*.

These two criteria are weighted 16.71 points and 15.71 points respectively, significantly increasing the score of project SCD – G compared to the other seven projects. The other reason why SCD – G performed well is due to the fact that this project is identified as the District's second priority project and it located within close proximity to the Jurisdictional Water of the US, giving the project an additional 16 points compared to some of the other projects.

Refer to **Table 19** on the following page for a summarized list of the Southcentral District projects and their corresponding results from the ADOT SWSWECS PPM, while **Appendix A** has the detailed breakdown for all evaluation criteria.

Table 19: Southcentral District Results

Project Information					Top 20 Project	
District	Project ID	Route	MP	Issue	Sum	Rank
SCD	SCD - A	WB I-10-Frontage Rd. (Pomerene Rd & Ramsey Rd)	306 & 306.917 (Benson)	Sediment upstream and downstream needs to be removed. Standard maintenance equipment will not fit in the 5-foot high box culverts.	43.47	34
SCD	SCD - B	WB I-10	306.9 (Benson-San Pedro River Bridge)	Tanner Wash getting closer to US 89, potential for highway failure.	44.10	33
SCD	SCD - C	SB SR 80	306.079 (St David)	Wash on the north side of US 89A at MP 556 is within 5-feet of highway.	39.46	39
SCD	SCD - D	SR 386	306.079 4.37, 6.05, 6.58, 7.5, 11.1 - Three Points	Pipes are 15 to 20-feet below grade at inlet causing highway to act as dam.	35.07	43
SCD	SCD - E	EB/WB I-10, Marsh Station Rd., UPRR, Ramps	289.41-291.70 (Marsh Station)	Scour slopes eroding.	37.99	41
SCD	SCD - F	I-19	8.9-9.1 (Nogales)	Scour slopes eroding.	44.36	32
SCD	SCD - G	SR 286	24.957	Roadway overtopping and sever erosion on NB side due to undersized CMP pipes at wash location.	63.67	10
SCD	SCD - H	SR 286	10.6	Considerable shoulder erosion and lateral migration of channel on downstream side of SR 286 crossing	46.92	26

SOUTHWEST DISTRICT (SWD) RESULTS

The Southwest District submitted ten total projects and five of them scored in the Statewide Top 20 Statewide Projects. The Southwest District has the #1 and #3 overall ranked statewide projects at 83.88 points and 70.67 points respectively. Project (SWD -B) is the #1 ranked project statewide and scored high in all evaluation criteria while the District's second highest scoring project scored well in two of the three highest weighted evaluation criteria which is the main reason for the 13 point difference between the two highly ranked projects.

Refer to **Table 20** on the following page for a summarized list of the Southwest District projects and their corresponding results from the ADOT SWSWECS PPM, while **Appendix A** has the detailed breakdown for all evaluation criteria.

Table 20: Southwest District Results

Project Information					Top 20 Project	
District	Project ID	Route	MP	Issue	Sum	Rank
SWD	SWD - A	US 95 / SR 95	65.2, 66.5, 66.9, 69.3, 92.1, 92.5, 92.9, 110.8, & 112.5	Nine low water crossings causing pavement erosion.	70.67	3
SWD	SWD - B	US 95	54-56	Stormwater run-off eroding shoulders.	83.88	1
SWD	SWD - C	I-8	WB 117.95	Flowing through box culvert flooding residential property.	61.93	13
SWD	SWD - D	Pacific Ave	Ave 2E Underpass Structure #1381	Stormwater flows damaging residential subdivision.	57.35	18
SWD	SWD - E	US 95	Fortuna Wash	Stormwater flows erosion threatening flooding of adjacent properties.	48.38	24
SWD	SWD - F	US 95	69.83-70.04	Wash cutting into roadway during storm events causing pavement undermining.	67.59	6
SWD	SWD - G	I-10	31.5-32.5	Roadway overtopping occurs during large storm events.	30.57	48
SWD	SWD - H	SR 85	139.81-141.11	Water overtopping bank of the wash into the median eroding the roadway shoulders.	47.79	25
SWD	SWD - I	I-10	18.89	Flooding occurs in southeast quadrant of structure threatening mobile businesses.	51.54	23
SWD	SWD - J	I-10	WB 95.8-97.5	Agricultural run-off compromising pavement section.	44.79	31

VI. SCOPING ELEMENTS MEMOS

Per Task 5 of the project scope of work, the Consultant team prepared a series of "scoping elements memos" for the top 20 statewide stormwater projects. Each project scoping elements memo represents a planning level evaluation, a conceptual mitigation design recommendation, and a preliminary cost estimate. Drawing from the more extensive ADOT Scoping Letter process, the scoping elements memos recognize that project scope limitations such as site visits for each project are not practical. Thus, the scoping elements memos incorporate many components of the ADOT Scoping Letter process but are adjusted to fit this study process and budget limitations by utilizing the best available past and current aerial photography, site photos, and anecdotal feedback from the TAC. It is noted here that a Scoping Letter process is recommended for all of the top 20 statewide stormwater projects that may proceed to construction. The complete scoping elements memos for each of the top 20 statewide stormwater projects are provided in **Appendix B**.

VII. SWSWECS PPM IMPLEMENTATION GUIDANCE

This section provides an overview of the Excel-based tool used to construct the SWSWECS PPM, as well as implementation guidance on how to properly score a project and update the SWSWECS PPM when ADOT will conduct this process is future years moving forward after the completion of this project.

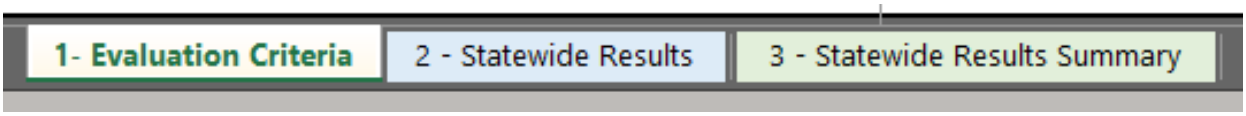
A. UNDERSTANDING THE INTERFACE OF THE SWSWECS PPM

The SWSWECS PPM excel file contains the three following tabs:

1. Evaluation Criteria
2. Statewide Results
3. Statewide Results Summary

Each tab has a specific function and role within the PPM. To access each worksheet, click the corresponding tab at the bottom of the screen as shown in **Figure 234** below:

Figure 234: SWSWECS PPM Tabs



The following three subsections will describe the functionality and purpose of each tab within the SWSWECS PPM.

TAB 1 - EVALUATION CRITERIA

The Evaluation Criteria tab (1 – Evaluation Criteria) showcases the SWSWECS PPM Evaluation Criteria described in ***Section IV*** – *Development of The Prioritization Model* of this report. This tab also includes the results from the TAC Evaluation Criteria Weighting Survey. The results of the TAC Evaluation Criteria Survey are highlighted in column J though column R with the Average Weight denoted in column S. The average value from the TAC survey is then used as the Weight for each Evaluation Criteria (column G). Refer to **Figure 235** on the following two pages for a visual representation of the Evaluation Criteria Tab.

If the weighting of the evaluation criteria would like to be updated/modified by ADOT in the future to reflect a shift in preferences or priorities, the results of the TAC Evaluation Criteria Weighting Survey can be changed to calculate a new weight for each of the Evaluation Criteria. Please note that this corresponding change would need to also be reflected in the following Tab.

Figure 235: SWSWECS PPM Tab 1 - Evaluation Criteria

Revised Evaluation Criteria - March 2020

Category		Criteria	Scoring Thresholds	Score	Weight (TBD by TAC Survey)
Protect Public Health/Safety of Adjacent Property	1	Project eliminates or reduces flooding or property damage of adjacent property.	Yes	Positive Impact	13.21
			No	Neutral Impact	
	2	The stormwater issue(s) cause roadway closures and/or restrictions.	Yes	Positive Impact	16.71
			No	Neutral Impact	
Environmental Benefits/ Regulatory Mandates	3	Existing condition is located in proximity to Jurisdictional Water of the US (WOTUS).	1 mile or less	Positive Impact	6.75
			More than 1 mile	Neutral Impact	
	4	Existing condition is located in proximity to Impaired and/or Outstanding Arizona Waters.	¼ mile or less	Positive Impact	7.13
			More than ¼ mile	Neutral Impact	
	5	Project location has a TMDL already in place.	Yes	Positive Impact	5.25
			No	Neutral Impact	
Economic/ Operational/ Asset Management Benefits	6	Is the project location located on an ADOT corridor of strategic significance as defined by a completed Corridor Profile Study?	Yes	Positive Impact	6.00
			No	Neutral Impact	
	7	Percentage of freight flow movement (T-Factor) reported on the ADOT corridor? *	T-Factor > 15%	Positive Impact (ex:+3)	5.25
			T-Factor 10%-15%	Positive Impact (ex: +2)	
			T-Factor 5 - 10%	Positive Impact (ex: +1)	
			T-Factor <5%	Neutral Impact (ex. +0)	
	8	Impact to the structural integrity of existing ADOT assets in the ROW.	Roadway,	3/3 = Positive Impact (ex: +3)	15.71
			Side Slopes, and	2/3 = Positive Impact (ex: +2)	
			Conveyance channels, catch basin or similar	1/3 = Positive Impact (ex. +1)	
			None	0/3 = Neutral Impact (ex. +0)	
	9	Project is identified by the ADOT District as a priority.	Priority 1-3	Positive Impact (ex:+3)	9.25
			Priority 4-6	Positive Impact (ex: +2)	
			Priority 7+	Neutral Impact (ex. +0)	
Implementation Complexity	10	Project can be completed entirely within the existing ADOT ROW.	Yes	Positive Impact	6.25
			No	Neutral Impact	
	11	Project is located within ADOT ROW or an easement upon public lands.	ADOT Right-of-Way	Positive Impact	4.75
			Public Easement	Neutral Impact	
	12	Opportunity to leverage financial partner participation.	Yes	Positive Impact	3.75
			No	Neutral Impact	
				TOTAL VALUE	100.00

Notes:
*Corresponds to ADOT P2P Modernization technical evaluation criteria

ADOT SWSWECS TAC
Evaluation Criteria Weighting Results

Northcentral District	Northeast District	Northwest District	Central District	Southcentral District	Southeast District	Southwest District	ADOT Environmental	ADOT MPD	Average Score
20.67	13.67	0	8.67	14.33	13.33	13.33	8.33	13.333	13.21
17.67	15.67	0	10.67	11.33	13.33	13.33	33.33	18.333	16.71
4	2	0	6	8	6	8	10	10	6.75
6	3	0	6	7	5	10	10	10	7.13
5	1	0	6	6	7	7	5	5	5.25
8	7	0	8	9	8	5	0	3	6.00
7	5	0	9	4	7	5	0	5	5.25
13.67	19.67	0.00	12.67	14.33	13.33	8.33	33.33	10.33	15.71
12	13	0	10	10	9	10	0	10	9.25
2	7	0	8	7	8	10	0	8	6.25
1	9	0	8	4	6	5	0	5	4.75
3	4	0	7	5	4	5	0	2	3.75
100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

TAB 2 - STATEWIDE RESULTS

The Statewide Results tab (2 – Statewide Results) is the element of the SWSWECS PPM that contains the most information as the scores of each project are calculated within this tab. Depending on a project's result for any given evaluation criteria, that project receives a score based on the scoring methodology described in ***Section IV*** – *Development of The Prioritization Model* of this report. The scores for each Evaluation Criteria are summed together to calculate a final score used in ranking the projects. Refer to **Figure 236** on the following two pages for a visual representation of the Statewide Results tab.

Information describing the location and general nature of each individual project is included in column A through column F (on the left). The projects are categorized by district in ascending order based on the Project ID. For example, NED – A, NED – B, NED – C, etc. The Evaluation Criteria are listed at the top of the page in columns G through column AD, and the tab is set up to allow the Evaluation Criteria to remain visible as you scroll down the entire list of the projects. The result and the score (see *Section IIIB – Score vs. Result* of this report for the difference between the two) of a project for each Evaluation Criteria are listed together. Depending on the result of a project for a given Evaluation Criteria, that project would receive the full weighted points, partial weighted points, or no points for that Evaluation Criteria. More detail on how to arrive at the score of each Evaluation Criteria is provided in the following *Section B – Workflow to Complete Scoring of the SWSWECS PPM Evaluation Criteria.*

The final score for each project with the corresponding rank are listed in column AF and column AG. The Top 20 Projects (highest scoring) are highlighted in green utilizing the conditional formatting tool within Excel.

Figure 236: SWSWECS PPM Tab 2 - Statewide Results

Scoring Methodology: Positive Impact - Full Weighted Points; Positive Impact Partial Weighted Point (as needed); Neutral Impact - No Points

Criteria:
1. Project eliminates or reduces flooding or property damage of adjacent property.
2. The stormwater issue(s) cause roadway closures and/or restrictions.
3. Existing condition is located in proximity to Jurisdictional Waters of the US (WOTUS).
4. Existing condition is located in proximity to impaired and/or Outstanding Arizona Waters.
5. Project location has a TMDL already in place.
6. Project located on an ADOT corridor of strategic significance as defined by a completed Corridor Profile Study
7. Percentage of freight flow movements (T-Factor) reported on the ADOT corridor? *
8. Project would eliminate the negative impacts the structural integrity of existing ADOT assets in the ROW.
9. Project is identified by the ADOT District as a priority.
10. Project can be completed entirely within the existing ADOT ROW.
11. Project is located within ADOT ROW or an easement upon public lands.
12. Opportunity to leverage financial partner participation.

#1 Scoring Methodology: Positive Impact - Full Weighted Points; Positive Impact Partial Weighted Point (as needed); Neutral Impact - No Points

District	Project ID	Route	MP	Issue	Project Type	[Unlabelled]	*	1 Result	1 Score	2 Result	2 Score	3 Result	3 Score	4 Result	4 Score	5 Result	5 Score	6 Result	6 Score	7 Result	7 Score	8 Result	8 Score	9 Result	9 Score	10 Result	10 Score	11 Result	11 Score	12 Result	12 Score	Sum	Rank
NED	NED - A	US 191	389.3	Area floods regularly and completely fills drainage.	Construction	N	0	Y	14.71	0.264	[illegible]	<.25 mi, [illegible]	0	N	0	Y	6	[illegible]	5.25	Roadway Drainage Conveyance	15.71	2	[illegible]	N	0	Easement	3	No/Unknown	0			59.67	15.5
NED	NED - B	US 160	420	Erosion threatening roadway.	Construction	N	0	N	0	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	Y	6	10.4	[illegible]	Roadway	15.71	[illegible]	[illegible]	N	0	Easement	3	Army Corp of Engineers-permitting	3.75			44.96	29.5
NED	NED - C	US 160	380.7-363.6	RA for pipe erosion.	Construction	N	0	N	0	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	Y	6	[illegible]	[illegible]	Roadway [illegible]	[illegible]	[illegible]	[illegible]	N	0	Easement	3	No/Unknown	0			41.21	38
NED	NED - D	SR 264	447.3	Flooding issues of a local school track and field.	Construction	Y	[illegible]	N	0	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	N	0	[illegible]	[illegible]	Drainage Conveyance	[illegible]	[illegible]	[illegible]	N	0	Easement	3	No/Unknown	0			38.11	44
NED	NED - E	SR 73	313	Slope erosion.	Construction	N	0	N	0	[illegible]	0	<.25 mi, [illegible]	0	N	0	N	0	[illegible]	[illegible]	Roadway [illegible] Drainage Conveyance	[illegible]	[illegible]	[illegible]	N	0	Easement	3	No/Unknown	0			27.13	50
NED	NED - F	US 180	415.6-415.7	Stormwater erosion and roadway scour issues.	Construction	N	0	Y	[illegible]	[illegible]	[illegible]	<.25 mi, [illegible]	0	Y	[illegible]	N	0	15.2	[illegible]	Roadway Drainage Conveyance	[illegible]	[illegible]	[illegible]	N	0	Easement	3	No/Unknown	0			54.09	21
NED	NED - G	US 160	373.3, 396	Severe deposition of material after each storm.	Construction	N	0	Y	[illegible]	[illegible]	0	<.25 mi, [illegible]	0	N	0	Y	6	[illegible]	[illegible]	Roadway [illegible] conveyance	[illegible]	[illegible]	[illegible]	N	0	Easement	3	Black Mesa & Lake Powell Railroad	[illegible]			45.67	28
NED	NED - H	US191	472	Significant down-cutting in ditch.	Construction	N	0	N	0	[illegible]	0	<.5 mi, [illegible]	0	N	0	N	0	[illegible]	[illegible]	Sideslope	[illegible]	[illegible]	[illegible]	N	0	Easement	3	No/Unknown	0			13.97	51.5
NED	NED - I	SR 264	417+/-	Severe erosion in cut ditches.	Construction	N	0	N	0	[illegible]	0	<.25 mi, [illegible]	0	N	0	N	0	[illegible]	[illegible]	Sideslope	[illegible]	[illegible]	[illegible]	N	0	Easement	3	No/Unknown	0			13.97	51.5
NED	NED - J	I-40	287 EB	Slow lane and onramp shoulders wash out.	Construction	Navajo County City of Holbrook	0	Y	[illegible]	[illegible]	[illegible]	<.5 mi, [illegible]	0	N	0	Y	[illegible]	[illegible]	[illegible]	Roadway Drainage Conveyance	[illegible]	[illegible]	[illegible]	Y	[illegible]	ROW	[illegible]	City of Holbrook	[illegible]			58.42	17
NED	NED - K	SR 377	8,13,24	During large rain storms the water overtops the road requiring a traffic	Construction	N	0	Y	[illegible]	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	Y	[illegible]	[illegible]	[illegible]	Roadway Drainage Conveyance	[illegible]	[illegible]	[illegible]	Y	[illegible]	ROW	[illegible]	No/Unknown	0			59.67	15.5
NCD	NCD - B	US 89	506.3 & 507.3 (Tanner Wash)	Tanner Wash getting closer to US 89, potential for highway failure.	Construction	N	0	N	0	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	Y	[illegible]	[illegible]	[illegible]	Roadway Sideslope	[illegible]	[illegible]	[illegible]	N	0	Easement	3	No/Unknown	0			42.86	36
NCD	NCD - C	US 89A	556	Wash on the north side of US 89A at MP 556 is within 5-feet of highway.	Construction	N	0	N	0	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	N	0	[illegible]	[illegible]	Roadway Sideslope	[illegible]	[illegible]	[illegible]	N	0	Easement	3	[illegible]	3.75			38.96	40
NCD	NCD - D	SR 98	299	Pipes are 15 to 20-feet below grade at inlet causing highway to act as dam.	Construction	N	0	N	0	[illegible]	0	<.5 mi, [illegible]	0	N	0	N	0	[illegible]	[illegible]	Roadway Sideslope	[illegible]	[illegible]	[illegible]	N	0	Easement	3	[illegible] Water Treatment Plant [illegible]	3.75			27.38	49
NCD	NCD - E	SR 87	239.5 (Hog Wash)	Private citizen dumps construction material upstream clogging culvert and causing sediment build up	Construction	N	0	N	0	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	Y	[illegible]	[illegible]	[illegible]	Drainage Conveyance	[illegible]	[illegible]	[illegible]	N	0	ROW	[illegible]	No/Unknown	0			32.40	46
NCD	NCD - F	US 160	322-325 (Tuba City)	Flowing water and mud/debris overtops roadway.	Construction	Y	[illegible]	Y	[illegible]	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	Y	[illegible]	[illegible]	[illegible]	Roadway	[illegible]	[illegible]	[illegible]	N	0	Easement	3	[illegible]	[illegible]			65.05	9
NCD	NCD - G	US 160	356	Pipe issues results in culvert plugged with sediment and flows overtop roadway.	Construction	Y	[illegible]	Y	[illegible]	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	Y	[illegible]	[illegible]	[illegible]	Roadway	[illegible]	[illegible]	[illegible]	N	0	Easement	3	Black Mesa & Lake Powell Railroad	[illegible]			65.63	8
NWD	NWD - A	I-40	144.0 WB	Existing - Sediment clogging box culvert causing flows to overtop the roadway resulting in roadway closures and lane restrictions. Proposed – Flows from breach in berm of nearby drainage basin causing erosion and sedimentation of north slope and box culverts, resulting in roadway overtopping.	Construction	N	0	Y	[illegible]	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	Y	[illegible]	[illegible]	[illegible]	Roadway Sideslope	[illegible]	[illegible]	[illegible]	Y	[illegible]	ROW	[illegible]	[illegible]	[illegible]			67.07	5
NWD	NWD - B	SR 95	165.3 - 165.4 SB/NB	The roadway is being compromised from the clogging of two culverts and overtopping of flows.	Construction	N	0	N	0	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	Y	[illegible]	[illegible]	[illegible]	Roadway [illegible]	[illegible]	[illegible]	[illegible]	N	0	Easement	3	[illegible]	[illegible]			44.96	29.5
NWD	NWD - C	US 93	157.6 SB, Cotton Wood Canyon	There is no support for slope except the strength of rock underlying fill and overhanging the scoured section.	Construction	N	0	N	0	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	Y	[illegible]	[illegible]	[illegible]	Roadway Sideslope	[illegible]	[illegible]	[illegible]	Y	[illegible]	ROW	[illegible]	No	0			53.98	22
NWD	NWD - D	I-17	237, SE corner of NB Bridge over Moore's	Scour occurring along the abutment embankment of the corner of the	Construction	N	0	N	0	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	Y	[illegible]	[illegible]	[illegible]	Roadway [illegible]	[illegible]	[illegible]	[illegible]	N	[illegible]	ROW	[illegible]	[illegible]	[illegible]			55.96	20
CD	CD - A	SR 347	SR 238 to GRIC Boundary	Erosion, bank protection and/or curb and gutter needed.	Construction	N	0	Y	[illegible]	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	Y	[illegible]	[illegible]	[illegible]	Sideslope	[illegible]	[illegible]	[illegible]	Y	[illegible]	ROW	[illegible]	City of Maricopa GRIC	[illegible]			65.68	7
CD	CD - B	I-10	163.9 Queen Creek TI	Unstable slopes, extreme rutting and pole foundations exposed.	Construction	N	0	N	0	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	Y	[illegible]	[illegible]	[illegible]	Sideslope	[illegible]	[illegible]	[illegible]	N	0	Easement	[illegible]	[illegible]	[illegible]			32.97	45
CD	CD - C	SR 238	24.00 – 44.24	Highway experiences frequent flooding at low points, often causing roadway closures.	Construction	N	0	Y	[illegible]	[illegible]	[illegible]	<.25 mi, [illegible]	0	N	0	N	0	[illegible]	[illegible]	Roadway	[illegible]	[illegible]	[illegible]	N	0	ROW	[illegible]	UPRR, City of Maricopa, Maricopa County, Pinal County, GRIC, Ak-Chin Indian Community	[illegible]			62.17	11

Scoring Methodology
Positive Impact - Full Weighted Points
Positive Impact Partial Weighted Point (as needed)
Neutral Impact - No Points

Statewide Results

Top 20 Project

#1 Scoring Methodology
Positive Impact - Full Weighted Points
Positive Impact Partial Weighted Point (as needed)
Neutral Impact - No Points

						Protect Public Health/Safety of Adjacent				Environmental Benefits/ Regulatory Mandates						Economic/ Operational/ Asset Management Benefits						Implementation Complexity							
						1		2		3		4		5		6		7		8		9		10		11		12			
						Project eliminates or reduces flooding or property damage of adjacent property.		The stormwater issue(s) cause roadway closures and/or restrictions..		Existing condition is located in proximity to Jurisdictional Water of the US (WOTUS).		Existing condition is located in proximity to Impaired and/or Outstanding Arizona Waters.		Project location has a TMDL already in place.		Is the project location located on an ADOT corridor of strategic significance as defined by a completed Corridor Profile Study?		Percentage of freight flow movement (T-Factor) reported on the ADOT corridor? *		Project would eliminate the negative impact to the structural integrity of existing ADOT assets in the ROW.		Project is identified by the ADOT District as a priority.		Project can be completed entirely within the existing ADOT ROW.		Project is located within ADOT ROW or an easement upon public lands.		Opportunity to leverage financial partner participation.			
Project Information						Result	Score	Result	Score	Result	Score	Result	Score	Result	Score	Result	Score	Result	Score	Result	Score	Result	Score	Result	Score	Result	Score	Result	Score	Sum	Rank
District	Project ID	Route	MP	Issue	Project Type																								
SED	SED - A	US 60	229.2 to 229.45	Stormwater will not drain at bridge and overtops roadway resulting in erosion.	Construction	N	0	Y	16.71	0.031165	6.75	<.25 mi, 0.031165	7.13	No	0	Y	6	14	3.50	Roadway Side slopes	15.71	1	9.25	Yes	6.25	ROW	4.75	No	0	76.05	2
SED	SED - B	SR 288	289	Stormwater overtops roadway resulting in erosion.	Construction	N	0	N	0	0.259539	6.75	>.25 mi, 15.219602	0	No	0	N	0	12	3.50	Roadway Side slopes	15.71	5	6.17	Yes	6.25	ROW	4.75	No	0	43.13	35
SED	SED - C	US 70	380.46	Channel sedimentation, overtopping by railroad.	Construction	Y	13.21	Y	16.71	0.037141	6.75	>.25 mi, 0.453506	0	Yes	5.25	N	0	16	5.25	None	0.00	4	6.17	Yes	6.25	ROW	4.75	Eastern AZ RR	3.75	68.09	4
SED	SED - D	SR 186	343-350 & 358, Wilcox to Kansas Settlement	Low water crossings.	Construction	N	0	Y	16.71	0.69661	6.75	>.25 mi, 41.288873 ; >.25 mi, 45.927402	0	No	0	N	0	14.3	3.50	Roadway Side slopes	15.71	8	3.08	Yes	6.25	ROW	4.75	No	0	56.75	19
SED	SED - E	SR 181	51, 55 & 60	Low water crossings.	Construction	N	0	N	0	0.004621	6.75	>.25 mi, 42.049197	0	No	0	N	0	22.9	5.25	Roadway Side slopes	15.71	9	3.08	Yes	6.25	ROW	4.75	No	0	41.79	37
SED	SED - F	SR 266	210, Gillespie Wash	Outlet scour protection.	Construction	N	0	N	0	0.007368	6.75	>.25 mi, 24.430095	0	No	0	N	0	N/A	0.00	Sideslopes	10.47	10	3.08	Yes	6.25	ROW	4.75	No	0	31.31	47
SED	SED - G	US 60	262-263	Embankment flumes scoured out needing reconstruction.	Construction	N	0	N	0	0.572764	6.75	>.25 mi, 14.292765	0	No	0	N	0	11.5	3.50	Roadway Side slopes Drainage Conveyence	15.71	3	9.25	Yes	6.25	ROW	4.75	No	0	46.21	27
SED	SED - H	SR 177	166.7	Significant erosion on outlet side of 48-inch CMP.	Construction	N	0	N	0	0.030864	6.75	>.25 mi, 0.925003	0	No	0	N	0	14.2	3.50	Sideslopes	10.47	6	6.17	Yes	6.25	ROW	4.75	No	0	37.89	42
SED	SED - I	SR 288	265.3	Culvert restoration of undersized aged structure.	Construction	N	0	Y	16.71	0.055784	6.75	>.25 mi, 0.363126	0	Yes	5.25	N	0	12	3.50	Roadway Sideslopes	15.71	7	3.08	Yes	6.25	ROW	4.75	No	0	62.00	12
SED	SED - J	SR 88	220.2 - 229.2	Culvert restoration.	Construction	N	0	Y	16.71	0.010198	6.75	>.25 mi, 1.103794	0	No	0	N	0	6.3	1.75	Roadway Side slopes Drainage Conveyence	15.71	2	9.25	Yes	6.25	ROW	4.75	No	0	61.17	14
SCD	SCD - A	WB I-10-Frontage Rd. (Pomerene Rd & Ramsey Rd)	306 & 306.917 (Benson)	Sediment upstream and downstream needs to be removed. Standard maintenance equipment will not fit in the 5-foot high box culverts.	Construction	N	0	N	0	0.021647	6.75	>.25 mi, 4.355522	0	No	0	Y	6	N/A	0.00	Drainage conveyence	10.47	4	9.25	Yes	6.25	ROW	4.75	No	0	43.47	34
SCD	SCD - B	WB I-10	306.9 (Benson-San Pedro River Bridge)	Tanner Wash getting closer to US 89, potential for highway failure.	Construction	N	0	N	0	0.007757	6.75	>.25 mi, 4.712769	0	No	0	Y	6	36.6	5.25	Sideslope	10.47	5	4.63	Yes	6.25	ROW	4.75	No	0	44.10	33
SCD	SCD - C	SB SR 80	306.079 (St David)	Wash on the north side of US 89A at MP 556 is within 5-feet of highway.	Construction	N	0	N	0	1.157216	0	>.25 mi, 1.814357	0	No	0	N	0	14.2	3.50	Sideslope	15.71	3	9.25	Yes	6.25	ROW	4.75	No	0	39.46	39
SCD	SCD - D	SR 386	306.079 4.37, 6.05, 6.58, 7.5, 11.1 - Three Points	Pipes are 15 to 20-feet below grade at inlet causing highway to act as dam.	Construction	N	0	Y	16.71	0.130068	6.75	>.25 mi, 36.775173	0	No	0	N	0	8.8	1.75	Roadway Sideslopes Drainage conveyence	5.24	7	4.63	No	0	Easement	0	No	0	35.07	43
SCD	SCD - E	EB/WB I-10, Marsh Station Rd., UPRR, Ramps	289.41-291.70 (Marsh Station)	Scour slopes eroding.	Construction	N	0.00	N	0.00	0.097126	6.75	>.25 mi, 17.635848	0.00	No	0.00	Y	6.00	30	5.25	Sideslopes	5.24	8	0.00	Yes	6.25	ROW	4.75	UPRR	3.75	37.99	41
SCD	SCD - F	I-19	8.9-9.1 (Nogales)	Scour slopes eroding.	Construction	N	0	N	0	0.508964	6.75	>.25 mi, 1.249597	0	No	0	Y	6	7.2	1.76	Sideslopes	10.47	6	4.63	Yes	6.25	ROW	4.75	Santa Cruz County	3.75	44.36	32
SCD	SCD - G	SR 286	24.957	Roadway overtopping and sever erosion on NB side due to undersized CMP pipes at wash location.	Construction	N	0	Yes	16.71	0.006316	6.75	22.299846	0	No	0	No	0	19.9	5.25	Roadway Sideslopes	15.71	2	9.25	Yes	6.25	Easement	0	ASLD	3.75	63.67	10
SCD	SCD - H	SR 286	10.6	Considerable shoulder erosion and lateral migration of channel on downstream side of SR 286 crossing	Construction	N	0	Y	16.71	1.192953	0	16.437124	0	No	0	No	0	19.6	5.25	Roadway Sideslopes Drainage Conveyance	15.71	1	9.25	No	0	Easement	0	No	0	46.92	26
SWD	SWD - A	US 95 / SR 95	65.2, 66.5, 66.9, 69.3, 92.1, 92.5, 92.9, 110.8, & 112.5	Nine low water crossings causing pavement erosion.	Construction	N	0	Y	16.71	0.406967	6.75	>.25 mi, 32.173704 ; >.25 mi, 34.333588 ; >.25 mi, 36.125354 ; >.25 mi, 54.383958 ; >.25 mi, 40.035849	0	No	0	Yes	6	22.3	5.25	Roadway Drainage Conveyence	15.71	1	9.25	Yes	6.25	ROW	4.75	No	0	70.67	3
SWD	SWD - B	US 95	54-56	Stormwater run-off eroding shoulders.	Construction	Y	13.21	Y	16.71	0.02165	6.75	>.25 mi, 24.002241	0	No	0	Yes	6	26.5	5.25	Roadway Sideslopes Drainage Conveyence	15.71	2	9.25	Yes	6.25	ROW	4.75	No	0	83.88	1
SWD	SWD - C	I-8	WB 117.95	Flowing through box culvert flooding residential property.	Construction	Y	13.21	N	0	0.449959	6.75	>.25 mi, 21.348218	0	No	0	Yes	6	26.8	5.25	Sideslopes	10.47	3	9.25	Yes	6.25	ROW	4.75	No	0	61.93	13
SWD	SWD - D	Pacific Ave	Ave 2E Underpass Structure #1381	Stormwater flows damaging residential subdivision.	Construction	Y	13.21	N	0	0.331041	6.75	>.25 mi, 2.82549	0	No	0	Yes	6	N/A	0.00	Sideslopes	10.47	4	6.17	Yes	6.25	ROW	4.75	City of Yuma	3.75	57.35	18
SWD	SWD - E	US 95	Fortuna Wash	Stormwater flows erosion threatening flooding of adjacent properties.	Construction	Y	13.21	N	0	0.027682	6.75	>.25 mi, 10.91026	0	No	0	Yes	6	22.9	5.25	None	0.00	5	6.17	Yes	6.25	ROW	4.75	No/ASLD	0	48.38	24
SWD	SWD - F	US 95	69.83-70.04	Wash cutting into roadway during storm events causing pavement undermining.	Construction	N	0	Y	16.71	0.062545	6.75	>.25 mi, 36.762624	0	No	0	Yes	6	26.5	5.25	Roadway Sideslopes	15.71	6	6.17	Yes	6.25	ROW	4.75	No	0	67.59	6
SWD	SWD - G	I-10	31.5-32.5	Roadway overtopping occurs during large storm events.	Construction	N	0	N	0	2.579191	0	>.25 mi, 41.247334	0	No	0	Yes	6	41.7	5.25	Drainage Conveyence	5.24	7	3.08	Yes	6.25	ROW	4.75	No	0	30.57	48
SWD	SWD - H	SR 85	139.81-141.11	Water overtopping bank of the wash into the median eroding the roadway shoulders.	Construction	N	0	N	0	0.016089	6.75	>.25 mi, 6.241138	0	No	0	Yes	6	23.5	5.25	Roadway Sideslopes	15.71	8	3.08	Yes	6.25	ROW	4.75	No	0	47.79	25
SWD	SWD -I	I-10	18.89	Flooding occurs in southeast quadrant of structure threatening mobile businesses.	Construction	N	0	N	0	0.131037	6.75	>.25 mi, 44.599253	0	No	0	Yes	6	44.8	5.25	Roadway Sideslopes	15.71	9	3.08	Yes	6.25	ROW	4.75	Town of Quartzite/ private property	3.75	51.54	23
SWD	SWD - J	I-10	WB 95.8-97.5	Agricultural run-off compromising pavement section.	Construction	N	0	N	0	1.311876	0	>.25 mi, 13.118574	0	No	0	Yes	6	34.6	5.25	Roadway Sideslopes	15.71	10	3.08	Yes	6.25	ROW	4.75	Adjacent property owner	3.75	44.79	31

TAB 3 – STATEWIDE RESULTS SUMMARY

The purpose of the Statewide Results Summary tab is to provide the final score for each of the projects in a summary fashion by pairing down the individual scores and results for each evaluation criterion. Similar to tab *2 – Statewide Results,* project location and brief descriptions for each individual project are found in columns B through column G. The projects are categorized by district in ascending order based on the Project ID. For example, NED – A, NED – B, NED – C, etc. Also, like tab *2 - Statewide Results,* the final score for each project with its corresponding rank are listed in column H and column I. The Statewide Top 20 Projects (highest scoring) are highlighted in green utilizing the conditional formatting tool within Excel. In the event of a tie score, as is the case with NED-A and NED K, both receiving a value of 59.67 for a tie in 15th place, each project is identified as being ranked "15.5" with the next project ranked as 17th. Refer to **Figure 237** across the next two pages for a visual representation of tab *3 – Statewide Results Summary*.

Figure 237: SWSWECS PPM Tab 3 - Statewide Results Summary

		Project Information					Top 20 Project Scoring Methodology Positive Impact - Full Weighted Points Positive Impact Partial Weighted Point (as needed) Neutral Impact - No Points	
	District	Project ID	Route	MP	Issue	Project Type	Sum	Rank
Northeast District	NED	NED - A	US 191	389.3	Area floods regularly and completely fills drainage.	Construction	59.67	15.5
	NED	NED - B	US 160	420	Erosion threatening roadway.	Construction	44.96	29.5
	NED	NED - C	US 160	380.7-363.6	PA for pipe erosion.	Construction	41.21	38
	NED	NED - D	SR 264	447.3	Flooding issues of a local school track and field.	Construction	33.11	44
	NED	NED - E	SR 73	313	Slope erosion.	Construction	27.13	50
	NED	NED - F	US 180	415.6-415.7	Stormwater erosion and roadway scour issues.	Construction	54.09	21
	NED	NED - G	US 160	373.3, 396	Severe deposition of material after each storm.	Construction	45.67	28
	NED	NED - H	US191	472	Significant down-cutting in ditch.	Construction	13.97	51.5
	NED	NED - I	SR 264	417+/-	Severe erosion in cut ditches.	Construction	13.97	51.5
	NED	NED - J	I-40	287 EB	Slow lane and onramp shoulders wash out.	Construction	58.42	17
	NED	NED - K	SR 377	8,13,24	During large rain storms the water overtops the road requiring a traffic detour.	Construction	59.67	15.5
Northcentral District	NCD	NCD - B	US 89	506.3 & 507.3 (Tanner Wash)	Tanner Wash getting closer to US 89, potential for highway failure.	Construction	42.96	36
	NCD	NCD - C	US 89A	556	Wash on the north side of US 89A at MP 556 is within 5-feet of highway.	Construction	38.96	40
	NCD	NCD - D	SR 98	299	Pipes are 15 to 20-feet below grade at inlet causing highway to act as dam.	Construction	27.38	49
	NCD	NCD - E	SR 87	239.5 (Hog Wash)	Private citizen dumps construction material upstream clogging culvert and causing sediment build up.	Construction	32.40	46
	NCD	NCD - F	US 160	322-325 (Tuba City)	Flowing water and mud/debris overtops roadway.	Construction	65.05	9
	NCD	NCD - G	US 160	356	Pipe issues results in culvert plugged with sediment and flows overtop roadway.	Construction	65.63	8
Northwest District	NWD	NWD - A	I-40	144.0 WB	Flows from breach in berm of nearby drainage basin causing erosion and sedimentation of north slope and box culverts, resulting in roadway overtopping.	Construction	67.67	5
	NWD	NWD - B	SR 95	165.3 - 165.4 SB/NB	The roadway is being compromised from the clogging of two culverts and overtopping of flows.	Construction	44.96	29.5
	NWD	NWD - C	US 93	157.6 SB, Cotton Wood Canyon	There is no support for slope except the strength of rock underlying fill and overhanging the scoured section.	Construction	53.96	22
	NWD	NWD - D	I-17	237, SE corner of NB Birdge over Moore's Gulch	Scour occurring along the abutment embankment of the corner of the bridge.	Construction	55.96	20
Central District	CD	CD - A	SR 347	SR 238 to GRIC Boundary	Erosion, bank protection and/or curb and gutter needed.	Construction	65.68	7
	CD	CD - B	I-10	163.9 - Queen Creek TI	Unstable slopes, extreme rutting and pole foundations exposed.	Construction	32.97	45
	CD	CD - C	SR 238	24.00 – 44.24	Highway experiences frequent flooding at low points, often causing roadway closures.	Construction	62.17	11

		Project Information					Top 20 Project Scoring Methodology Positive Impact - Full Weighted Points Positive Impact Partial Weighted Point (as needed) Neutral Impact - No Points	
	District	Project ID	Route	MP	Issue	Project Type	Sum	Rank
Southeast District	SED	SED - A	US 60	229.2 to 229.45	Stormwater will not drain at bridge and overtops roadway resulting in erosion.	Construction	76.05	2
	SED	SED - B	SR 288	289	Stormwater overtops roadway resulting in erosion.	Construction	43.13	35
	SED	SED - C	US 70	380.46	Channel sedimentation, overtopping by railroad.	Construction	68.09	4
	SED	SED - D	SR 186	343-350 & 358, Wilcox to Kansas Settlement	Low water crossings.	Construction	56.75	19
	SED	SED - E	SR 181	51, 55 & 60	Low water crossings.	Construction	41.79	37
	SED	SED - F	SR 266	210, Gillespie Wash	Outlet scour protection.	Construction	31.31	47
	SED	SED - G	US 60	262-263	Embankment flumes scoured out needing reconstruction.	Construction	46.21	27
	SED	SED - H	SR 177	166.7	Significant erosion on outlet side of 48-inch CMP.	Construction	37.89	42
	SED	SED - I	SR 288	265.3	Culvert restoration of undersized aged structure.	Construction	62.00	12
	SED	SED - J	SR 88	220.2 - 229.2	Culvert restoration.	Construction	61.17	14
Southcentral District	SCD	SCD - A	WB I-10-Frontage Rd. (Pomerene Rd & Ramsey Rd)	306 & 306.917 (Benson)	Sediment upstream and downstream needs to be removed. Standard maintenance equipment will not fit in the 5-foot high box culverts.	Construction	43.47	34
	SCD	SCD - B	WB I-10	306.9 (Benson-San Pedro River Bridge)	Tanner Wash getting closer to US 89, potential for highway failure.	Construction	44.10	33
	SCD	SCD - C	SB SR 80	306.079 (St David)	Wash on the north side of US 89A at MP 556 is within 5-feet of highway.	Construction	39.46	39
	SCD	SCD - D	SR 386	306.079 4.37, 6.05, 6.58, 7.5, 11.1 - Three Points	Pipes are 15 to 20-feet below grade at inlet causing highway to act as dam.	Construction	35.07	43
	SCD	SCD - E	EB/WB I-10, Marsh Station Rd., UPRR, Ramps	289.41-291.70 (Marsh Station)	Scour slopes eroding.	Construction	37.99	41
	SCD	SCD - F	I-19	8.9-9.1 (Nogales)	Scour slopes eroding.	Construction	44.36	32
	SCD	SCD - G	SR 286	24.957	Roadway overtopping and sever erosion on NB side due to undersized CMP pipes at wash location.	Construction	63.67	10
	SCD	SCD - H	SR 286	10.6	Considerable shoulder erosion and lateral migration of channel on downstream side of SR 286 crossing	Construction	46.92	26
Southwest District	SWD	SWD - A	US 95 / SR 95	65.2, 66.5, 66.9, 69.3, 92.1, 92.5, 92.9, 110.8, & 112.5	Nine low water crossings causing pavement erosion.	Construction	70.67	3
	SWD	SWD - B	US 95	54-56	Stormwater run-off eroding shoulders.	Construction	83.88	1
	SWD	SWD - C	I-8	WB 117.95	Flowing through box culvert flooding residential property.	Construction	61.93	13
	SWD	SWD - D	Pacific Ave	Ave 2E Underpass Structure #1381	Stormwater flows damaging residential subdivision.	Construction	57.35	18
	SWD	SWD - E	US 95	Fortuna Wash	Stormwater flows erosion threatening flooding of adjacent properties.	Construction	48.38	24
	SWD	SWD - F	US 95	69.83-70.04	Wash cutting into roadway during storm events causing pavement undermining.	Construction	67.59	6
	SWD	SWD - G	I-10	31.5-32.5	Roadway overtopping occurs during large storm events.	Construction	30.57	48
	SWD	SWD - H	SR 85	139.81-141.11	Water overtopping bank of the wash into the median eroding the roadway shoulders.	Construction	47.79	25
	SWD	SWD - I	I-10	18.89	Flooding occurs in southeast quadrant of structure threatening mobile businesses.	Construction	51.54	23
	SWD	SWD - J	I-10	WB 95.8-97.5	Agricultural run-off compromising pavement section.	Construction	44.79	31

B. WORKFLOW TO COMPLETE SCORING OF SWSWECS PPM EVALUATION CRITERIA

The purpose of this section is to provide future users of the SWSECS PPM a brief description of the process and workflow on how to arrive at the result and score (see ***Section IV*** – *Development of The Prioritization Model* of this report for the definitions and relationship between the two) for each Evaluation Criterion. In addition, noteworthy observations (if needed) about the weighting of this criteria and identified trends in scoring results/findings are included. The following subsections detail each of the 12 Evaluation Criteria.

CRITERION 1: PROJECT ELIMINATES OR REDUCES FLOODING/ PROPERTY DAMAGE OF ADJACENT PROPERTY

Criterion 1: Project eliminates or reduces flooding/property damage of adjacent property is one of the foundational criteria that reflects this project's main objectives. The result and score of this criterion are listed for each project in column G and column H.

As part of the part of *SWSWECS Working Paper #1*, phone interviews were conducted with representatives from each ADOT District to gather background information and descriptions of the issue/problem for each of the District-submitted stormwater/erosion control projects. The description of the stormwater/erosion control project or issue derived from the interviews was used to determine if property damage or flooding of adjacent property is alleviated from the potential mitigation.

Once mitigation of property damage or flooding of the adjacent property is determined, populate the result cell (column G) with either a "N" for no, property damage or flooding is not mitigated; or populate the result cell (column G) with "Y" for yes, property damage or flooding is mitigated as a result of the project. Refer to **Figure 238** below for an example of how *Criterion 1: Project eliminates or reduces flooding/property damage of adjacent property* is populated within the SWSWECS PPM.

Figure 238: Example of Criterion 1 - Project eliminates or reduces flooding/ property damage of adjacent property

A	B	C	D	E	F	G	H
				Scoring Methodology Positive Impact - Full Weighted Points Positive Impact Partial Weighted Point (as needed) Neutral Impact - No Points		**1** Project eliminates or reduces flooding or property damage of adjacent property.	
Project Information						**Result**	**Score**
District	**Project ID**	**Route**	**MP**	**Issue**	**Project Type**		
NED	*NED - A*	*US 191*	*389.3*	*Area floods regularly and completely fills drainage.*	*Construction*	N	0

Based on the Scoring Methodology (described in ***Section IV*** – *Development of The Prioritization Model*) and the fact that the result can only be one of two possible options - yes or no – there are only two possible scores a project can receive. If a project does not eliminate or reduce flooding/property damage to adjacent property, the project will receive a neutral impact and be awarded zero points. On the other hand, if a project does eliminate or reduce flooding/property damage to adjacent property, the project will receive a positive impact and be awarded the full weighted points – 13.21 points for this specific criterion. The score of the project in column H will automatically populate the full weighted value of the criterion (sourced from column G in tab *1 – Evaluation Criteria)* or zero points based on whether a "Y" or a "N" are inputted into the result cell (column G of tab *2 – Statewide Results*).

CRITERION 2: THE STORMWATER ISSUE(S) CAUSE ROADWAY CLOSURES AND/OR RESTRICTIONS

Criterion 2: The stormwater issue(s) cause roadway closures and/or restrictions is another one of the foundational criteria. The result and score of this criterion are listed for each project in column I and column J.

As part of the part of *SWSWECS Working Paper #1*, phone interviews were conducted with representatives from each ADOT District to gather background information about the submitted stormwater/erosion control projects and issues. The description of the stormwater/erosion control project or issue derived from the interviews was used to determine if roadway closures and/or restrictions occur as a byproduct of the submitted stormwater/erosion control issue.

Once roadway closures and/or restrictions occur as a byproduct of the stormwater/erosion control issue has been determined, populate the result cell (column I) with either a "N" for no, roadway closure/restrictions do not occur; or populate the result cell (column I) with "Y" for yes, roadway closure/restrictions do occur. Refer to **Figure 239** below for an example of how *Criterion 2: The stormwater issue(s) cause roadway closures and/or restrictions* is populated within the SWSWECS PPM.

Figure 239: Example of Criterion 2 - The stormwater issue(s) cause roadway closures and/or restrictions

A	B	C	D	E	F	I	J
				Scoring Methodology Positive Impact - Full Weighted Points Positive Impact Partial Weighted Point (as needed) Neutral Impact - No Points		**2** The stormwater issue(s) cause roadway closures and/or restrictions.	
Project Information						Result	Score
District	Project ID	Route	MP	Issue	Project Type		
NED	*NED - A*	*US 191*	*389.3*	*Area floods regularly and completely fills drainage.*	*Construction*	Y	16.71

Based on the Scoring Methodology (described in ***Section IV*** – *Development of The Prioritization Model*) and that the result can only be one of two possible options - yes or no – there are only two possible scores a project can receive. If a project does not cause roadway closures/restrictions, the project will receive a neutral impact and be awarded zero points. Conversely, if a project does cause roadway closures/restrictions, the project will receive a positive impact and be awarded the full weighted points – 16.71 points for this specific criterion. The score of the project in column J will automatically populate the full weighted value of the criterion (sourced from column G in tab *1 – Evaluation Criteria)* or zero points based on whether a "Y" or a "N" are inputted into the result cell (column J of tab *2 – Statewide Results*).

CRITERION 3: EXISTING CONDITION IS LOCATED IN PROXIMITY TO JURISDICTIONAL WATERS OF THE US (WOTUS)

Criterion 3: Existing condition is located in proximity to Jurisdictional Waters of the U.S. (WOTUS) is one of the criteria that will require the use of geographic software to measure the distance between a project location and Jurisdictional WOTUS. The result and the score of this criterion are listed in column K and column L.

This criterion evaluates whether a project is located within one mile of any Jurisdictional WOTUS or not. A user can either use ArcGIS software or Google Earth to measure between the two points. ArcGIS is

recommended since the WOTUS data is readily available from ADOT (and others). Once the distance between the project location and any jurisdictional WOTUS has been measured, input the distance (in miles) within the results cell (column K). Refer to **Figure 240** for a visual representation of how *Criterion 3: Existing condition is located in proximity to Jurisdictional WOTUS* is populated within the SWSWECS PPM.

Figure 240: Example of Criterion 3 - Existing condition is located in proximity to Jurisdictional Water of the US (WOTUS)

A	B	C	D	E	F	K	L
				Scoring Methodology Positive Impact - Full Weighted Points Positive Impact Partial Weighted Point (as needed) Neutral Impact - No Points		**3** Existing condition is located in proximity to Jurisdictional Water of the US (WOTUS).	
Project Information						**Result**	**Score**
District	**Project ID**	**Route**	**MP**	**Issue**	**Project Type**		
NED	*NED - A*	*US 191*	*389.3*	*Area floods regularly and completely fills drainage.*	*Construction*	0.068	6.75

Projects receive full weighted points – 6.75 points – if located within one mile of any Jurisdictional WOTUS, while projects located greater than one mile from any Jurisdictional WOTUS receive zero points. The score for a project in column L will automatically populate with the full weighted value (sourced from column G in tab *1 – Evaluation Criteria)* or zero points based on whether or not the value in the result cell is less than or equal to one mile or greater than one mile.

In the application of this criterion in future years by ADOT, it is recommended that ADOT annually assess the presence of any existing WOTUS in proximity to a proposed ADOT stormwater project as WOTUS designations may change based on new WOTUS determinations and/or rule decisions made by the Federal government and/or judicial processes.

CRITERION 4: EXISTING CONDITION IS LOCATED IN PROXIMITY TO IMPAIRED AND/OR OUTSTANDING ARIZONA WATERS

Criterion 4: Existing condition is located in proximity to Impaired and/or Outstanding Arizona Waters is another criterion that will require the use of geographic software to measure the distance between a project location and the location of any impaired and/or outstanding Arizona waters. The result and the score of this criterion are listed in column M and column N.

This criterion evaluates whether a project is located within a one-quarter mile radius of any impaired and/or outstanding Arizona waters or not. A user can either use ArcGIS software or Google Earth to measure the distance between the two points, although ArcGIS is recommended because recent data is readily available within ADOT. Once the distance between the project location and any jurisdictional WOTUS has been measured, input the distance in miles within the results cell (column K). Refer to **Figure 241** for a visual representation of how *Criterion 4: Existing condition is located in proximity to Impaired and/or Outstanding Arizona Waters* is populated within the SWSWECS PPM.

Figure 241: Example of Criterion 4 - Existing condition is located in proximity to Impaired and/or Outstanding Arizona Waters

A	B	C	D	E	F	M	N
				Scoring Methodology Positive Impact - Full Weighted Points Positive Impact Partial Weighted Point (as needed) Neutral Impact - No Points		**4** Existing condition is located in proximity to Impaired and/or Outstanding Arizona Waters.	
Project Information						Result	Score
District	Project ID	Route	MP	Issue	Project Type		
NED	*NED - A*	*US 191*	*389.3*	*Area floods regularly and completely fills drainage.*	*Construction*	>.25 mi, 32.716038	0

Projects receive full weighted points – 7.13 points – if located within a one-quarter mile radius impaired and/or outstanding Arizona waters, while projects located greater than one-quarter mile from radius impaired and/or outstanding Arizona waters receive zero points. The score for a project in column N will automatically populate with the full weighted value (sourced from column G in tab *1 – Evaluation Criteria)* or zero points based on whether or not the value in the result cell is less than or equal to one-quarter mile or greater than one-quarter mile.

In the application of this criterion in future years by ADOT, it is recommended that ADOT annually assess the presence of any existing *Impaired and/or Outstanding Arizona Waters* in proximity to a proposed ADOT stormwater project as such designations are subject to periodic change.

CRITERION 5: PROJECT LOCATION HAS A TMDL (TOTAL MAXIMUM DAILY LOAD) ALREADY IN PLACE

Criterion 5: Project location has a TMDL Already in Place is another criterion that will require the use geographic software to determine if a project location has a TMDL designation. This criterion evaluates whether a project location currently has a TMDL designation in place or not. The result and the score of this criterion are listed in column O and column P.

Once the TMDL designation has been determined, input "Y" in the result cell (column O) is there is a TMDL designation in place, or input a "N" in the result cell if there is not currently a TMDL designation in place at the project location. **Figure 242** provides a visual representation of how *Criterion 5: Project location has a TMDL Already in Place* is populated within the SWSWECS PPM.

Figure 242: Example of Criterion 5 - Project location has a TMDL Already in Place

A	B	C	D	E	F	O	P
				Scoring Methodology Positive Impact - Full Weighted Points Positive Impact Partial Weighted Point (as needed) Neutral Impact - No Points		**5** Project location has a TMDL already in place.	
Project Information						Result	Score
District	Project ID	Route	MP	Issue	Project Type		
NED	*NED - A*	*US 191*	*389.3*	*Area floods regularly and completely fills drainage.*	*Construction*	N	0

Projects receive full weighted points – 5.25 points – if there is a TMDL designation currently in place, while projects without a current TMDL designation receive zero points. The score for a project in column N will automatically populate with the full weighted value (sourced from column G in tab *1 – Evaluation Criteria)* or zero points based on whether or not the value in the result cell is a "Y" or a "N".

In the application of this criterion in future years by ADOT, it is recommended that ADOT annually assess the presence of any existing TMDLs in proximity to a proposed ADOT stormwater project as such designations are subject to periodic change. Consultant is providing ArcGIS file packages for existing TMDLs. Future users will want to reference http://azdeq.gov/watershed-plans-and-tmdls for the most up to date information.

CRITERION 6: PROJECT LOCATED ON AN ADOT CORRIDOR OF STRATEGIC SIGNIFICANCE AS DEFINED BY A COMPLETED CORRIDOR PROFILE STUDY

Criterion 6: Project located on an ADOT corridor of strategic significance as defined by a completed Corridor Profile Study is identifying the relative importance of the corridor through the connection with a previous and/or ongoing ADOT Corridor Profile Study. The result and the score of this criterion are listed in column Q and column R.

The user will need to refer to the ADOT Corridor Profile Study project website to determine whether a project is located within the limits of a corridor of strategic significance as defined by a completed Corridor Profile Study or not. At the time of publication, there were a total of 22 Corridor Profile Studies conducted across the state and the static map available on the project website was utilized to determine if a project was located on an ADOT corridor of strategic significance as defined by a completed Corridor Profile Studies. Refer to the Corridor Profile Study project website to determine ADOT's corridors of strategic significance as defined by a completed Corridor Profile Study.

Once a project location has been identified within or outside the limits of an ADOT corridors of strategic significance as defined by a completed Corridor Profile Study, input "Y" in the result cell (column Q) if the project is within the limits, or input a "N" in the result cell if the project is located outside the limits. **Figure 243** below shows how *Criterion 6: Project located on an ADOT corridor of strategic significance as defined by a completed Corridor Profile Study* is populated within the SWSWECS PPM.

Figure 243 - Example of Criterion 6: Project located on an ADOT corridor of strategic significance as defined by a completed Corridor Profile Study

A	B	C	D	E	F	Q	R
				Scoring Methodology Positive Impact - Full Weighted Points Positive Impact Partial Weighted Point (as needed) Neutral Impact - No Points		**6** Project located on an ADOT corridor of strategic significance as defined by a completed Corridor Profile Study	
Project Information						**Result**	**Score**
District	**Project ID**	**Route**	**MP**	**Issue**	**Project Type**		
NED	*NED - A*	*US 191*	*389.3*	*Area floods regularly and completely fills drainage.*	*Construction*	Y	6

Projects receive full weighted points – 6 points – if the project is located on an ADOT corridor of strategic significance as defined by a completed Corridor Profile Studies, while projects located outside of the limits receive zero points. The score for a project in column R will automatically populate with the full weighted value (sourced from column G in tab *1 – Evaluation Criteria)* or zero points based on whether or not the value in the result cell is a "Y" or a "N".

CRITERION 7: PERCENTAGE OF FREIGHT FLOW MOVEMENT (T-FACTOR) REPORTED ON THE ADOT CORRIDOR

Criterion 7: Percentage of freight flow movement (T-Factor) reported on the ADOT corridor is identifying the relative importance of the corridor with respect to the percentage of freight traffic in the project corridor. The result and the score of this criterion are listed in column S and column T.

The future user will need to collaborate with ADOT's Traffic Monitoring Group to obtain the most recent Annual Average Daily Traffic (AADT) publication to determine the percentage of freight traffic, which is known as the T-Factor. At the time of publication, ADOT's Traffic Monitoring Group provided the most recent available AADT data in Excel format to identify the T-Factor for any given corridor. Utilizing the sort function within Excel, determine the T-Factor on the corridor within the mile posts that match the project location.

Through consultant recommendation and buy-in from the TAC and the Project Team, four thresholds of a corridor T-Factors were identified to score projects. Projects located on a corridor with a T-Factor greater or equal to 15% receive the full weighted value; and projects located on a corridor with a T-Factor of 10% - 15% and 5% - 10% receive partial weighted points; and any project located on a corridor with a T-Factor less than or equal to 5% receive zero points. Once the T-Factor has been identified, populate the numerical value of the percentage in the result cell (column S). **Figure 244** highlights how *Criterion 7: Percentage of freight flow movement (T-Factor) reported on the ADOT corridor* is populated within the SWSWECS PPM.

Figure 244: Example of Criterion 7 - Percentage of freight flow movement (T-Factor) reported on the ADOT corridor

A	B	C	D	E	F	S	T
				Scoring Methodology Positive Impact - Full Weighted Points Positive Impact Partial Weighted Point (as needed) Neutral Impact - No Points		**7** Percentage of freight flow movement (T-Factor) reported on the ADOT corridor? *	
Project Information						Result	Score
District	Project ID	Route	MP	Issue	Project Type		
NED	*NED - A*	*US 191*	*389.3*	*Area floods regularly and completely fills drainage.*	*Construction*	21.3	5.25

As previously described, there are four possible scores a project can receive based on the Scoring Methodology (described in ***Section IV*** *– Development of The Prioritization Model*) and that the result can only be one of four possible options based on the four T-Factor thresholds. For instance, a project will receive the full weighted points – 5.25 points – if the project is located on a corridor with a T-Factor greater or equal to 15%. Projects located on a corridor with a T-Factor of 10% - 15% receive a partial weighted score of 3.50 points; while projects located on a corridor with a T-Factor between 5% - 10% receive an even smaller partial weighted value of 1.75 points. Any project located on a corridor with a T-Factor less than or equal to 5% receive zero points. The score of the project in column T will automatically populate the full weighted value, partial weighted value, or zero points (sourced from column G in tab *1 – Evaluation Criteria)* based on the T-Factor percentage inputted into the result cell.

CRITERION 8: IMPACT TO THE STRUCTURAL INTEGRITY OF EXISTING ADOT ASSETS IN THE RIGHT-OF-WAY

Criterion 8: Impact to the structural integrity of existing ADOT assets in the Right-of-Way (ROW) is another one of the foundational criteria. The result and score of this criterion are listed for each project in column U and column V.

As part of the part of *SWSWECS Working Paper #1*, phone interviews were conducted with representatives from each ADOT District to obtain information about the submitted stormwater/erosion control projects and issues. The description of the stormwater/erosion control project or issue is derived from the interviews is the source to determine if there is an impact to the structural integrity of existing ADOT assets in the ROW.

The three types of ADOT assets evaluated for impact to their structural integrity are the roadway, sideslopes, and conveyance channels, catch basin or similar structures. Through conversations with District representatives, consultant analysis, and TAC input, a determination of impacts to the structural integrity of roadways were determined to be the most significant, followed by impacts to the structural integrity of sideslopes, and then impacts to the structural integrity of conveyance channels, catch basin or similar structures. In other words, stormwater/erosion control issue that cause impacts to the roadway receive the full possible points; while if a project causes impacts to sideslopes or conveyance channels, catch basin or similar structures, the project would receive partial points. If there are no impacts to ADOT assets within the ROW the project would be awarded zero points.

Once impacts to the structural integrity of the three types ADOT assets within the ROW have been identified from the description of stormwater/erosion control issue, populate the result cell (column U) with the assets impacted. Input "Roadway" if the structural integrity of the roadway is impacted, input "Sideslopes" if the structural integrity of the sideslopes are impacted, and/or input "drainage conveyance" if the structural integrity of conveyance channels, catch basin or similar structures are impacted. Insert the asset with the highest points into the result cell (column U). Refer to **Figure 245** for an example of how *Criterion 8: Impact to the structural integrity of existing ADOT assets in the ROW* is populated within the SWSWECS PPM.

Figure 245: Example of Criterion 8 - Impact to the structural integrity of existing ADOT assets in the Right-of-Way

A	B	C	D	E	F	U	V
				Scoring Methodology Positive Impact - Full Weighted Points Positive Impact Partial Weighted Point (as needed) Neutral Impact - No Points		**8** Project would eliminate the negative impact to the structural integrity of existing ADOT assets in the ROW.	
Project Information						Result	Score
District	Project ID	Route	MP	Issue	Project Type		
NED	*NED - A*	*US 191*	*389.3*	*Area floods regularly and completely fills drainage.*	*Construction*	Roadway Drainage Conveyance	15.71

There are four possible scores a project can receive based on the Scoring Methodology (described in ***Section IV*** *– Development of The Prioritization Model*) and that the result can only be one of four possible options. A project will receive full weighted points – 15.71 points – if the project eliminates impacts to the structural integrity of the roadway; a project will receive partial weighted points – 10.47 points - if the

project eliminates impacts to the structural integrity of the sideslopes; a project will receive partial weighted points – 5.24 points - if the project eliminates impacts to the structural integrity of conveyance channels, catch basin or similar structures; or a project will receive zero points if a project would not eliminate impacts to the roadway, sideslopes, and/or conveyance channels, catch basin or similar structures.

The score of the project in column V will automatically populate the full weighted value, partial weighted value, or zero points (sourced from column G in tab *1 – Evaluation Criteria)* based on assets were inputted into column U as previously described.

CRITERION 9: PROJECT IS IDENTIFIED BY THE ADOT DISTRICT AS A PRIORITY

Criterion 9: Project is identified by the ADOT District as a priority is another one of the foundational criteria to help ensure that projects deemed a priority by the local ADOT District receive higher scores. The result and score of this criterion are listed for each project in column W and column X.

As part of the part of *SWSWECS Working Paper #1*, phone interviews were conducted with representatives from each ADOT District to obtain information about the submitted stormwater/erosion control projects and issues. The ADOT District representative was asked to rank their submitted stormwater/erosion control projects in order from most important to least important. Starting with the value one, the representative ranked their submitted projects in ascending order. These ranks identified by the ADOT District representative are used to calculate the result and the score of a project.

Three thresholds to score projects were selected through conversations with the TAC and the Project Team. The projects the Districts ranked as priority 1 – 3 receive the full weighted value, projects the Districts prioritized as 4 – 6 received a partial weighted value, and any projects prioritized at 7 or greater receive zero points.

Once the priority of the submitted stormwater/erosion control projects have been determined, populate the result cell (column W) accordingly with the numerical value of the District's prioritized rank (1 – 7+). Refer to **Figure 246** for an example of how *Criterion 9: Project is identified by the ADOT District as a priority* is populated within the SWSWECS PPM.

Figure 246: Example of Criterion 9 - Project is identified by the ADOT District as a priority

A	B	C	D	E	F	W	X
				Scoring Methodology Positive Impact - Full Weighted Points Positive Impact Partial Weighted Point (as needed) Neutral Impact - No Points		**9** Project is identified by the ADOT District as a priority.	
Project Information						Result	Score
District	Project ID	Route	MP	Issue	Project Type		
NED	*NED - A*	*US 191*	*389.3*	*Area floods regularly and completely fills drainage.*	*Construction*	2	9.25

There are three possible scores a project can receive based on the Scoring Methodology (described in ***Section IV*** *– Development of The Prioritization Model*) and that the result can only be one of three possible options based on the three thresholds previously described. A project will receive full weighted points – 9.25 points – if a District has ranked the project 1 -3, while projects ranked 4 -6 receive partial weighted points – 6.17 points. If a District has ranked the project at 7 or greater the project will receive zero points.

The score of the project in column X will automatically populate the full weighted value, partial weighted value, or zero points (sourced from column G in tab *1 – Evaluation Criteria)* based on the numerical value of the District's prioritized rank for that project inputted into column W as previously described.

CRITERION 10: PROJECT CAN BE COMPLETED ENTIRELY WITHIN THE EXISTING ADOT RIGHT-OF-WAY

Criterion 10: Project can be completed entirely within the existing ADOT ROW is a criterion that is calculated utilizing the project description and ADOT's ROW database. The result and score of this criterion are listed for each project in column Y and column Z.

As part of the part of *SWSWECS Working Paper #1*, phone interviews were conducted with representatives from each ADOT District to obtain information about the submitted stormwater/erosion control projects and issues. The description of the stormwater/erosion control project from the interview is used to determine if the entire mitigation project can be completed within the ADOT's ROW. Once the limits of the proposed stormwater/erosion control project have been identified, confirm that the project can be entirely completed within ADOT's ROW by using ADOT's Records Research or ADOT's ROW GIS data.

After determining whether or not a project can be completed entirely within ADOT's ROW, populate the result cell (column Y) with either a "N" for no, the project cannot be completed entirely within ADOT's ROW; or populate the result cell (column Y) with "Y" for yes, the project can be completed entirely within ADOT's ROW. Refer to **Figure 247** for an example of how *Criterion 10: Project can be completed entirely within the existing ADOT ROW* is populated within the SWSWECS PPM.

Figure 247: Example of Criterion 10 - Project can be completed entirely within the existing ADOT Right-of-Way

A	B	C	D	E	F	Y	Z
				Scoring Methodology Positive Impact - Full Weighted Points Positive Impact Partial Weighted Point (as needed) Neutral Impact - No Points		**10** Project can be completed entirely within the existing ADOT ROW.	
Project Information						Result	Score
District	Project ID	Route	MP	Issue	Project Type		
NED	*NED - A*	*US 191*	*389.3*	*Area floods regularly and completely fills drainage.*	*Construction*	N	0

Based on the Scoring Methodology (described in ***Section IV*** *– Development of The Prioritization Model*) and that the result can only be one of two possible options - yes or no – there are only two possible scores a project can receive. If a project cannot be completed entirely within ADOT's ROW, the project will receive a neutral impact and be awarded zero points. On the other hand, if a project can be completed entirely within ADOT's ROW, the project will receive a positive impact and be awarded the full weighted points – 6.25 points for this specific criterion. The score of the project in column Z will automatically populate the full weighted value of the criterion (sourced from column G in tab *1 – Evaluation Criteria)* or zero points based on whether a "Y" or a "N" are inputted into the result cell (column Z of tab *2 – Statewide Results*).

CRITERION 11: PROJECT IS LOCATED WITHIN ADOT ROW OR AN EASEMENT UPON PUBLIC LANDS

Criterion 11: Project is located within ADOT ROW or an easement upon public lands is one of the criteria that is calculated utilizing either geographic software or ADOT's ROW database. The result and score of this criterion are listed for each project in column AA and column AB.

As part of the part of *SWSWECS Working Paper #1*, phone interviews were conducted with representatives from each ADOT District to obtain information about the submitted stormwater/erosion control projects and issues. The exact location and a description of the stormwater/erosion control project or issue were provided by the Districts during the interviews. The District provided exact mileposts in which the stormwater/erosion control project or issue occur. After determining the extent of the stormwater/erosion control project and the exact location of the project, use ADOT's Records Research and/or ADOT's ROW GIS data to determine if the stormwater/erosion control project is located within ADOT's ROW or an easement.

Once the stormwater/erosion control project location has been identified in ADOT's ROW or an easement, simply input "ROW" in the result cell (column AA) if the project is located within ADOT's ROW, or input "easement" in the result cell (column AA) if the project is located within an easement. **Figure 248** provides an example of how *Criterion 11: Project is located within ADOT ROW or an easement upon public lands* is populated within the SWSWECS PPM.

Figure 248: Example of Criterion 11 - Project is located within ADOT ROW or an easement upon public lands

A	B	C	D	E	F	AA	AB
				Scoring Methodology Positive Impact - Full Weighted Points Positive Impact Partial Weighted Point (as needed) Neutral Impact - No Points		**11** Project is located within ADOT ROW or an easement upon public lands.	
Project Information						**Result**	**Score**
District	**Project ID**	**Route**	**MP**	**Issue**	**Project Type**		
NED	*NED - A*	*US 191*	*389.3*	*Area floods regularly and completely fills drainage.*	*Construction*	Easement	0

Based on the Scoring Methodology (described in ***Section IV*** – *Development of The Prioritization Model*) and that the result can only be one of two possible options – within ADOT's ROW or an easement – there are only two possible scores a project can receive. If a project is located within an easement, the project will receive a neutral impact and be awarded zero points. On the other hand, if a project is located within ADOT's ROW, the project will receive a positive impact and be awarded the full weighted points – 4.75 points for this specific criterion. The score of the project in column AB will automatically populate the full weighted value of the criterion (sourced from column G in tab *1 – Evaluation Criteria)* or zero points based on whether "easement" or a "ROW" are inputted into the result cell (column AA of tab *2 – Statewide Results*).

CRITERION 12: OPPORTUNITY TO LEVERAGE FINANCIAL PARTNER PARTICIPATION

Criterion 12: Opportunity to leverage financial partner participation is one of the criteria that will require the use of geographic software to identify adjacent land ownership to determine if there is a potential

opportunity to leverage financial partnership in the implementation of a project. The result and the score of this criterion are listed in column AC and column AD.

This criterion evaluates whether a project has the potential opportunity to partner with an adjacent property owner to complete the project or not. A user will require the use of ArcGIS software to determine if adjacent property owners could potentially have a vested interest in the construction of the project. Many of the property owners identified at potential partners included railroad operators, municipalities, various Indian Communities, Counties, and the federal entities such as the Bureau of Land Management and the Army Corps of Engineers. After inventorying adjacent property owners, determine if any of them could potentially have a vested interest in the project based on the project description.

Once any opportunity for potential financial partnership has been determined, populate the result cell (column AC) with name of the potential partner. If there is no likely potential financial partnership identified, populate the result cell (column AC) with "no/unknown". See **Figure 249** for a visual representation of how *Criterion 12: Opportunity to leverage financial partner participation* is populated within the SWSWECS PPM.

Figure 249: Example of Criterion 12 - Opportunity to leverage financial partner participation

A	B	C	D	E	F	AC	AD
				Scoring Methodology Positive Impact - Full Weighted Points Positive Impact Partial Weighted Point (as needed) Neutral Impact - No Points		**12** Opportunity to leverage financial partner participation.	
Project Information						Result	Score
District	Project ID	Route	MP	Issue	Project Type		
NED	*NED - A*	*US 191*	*389.3*	*Area floods regularly and completely fills drainage.*	*Construction*	No/Unknown	0

There are only two possible scores a project can receive based on the Scoring Methodology (described in ***Section IV*** *– Development of The Prioritization Model*) and that the result can only be one of two possible options. If there has not been any opportunity for potential finical partnership identified, the project will receive a neutral impact and be awarded zero points. On the other hand, if any opportunity for potential financial partnership has been determined, the project will receive a positive impact and be awarded the full weighted points – 3.75 points for this specific criterion. The score of the project in column AD will automatically populate the full weighted value of the criterion (sourced from column G in tab *1 – Evaluation Criteria)* or zero points based on whether "no/unknown" has been inputted into the result cell (column AC of tab *2 – Statewide Results*).