

Arizona Department of Transportation

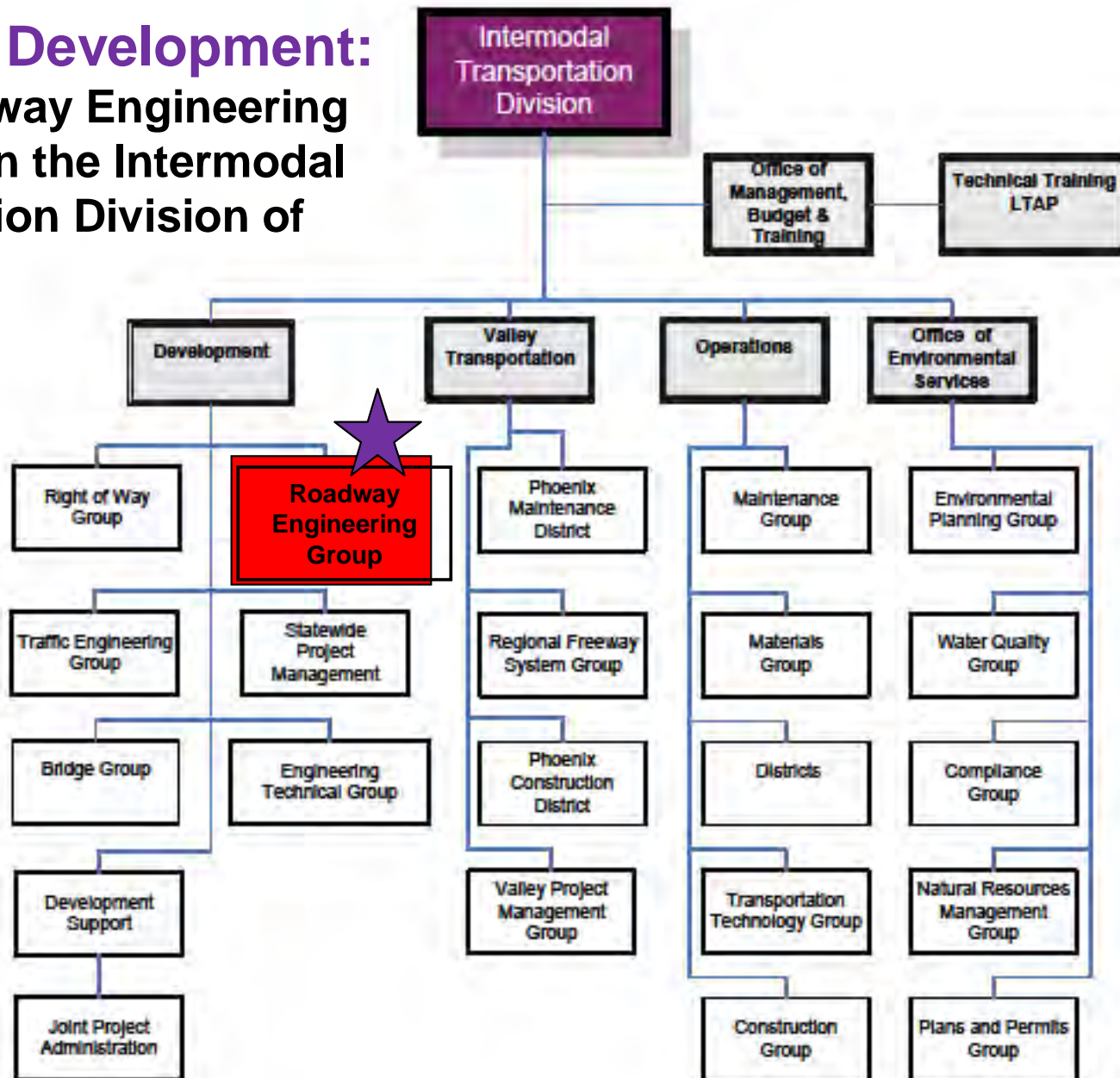


Roadway Group Roadside Development Section



ADOT Intermodal Transportation Division

Roadside Development:
in the Roadway Engineering
Group within the Intermodal
Transportation Division of
ADOT.



Roadway Engineering Group



Contact Us

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Roadside Development Section



Roadside Development



Personnel

Areas of Responsibility	Name	Phone
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Erosion/Sediment Control Design, Pollution Prevention, and Water Quality Protection	LeRoy Brady Tao Fong	602.712.7357 602.712.8476
Landscape Architectural Environmental Design and Planning	Joseph R. Salazar Han Meng	602.712.7077 602.712.8626
Revegetation and Native Seed Mix Design, Environmental Mitigation and Landscape Ecological Design, Native Plant Salvage and Replanting	LeRoy Brady Tao Fong Han Meng	602.712.7357 602.712.8476 602.712.8626
Statewide Rest Area Design	LeRoy Brady	602.712.7357
Xeriscape/Smartscape and DesertWise Landscape Architectural Irrigation Design	LeRoy Brady Joseph R. Salazar Tao Fong	602.712.7357 602.712.7077 602.712.8476

Mission Statement



Roadside Development provides landscape architectural and environmental technical design direction and expertise for Arizona Department of Transportation projects statewide.

Technical direction and expertise include development of plans and specifications and review of consultant plans involving:

- aesthetic enhancements and design
- environmental mitigation and landscape ecological restoration
- stormwater quality and erosion/sediment control
- seeding and revegetation
- native plant salvage and replanting
- landscape and irrigation design
- as well as statewide rest area program and design

Landscape Architecture Practice and Design



450 Landscape Architectural Practice and Design

From ADOT Statewide Dictionary of Standardized Work Tasks

<http://www.azdot.gov/Highways/SWProjMgmt/PDF/DictionaryStandardTasks.pdf>

A. The Landscape Architect shall be responsible for performance of professional services such as **investigation, reconnaissance, research, planning, design or responsible supervision** in connection with the development of land and incidental water areas where the dominant purpose of such services is the **preservation, landscape ecological restoration, enhancement** of proper land uses, natural land features ground cover and planting, naturalistic and aesthetic values, the settings and approaches to building, structures, facilities or other improvements, natural drainage and the consideration and the determination of inherent problems of the land relating to erosion wear and tear, light or other hazards.

Landscape Architecture Practice and Design



450 Landscape Architectural Practice and Design

Continued

B. Landscape Architecture services to accomplish the above mentioned may result in the preparation of the following work products:

- Reports for Site Analysis and Planning
- Visual Analysis
- Resource Planning Inventory and Evaluation
- Research Information and Documentation
- Design and Construction Documents
- Specifications
- Constructability Reviews
- Post Design and Responsible Construction Supervision

Landscape Architecture Practice and Design



450 Landscape Architectural Practice and Design

Continued

C. Investigation, Reconnaissance Research, Planning, Design and Responsible Supervision Work may include but not be limited to:

- Aesthetic evaluations and Visual Quality & Impact Analysis
- Design of Structure and Wall Aesthetic Treatments
- Landscape & Irrigation Systems, when possible Sustainable Design
- Landform Grading & Graphics
- Water Conservation Measures, Audits; Water Harvesting
- Landscape Ecological Planning - Resource Conservation & Protection
- Habitat Mitigation and Restoration
- Reclamation and Revegetation
- Native Plant Inventory, Salvage, Replanting & Establishment
- Noxious Weed and Invasive Non-native Plant Control
- BMPs for Erosion/Sediment Control, Water Quality Protection
- Design Construction Plans, Documents, Specifications & Estimates

Aesthetic Enhancements and Design



Aesthetic Enhancements and Design



Aesthetic Enhancement Design/Construction Guidelines

Corridor themes are defined for the ADOT regional freeway systems. Local communities desiring aesthetic enhancements to these established themes shall comply with the following aesthetic design guidelines for consideration of development and incorporation of local community aesthetic enhancements along with the ADOT corridor architectural design patterns.

Guideline topics include:

- Funding
- Design Concepts and Design
- Review Process
- Color Palettes
- Maintenance Responsibility
- Approval Sequence
- Bid Items
- Artist Copyright
- Rendering and Mockups
- Cost Estimating

Aesthetic Enhancements and Design

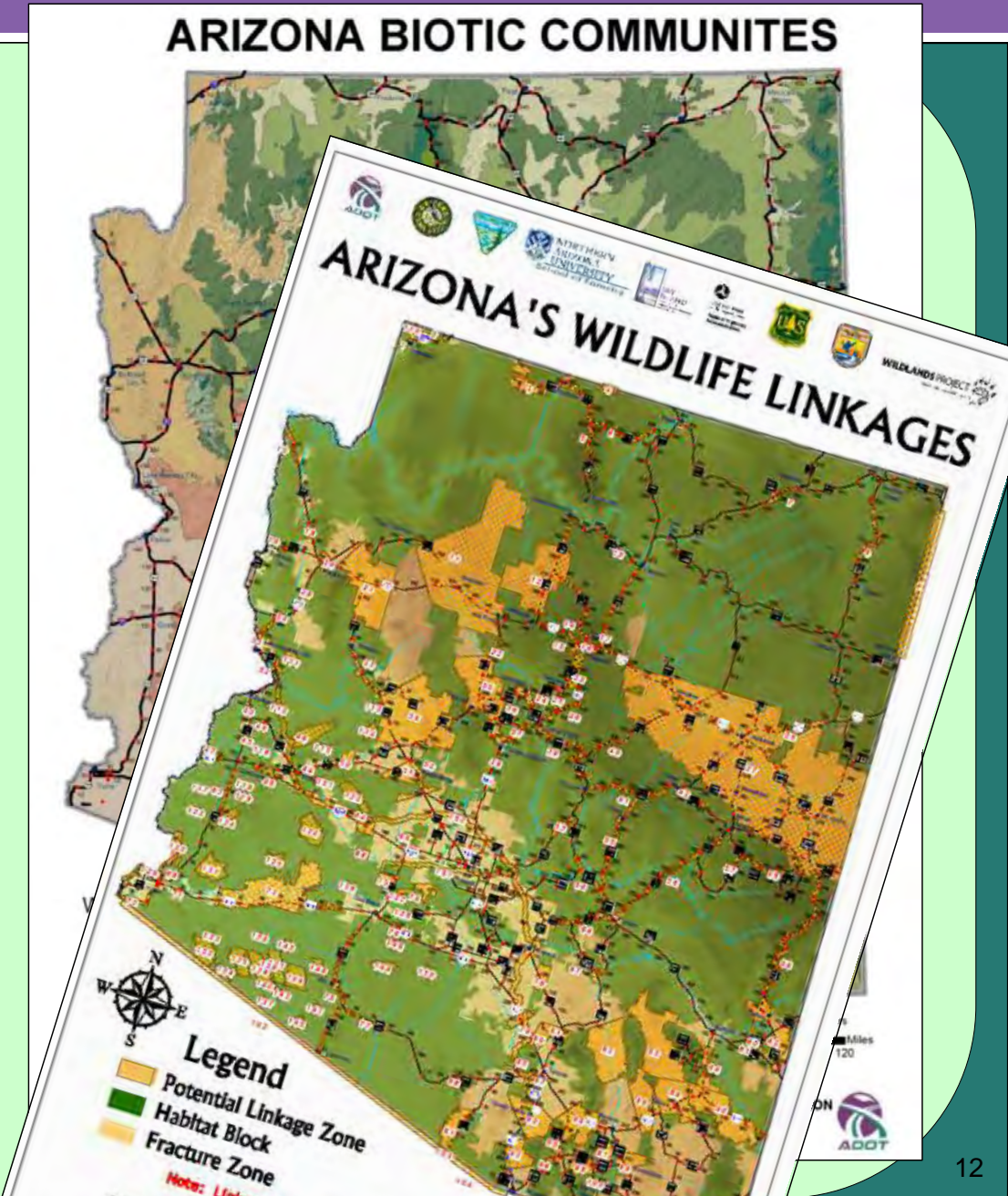


Environmental Mitigation & Landscape Ecological Restoration



Environmental Mitigation

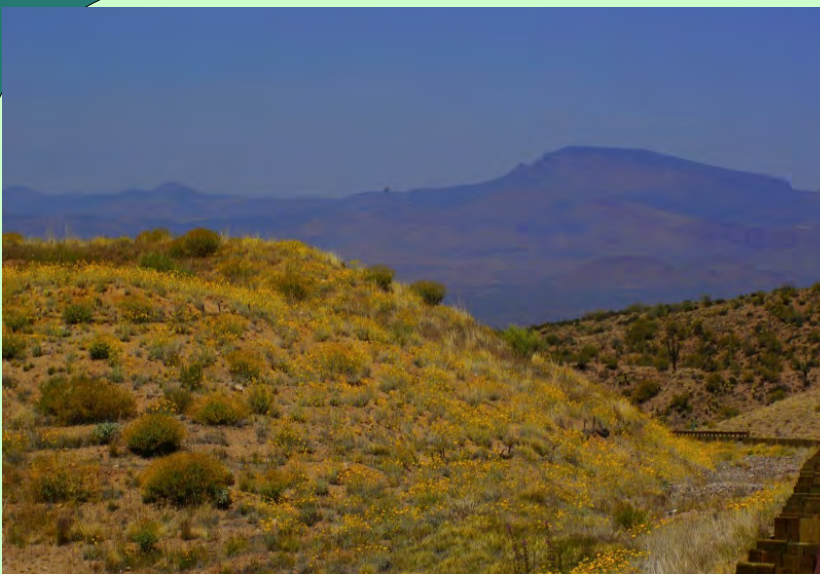
- Restoration of degraded habitat.
- Restoration of damaged wildlife corridors (i.e. riparian areas).
- Combination of techniques to improve connectivity among isolated habitat patches.



Environmental Mitigation & Landscape Ecological Restoration



Environmental Mitigation & Landscape Ecological Restoration



Stormwater Quality & Erosion/Sediment Control

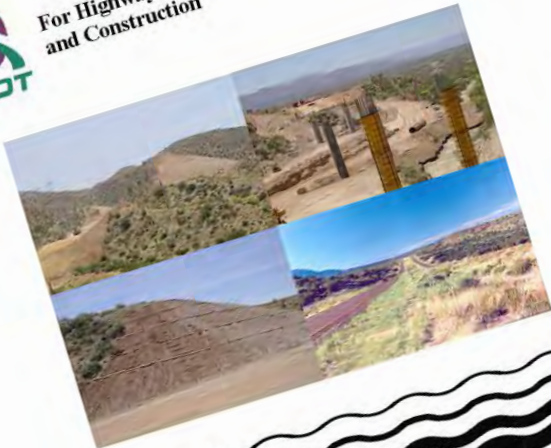
ADOT Erosion and Pollution Control Manual



ADOT EROSION AND POLLUTION CONTROL MANUAL



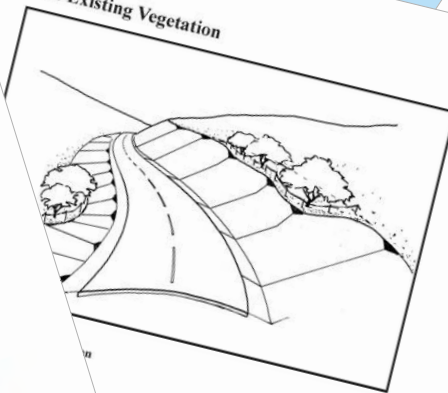
For Highway Design and Construction



Intermodal Transportation Division

Arizona Department of Transportation

Preserve Existing Vegetation



of trees and natural vegetated areas within the construction site to minimize the amount of bare soil exposed to erosive forces and to reduce water runoff.

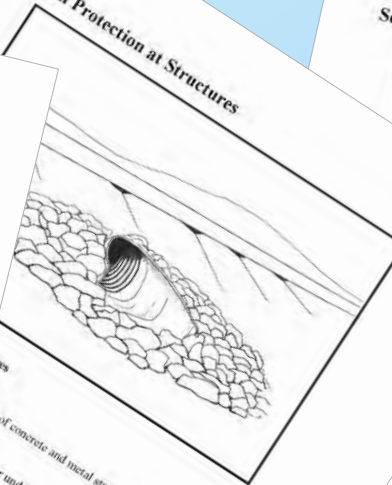
port, and tracking.

conflict with construction activities.

construction activity.

signs and Construction

Erosion Protection at Structures



face of concrete and metal structures

ential for undercutting at structures.

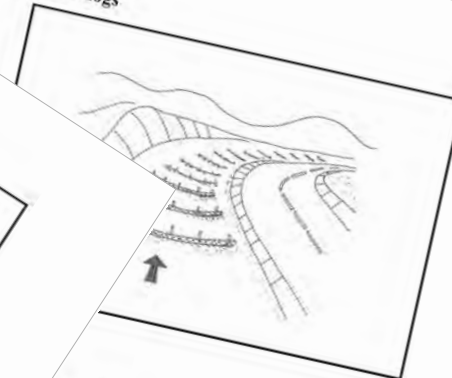
a soil surface and where concentration and or high to cause erosive flows.

when the rock is sized and placed

documents or as directed by the

signs and Construction

Sediment Logs



sio, straw, flax, compost, or other material that has been bound into a tight sediment from runoff.

runoff and reduce flow velocities.

ifications
check dams in roadway ditches and channels downstream of disturbed soils.
round storm drain inlets associated with disturbed areas.
outfalls of small drainage channels or structures.

Not practicable where large flows are involved.
Offer a potential for accidental introduction of undesirable weed species if filled with straw.

Not suitable for rock subgrades where stakes cannot be securely installed.

100

ADOT Erosion and Pollution Control Manual For Highway Design and Construction

Stormwater Quality & Erosion/Sediment Control

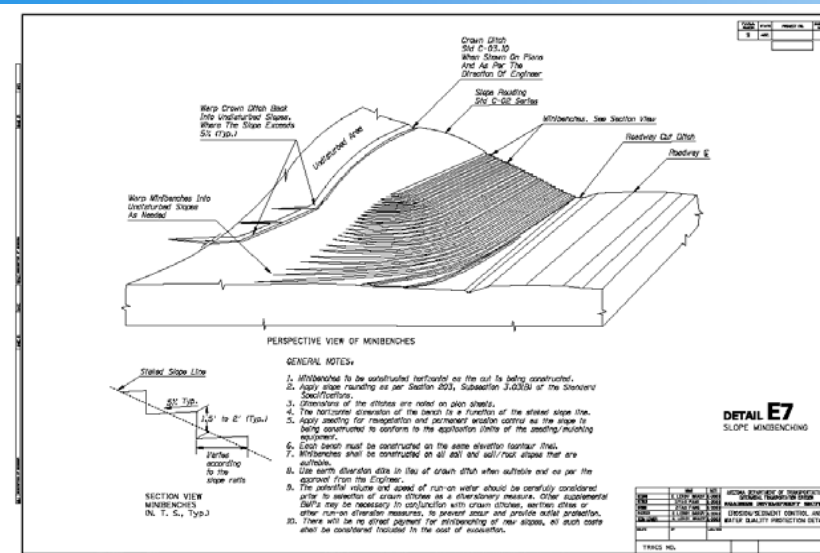


Stormwater Quality & Erosion/Sediment Control



Stormwater Quality & Erosion/Sediment Control

Mini-Benching BMP Detail



Stormwater Quality & Erosion/Sediment Control



**Unbenched Slopes
VS
Benched Slopes**



Stormwater Quality & Erosion/Sediment Control

Limitations of Erosion Control Blankets

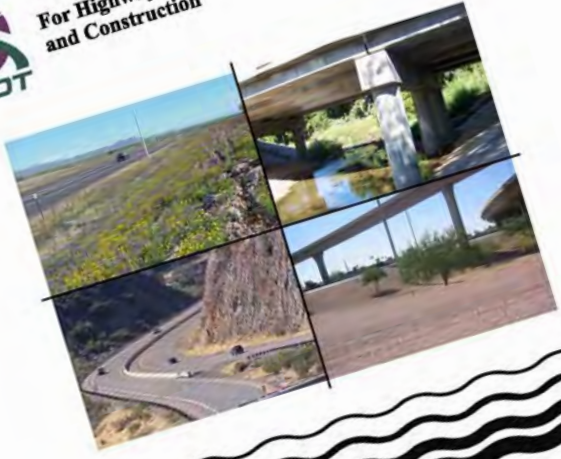




Preliminary Draft



**For Highway Design
and Construction**



January 2008

Intermodal Transportation Division



The following is a list of ADOT recommended post-construction BMP selection flowchart to be presented in Section 3.0.

- Decomposed Granite Cover
- Erosion Control Blankets
- Impermeable Membranes

- Decomposed Granite Cover
- Erosion Control Blankets
- Impervious Cover
- Retaining Wall
- Riprap
- Seed Mix
- Slope Modification and New Slope Construction
- Wire-tied Rock

- Bridge Drainage Systems
- Catch Basins

- Bridge Drainage Systems
- Catch Basins and Downdrain Conduits
- Culverts
- Impervious Channel Lining
- Inlet Protection
- Outlet Protection
- Pervious Channel Lining
- Rainwater Harvesting
- Spillways

- ADOT Approved Vendor
- Bioretention

- ADOT Approved Vendor Treatment Devices
- Bioretention
- Filtration Structures
- Infiltration Basin
- Infiltration Trench
- Retention and Detention Basins (pond-in-place)
- Submerged Filter Strips

ended List of Post-Construction BMPs

view of current ADOT practices and research of additional BMPs (particularly those that have been implemented by the Department of Transportation (DOTs) have implemented. As BMP technology is dynamic and open to revision, ADOT will always be evaluating BMPs, provided that the technology meets ADOT criteria and the other restrictions, and management considerations are successfully addressed.



Rainwater Harvesting



C

Seed Mix

DEFINITION
The application of native vegetation seed to a previously disturbed soil surface. Seed can be mixed with fiber, fertilizers, mulch, or stabilizing emulsions to enhance the seed germination.

OVERVIEW

GENERAL INFORMATION				RATINGS				H	M	L
Key design factors:				Associated Costs						
▪ Selection of correct seeding mixture.				Design						X
▪ Proper seedbed preparation.				Construction					X	
				Maintenance						X
Maintenance needs:				BMP Objective						
▪ Periodic inspections of seeded areas.				Erosion control					X	
▪ Re-seeding areas where vegetation does not establish.				Drainage conveyance						X
				Water Quality/Treatment						X
Most effective when used with:				DOT Target Pollutants Removal						
▪ Slope Modification and New Slope Construction				Dissolved or suspended sediment						N/A
				Biological constituents						N/A
Alternative BMPs to consider:				Nutrients and pesticides						N/A
▪ Decomposed Granite Cover (urban areas)				Heavy metals						N/A
▪ Erosion Control Blankets				Organics						N/A
▪ Vegetative Filter Strips										

PHOTOGRAPHS



narrow areas of natural (undisturbed) are used to retard stormwater runoff and sheet flow and are often well-protected surface waterbodies (BMPs), such as infiltration.

[illegible]

Stormwater Quality & Erosion/Sediment Control

Comply with requirements for control of storm water quality as described in the National Pollution Discharge Elimination System (NPDES) and the Arizona Pollution Discharge Elimination System (AZPDES).

Employ Best Management Practices (BMPs).

- Construction (Temporary)
- Post-Construction (Permanent)

EPA NPDES - Office of Wastewater Management

U.S. ENVIRONMENTAL PROTECTION AGENCY

National Pollutant Discharge Elimination System (NPDES)

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NPDES Topics | Alphabetical Index | About NPDES | Glossary

NPDES Current Issues

Who Are You?

- Agriculture
- Industrial
- Commercial
- Interested
- Municipal Wastewater Treatment
- States and

NPDES Information

- NPDES Permit Program
- Where You

Program Areas

- Animal Feeding Operations
- Combined Sewer Overflows
- Pretreatment
- Sanitary Sewer Overflows
- Stormwater

Water Quality Home

- Compliance
- Data Management
- Monitoring & Assessment
- » **Permits**
- Aquifer Protection
- AZPDES
- Dredge and Fill
- Drywell
- Permits Assistance
- Reclaimed Water
- Related Statutes & Rules
- Subdivisions, Sewage Collection Systems & Onsite Systems
- Safe Drinking Water
- Wastewater Management
- Watershed Management
- Water Quality Standards

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Protecting public health and the environment

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PERMITS: ARIZONA POLLUTANT DISCHARGE ELIMINATION SYSTEM (AZPDES)

On Dec. 5, 2002, Arizona became one of 45 states with authorization from EPA to operate the National Pollutant Discharge Elimination System (NPDES) Permit Program (Section 402 of the Clean Water Act) on the state level.

Under the Arizona Pollutant Discharge Elimination System (AZPDES) Permit Program, all facilities that discharge pollutants from any point source into waters of the United States (navigable waters) are required to obtain or seek coverage under an AZPDES permit. Pollutants can enter waters of the United States from a variety of pathways, including agricultural, domestic and industrial sources. For regulatory purposes these sources are generally categorized as either point source or nonpoint sources.

AZPDES Rules

ADEQ developed rules for the AZPDES program in 2001 and revised them in 2002 and 2004. The most recent revision was published in the [Arizona Administrative Code](#) on Dec. 26, 2003. View the final version of the AZPDES rules at [18 A.A.C. 9, Art 9](#), effective on Feb. 2, 2004 (page 82).

- [Overview of the AZPDES Process](#)
- [Individual Permits](#)
- [General Permits](#)
 - [De Minimis](#)
 - [Concentrated Animal Feeding Operations](#)
- [Stormwater](#)
 - [Phase II](#)
 - [Construction Activities](#)
 - [Multi Sector \(Industrial Activities\)](#)
 - [Municipal Stormwater Program](#)
- [Pretreatment Program](#)
- [Biosolids/Sewage Sludge](#)
- [Forms and Guidance](#)
- [FAQs](#)
- [NOI Construction Database Search](#)
- [Other Programs Affecting AZPDES](#)
- [Contacts](#)

News Releases

- [06/25/07: ADEQ Director Steve Owens' Statement on U.S. Supreme Court Decision Upholding Arizona's Water Quality Permitting Program](#)

<http://cfpub.epa.gov>

<http://www.adeq.gov/arizon/water/permits/npdes.html> (1 of 2) 11/10/2009 3:08:17 PM

Landscape Restoration

- Is the integration and blending of the highway facility with the surrounding natural landscape.
- Includes aesthetic considerations in earthform design of slopes, rounding, and transitions between cuts and fills.

Reclamation, revegetation and stabilization of disturbed soils for the purposes of erosion control are predicated on successful earthform design.

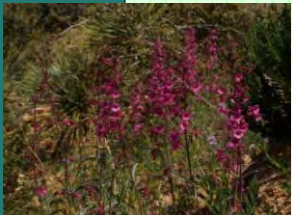


Landscape Restoration



Design Considerations

- Slopes
- Existing Vegetation
- Revegetation
 - Topsoil Salvage
 - Slope Finishes
 - Native Plant Salvage
 - Container-Grown Stock
 - Noxious and Invasive Vegetation
- Existing Boulders
 - Salvage for reuse



Landscape Restoration



Successful Restoration Considerations:

- Condition of the finished grade (compacted/loose, crusted/friable)
- Timing of seed applications
- Inspection of fertilizer, compost, mulch, tackifier and seed mixes
- Adherence to proper seed application techniques



Seeding & Revegetation



Specification:

Item 8050003- SEEDING (CLASS II)

(805SEED, 07/27/05)

ITEM 8050003 - SEEDING (CLASS II):

1.0 Description:

The work under this item shall consist of furnishing all materials, preparing the soil, applying Class II seed, and establishing the seeded areas.

Areas to be seeded are those disturbed or unvegetated areas listed herein, shown on the plans, called for in the contractor's erosion control plan, or designated by the Engineer.

Seeding may be included as part of a landscape project as specified in Section 807, or used for erosion control as part of a Storm Water Pollution Prevention Plan (SWPPP) as specified in Subsection 104.09 of the specifications, or both.

In either case, seeding shall be accomplished in two stages. The first stage shall consist of tillage, furnishing and applying chemical fertilizer, furnishing and planting the contract-specified seed mix, and furnishing, applying and affixing mulch. The second stage, beginning after the first stage has been accepted by the Engineer, shall be a 45 calendar-day period during which time the contractor shall be responsible for maintaining and stabilizing the seeded and mulched areas, and restoring damaged or eroded areas.

Seeding used as part of a SWPPP shall be completed, including the 45 calendar-day maintenance period, before the end of the contract time, or sooner as specified in the SWPPP. Seeding used as part of a landscape project shall be completed, including the 45 calendar-day maintenance period, before the end of the Construction Phase. When seeding is part of a landscape project, the maintenance activities described herein shall be in addition to the work specified in Section 807 for landscape establishment. No time extension will be granted for seeding not completed as specified herein, including the 45 calendar-day maintenance period, before the end of the contract time or Construction Phase as applicable.

2.0 Materials:

2.01 General:

Appropriate documentation, as specified below, shall be submitted to the Engineer a minimum of 30 calendar days before the start of a scheduled seeding activity. No materials shall be delivered to the site until the documentation has been approved by the Engineer.

805SEED - 1/12



Seeding & Revegetation



Methodology for Determining Final Stabilization



Arizona Department of Transportation Methodology for Determining Final Stabilization

(Last updated in January 2006)

"Final Stabilization" is a stipulation that must be met in order for an operator of a construction site to submit a Notice of Termination (NOT) to the Arizona Department of Environmental Quality (ADEQ) under the Arizona Pollutant Discharge Elimination System (AZPDES) Permit Program (Permit No. AZG2003-001) or to the U.S. Environmental Protection Agency under the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP). AZPDES is applicable to projects that disturb greater than one (1) acre on non-Tribal lands; NPDES is applicable for projects on Tribal lands. A NOI is submitted by the operator to terminate coverage for discharges from construction activities to Waters of the United States.

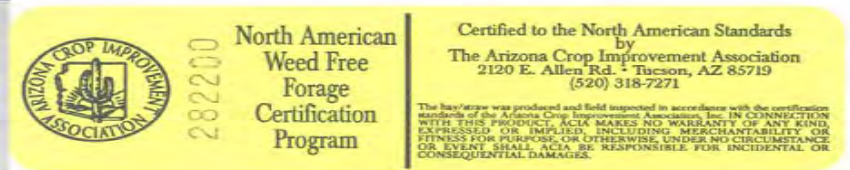
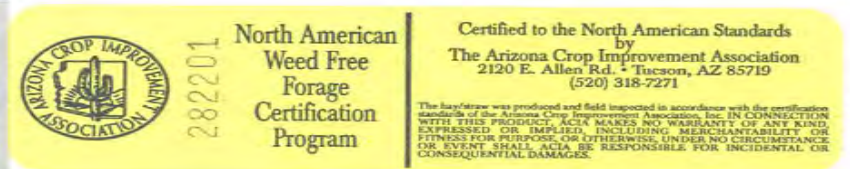
According to AZPDES, "Final Stabilization" means that:

1. All soil disturbing activities at the site have been completed and either of the two following criteria are met:
 - a. A uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of 70% of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or
 - b. Equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.
2. When background native vegetation will cover less than 100 percent of the ground (e.g., arid areas, beaches), the 70 percent coverage criteria is adjusted as follows: if the native vegetation covers 50 percent of the ground, 70 percent of 50 percent ($.70 \times .50 = .35$) would require 35% total cover for final stabilization. On a beach with no natural vegetation, no stabilization is required.

According to NPDES, "Final Stabilization" means that:

1. All soil disturbing activities at the site have been completed and either of the two following criteria are met:
 - a. a uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of 70 percent of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or
 - b. equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.

Seeding & Revegetation



Seeding & Revegetation



Native Plant Salvage & Replanting

Native Plant Salvage & Replanting Evaluation Guidelines

ADOT Roadway Engineering Group
Roadside Development Section



Native Plant Salvage & Replanting Evaluation Guidelines

Arizona vegetative zones include many rare and unusual plant species that may be found only in limited numbers, geographic areas and in some cases limited to the State. Native plant salvage and replanting on a project must be in conformance to the requirements of Arizona Native Plant Laws.

Mitigation requirements, project stipulations and impacts require during the design development that appropriate evaluation of project area vegetative cover be made using the following and other additional project specific criteria as appropriate in the evaluation for plant salvage and replanting within the highway right of way.

Plant salvage, nursery establishment and maintenance and replanting on the project under usual conditions should be limited to \$200,000 per mile not including a one or two year establishment period. Exceptions would be in cases where Saguaros, Barrels, Ocotillos and other primary or climax species such as Ironwood may require additional funding to accomplish the ADOT approved level of plant salvage and replanting.

Non Discretionary Evaluation Requirements:

1. Conformance to requirements of Arizona Native Plant Laws.
2. NEPA Decision Document requirement.
3. Highway safety would not be compromised.
4. Mitigation for 404 permit requirement.
5. Plants must be species that would be self-sustaining after planting and establishment.

Discretionary Evaluation Requirements:

1. Replanting of salvaged or planting of nursery plant materials would maintain or restore wildlife habitat value for cover and movement connectivity between habitat areas crossing the highway.

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1 of 2

ADOT Roadway Engineering Group
Roadside Development Section



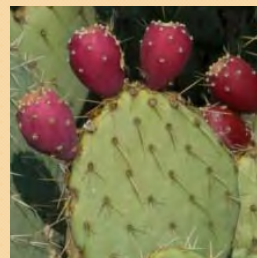
2. Plant species that exhibit difficulty in regenerating naturally or establishing from seeding.
3. Designed replanting quantities should not exceed the area's existing density for individual species and area plant spacing which are good indicators of the areas capacity for sustainable plant survival.
4. Maintain or enhance the visual resource quality of the highway right of way, professional judgment should be used to achieve an appearance similar to the surrounding area and at the same time self-sustaining with the available natural moisture.
5. Required maintenance activities would not be affected such as ditch and culvert cleaning, mowing, shoulder repair and vegetative management and erosion control within a vehicle recovery area.
6. Plants are in good condition with high level of assurance for survival and reestablishment. Locations of plants are accessible for equipment.
7. Salvage and transplanting of primary or climax vegetation is emphasized over transitional or secondary species.
8. Unique species, densities and site conditions that result in estimated plant salvage, nursery and planting costs above \$200,000 per mile requires project specific justification and cost increase approval.

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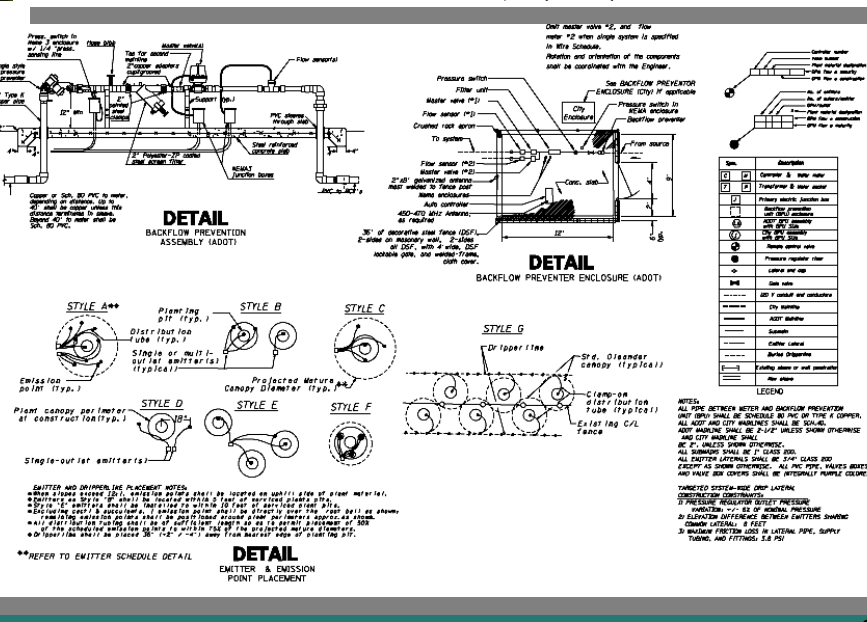
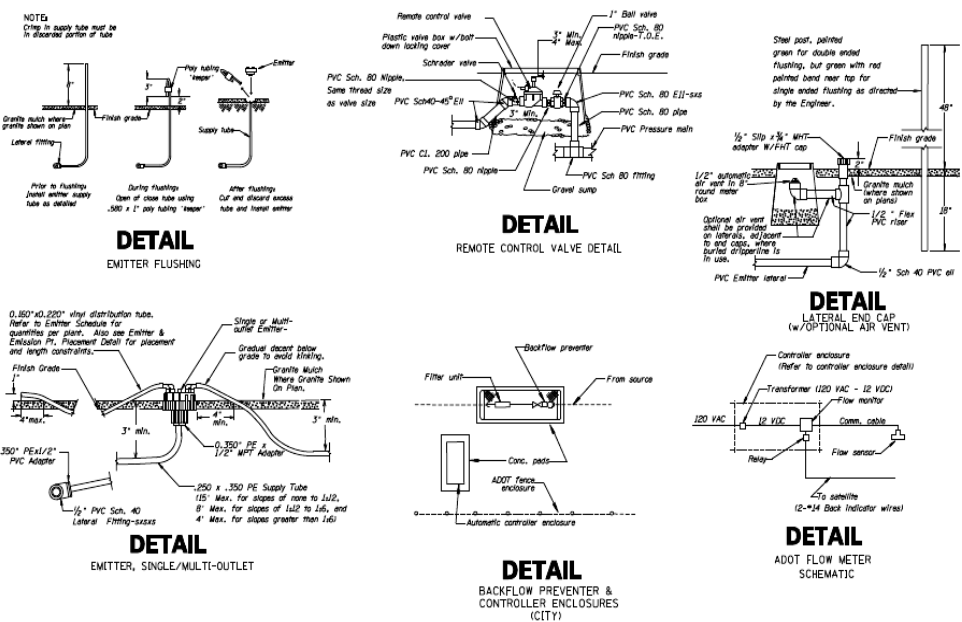
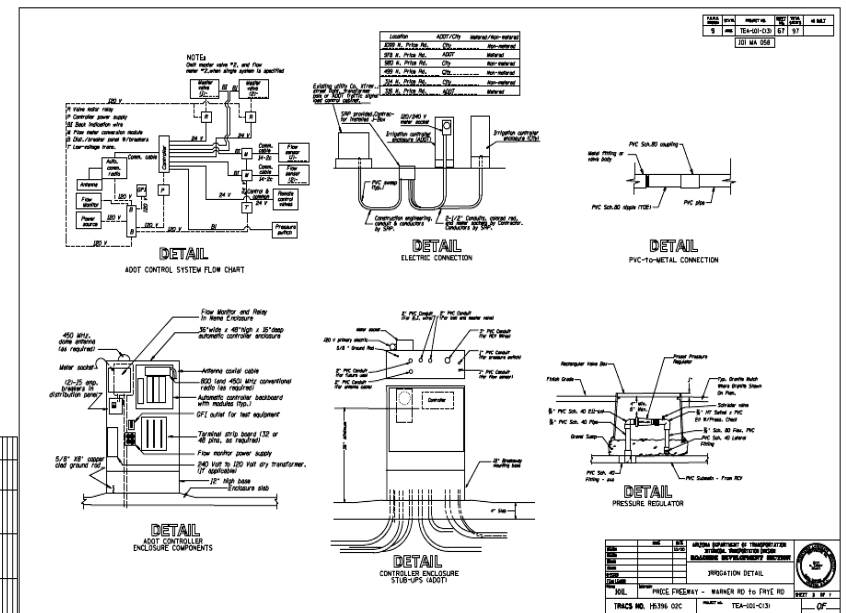
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2 of 2

Native Plant Salvage & Replanting



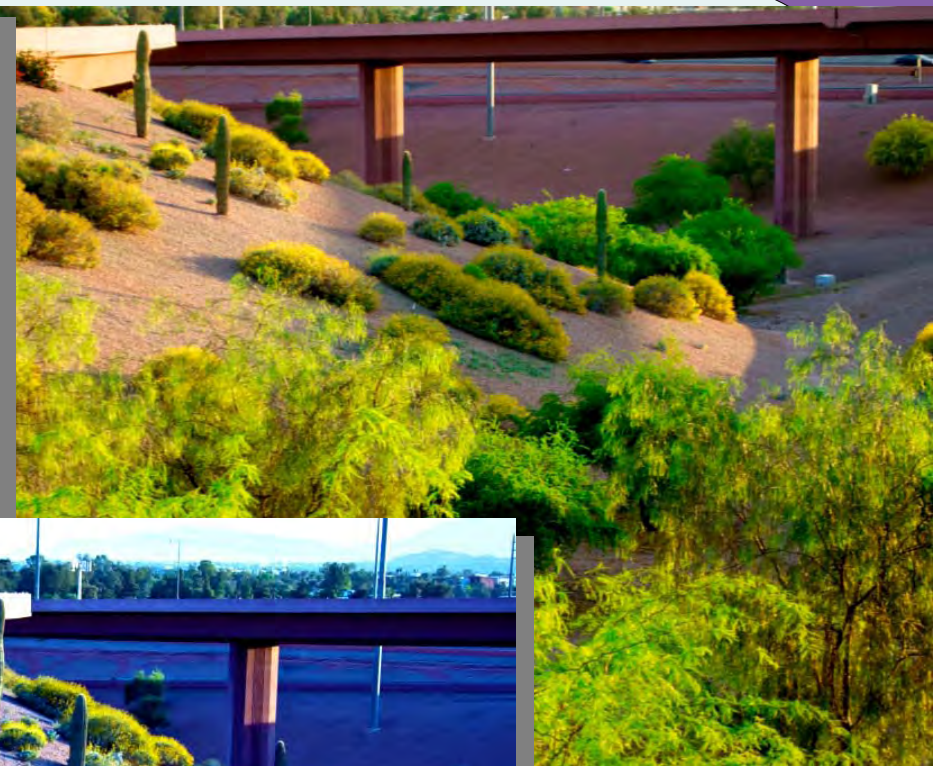
Landscape & Irrigation Design



Landscape & Irrigation Design



Landscape & Irrigation Design



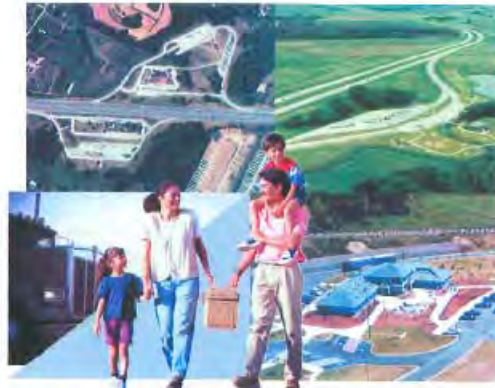
Statewide Rest Area Program & Design



AASHTO

Guide for Development of Rest Areas on Major Arterials and Freeways

Third Edition



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Statewide Rest Area Program & Design

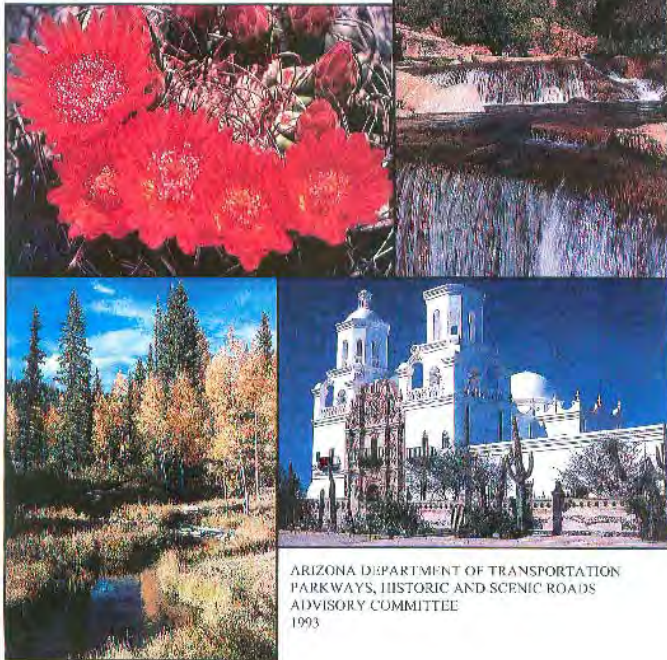


Arizona Parkways, Historic & Scenic Roads Program

ADOT is charged with nomination, designation and maintenance of Parkways, Historic and Scenic Roads.

Roadside Development administers this program.

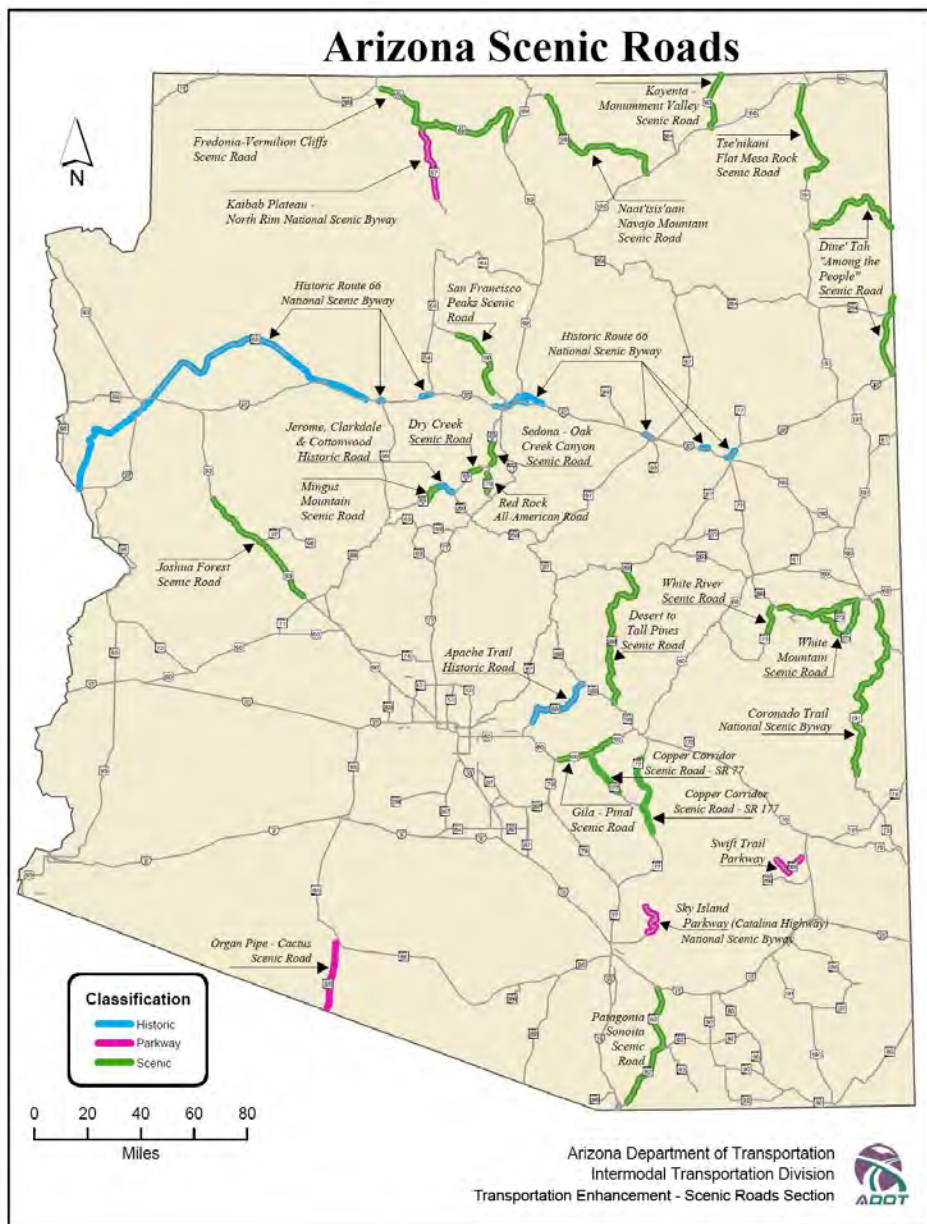
APPLICATION PROCEDURES for DESIGNATION of PARKWAYS HISTORIC and SCENIC ROADS IN ARIZONA



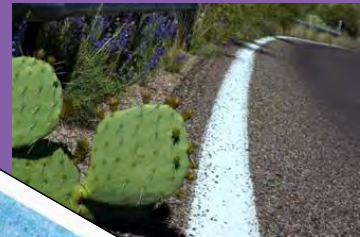
ARIZONA DEPARTMENT OF TRANSPORTATION
PARKWAYS, HISTORIC AND SCENIC ROADS
ADVISORY COMMITTEE
1993



Arizona Parkways, Historic & Scenic Roads Program



Publications



Arizona Department of Transportation Guidelines for Highways on Bureau of Land Management and U.S. Forest Service Lands



ADOT POST-CONSTRUCTION BEST MANAGEMENT PRACTICES MANUAL



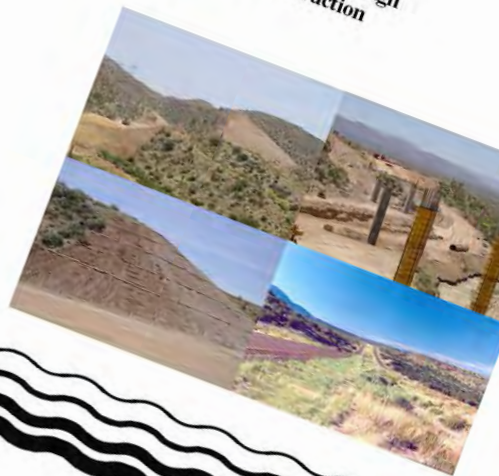
For Highway Design
and Construction



ADOT EROSION AND POLLUTION CONTROL MANUAL



For Highway Design
and Construction

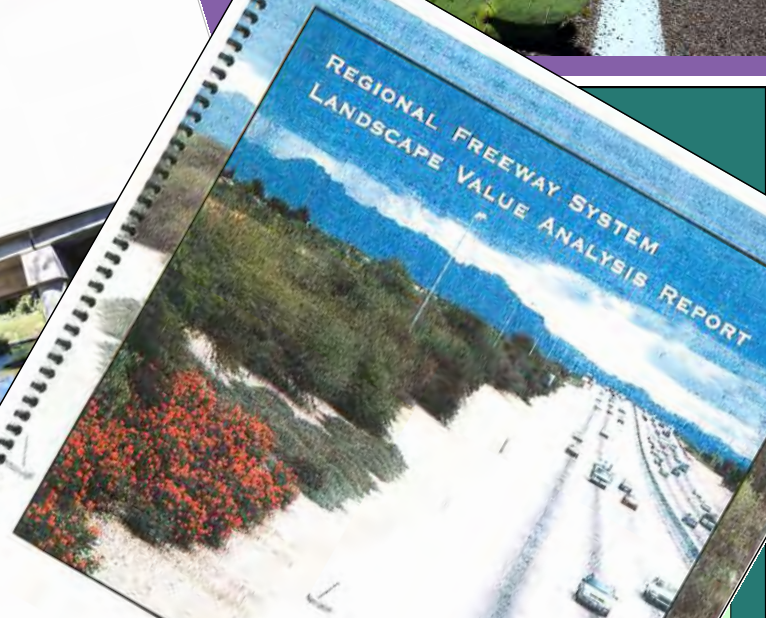


Arizona Department of Transportation

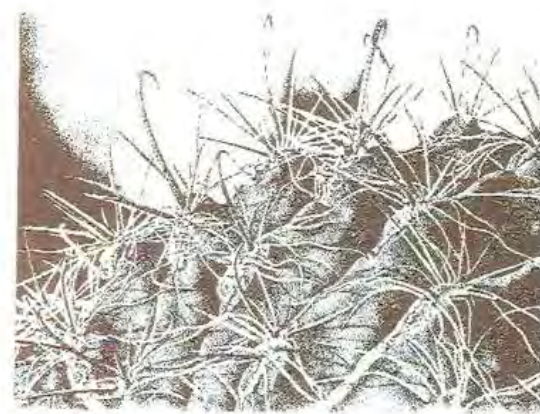
Intermodel 7-

Preliminary Draft

REGIONAL FREEWAY SYSTEM LANDSCAPE VALUE ANALYSIS REPORT



Original Copy



Landscape Design Guidelines for Urban Highways

prepared for Roadside Development Services
Arizona Department of Transportation

Looking to the Future



What's Ahead.....

- Increased emphasis on Context Sensitive Design and Functional Landscape Ecological Design of new highway projects and surrounding environments
- Improved handling of stormwater quality features such as infiltration beds, water harvesting for sustainable landscapes
- Implementation of the next phase of EPA Stormwater Regulations, anticipated to be more stringent in protection of stormwater quality
- Combination of Rest Area and Public/Private Partnership “Oasis Rest Areas”
- Improved Noxious and Invasive Non-native Plant Species Control measures during construction
- Better revegetation results with improved Specification enforcement
- Emphasis on Low Impact Development (LID) for stormwater quality control and Sustainable Projects
- Design/Construction features and construction methods to enhance sustainability and reduce maintenance

Summary



Look to Roadside Development for Guidance in.....

- Aesthetic enhancement and design
- Environmental mitigation and landscape ecological restoration
- Stormwater quality and erosion/sediment control
- Seeding and revegetation
- Native plant salvage and replanting
- Landscape and irrigation design
- Statewide rest area design and management
- Designation of Parkways, Historic and Scenic Roads in Arizona
- Noxious and Invasive Non-native Plant Species management



