



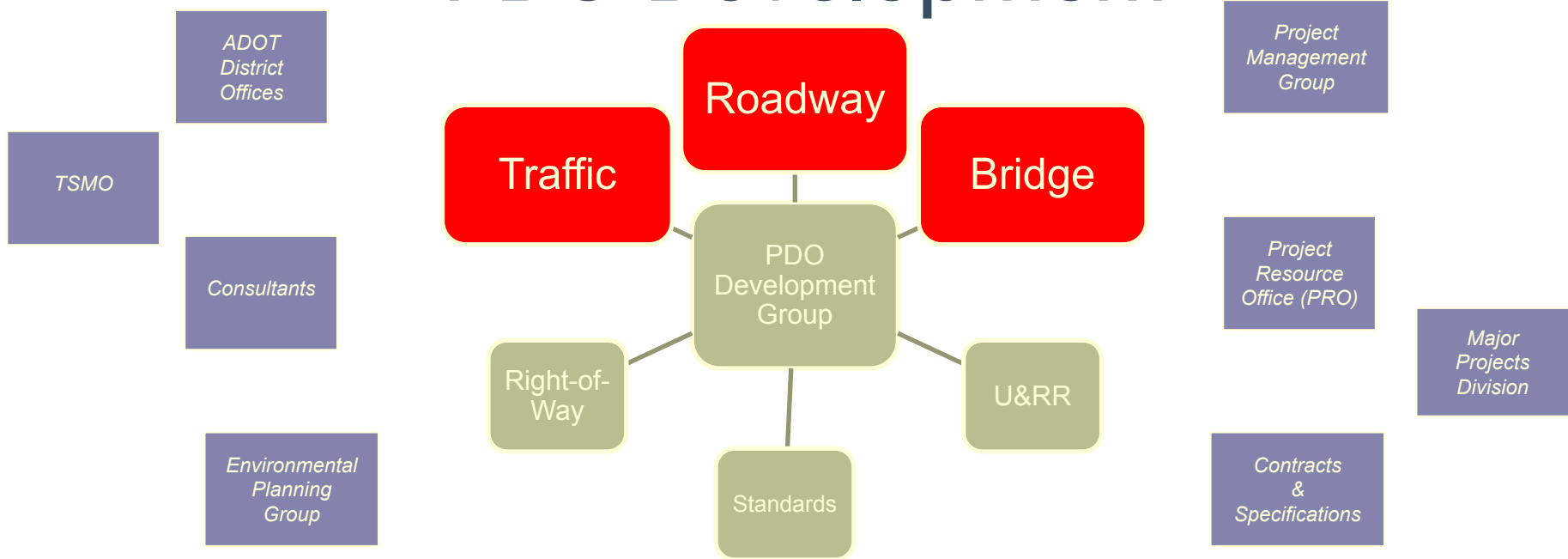
Project Delivery Academy

**Design & Delivery Technical Groups
Project Delivery and Operations Division**

***Roadway, Bridge & Traffic
Design Groups***

Where Do We Fit In?

PDO Development



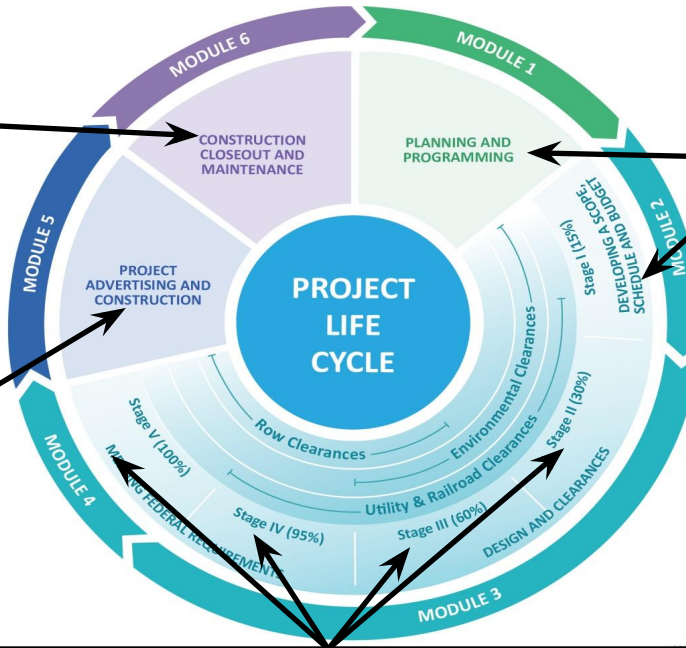
Where Do We Fit In?

Roadway, Bridge & Traffic Design Teams Assist in Addressing Construction Questions and Providing Technical Guidance for Construction Related Matters

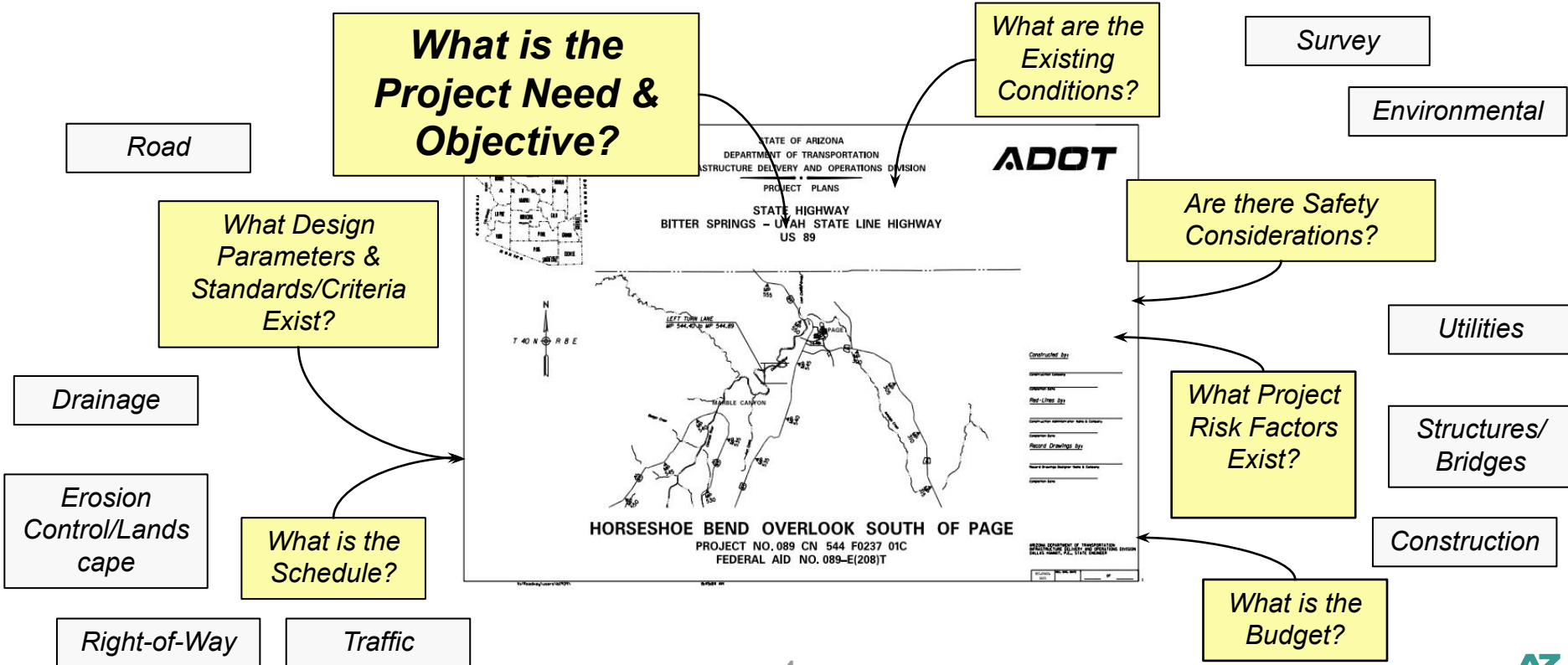
Roadway, Bridge & Traffic Design Teams Provide Critical Input into Development of a Project's Scope, Schedule and Budget

Roadway, Bridge & Traffic Design Teams Assist in the Preparation of Bid Documents and Address Bid RFIs

Roadway, Bridge & Traffic Design Teams Coordinate to Deliver Technical Designs and Construction Documentation



Design - What is Needed & Where do we start??



ADOT's Roadway Group

Project Delivery and Operations Division

*Designing, Supporting &
Delivering
ADOT's Roadway Projects*

*Hiren Shah, PE
Roadway Engineering Group
October 8, 2025*

What Do We Do?

We Design Roads



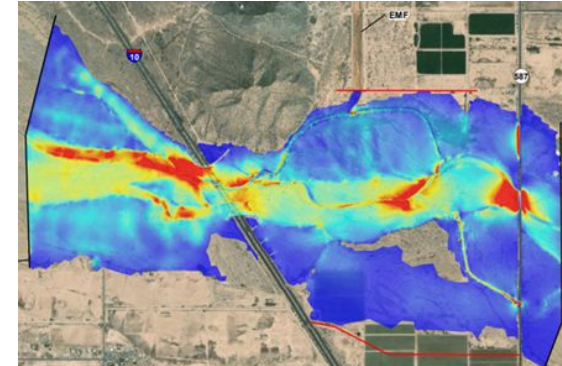
*We Design Landscape Features
to Restore & Maintain our ROW*



*We Design Key Features to Improve
Performance and Safety*



*We Study & Design Drainage
Features Impacting Our Roads*



*We Survey What We Have, What We Need,
& What We Build*

Who Are We?



Where & How Do We Fit In?

Address Construction Questions &
Providing Technical Guidance on
Construction Related Matters

Assist in Preparation of Bid
Documents & Addressing RFIs

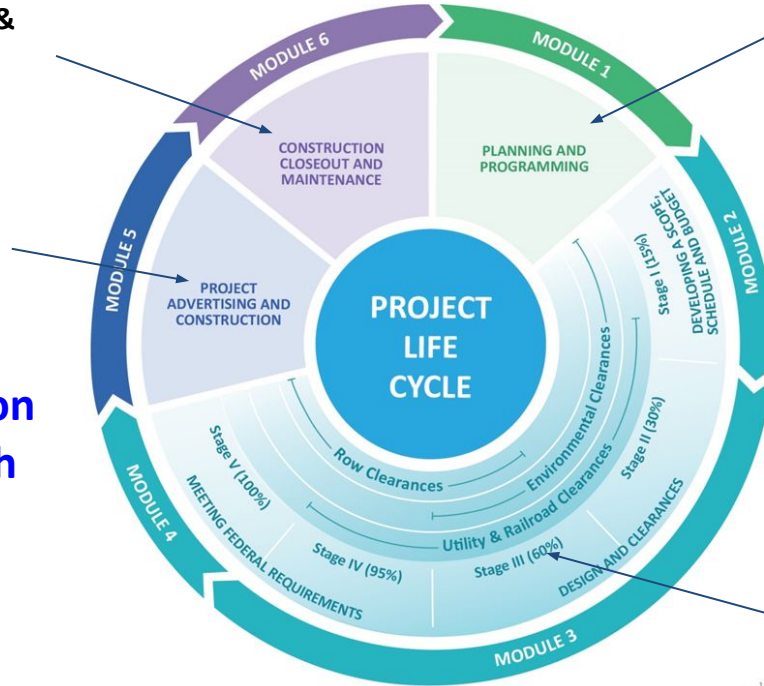
**Continuous Coordination
& Communication with
Our Partners**

Consultants

TSMO

Environmental
Planning

MPD



Provide Critical Input into the
Development of a Project's Scope,
Schedule and Budget

Traffic Group

Project Managers

Bridge Group

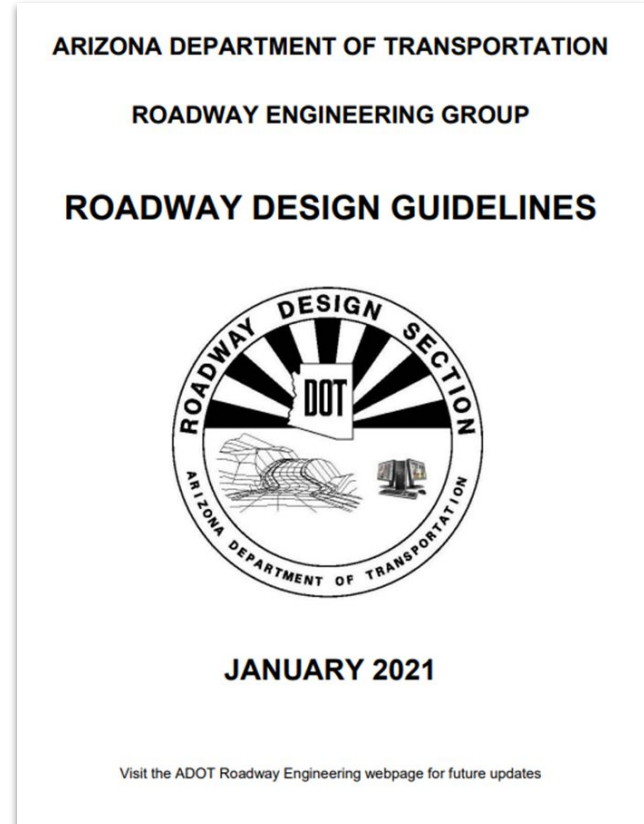
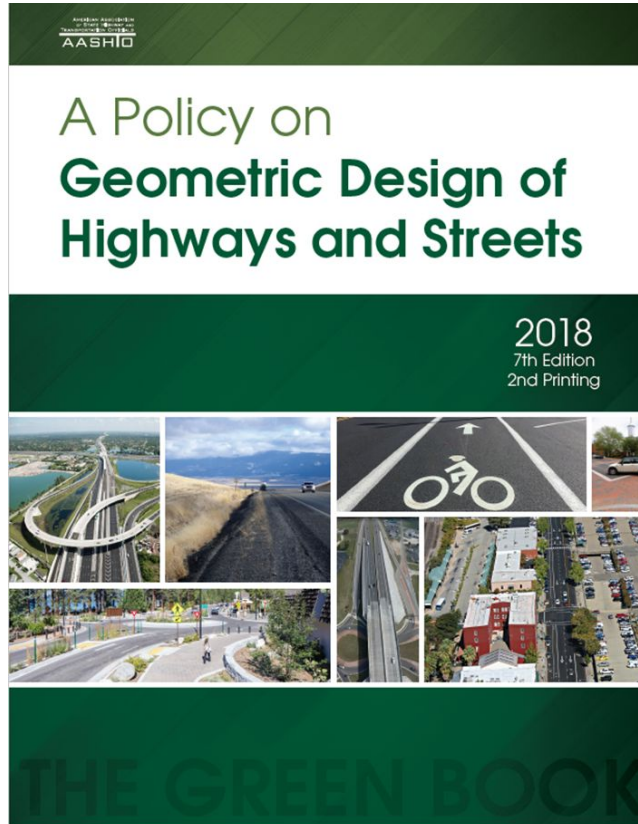
ADOT District Offices

Clearances Teams

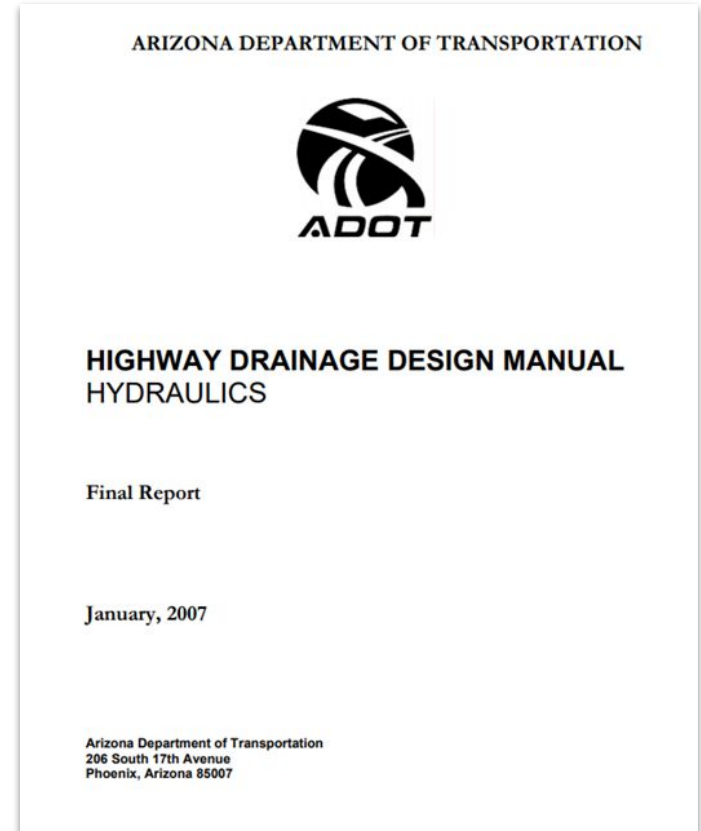
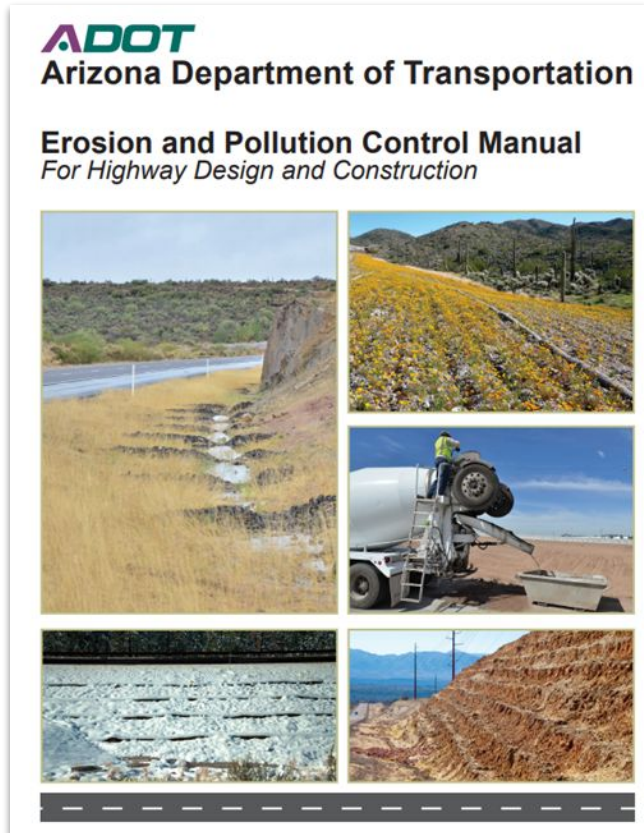
Review Design Alternatives and
Deliver Technical Designs &
Construction Documentation

15-024
updt 03-11-20

What Do We Use?



What Do We Use?



What Do We Use?



Infrastructure Delivery and Operations

An Arizona Management System Agency

Douglas A. Ducey, Governor
John S. Halliwell, Director
Dallas Hammett, State Engineer
Steve Boschen, Division Director

Arizona Department of Transportation

Guiding Principles for Performance-Based Practical Design

Date: March 14, 2019

Introduction & Overview

This document has been prepared to provide guidance on using Performance-Based Practical Design (PBPD) in the development of Arizona Department of Transportation (ADOT) projects. PBPD is not intended to replace existing design standards or project development processes, but provides flexibility and encourages project development professionals to diligently evaluate design decisions and alternatives. Utilizing the PBPD approach will help ensure that designs meet the project's objective and need, resulting in the most optimized performance of the roadway system.

The Federal Highway Administration (FHWA) has defined PBPD as a decision-making approach that relies on quantitative analyses to guide decision-making throughout the project development process resulting in a better system performance. The PBPD approach combines the Practical Design philosophy of designing roadway facilities that makes the best use of financial resources to optimize performance, with the Performance-Based Design philosophy of evaluating the effects the roadway features have on its actual performance. By focusing on the overall system performance, PBPD helps agencies better manage their transportation investment and serve system-level needs and performance priorities with the limited resources it has.

It is expected that all ADOT project development professionals and consultants will apply the PBPD approach on every project by incorporating:

- Clear project objective and need statements that document the Departments performance objectives for the project.
- Performance-based, data-driven decision making.
- Practical Design methodology that results in the most cost effective (efficient) design solution that meets the project objective and optimizes system performance.
- Consideration of design alternatives that address and support the documented project objectives and need, while maximizing system improvements. Evaluation of more than one design option is inherent in the performance-based approach.

Performance Based Practical Design (PBPD):

ADOT's "Guiding Principles for Performance Based Practical Design" provides guidance and expectations for performance-based, data-driven decision making on all projects with a focus on delivering projects that:

1. Maintain or improve the operational performance of the roadway system.
2. Reduce fatal and serious injuries on the roadway system.
3. Are the most cost effective solution to meeting the Project Objective and Needs.

Performance Based Design - Philosophy of considering and evaluating the effects the roadway features have on its actual performance

Design
Outcomes

Practical Design - Philosophy of designing roadways that makes the best use of the financial resources to optimize performance

Design
Flexibility

What Do We Use?

When to Utilize PBPD?



**EVERY
PROJECT.**



**EVERY
TIME.**

ADOT's Performance Based Design Approach

**Connecting Performance Outcomes with Design
Decisions**



Maintain
or Improve
Operational
Performance.



Reduce Fatal
and Serious
Injuries.

Safe System Approach.



Cost-Effective
Solutions to Meet
Project Needs.

ADOT's Design Decision Process



ADOT Design Decision Guide

in support of

Performance Based Practical Design (PBSD)

This document has been prepared to provide guidance on required documentation of design decisions made during the development of a project (specifically rehabilitation, reconstruction and new construction projects), including evaluations of different design alternatives, decisions about retaining existing features, or the design of new roadway features that vary from published design values, criteria or standards. ADOT supports incorporating flexibility in applying design values, criteria and standards and supports the engineer's use of the Performance Based Practical Design (PBSD) approach in diligently evaluating design decisions and alternatives that meet the project and system objectives and needs. When conditions warrant, approval may be granted for a project design that proposes one or more design features/elements to have or retain design values that vary from published design values, criteria or standards. Consistent with engineering best management practices, documentation of planning and design decisions, including those associated with features that vary from published design values, criteria and standards within the project work limits must be identified, quantified, evaluated, justified and approved in accordance with FHWA and ADOT requirements.

In support of ADOT's Performance Based Practical Design initiative, and to standardize required documentation for project specific design decisions, ADOT has created a project-specific "Design Decision Document" to record key decisions related to design standards utilized on a project (specifically those that deviate from established design guidance or fall outside the range of values provided for that element in the design manual(s)). The "Design Decision Document" is a process and a tool used to document not only decisions made, but also the justification (including data, evaluations, etc.) supporting design decisions. Planners and Engineers are encouraged to use this process and tool for all design decisions, but it is required to be used for all decisions to use design values that vary from values published in accepted design guidance published by AASHTO and ADOT (exemptions from this requirement are listed below). The designer shall prepare and submit a Design Decision Document prior to, or along with the Stage II (30%) project milestone for all projects, except as described below (however, the process and documentation does not change regardless of what stage a project is in). The Design Decision Document provides a uniform method for considering and evaluating design standards, controlling criteria, alternatives, and for documenting design decisions and standards used. The form shall be completed in its entirety by the Engineer of Record, who is responsible for all the documentation, analysis, recommendations and decisions outlined in the document. Upon completion, and based on the design feature evaluated, the form shall be submitted for acceptance and approval by the State Roadway, Bridge and/or Traffic Engineer (as applicable to the design feature), and retained as part of the project design documentation.

Design Decision Document Guidance

Effective January 1, 2025, FHWA and ADOT have established the following guidance related to the approval of design features that vary from published design values, criteria or standards.:

- In support of retaining existing features or the design of new or modified roadway features on the National Highway System (NHS) and State Highway System (SHS) that vary from established controlling design criteria by FHWA or documented in AASHTO Guidelines and ADOT's Roadway Design Guidelines (RDG), the designer shall complete, submit and obtain approval of the required "Design Decision Document", including all supporting required analyses and documentation. Approval by the State Roadway, Bridge and/or Traffic Engineer is required (based on the applicable design feature) prior to any request for authorization of construction of the project.
- This guidance replaces the following previous guidance document on all projects initiated after this document's implementation date:
 - o Design Exception and Design Variance Process Guide - December 14, 2009

In support of ADOT's Performance Based Practical Design initiative, and to standardize required documentation for project specific design decisions, ADOT has created a project-specific "Design Decision Document" to record key decisions related to design standards utilized on a project (specifically those that deviate from established design guidance or fall outside the range of values provided for that element in the design manual(s)).

Design Decision - Project Data and Description (Form 1)

Project Name:				Project Number:	
District Name:				Hwy/Route No.:	
Highway/Route Name:				Highway No.:	
County Name:	Begin MP		End MP	Classification:	
Municipality Name:					
Type of Project:					

PROJECT DATA

Functional Classification:					
Current AADT (Year):			Design AADT (Year):		
% Trucks and Truck DHV:			Vertical Clearance Route:	☐ Yes ☐ No	
Posted Speed:			Design Speed:	Bid Date:	
Programmed Year and Funding Source:					
Current Estimate:			Additional Cost to Meet Standards:		
Federal Highway Approval Required:	Yes ☐ No ☐	Alt. Modal Considerations	Yes ☐ No ☐	NHS: ☐ Non NHS: ☐	SHS: ☐ Non SHS: ☐

BASELINE PROJECT DESCRIPTION

Primary Objective of the Project	Statement summarizing the issues/alternatives that ADOT expects to solve as part of the successful design and construction of the project - specifically identifying performance and/or safety objectives that are targeted to be achieved by the successful completion and construction of this project.
Baseline Need(s)	Identify the problem or problems that the proposed action (design and construction) is intended to address and explain, to the extent possible, the underlying cause(s) of those problems.
Safety Analysis	Yes ☐ No ☐ (If Yes, enter the title and date. If NO, enter why it was not needed.) Document source and results/recommendations from the "Basic" or "HSR-based Safety Assessment" of existing conditions. Crash Analysis shall include 5-yr crash history (including collision data file type, severity, time of day, season, MP length). Analysis shall document patterns, contributing factors, types of crashes that could be attributed to substandard features, field observations, and conclude based on crash history. Crash history available shall be reviewed in accordance with the ADOT's Traffic Safety Review.
Traffic Operational Analysis	Yes ☐ No ☐ (If Yes, enter the title and date. If NO, enter why it was not needed.) Document source and results/recommendations from the Traffic Operational Analysis of existing conditions. All worksheet traffic data (and source) should be included.
AASHTO Controlling Criteria Report	Yes ☐ No ☐ (If Yes, enter the title and date. If NO, enter why it was not needed.) Required for all Rehabilitation, Reconstruction, Modernization and Expansion Projects.
Environmental Clearance Required	CE ☐ EA ☐ Other ☐ Date: _____

Dated: January 1, 2025

What Do We Use?

Congestion & Travel Time

**As-Built & Maintenance
History**

Soils & Geotechnical

Pavement Performance

Crash History

Construction Cost

Research & Studies

Traffic

Maintenance Cost

Rainfall & Climate

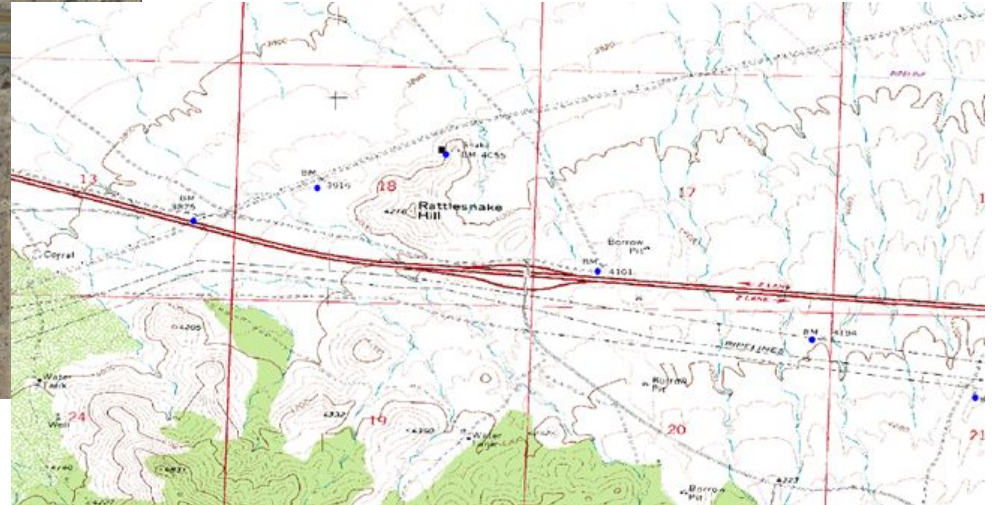
Survey & ROW



What We Do...*Survey*



*We Survey What We Have &
What We Need & What We Build!*



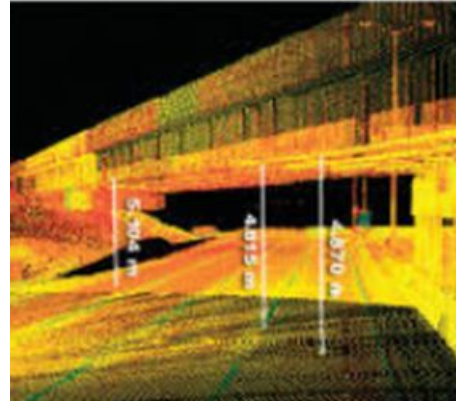
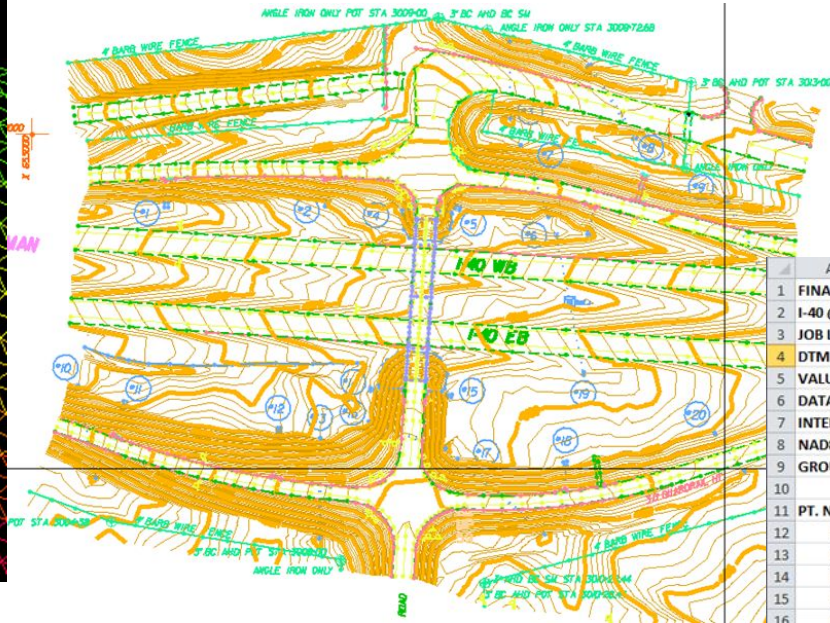
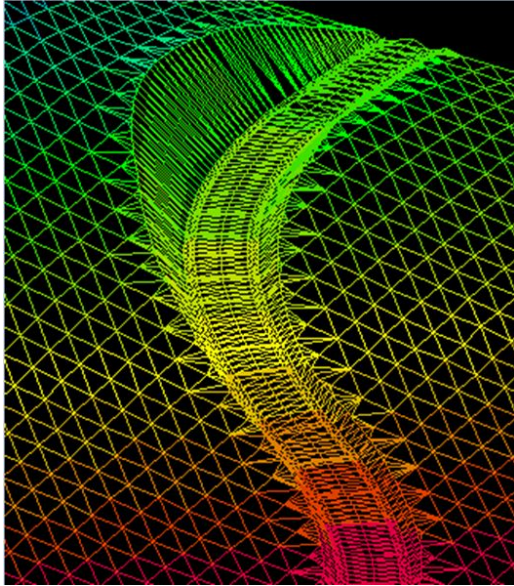
Mapping and Research

What We Do...*Survey*

*Field Data
Collection*



What We Do...*Survey*



- Digital Terrain Models
- 3D Scans
- Topographic Maps

	A	B	C	D	E	F	G
1	FINAL GROUND COORDINATES WESTERN ZONE						
2	I-40 @ DW RANCH RD T.I. MP 59.71						
3	JOB LS1226, TRACS H879901D						
4	DTM						
5	VALUES OBTAINED BY STATIC GPS						
6	DATA COLLECTED BY McWHORTER CREW						
7	INTERNATIONAL FEET						
8	NAD83/92 HORIZONTAL & NAVD88 VERTICAL (GEOID 09AZ)						
9	GROUND ADJUSTMENT FACTOR = 1.00025						
10							
11	PT. NO.	GROUND (N)	GROUND (E)	ELEV.	DESC.		
12	1001	1527305.252	653582.303	4111.218	CLS ST		
13	1002	1527306.428	653564.973	4111.014	EP ST		
14	1003	1527306.290	653564.273	4111.275	GR ST * 2.9FT ON 6IN CURB		
15	1004	1527306.216	653564.278	4111.108	GB ST		
16	1005	1527305.650	653570.288	4111.171	DS ST * 6INCH		
17	1006	1527347.914	653584.892	4111.271	CLS		
18	1007	1527350.601	653567.816	4111.045	EP		
19	1008	1527350.563	653566.903	4111.307	GR		
20	1009	1527350.589	653566.857	4111.040	GB		
21	1010	1527350.098	653572.700	4111.155	DS		
22	1011	1527368.388	653573.414	4111.045	DS		
23	1012	1527367.877	653586.077	4111.198	CLS		
24	1013	1527384.167	653587.165	4111.128	CLS		
25	1014	1527383.104	653567.664	4110.771	DS		

What We Do...*Pre-Design & Standards*

Defining the Project's Scope, Schedule & Budget

- What Conditions Exist Today?
- What are the Objectives & Needs to be addressed by this project?
- Data Collection (Traffic, Safety, Geometric Features, etc.)
- Field Analysis/Research



Project No. 089 CN 544 F0237 01C

ATTACHMENT 1 - VERTICAL CURVE INVENTORY

PROJECT NAME: HORSESHOE BEND OVERLOOK SOUTH OF PAGE
 PROJECT NO: 089 CN 544 F0237 01C

ROADWAY TYPE: UNDIVIDED ROADWAY (BI-DIRECTIONAL)

VPI STATION (FT)	MILEPOST	GRADE (%)		CURVE LENGTH (FT)	CURVE TYPE	STOPPING SIGHT DISTANCE (FT)		SPEED (MPH)	
		BEGIN	END			EXISTING	REQUIRED	EXISTING	POSTED
1215+00.00	544.00	544.11	-1.4000	-2.5000	600.00	Crest	1281	675	95 65
1225+00.00	544.19	544.30	-2.5000	-1.1430	600.00	Sag	+9999	675	+100 65
1232+00.00	544.32	544.43	-1.1430	-2.2500	600.00	Crest	1275	672	95 65
1240+00.00	544.47	544.58	-2.2500	-1.2000	600.00	Sag	+9999	672	+100 65
1250+00.00	544.66	544.77	-1.2000	-2.5860	600.00	Crest	1078	676	86 65

VPI STATION (FT)	MILEPOST	GRADE (%)		CURVE LENGTH (FT)	CURVE TYPE	STOPPING SIGHT DISTANCE (FT)		SPEED (MPH)	
		BEGIN	END			EXISTING	REQUIRED	NEW	DESIGN
1215+00.00	544.00	544.11	-1.4000	-2.5000	600.00	Crest	1281	592	95 60
1225+00.00	544.19	544.30	-2.5000	-1.1430	600.00	Sag	+9999	592	+100 60
1232+00.00	544.32	544.43	-1.1430	-2.2500	600.00	Crest	1275	589	95 60
1240+00.00	544.47	544.58	-2.2500	-1.2000	600.00	Sag	+9999	589	+100 60
1250+00.00	544.66	544.77	-1.2000	-2.5860	600.00	Crest	1078	593	86 60

VPI STATION (FT)	MILEPOST	GRADE (%)		CURVE LENGTH (FT)	CURVE TYPE	STOPPING SIGHT DISTANCE (FT)		SPEED (MPH)	
		BEGIN	END			EXISTING	REQUIRED	NEW	POSTED
1215+00.00	544.00	544.11	-1.4000	-2.5000	600.00	Crest	1281	514	95 55
1225+00.00	544.19	544.30	-2.5000	-1.1430	600.00	Sag	+9999	514	+100 55
1232+00.00	544.32	544.43	-1.1430	-2.2500	600.00	Crest	1275	512	95 55
1240+00.00	544.47	544.58	-2.2500	-1.2000	600.00	Sag	+9999	512	+100 55
1250+00.00	544.66	544.77	-1.2000	-2.5860	600.00	Crest	1078	515	86 55

Meaning of Symbols:

- GB = Grade Break - Stopping Sight Distance and Speed not calculated
- + = Existing Stopping Sight Distance less than AASHTO required value

Note:

Input grade with direction of traffic for one-way traffic

Project Limits MP 544.00 - MP 545.00

What We Do... ***Pre-Design & Standards***

Design Scoping Reports & Technical Memorandums

- *What Are We Building?*
- *What are our Objectives?*
- *What Will it Cost?*
- *What Risks Exist?*
- *How Will it Perform?*

Design Compliance Reviews & Approvals

- *Design Decisions (Exceptions)*
- *Change of Access*

Design Standards

- *Roadway Design Guidelines*
- *Approved Product List*
- *CADD Standards*

Documentation of What We are Building

Project 101L MA 001 F0203 01C
Federal ID Number – 888-A(234)T
Agua Fria Freeway
Interstate 10 (I-10) to Interstate 17 (I-17)
State Route 101 Loop (SR 101L)

FINAL SCOPING LETTER

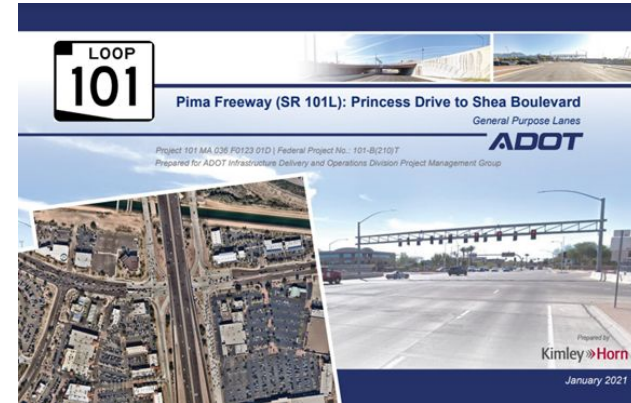
November 1, 2019

Revised February 25, 2020

Prepared For:



ARIZONA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION TECHNOLOGY GROUP



What We Do...*Drainage*

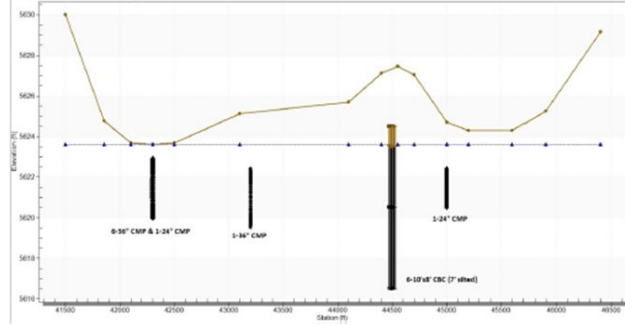


Figure 4. US 191 Roadway center line profile and existing culverts.

- *Data Collection*
- *Field Analysis*
- *Calculations & Modeling*

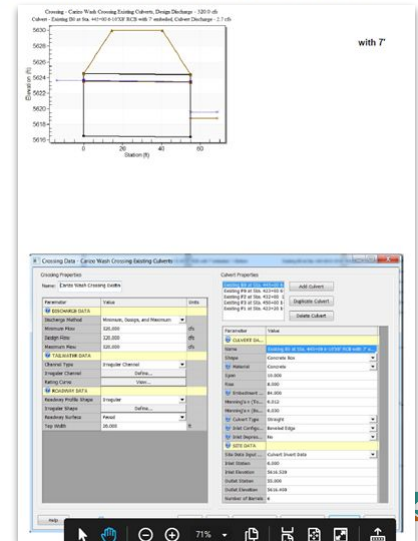
Finding Practical Solutions for New and Existing Drainage Needs



Roadway overtopping at around Sta. 432+00 South of Existing Box Culvert.



Photo 1: Siltation at Inlet of Existing 6 - 10'X8' CBC located at Carrizo Wash, MP 323.85



What We Do...*Drainage*

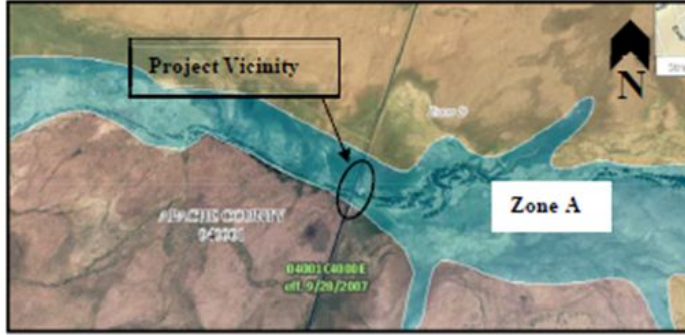
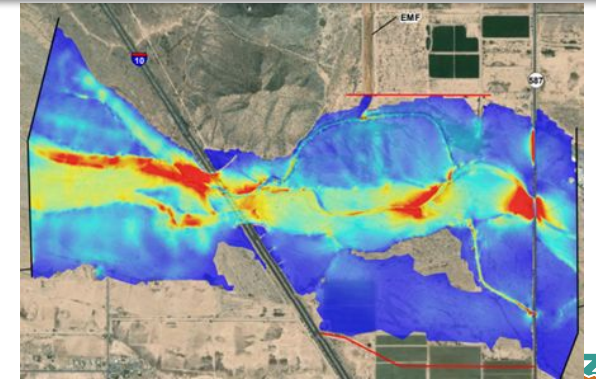
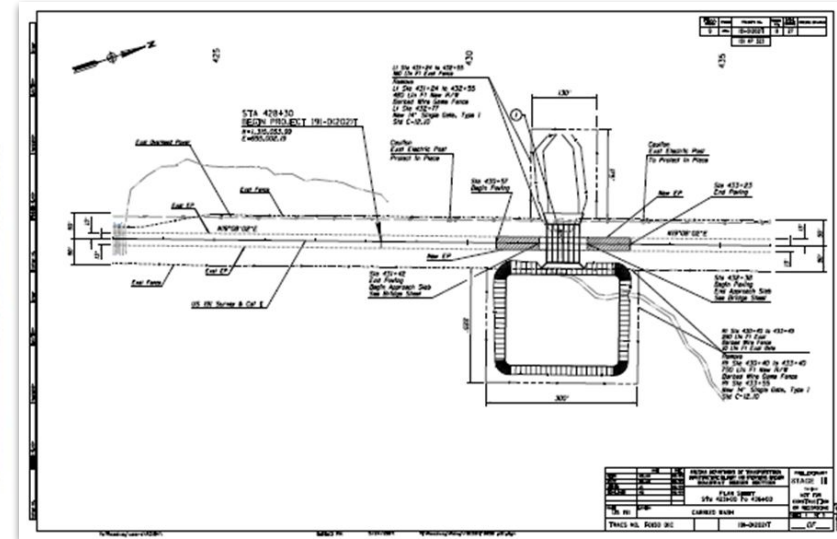


Figure 5: FEMA Flood Zone



- *Design Reports & Documentation*
- *Construction Details & Plans*
- *Floodplain Modeling*

What We Do...*Drainage*

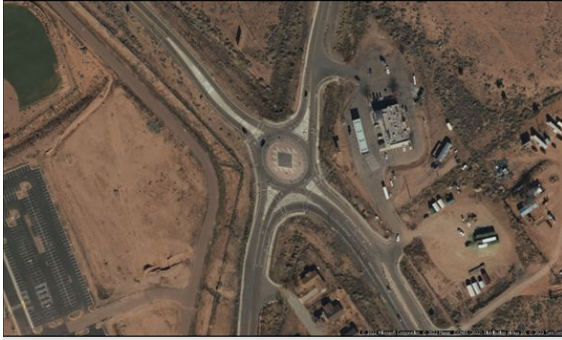


Drainage Example – SR 87

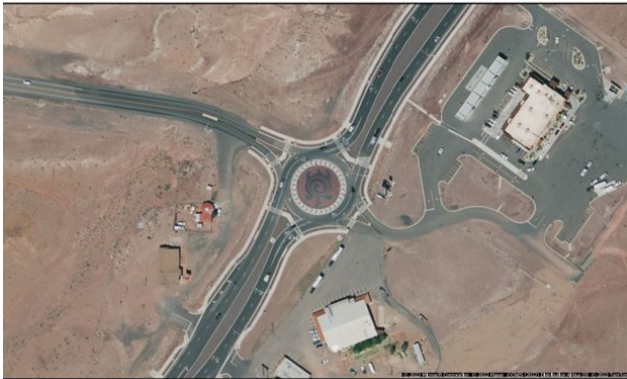


What We Do...*Roadway Design*

Genado Roundabout
US191, SR264, and IR16



Cameron Roundabout
US89 and SR64



*Designing Not Just Roads -
But Also
How the Public Uses Them*

SR 303L Peoria Ave TI

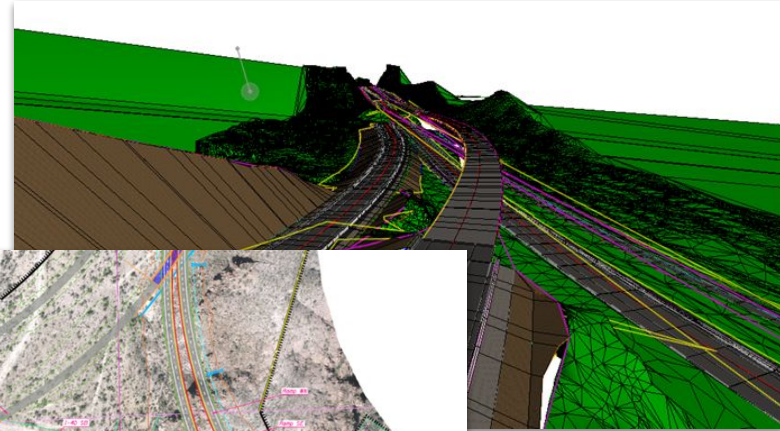
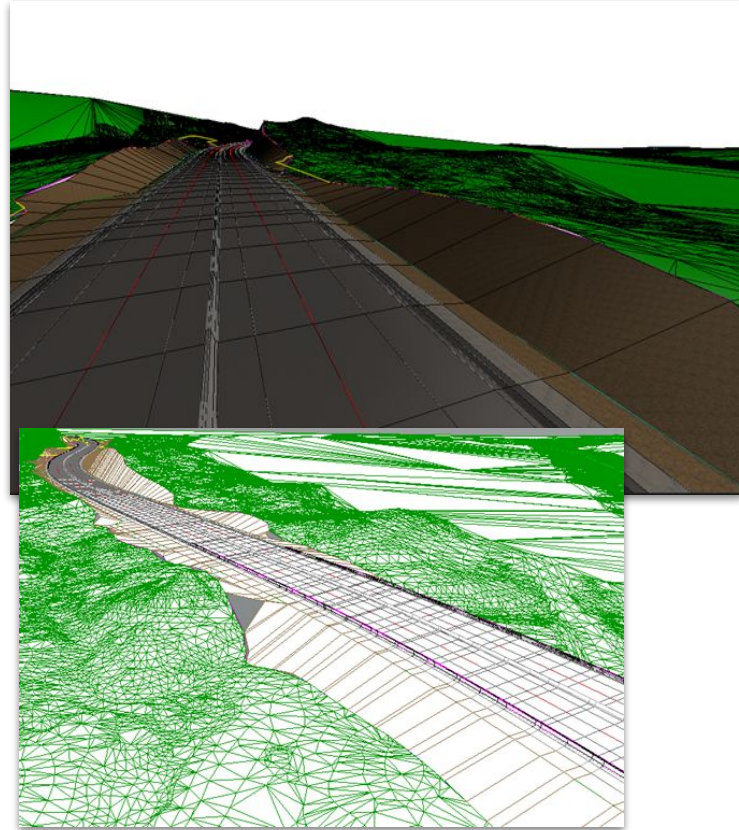


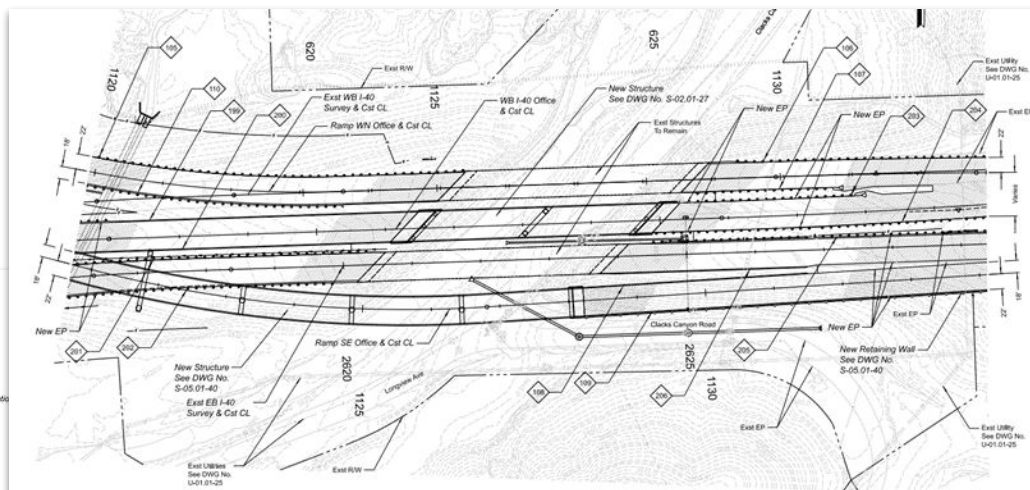
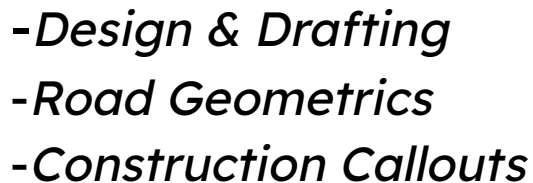
SR 303L Bethany Home Rd TI



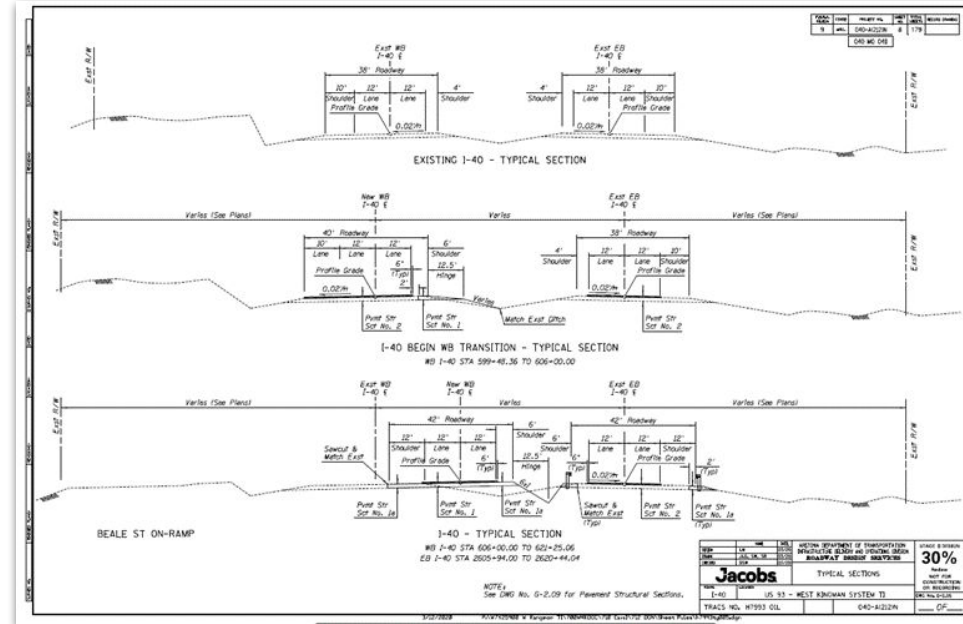
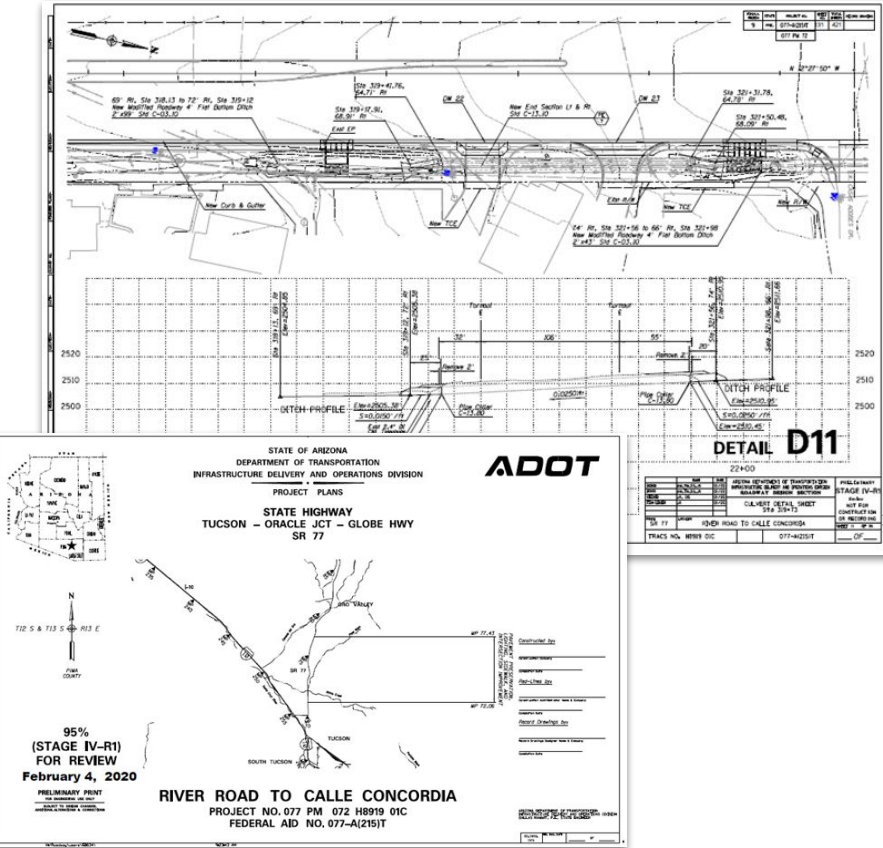
What We Do...*Roadway Design*

*CADD Based
Modeling and
Geometrics*





What We Do...*Roadway Design*



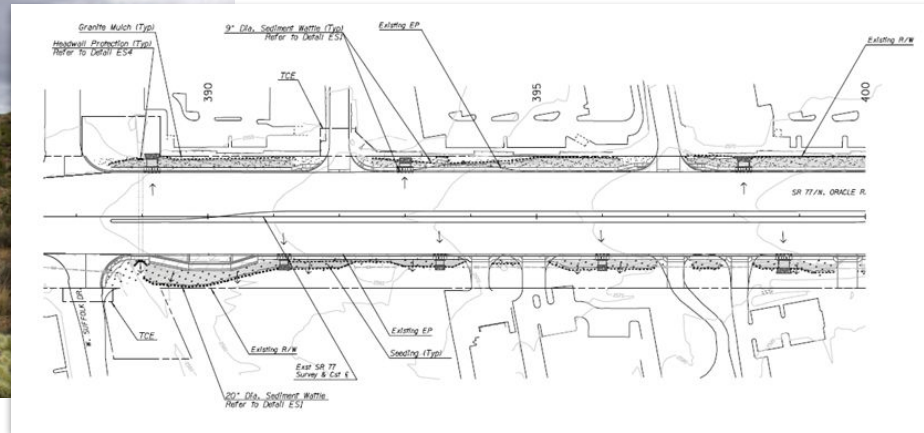
*Construction Plan
Production & Delivery*

What We Do...*Roadside Development*



Roadway Group Roadside Development Section

- Erosion Control
- Landscape Design
- Aesthetics



What We Do... ***Roadside Development***

- *Erosion Control*
- *Seeding Specifications*
- *Landscape Design*

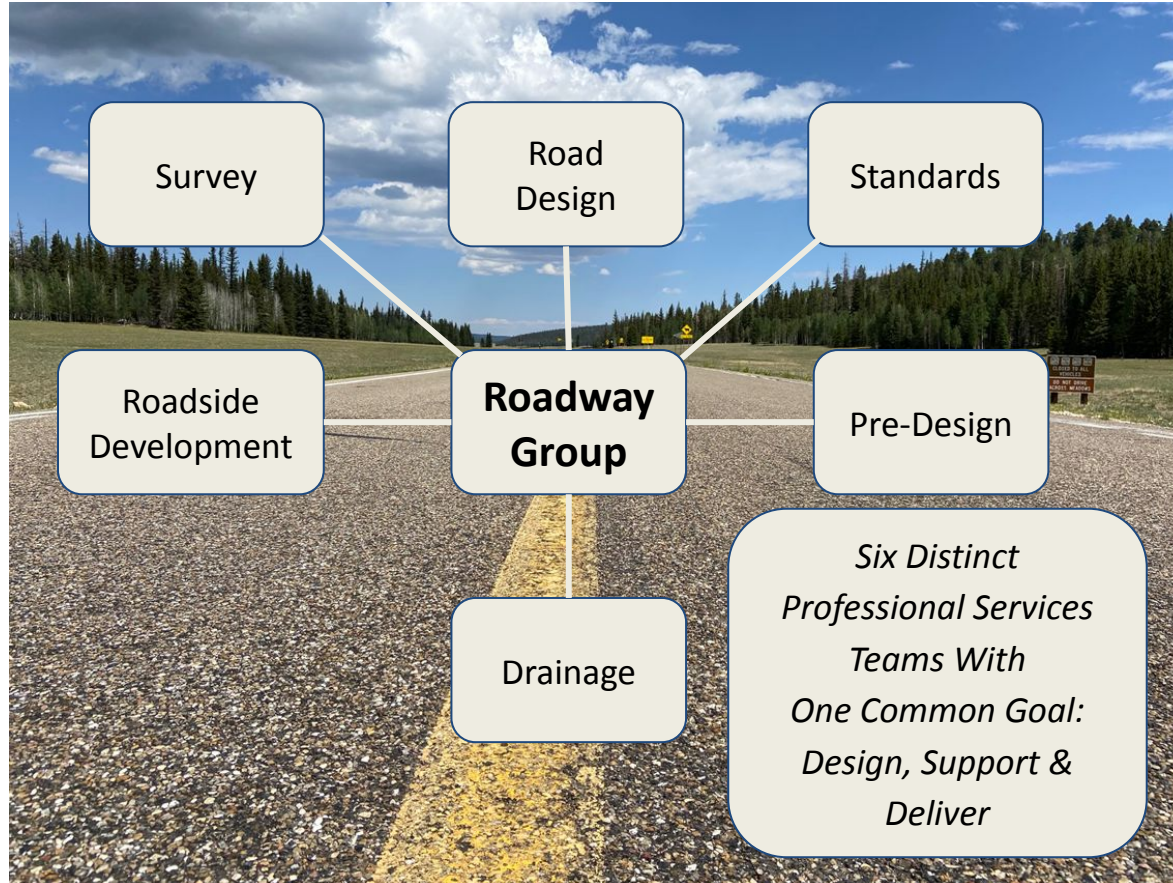


What We Do...*Roadside Development*



- *Aesthetics Design*





Questions?



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