

Project Delivery Academy

Design & Delivery Technical Groups
Infrastructure Delivery and Operations Division

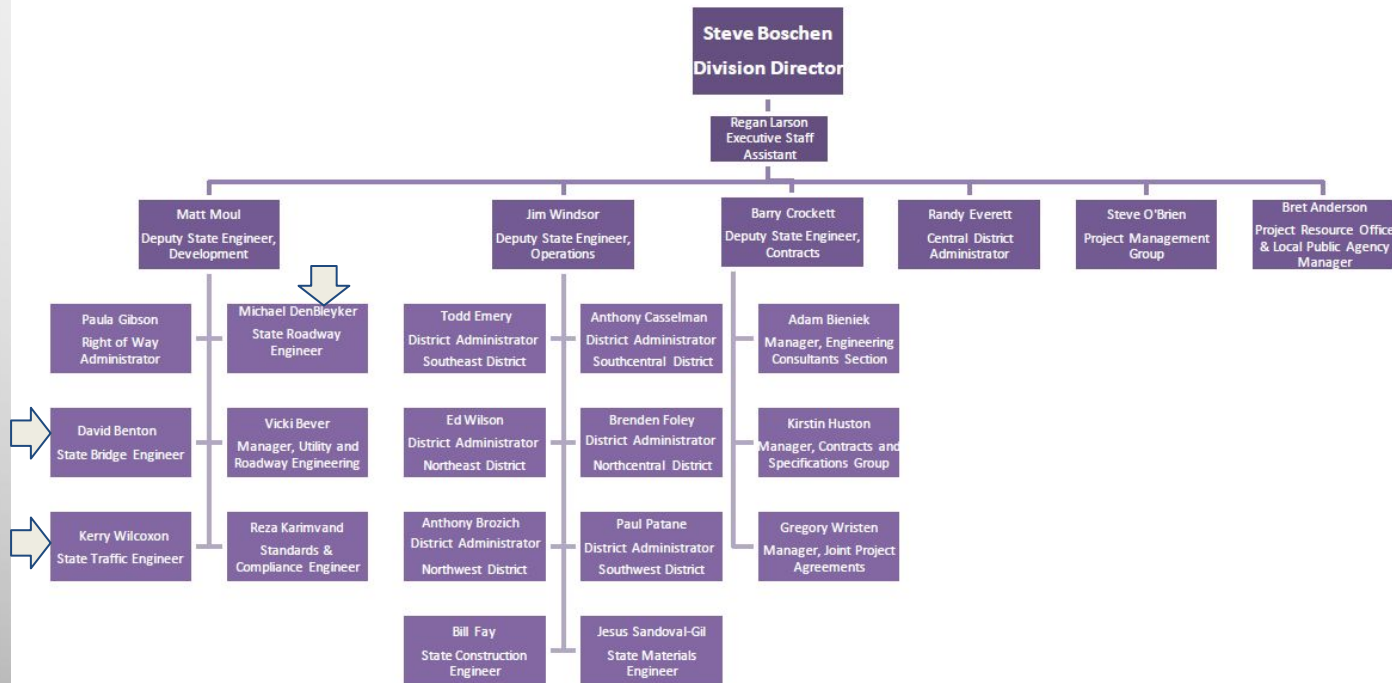
*Roadway, Bridge & Traffic
Design Groups*



ARIZONA DEPARTMENT OF TRANSPORTATION

*Module 4 - Project Delivery Academy
Project Design and Securing Clearances
October 9, 2024*

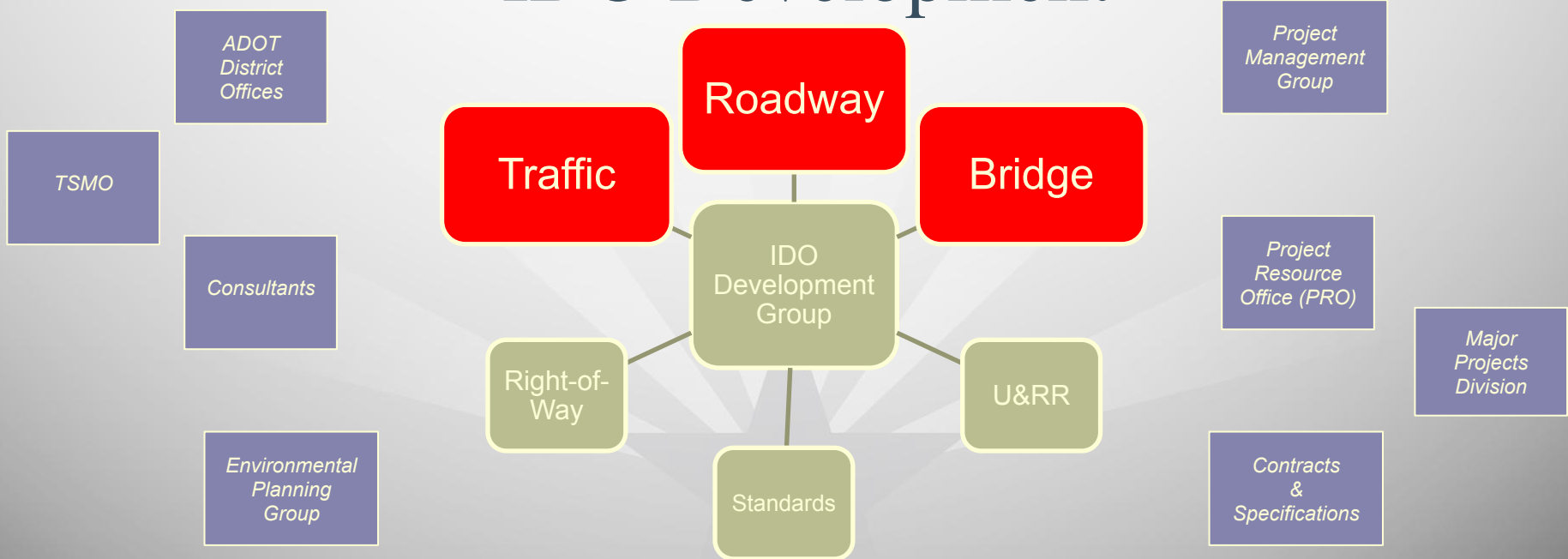
Infrastructure Delivery and Operations



Where Do We Fit In?

Where Do We Fit In?

IDO Development



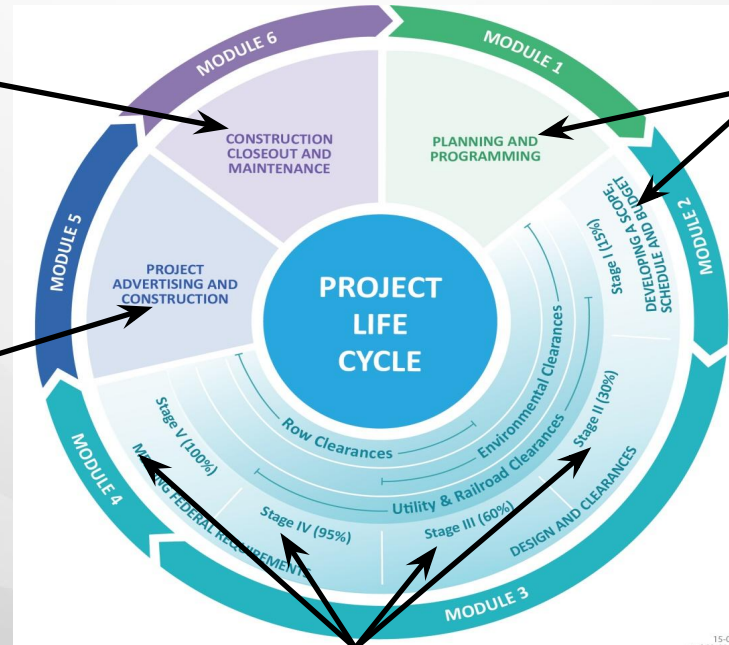
Where Do We Fit In?

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



What is the Project Need & Objective?

What are the Existing Conditions?

Survey

Environmental

Road

What Design Parameters & Standards/Criteria Exist?

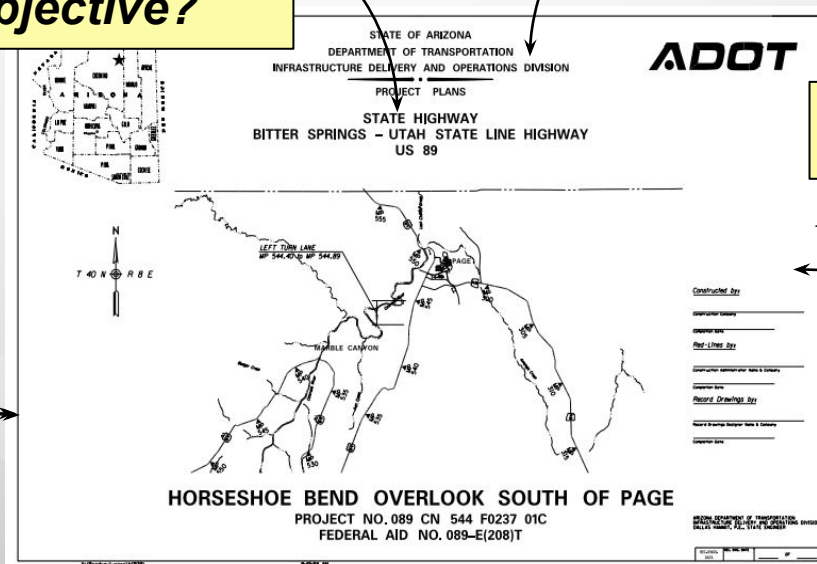
Drainage

*Erosion
Control/Lands
cape*

What is the Schedule?

Right-of-Way

Traffic



Are there Safety Considerations?

Utilities

What Project Risk Factors Exist?

Structures/ Bridges

Construction

What is the Budget?

ADOT's Roadway Group

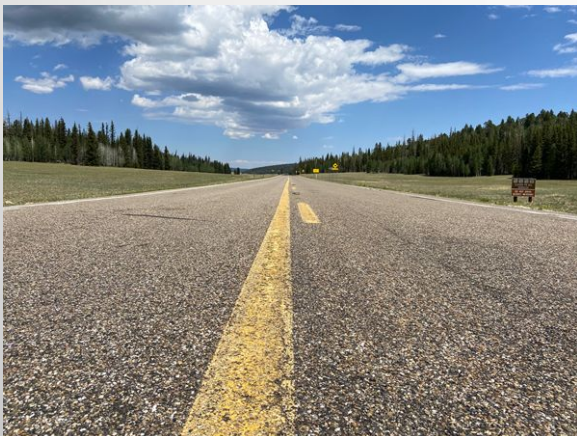
Infrastructure Delivery and Operations Division

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

*Michael DenBleyker, P.E.
Roadway Group Manager
State Roadway Engineer*

What Do We Do?

We Design Roads



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



ADOT

*We Design Key Features to Improve
Performance and Safety*



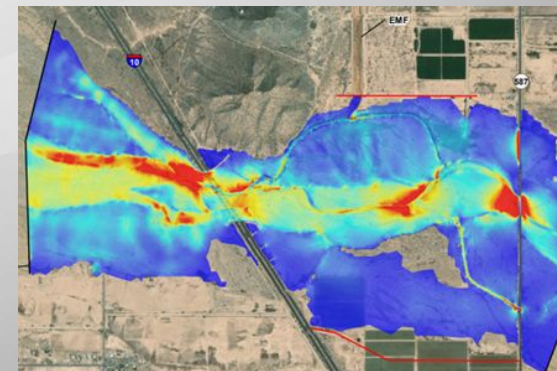
*We Survey What We Have, What We Need,
& What We Build*

ARIZONA DEPARTMENT OF TRANSPORTATION

*We Design What Our
Roads are Built Out Of*



*We Study & Design Drainage
Features Impacting Our Roads*



Who Are We?

ADOT



Seven Distinct Professional Services Teams – One Common Goal: Design, Support & Deliver

Where & How Do We Fit In?

Address Construction Questions &
Providing Technical Guidance on
Construction Related Matters

Assist in Preparation of Bid
Documents & Addressing RFIs

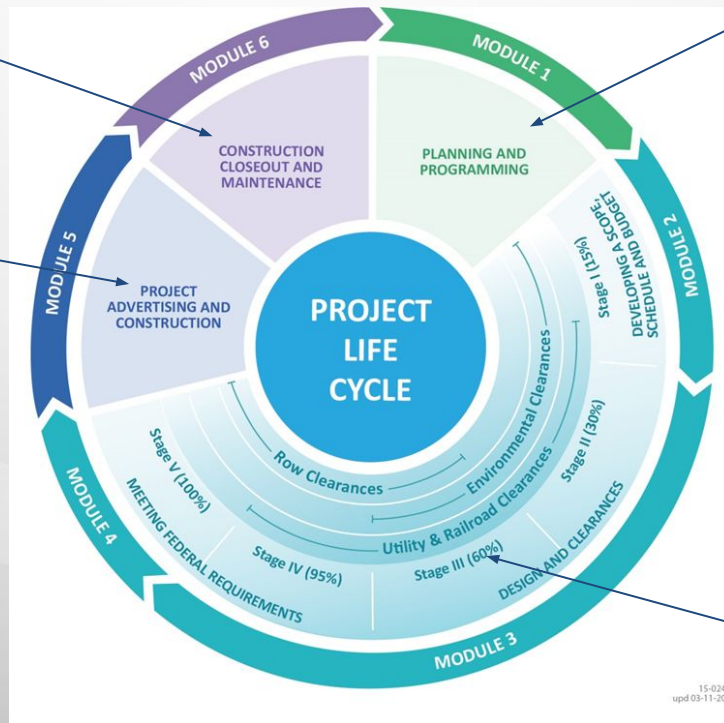
**Continuous Coordination
& Communication with
Our Partners**

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

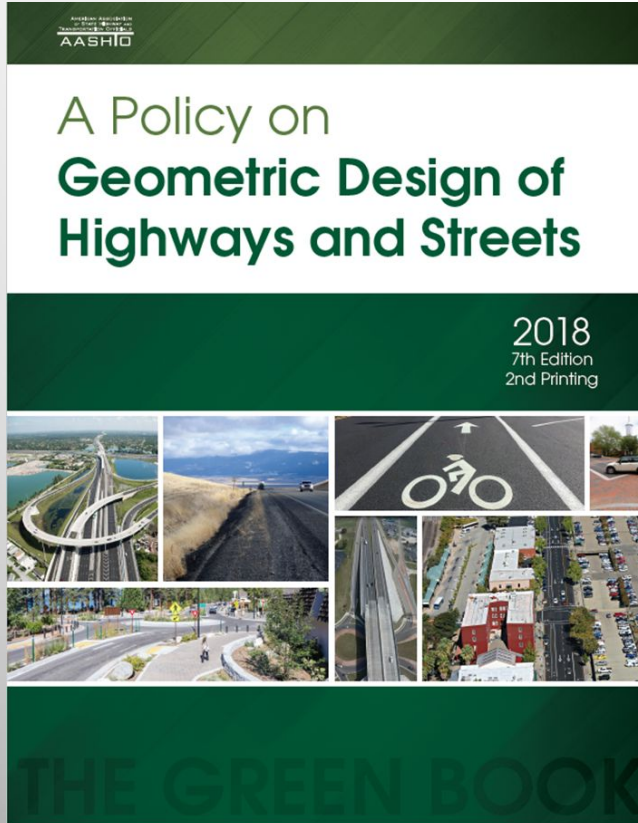
ADOT District Offices

Clearances Teams

Deliver Technical Designs &
Construction Documentation

15-024
upd 03-11-20

What Do We Use?



ARIZONA DEPARTMENT OF TRANSPORTATION

ROADWAY ENGINEERING GROUP

ROADWAY DESIGN GUIDELINES



JANUARY 2021

Visit the ADOT Roadway Engineering webpage for future updates

What Do We Use?

ADOT

ARIZONA DEPARTMENT OF TRANSPORTATION



PAVEMENT DESIGN MANUAL

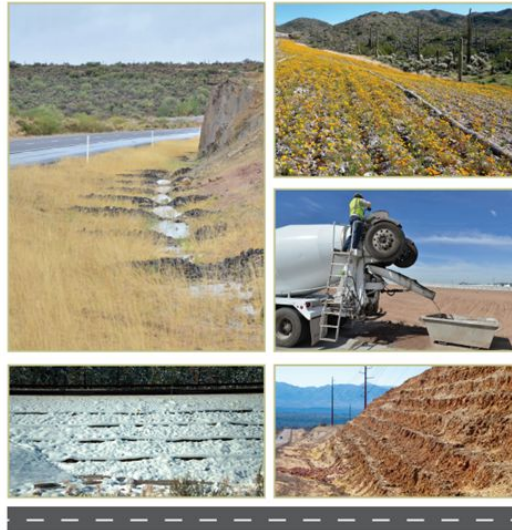
September 29, 2017

ROADWAY ENGINEERING GROUP
PAVEMENT DESIGN SECTION



Arizona Department of Transportation

Erosion and Pollution Control Manual *For Highway Design and Construction*



ARIZONA DEPARTMENT OF TRANSPORTATION



HIGHWAY DRAINAGE DESIGN MANUAL HYDRAULICS

Final Report

January, 2007

Arizona Department of Transportation
206 South 17th Avenue
Phoenix, Arizona 85007

ARIZONA DEPARTMENT OF TRANSPORTATION

What Do We Use?

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 Goal is to deliver 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.

-**PBPD** is a decision-making approach that **relies on quantitative analysis to guide decision-making** throughout the project development process resulting in a better system performance.

-**PBPD** combines "Practical Design" philosophy of designing roadway facilities that makes the best use of the financial resources to optimize performance, with the "Performance-Based Design" philosophy of evaluating the effects the roadway features have on its actual performance.

-**PBPD** helps agencies better manage their transportation investment and serve system-level needs and performance priorities with the limited resources it has.

-**PBPD** is not intended to replace existing design standards or project development processes. **PBPD** provides flexibility and encourages professionals to diligently evaluate design decisions and alternatives.

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

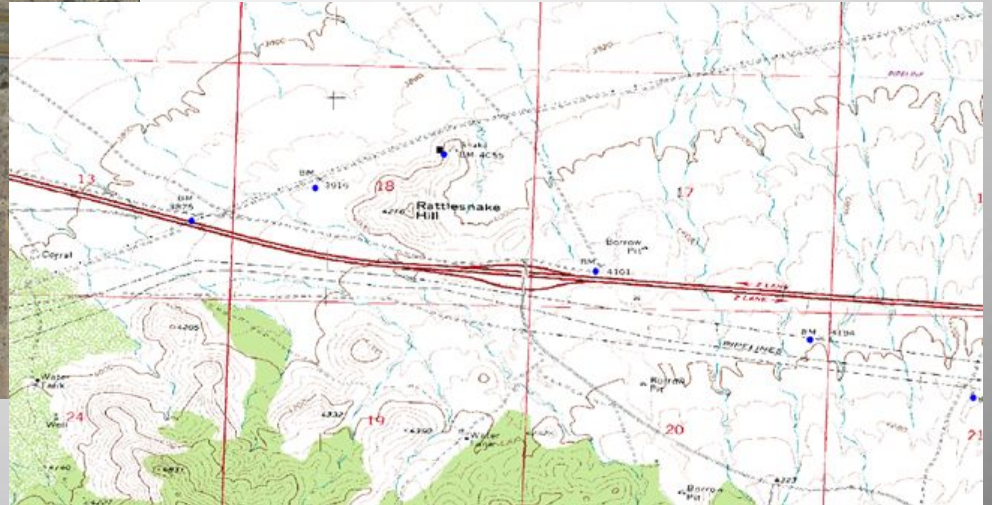
Survey & ROW



What We Do...*Survey*



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



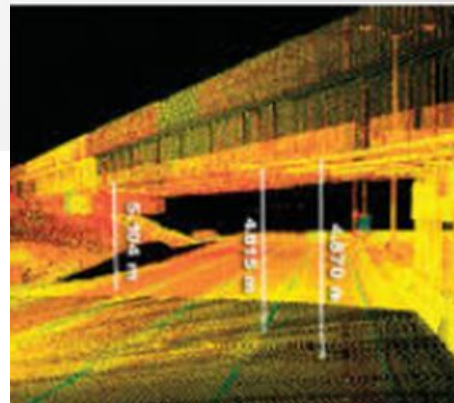
Mapping and Research

What We Do...*Survey*

*Field Data
Collection*



What We Do...Survey



	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		

- Digital Terrain Models
- 3D Scans
- Topographic Maps

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



ARIZONA DEPARTMENT OF TRANSPORTATION

ADOT

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)		
		APPROACH	DEPARTURE			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)		
		APPROACH	DEPARTURE			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)		
		APPROACH	DEPARTURE			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 ADOT required value

None

Input grade with direction of traffic for one-way traffic

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

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

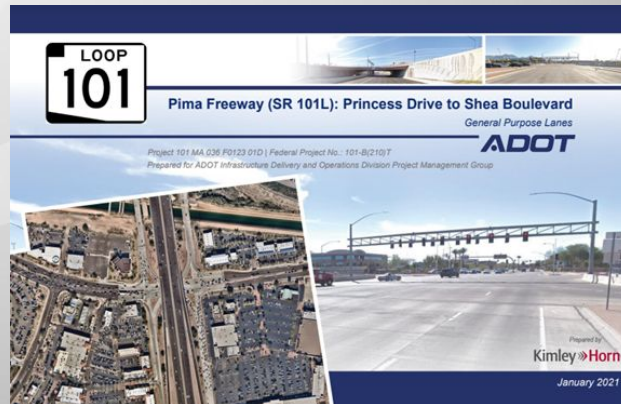
Design Scoping Reports & Technical Memorandums

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

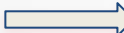
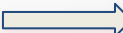
Design Compliance Reviews & Approvals

- Design Exceptions
- Change of Access

Documentation of What We are Building



What We Do... *Pavement Design*

Poor Pavement Conditions  Fair Pavement Conditions  Good Pavement Conditions



Goal: Developing Pavement Designs to Return Pavement Conditions to “Good” Condition

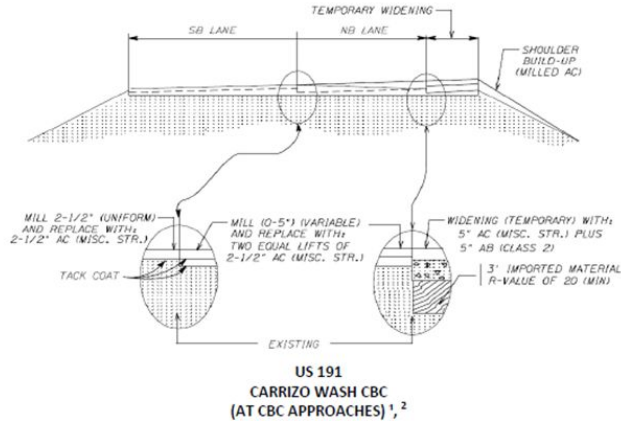
What We Do... *Pavement Design*

*Data Collection
& Field Analysis/Research*



What We Do... *Pavement Design*

TYPICAL SECTION
191 AP 323 F015001C / STBG-191-D(202)T
CARRIZO WASH



ARIZONA DEPARTMENT OF TRANSPORTATION * ROADWAY ENGINEERING GROUP
205 SOUTH 17TH AVENUE * PHOENIX, AZ 85007 * PHONE: 602.712.7360

May 28, 2020

MATERIALS DESIGN REPORT

Report Type: Revised Final (Rev. 1) Report # 19-12-RF1

HIGHWAY NAME: ST JOHNS-SANDERS HWY (US 191)
PROJECT NAME: CARRIZO WASH
PROJECT NUMBER: 191 AP 323 F015001C / STBG-191-D(202)T
PROJECT SCOPE: DRAINAGE IMPROVEMENT
MILE POST LIMITS: MP 323.53 AND MP 324.03

Prepared by:
Pavement Design Section
Roadway Engineering Group
Arizona Department of Transportation

Design Reports
Calculations & Documentation of What We are Building

What We Do...*Drainage*

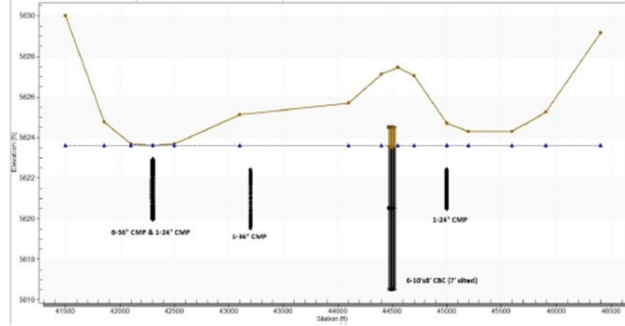


Figure 4. US 191 Roadway center line profile and existing culverts.

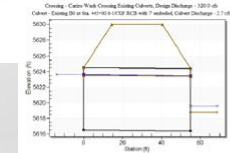
Finding Practical Solutions for New and Existing Drainage Needs



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

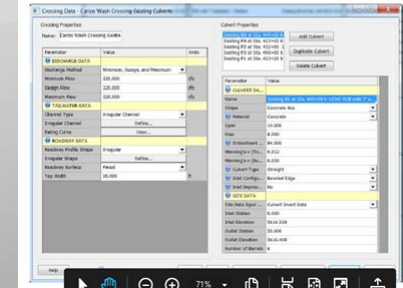


Photo 1: Siltation at Inlet of Existing 6 - 10'X8' CBC located at Carrizo Wash, MP 323.85



with 7'

- Data Collection
- Field Analysis
- Calculations & Modeling



What We Do...*Drainage*

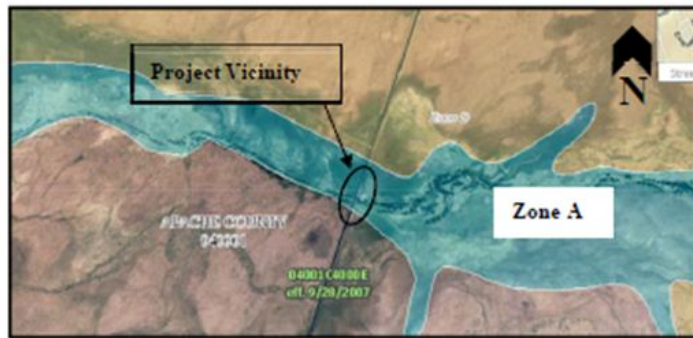
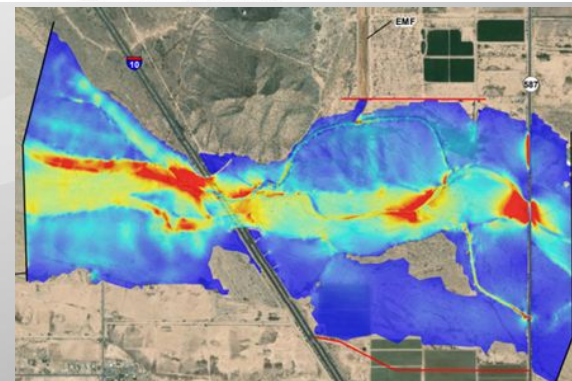
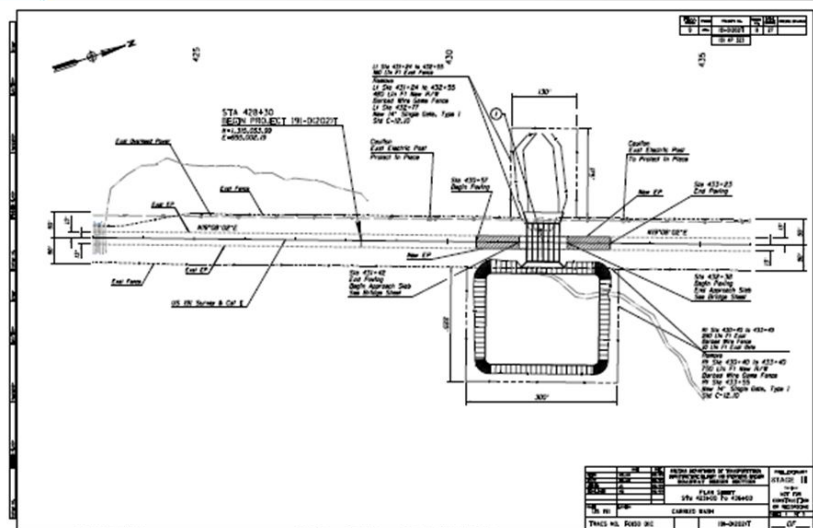


Figure 5: FEMA Flood Zone



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

US 191 - Carrizo Wash

Revised Final Drainage Report

TRACS NO. F015001D

Prepared for:
Arizona Department of Transportation



November 2019

Prepared by
Arizona Department of Transportation

Khandaker Haque, PE

Abu S. Mohsenin

What We Do...*Drainage*



Drainage Example – SR 87



What We Do... *Roadway Design*

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

Genado Roundabout
US191, SR264, and IR15



Cameron Roundabout
US89 and SR64



SR 303L Peoria Ave TI

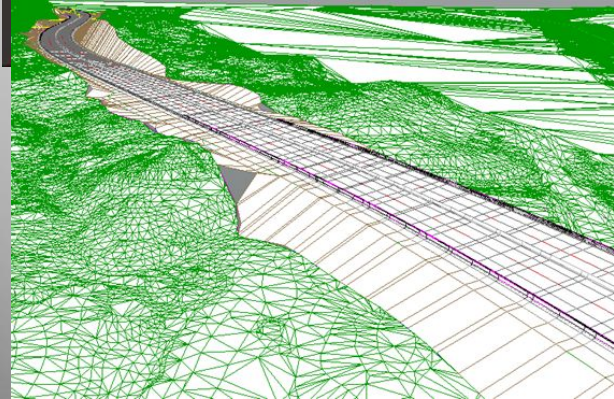
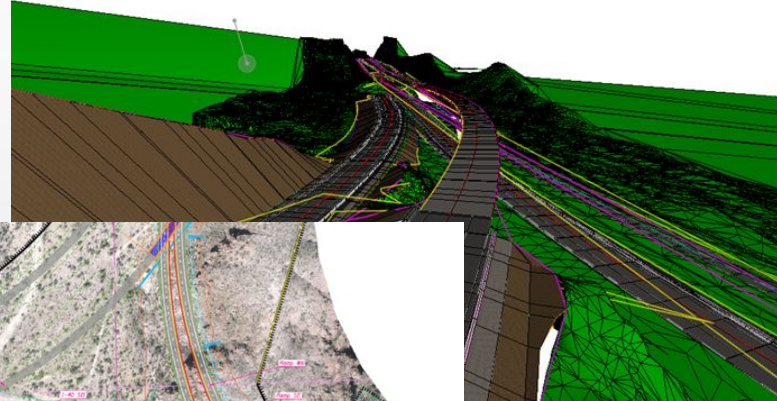
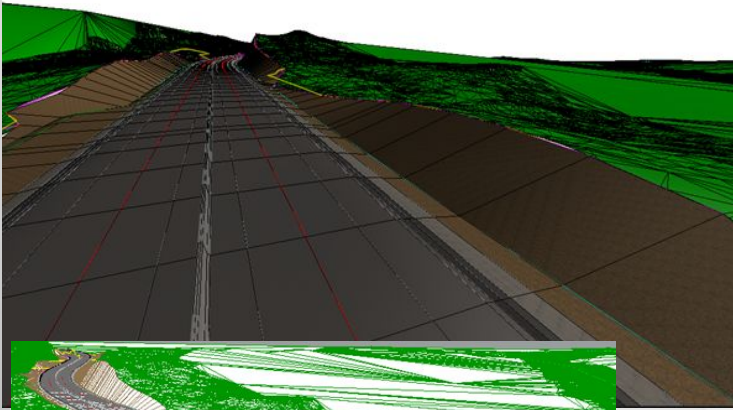


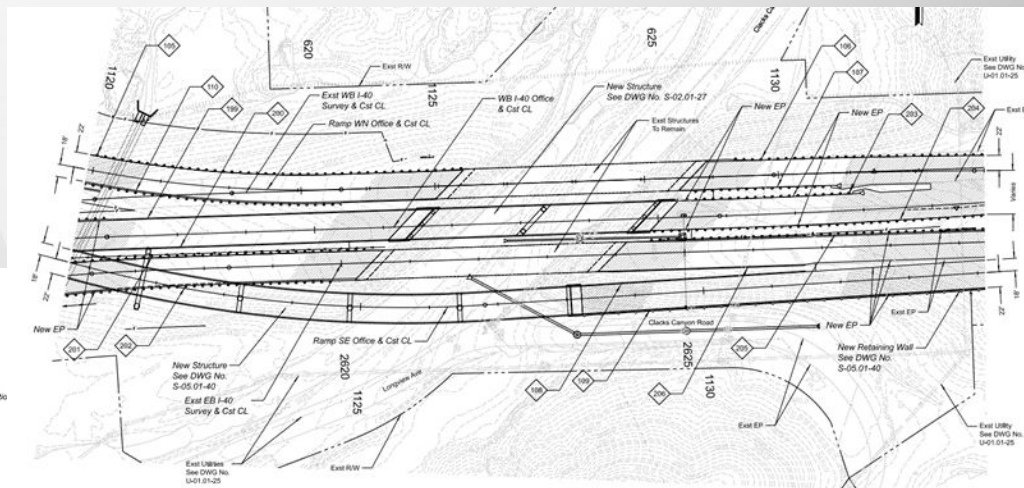
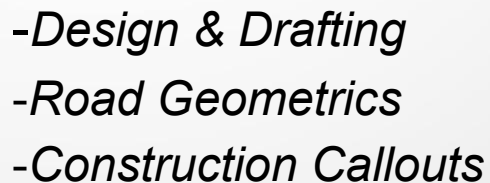
SR 303L Bethany Home Rd TI



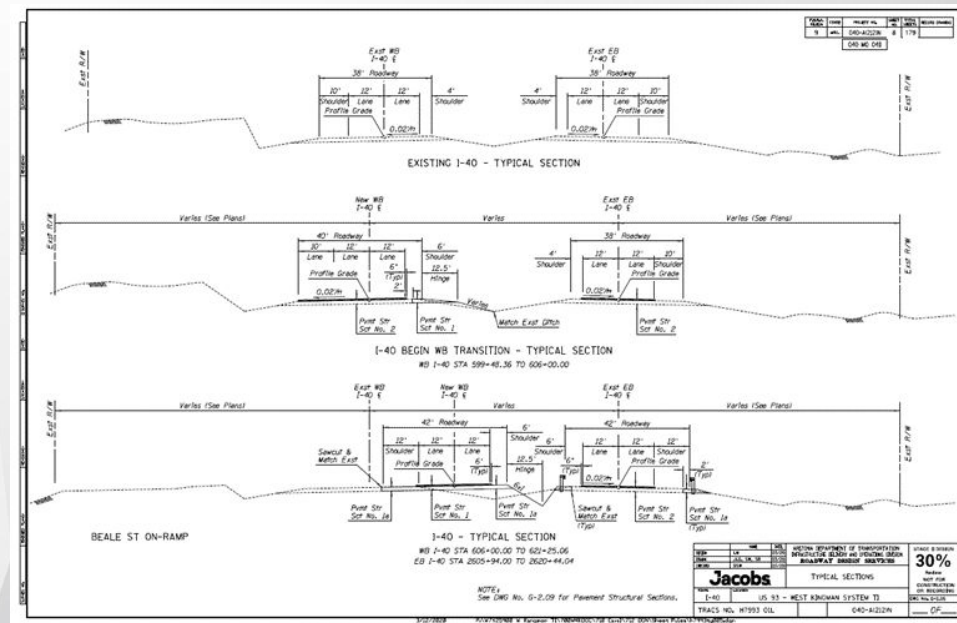
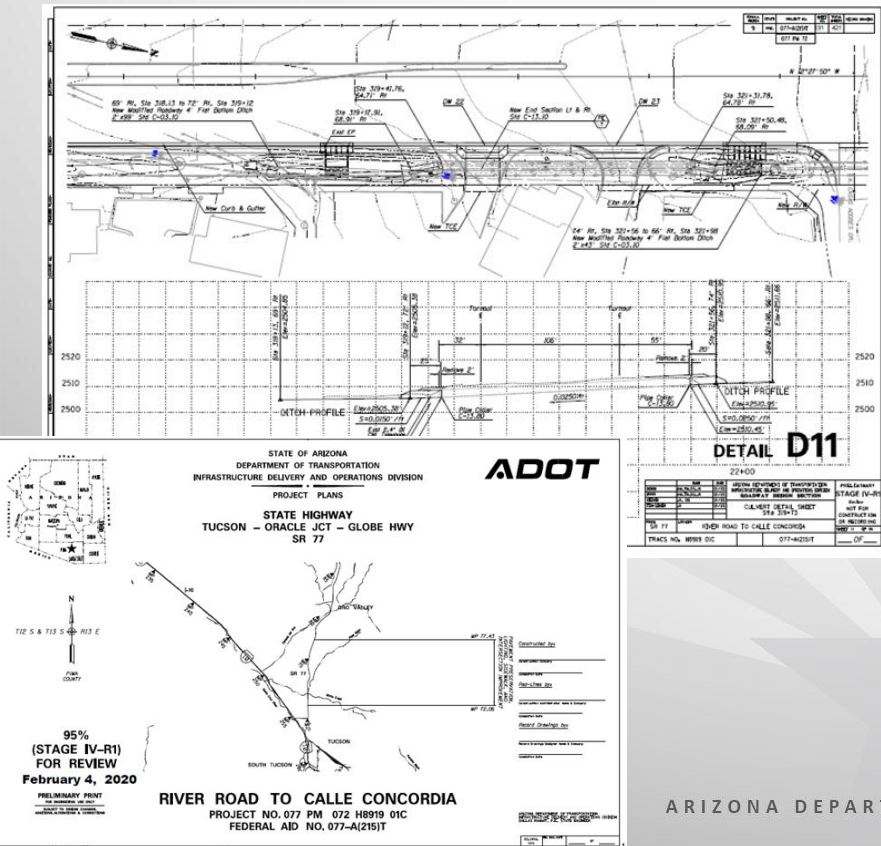
What We Do... *Roadway Design*

*CADD Based
Modeling and
Geometrics*





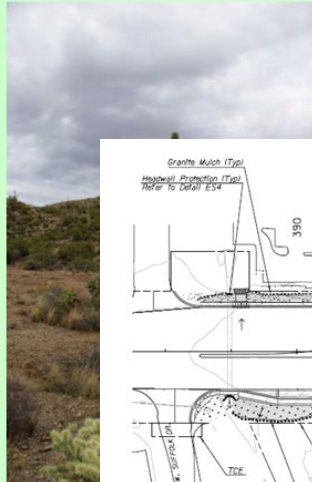
What We Do... *Roadway Design*



*Construction Plan
Production & Delivery*

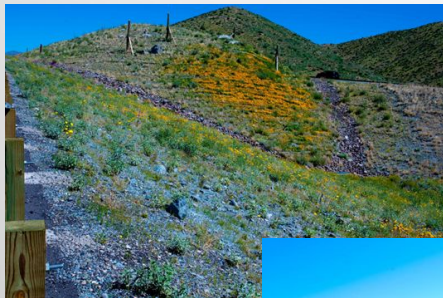


- *Erosion Control*
- *Landscape Design*
- *Aesthetics*



What We Do... *Roadside Development*

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

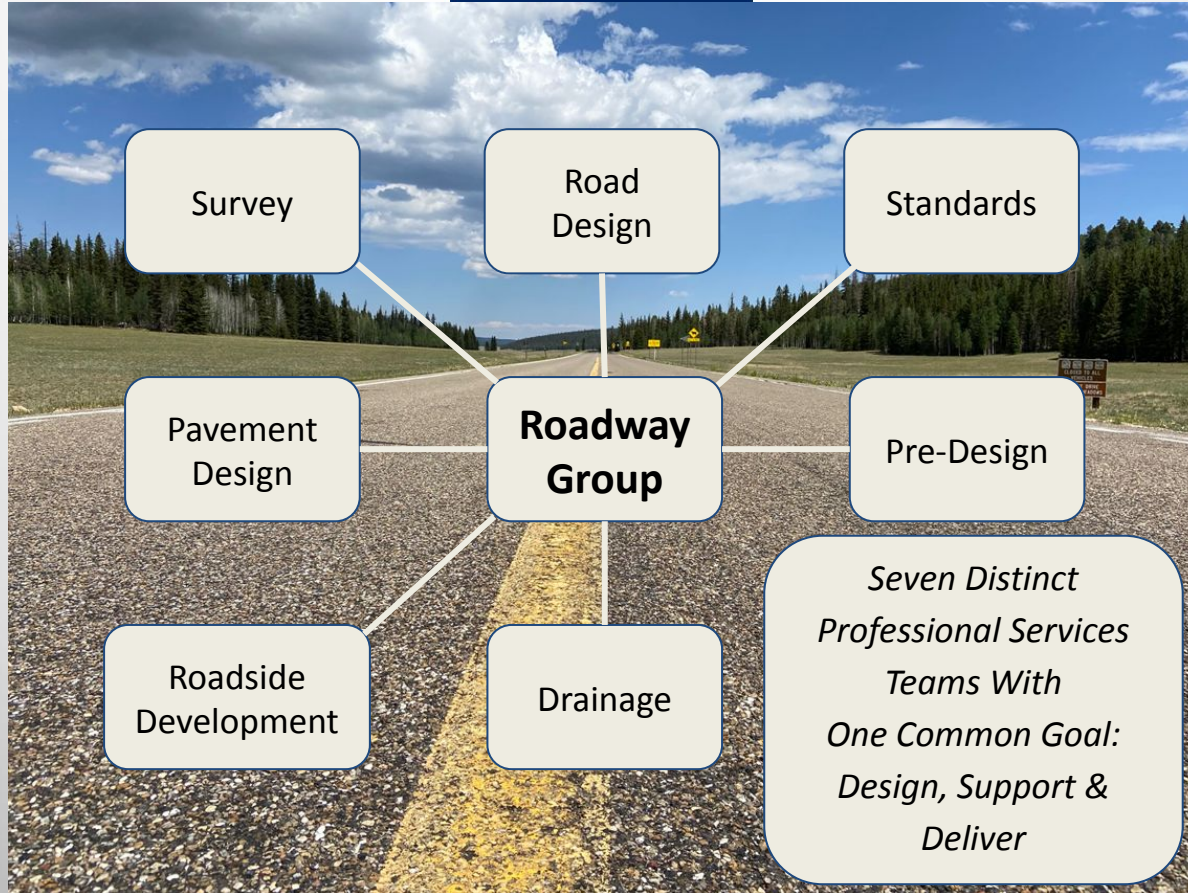


What We Do... *Roadside Development*



- *Aesthetics Design*





Questions?



© Laurence Norah - findingtheuniverse.com