



Erosion and Pollution Control Manual

For Highway Design and Construction

2020

ADOT



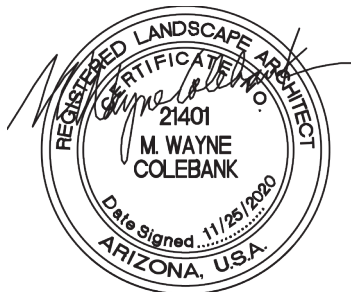
Erosion and Pollution Control Manual *For Highway Design and Construction*

Rewritten and Edited
by
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L O G A N S I M P S O N

for the
**Arizona Department of Transportation,
Infrastructure Delivery & Operations**



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CHAPTER 1: INTRODUCTION



1.1 HIGHWAY CONSTRUCTION AND STORMWATER QUALITY

The highway design and construction process requires thorough planning, thoughtful design, responsible construction practices and diligent inspection and maintenance of all erosion and pollution controls (both structural and non-structural) to meet the water quality requirements of federal, state and local agencies.

ADOT Construction projects typically disturb large areas of natural vegetative cover, modifies slopes, and drainage patterns resulting in higher volumes of runoff and accelerated rates of soil erosion and sediment transfer. Stormwater runoff from construction activities has been identified as a primary source of soil erosion and generation of sediment. This runoff can have significant impacts on water quality through the collection, transport and deposition of sediment, debris and chemical pollutants to storm sewer systems or Waters of the United States (e.g. wetlands, dry washes, rivers, lakes, coastal waters, etc.)

Sedimentation can degrade or destroy aquatic habitat and disturb the physical stability of ephemeral channels; debris can clog receiving waters and reach oceans to impact marine wildlife habitat and chemical pollutants can harm or kill fish and other wildlife. Other environmental impacts of stormwater runoff include:

- **Turbidity** reduces in-stream photosynthesis and increases water temperatures leading to reduced food supply and aquatic habitat
- **Nutrient Loading**, also known as eutrophication, increases excess nutrients that stimulate excessive plant growth and decay, reducing dissolved oxygen in the water
- **Removal of top** soil leaves hard, rocky and infertile soils that are difficult to revegetate

Construction Stormwater Control Measure stormwater control measures are required to help prevent, reduce and/or mitigate the potentially harmful effects of construction pollutants in stormwater runoff. Mitigation of pollutant sources, including sediment, is a key component of any design and construction process. As used in this manual, Stormwater Control Measure stormwater control measures refer to operational activities (non-structural) or physical controls (structural) implemented to meet water quality goals.

The Arizona Department of Transportation (ADOT) has adopted this Manual to assist in developing erosion and pollution controls during the design, construction and maintenance of roadways.

1.2 PURPOSE OF MANUAL

The Manual is written to provide guidance to contractors, design professionals, field inspectors, maintenance personnel, ADOT staff and local public officials or staff.

The purpose of the Manual is to:

- Provide an overview of water quality regulations and permits
- Outline ADOT's procedures for complying with water quality regulations and permits
- Provide guidance for the selection of construction (temporary) Stormwater Control Measure stormwater control measures on ADOT construction projects
- Provide a "tool box" of construction Stormwater Control Measures

1.3 ORGANIZATION OF THE MANUAL

The manual is organized into five chapters:

Chapter 1: Introduction includes an introduction to stormwater runoff pollutants, the purpose of the manual and an overview of water quality regulations and permits.

Chapter 2: Project Planning and Design Guide provides design guidance for incorporating stormwater quality controls into the project planning and design phases and discusses the selection of construction Stormwater Control Measures.

Chapter 3: Instructions for Obtaining Stormwater Discharge Permit Authorization For ADOT Construction Projects describes the steps necessary to obtain Arizona or Federal Construction General Permit authorization for ADOT projects.

Chapter 4: Stormwater Pollution Prevention Plans provides an overview of Stormwater Pollution Prevention Plan (SWPPP) preparation, a requirement for Construction General Permit (CGP) or ADOT Statewide Stormwater Discharge Permit authorization (ADOT staff only projects).

Chapter 5: Stormwater Control Measures Practices is a tool box of stormwater control measures for consideration by ADOT, design professionals and the contractor during design and construction of ADOT projects. Both the EPA Construction General Permit (CGP) and the ADEQ CGP now use the term stormwater control measures and no longer refer to these practices as Best Management Practices (Stormwater Control Measures).

Colors and Symbols Used for each Stormwater Control Measure:



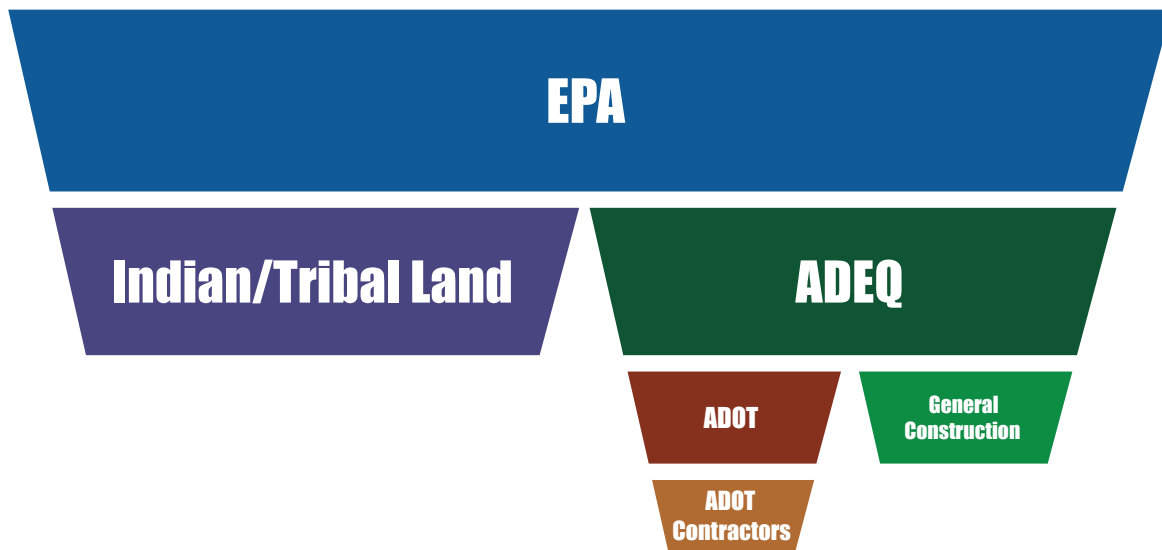
Symbols Used on each Stormwater Control Measure Sheet:

General Information:



ings





Hierarchy of Water Quality Regulations and Permits

1.4 HOW TO USE THIS MANUAL

This Manual is written to provide guidance to a wide range of users with potentially different levels of knowledge and experience.

If you are new to the subject of stormwater management, read the entire Manual to grasp the regulations and review each of the stormwater control measures to better understand your role in erosion and pollution control and review the Stormwater Control Measures.

If you are experienced and familiar with the United States Environmental Protection Agency (EPA) I, Arizona Department of Environmental Quality (ADEQ) and ADOT stormwater quality requirements and erosion and pollution control techniques, browse the table of contents, review section titles for new information, review the revised Construction Stormwater Control Measures and note the website locations for SWPPP templates and electronic Notice of Intent (NOI)/Notice of Termination (NOT) filings that will facilitate document preparation. Always read the definitions of regulatory terms in this Manual, ADEQ, EPA, and all regulations first. Regulatory defined terms are specific and exact, and may not equal your interpretation of a term.

Remember, this Manual is a guide; always refer to the applicable regulations and permits for the exact requirements that apply to your specific project.

1.5 WATER QUALITY REGULATIONS AND PERMITS

All ADOT construction projects must comply with federal, state and local water quality regulations and permit requirements. Attention must be given to these regulations and permit requirements throughout the planning, design, construction and maintenance of a project to ensure that the quality of the Waters of the United States is not compromised.

1 INTRODUCTION

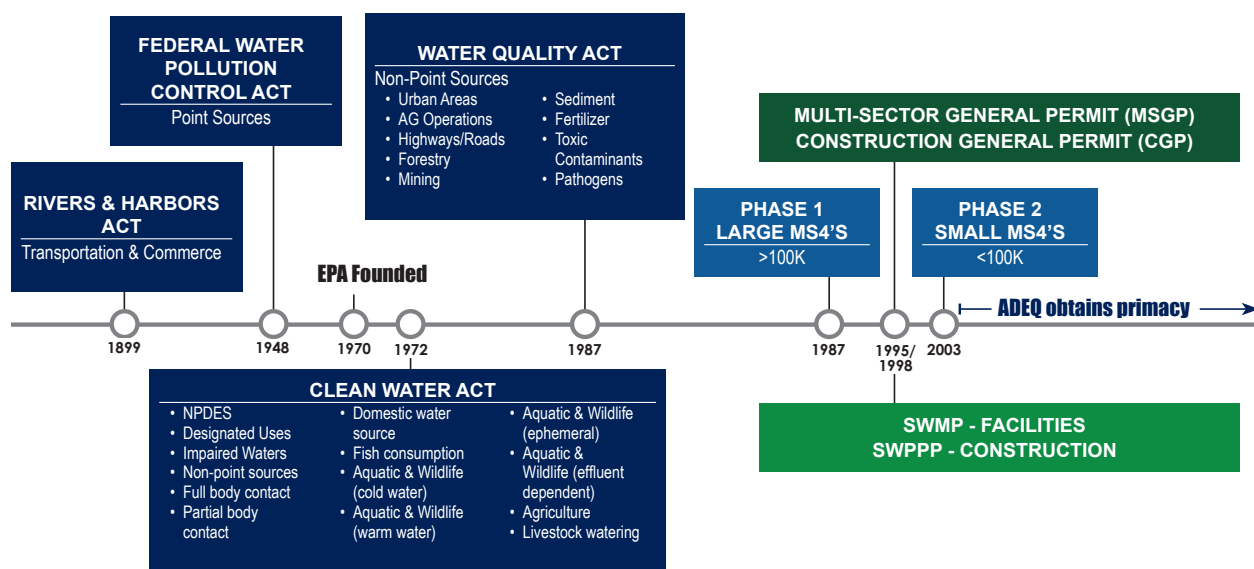
Water quality regulations and permits are administered by Federal and State agencies/programs. County, City or other local agencies/programs may also have ordinances and rules that build on the established Federal and State regulations.

The figure on the previous page illustrates water quality regulation/agency/program/permit relationships for discharge of pollutants and dredged/fill material to waters of the United States. Use this chart to assist in understanding the overview of the pertinent regulations and permitting requirements in the chapter text. Detailed information on water quality regulations and permits is found at agency websites.

United States Clean Water Act

The United States Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and for regulating quality standards Waters of the United States. The basis of the current CWA, the Federal Water Pollution Control Act, was enacted in 1948, and was significantly reorganized and expanded in 1972. The Environmental Protection Agency (EPA) administers the CWA.

In 1972 the CWA was amended and established the National Pollutant Discharge Elimination System (NPDES). The focus of NPDES was primarily point sources of pollution (sewage treatment plants and process wastewater from industrial or manufacturing facility. In 1987 further amendments to WATER POLLUTION CONTROL ACT established the framework for regulating Storm Water as a Point Source. In 1990 EPA Published Final Regulations (Phase I) which established permit requirements for stormwater discharges associated with industrial (Including Construction) activities.



Clean Water Act Timeline

NPDES Construction General Permit:

- 1990 Phase I
- Applied to large and medium municipal separate storm sewer systems (MS4) and 11 industrial categories including construction sites disturbing five acres of land or more
- 2003 Phase II
- Applies to MS4s and construction sites disturbing equal to or greater than one but less than five acres of land OR less than 1 acre if part of a larger common plan that will disturb equal to or greater than 1 acre

Three sections of the CWA have significant impact on the design, construction and maintenance of Arizona's highways:

Section 401

Clean Water Act Section 401

CWA Section 401 requires that proposed discharges to Waters of the U.S. meet applicable effluent limits and Arizona's water quality standards. Section 401 certification requirements apply to all activities regulated under Section 404 of the CWA. EPA has delegated authority to ADEQ to grant, deny, or waive Section 401 water quality certification. Certain activities have been conditionally certified by ADEQ if they meet the Section 401 certification requirements of the applicable Section 404 NWP. If individual certification is required, the CWA Section 401 water quality certification must be completed and submitted to ADEQ. To obtain individual certification, the applicant must demonstrate that the proposed project will not cause or contribute to the violation of state water quality standards or conditions.

If a project is located on tribal land, individual water quality certification may be required from the EPA or from Tribes which have been designated Section 401 authority. The EPA's Conditional Clean Water Act Section 401 certification of the 2017 U.S. Army Corps of Engineers Nationwide Permits on tribal lands, including general conditions, describes EPA's process and submittal requirements for Section 401 certification on tribal land.

Section 402 vs. Section 404: What's the Difference?

Section 402 provides authorization to discharge treated stormwater to Waters of the United States in compliance with permit limitations, conditions and use of Stormwater Control Measures.

Section 404 provides permission to add dredged or fill material to the waters of the United States.

Section 402

Section 402 of the CWA established the NPDES Permit Program which issues individual permits for allowable discharges to waters of the United States and grants authorization to use the EPA Construction General Permit (EPA-CGP) to applicants meeting the eligibility standards (i.e. construction activities disturbing \geq an acre. Most facilities that discharge pollutants from any point source into waters of the United States are required to obtain coverage under a NPDES permit. There are waivers and exemptions for certain dischargers and discharges that are not required to obtain coverage under NPDES Permits. The EPA administers this National Program and has authorized individual states to operate the Program at the state level. In Arizona, this permit (EPA-CGP) provides coverage for projects in Indian Country.

The Arizona Department of Environmental Quality (ADEQ) operates the Arizona Pollutant Discharge Elimination System (AZPDES) Permit Program and issues individual permits for allowable discharges to waters of the United States and grants authorization to use the Arizona Construction General Permit (AZCGP) to qualified applicants. In Arizona, this permit provides coverage for projects outside of Indian Country.

ADOT is authorized to discharge stormwater under the ADOT Statewide Permit for Discharge to Waters of the United States Individual Permit issued by ADEQ. This permit covers ADOT staff- only projects; operators (refer to glossary) under contract to ADOT must apply for authorization under the EPA-CGP or the AZCGP.

Compliance with the requirements of the AZCGP constitutes compliance with the EPA-CGP.

Chapter 3 describes the steps necessary for operators to obtain AZCGP or EPA-CGP authorization and the steps ADOT must follow to comply with the ADOT Statewide Stormwater Discharge Permit requirements.

Other environmental issues such as archaeological and/or cultural sites affecting design and construction decisions may be identified during project planning and design. These issues may affect the contractor's proposed activities outside of the environmentally-cleared construction areas.

Section 404**Clean Water Act Section 404**

Section 404 of the CWA regulates the discharge of dredged material and the placement of fill material within Waters of the U.S. and authorizes the US Army Corps of Engineers (USACE) to issue permits for such activities. Certain activities involving the discharge of dredged or fill material into Waters of the U.S. are authorized by the USACE under the Section 404 Nationwide Permit Program in Arizona. For activities to be authorized under any Nationwide Permit (NWP), the activity and all associated activities must comply with the applicable NWP General and Regional Conditions. Activities that meet the conditions of a NWP for the applicable NWP are authorized to proceed without notification to the USACE. If an activity exceeds one or more of the notification conditions for the

applicable NWP, notification to the USACE in the form of a Preconstruction Notification (PCN) is necessary. When needed, the PCN must be submitted to the USACE for review and authorization must be obtained before construction can commence. An Individual Permit is required for activities that will involve discharging dredged or fill material into Waters of the U.S, but that do not meet the conditions of a NWP (i.e., impacts exceed acreage thresholds, impacts occur to aquatic resources).

Contact the Corps for determination of permit requirements. Locate the district office nearest the project at <http://www.spd.usace.army.mil/cwpm/public/ops/regulatory/index.html>.

Other AZPDES Permits

Other permits that fall under the AZPDES Program are for discharges to waters of the U.S. (surface waters) throughout Arizona, except within Indian Country and include:

- De Minimis General Permit (DMGP) is a statewide permit that provides a way to obtain AZPDES permit coverage for certain types of non-stormwater and covers small discharges from potable water systems, subterranean dewatering, well development, and aquifer testing, provided they are a limited and insignificant threat to water quality
- Multi-Sector General Permit (MSGP) is a statewide permit that provides a way to obtain AZPDES permit coverage for discharges from certain industrial sites of a non-construction nature
- Municipal Separate Storm Sewer System (MS4) General Permit covers discharges from small or large municipal storm sewer systems

Although these permits are not always required for highway construction projects, they are relevant to a discussion of stormwater discharges.

Learn more about these permits at <http://www.azdeq.gov/envIRON/water/permits/index>.

Aquifer Protection Program Permit

ADEQ administers the Aquifer Protection Program and issues Aquifer Protection Permits (APP). A permit must be obtained "if you own or operate a facility that discharges a pollutant to an aquifer or the land surface or the vadose zone in such a manner that there is a reasonable probability that the pollutant will reach an aquifer." All construction projects with concrete washout activities must follow the conditions of APP Concrete Washout Aquifer Protection General Permit A.A.C. R18-9-B301. Type 1 General Permit.

Additional Federal Land Requirements

Several agencies within the U.S. government manage public lands and may have their own erosion and pollution control requirements. These agencies include the Bureau of Indian Affairs (BIA), the Bureau of Land Management (BLM), the National Park Service (NPS), the U.S. Department of Agriculture Forest Service (USFS), Natural Resource Conservation Service (NRCS), Bureau of Reclamation (BOR), and the USFWS. Each affected agency must be included in the planning and design process when roadway plans are prepared within their jurisdictions. Doing so will ensure that their requirements are incorporated into the plans.

Contact Information:

Bureau of Indian Affairs - <http://www.bia.gov/>

National Resource Conservation Service - <https://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/>

Bureau of Reclamation - <https://www.usbr.gov/lc/>

Bureau of Land Management - <https://www.blm.gov/office/national-office>

National Park Service - <http://www.nps.gov/>

U.S. Department of Agriculture Forest Service - <http://www.fs.fed.us/>

U.S. Fish and Wildlife Service – <http://www.fws.gov/>

Local Government Requirements

Projects may also be located within the jurisdictions of local governments. These may include MS4s and County Flood Control Districts. Each affected agency must be included in the planning and design process when roadway plans are prepared within their jurisdictions. This will ensure that their requirements are incorporated into the plans.

Contact Information:

Local Government Units

ADOT Local Public Agency

ADOTLPA Section provides guidance, assistance with project delivery and oversight to local public agencies such as counties, towns, cities and tribal governments within our state. LPA programs include:

- Transportation Alternative Program (TA)
- Safe Routes to School
- Off System Bridge Program
- Highway User Revenue Fund (HURF) Exchange

There are three acceptable administration options in which LPA projects may qualify for federal funding:

- ADOT Administered Project (AA)
- Self-Administered Project (SA)
- Certification Acceptance (CA)

LPAs are encouraged to visit our “One-Stop-Shop” portal for more information on project initiation guidance and materials related to managing local project.

<https://azdot.gov/business/programs-and-partnerships/local-public-agency>

Arizona Council of Governments Website:

<https://www.azmag.gov/>

Municipal Separate Storm Sewer Systems

Arizona Department of Environmental Quality Listings:

http://www.azdeq.gov/MS4_GP

EPA Region 9: Water Programs Website:

<https://www.epa.gov/npdes-permits/npdes-permits-epas-pacific-southwest-region>

County Flood Control Districts

Phone Listings County Government Pages

Arizona Association of Counties Website:

<http://www.azcounties.org/>

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CHAPTER 2

PROJECT PLANNING & DESIGN GUIDE



2.1 INTRODUCTION

Effective erosion and pollution control begins with project planning and design, continues through construction and is ongoing throughout project establishment and maintenance. Planning and scheduling may be the best stormwater control measure. If performed correctly, time, effort, rework, and escalation may be greatly reduced or even prevented.

This chapter defines erosion and sediment control and Pollution Prevention principles; discusses erosion and pollution control considerations in project planning and design, and control methods to support the principles; outlines ADOT categories of construction Stormwater Control Measures; and provides guidance for selecting construction Stormwater Control Measures.

Use this chapter, together with Chapter 5 Stormwater Control Measures, as a planning and design guide to define control methods and select Stormwater Control Measures that are the right control, for the correct application, and in the best location to meet water quality goals.

2.2 PROJECT PLANNING AND DESIGN

During the design process, the Landscape Architect and Engineer must endeavor to minimize the impacts to water quality that may be caused by the project.

As part of the project design process, the designer will develop Erosion and Pollution Control Plans and Details which specify Stormwater Control Measure locations and direct the contractor in the proper installation and maintenance of Stormwater Control Measures. The intent of these plans and details is to provide general direction and specific Stormwater Control Measure expectations to the contractor. They will not be considered a Stormwater Pollution Prevention Plan (SWPPP) and shall not replace the contractor's SWPPP, since the project plans and details are prepared assuming standard construction practices and may not reflect the contractor's actual methods of construction, access requirements or project phasing. The contractor shall use the project Construction Documents including the Erosion and Pollution Control Plans and Details as a guide in developing his or her own SWPPP.

SWPPP vs. Erosion and Pollution Control Plans and Details: What's the Difference?

The SWPPP, required to obtain coverage under NPDES EPA-CGP of AZPDES CGP permits, will include Erosion and Pollution Control Plans and Details and/or Stormwater Control Measures.

Erosion and Pollution Sediment Control Plans and Details provided in a bid set **are not** the SWPPP, or SWPPP Site Maps.

The Erosion and Sediment Control Plans and Control Measure Details provided to a contractor in a Bid Set/Plan Set are not to be confused with SWPPP, much less the SWPPP Site Maps. The SWPPP is a large, detailed understanding of processes, schedules, written expectations of each role and trade for a construction project to meet stormwater permit conditions and compliance. The SWPPP is constantly changing to meet the field conditions and is required to be updated when site structural and non-structural conditions change. The SWPPP is often referred to as a “Living Document” for this reason. The Erosion and Sediment (E&S) Sheets provided in a Plan Set will only show an approved area of construction. While these sheets do provide topography, final erosion control features (plunge basins, box culverts, etc.) they will not have all of the elements indicated by the CGPs to be placed on a SWPPP Site Map. The E&S Sheets are the final product of what the project should reflect upon completion of the contract. At the time of the E&S Sheet creation, ADOT cannot know where a contractor may place spoil piles, how many track out pads will be used, areas where concrete washout devices will be used, or construction yards may be located. These items are the responsibility of the Contractor and allows for contractor ingenuity and creativity in estimating and bidding projects.

Notice that this manual has provided initials to each of the control measures (EC, SC, WM, NS). This naming scheme differs from the E&S details and callouts in a Plan Set. ADOT Roadway Engineering, Roadside Development website contains Erosion/Sediment and Water Quality Protection Best Management Practices (BMP) Details. These details may reflect Sediment wattles, gravel bags, mini-benching, etc., and in a Plan Set will be titled with initials “ES”. Specific erosion and pollution control design considerations are included with each erosion and sediment control principle discussion in section 2.5 Applying the Principles.

Low Impact Development

The Center for Environmental Excellence by AASHTO defines Low Impact Development (LID) as a stormwater management strategy concerned with maintaining or restoring the natural hydrologic functions of a site to achieve natural resource protection objectives and fulfill environmental regulatory requirements. LID incorporates a set of overall site design strategies as well as highly localized, small-scale, decentralized source control techniques known as Integrated Management Practices. Consider LID strategies and practices in preparing your *Erosion and Pollution Control Plans and Details*. Examples of LID site design strategies and practices include:

- Phase and limit the amount of actively disturbed area on a construction site to reduce erosion and sediment loss
- Grade to encourage sheet flow and lengthen flow paths
- Maintain natural drainage divides to keep flow paths dispersed
- Preserve naturally vegetated areas and soil types that slow runoff, filter pollutants, and facilitate infiltration
- Direct runoff into or across vegetated areas to help filter runoff and encourage recharge
- Provide small-scale distributed features and devices that help meet regulatory and resource objectives
- Treat pollutant loads where they are generated, or prevent their generation

Bioretention, filter strips, grassed swales, infiltration trenches, inlet pollution traps/removal devices, and permeable pavers and pavement are some of the common LID tools. Greater use of soil amendments increases the capacity of soil to absorb moisture and sustain vegetation, curbside or in swales, which in turns removes water through transpiration. Additional information is available at https://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/3_7.aspx.

2.3 STORMWATER CONTROL MEASURES

In this manual the term Stormwater Control Measure refers to operational activities (Non-Structural) or physical (Structural) that reduce erosion, the discharge and minimize potential impacts upon receiving waters. There are two major classifications of Erosion and Pollution Control Stormwater Control Measures within ADOT: construction (temporary) and post-construction (permanent).

This manual focuses primarily on construction Stormwater Control Measures. Construction Stormwater Control Measures are temporary measures to control stormwater quality during the construction process. Most construction Stormwater Control Measures will be removed as construction progresses and stabilization is achieved or at the completion of construction, but some could remain in place as permanent control measures. The table at right lists, by category, construction Stormwater Control Measures included in this manual.

Non-Structural control measures have the potential to be more important than many Structural control measures. While unseen by most personnel on a project, these control measures dictate when, where, why, and how many structural control measures will be used on a project. Non-structural controls such as, planning, schedule, listing prohibited practices, and employee training should be inspected as frequently as the structures in the field. If training and certifications are not up to date, or contractors/sub-contractors are refueling near open water or next to a MS4 inlet, the best structures used on a project may not be effective as the non-structural controls that will minimize or even prevent pollutants from entering stormwater runoff from a project. Non-structural control measures can include procedures on material staging and storage, maintenance of structural control measures, SWPPP management, and personnel training on stormwater management and what is included in the SWPPP.

Non-Structural Control Measures are stormwater controls used to address scheduling, approved practices, prohibited actions, effluent limitations, used to prevent or reduce the discharge of pollutants to waters of the United States.

Non-Structural items are often overlooked due to not having a listed category like erosion control, or sediment controls. This is because non-structural controls can apply to each one of these categories. Non-Structural items are also overlooked because they are “no-bid” items and processes are assumed to be followed with each structural item. These “no-bid” items will save time, effort, and money by preventing pollutant discharges and their remediation.



Non-Structural control measures (planning, staging and sub-contractor training) would have prevented this example of non-compliance. See Control Measure PP-9 for proper staging.

Post-construction Stormwater Control Measures are permanent measures to manage stormwater quality both during and after construction of the project. The ADOT Post-Construction Best Management Practices Manual serves to guide the roadway designer in the selection and design of structural post-construction Stormwater Control Measures. Chapter 2 of that manual describes how to properly plan for and select post-construction Stormwater Control Measures on ADOT roadway projects. Off-road, Overland Flow Erosion Control; Roadway Drainage Conveyance; and Water Quality and Treatment are the Stormwater Control Measure categories featured in the ADOT Post-Construction Stormwater Control Measure Manual.

The ADOT Post-Construction Best Management Practices Manual should be used with this manual to select the most effective erosion and pollution control measures for each ADOT project.

Understanding the difference between erosion and sediment is a key factor in understanding which control measure to use for a given application. Using incorrect stormwater control measures in the wrong location, for the wrong purpose will result in control measure failure, rework, non-compliance with a CGP and potential for violation or civil liability.

Erosion is an action or a process making erosion controls the primary means of mitigating stormwater pollution.

Sediment is the result of the action or process of erosion, making sediment controls a necessary second line of defense to properly designed and installed erosion controls.

Both the EPA-CGP and the AZCGP require the design and use of a combination of these control measures to address sediment from leaving the project boundaries, a discharge of pollutants.

CP	Construction Site Planning and Management		
CP-1	Construction Sequencing	SC-10	Stabilized Construction Entrance/Exit
CP-2	BMP Inspection and Maintenance	SC-11	Stabilized Construction Roadway
EC	Erosion Control	SC-12	Compost Sock
EC-1	Preserve Existing Vegetation	SC-13	Rock Berm
EC-2	Minibench/Slope Roughening	SC-14	Pipe Inlet Protection
EC-3	Mulch Cover	PP	Pollution Prevention
EC-4	Seeding	PP-1	Vehicle and Equipment Cleaning
EC-5	Geotextiles/Erosion Control Blankets	PP-2	Vehicle and Equipment Fueling
EC-6	Soil Binders	PP-3	Vehicle and Equipment Maintenance
EC-7	Crown Ditch	PP-4	Street Sweeping and Vacuuming
EC-8	Rock Cover	PP-5	Material Delivery and Storage
RC	Runoff Control	PP-6	Material Use
RC-1	Earth Dikes/Drainage Swales and Lined Ditches	PP-7	Stockpile Management
RC-2	Cut to Fill Slope Transitions	PP-8	Spill Prevention and Control
RC-3	Erosion Protection at Structures	PP-9	Portable Toilet
RC-4	Rock Outlet Protection/ Velocity Dissipation Devices	NS	Non-Stormwater
RC-5	Slope Drains	NS-1	Water Conservation Practices
RC-6	Check Dam	NS-2	Dewatering Operations
SC	Sediment Control	NS-3	Paving and Milling Operations
SC-1	Sediment Control Berm	NS-4	Temporary Watercourse Crossing
SC-2	Silt Fence	NS-5	Water Diversion
SC-3	Sediment Trap	NS-6	Structure Demolition/Removal Over or Adjacent to Water
SC-4	Sediment Basin	NS-7	Material and Equipment Use In/Over Watercourses
SC-5	Sediment Wattle	WM	Waste Management
SC-6	Sediment Log	WM-1	Solid Waste Management
SC-7	Gravel Bag Protection	WM-2	Hazardous Waste Management
SC-8	Storm Drain Inlet Protection	WM-3	Contaminated Soil Management
SC-9	Curb Inlet Protection	WM-4	Concrete Waste Management
		WM-5	Liquid Waste Management

Interim construction Stormwater Control Measures

The Permits require:

"Design, install and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants." (AZCGP Part 3.1.1).

"You must implement erosion and sediment controls in accordance ... to minimize the discharge of pollutants in stormwater from construction activities." (EPA-CGP Part 2.2).

Erosion Controls prevent/reduce erosion from being dislodged.

Sediment controls capture/contain sediment after it has become dislodged.

Erosion Control	Sediment Control
Covers the soil 90-98% effective in reducing sediment	Prevents sediment from leaving the site 70-90% effective Sediment controls such as silt fence are only 40-50% effective <u>when installed correctly</u>

Temporary, interim construction, stormwater control measures are to be used appropriately and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date.

Permittees are encouraged to perform necessary and permitted work within Waters of the United States during periods of low-flow or no-flow. This means a 404 CWA permit(s) is on site and being followed. All installed stormwater control measures shall perpetuate natural flow patterns and conveyances such that flooding or ponding is not caused inside or outside of the right-of-way or that may pose a hazard to motorists, pedestrians, or any other user.

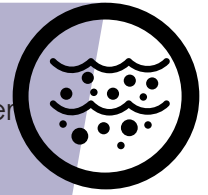
2.4 EROSION AND SEDIMENT CONTROL AND POLLUTION PREVENTION PRINCIPLES

Erosion and pollution control principles serve as the foundation for successful erosion and pollution control on all ADOT projects. These principles drive planning, design, construction and maintenance of erosion and pollution control measures. They serve as the criteria for all to ensure meeting required water quality goals throughout all project stages.

The EPA document, *Developing Your Own Stormwater Pollution Prevention Plan*, identifies the following Erosion and Sediment Control and Pollution Prevention Principles with example Stormwater Control Measures to assist in developing effective erosion and pollution control measures. Pollution Prevention Principles are also defined to assist contractors in developing site controls to prevent contamination of stormwater runoff.

Erosion Control Principles (1st Line of Defense)

1. Minimize disturbed area and protect natural features and soil (Stormwater Control Measure- Preserve Existing Vegetation)
2. Phase construction activity (Stormwater Control Measure- Construction Sequencing)
3. Control stormwater flowing onto and through the project (Stormwater Control Measure- Earth Dikes/Drainage Swales and Lined Ditches)
4. Stabilize soils promptly (Stormwater Control Measures- Hydroseeding, Soil Binders)
5. Protect slopes (Stormwater Control Measures- Geotextiles/Erosion Control Blankets, Crown Ditch, Slope Drains)
6. Prevent downstream erosion and control velocity of flows



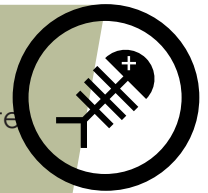
Sediment Control Principles (2nd Line of Defense)

1. Protect storm drain inlets (Stormwater Control Measure- Storm Drain Inlet Protection)
2. Establish perimeter controls (Stormwater Control Measures- Silt Fence, Sediment Logs)
3. Retain sediment on-site and control dewatering practices (Stormwater Control Measure- Sediment Trap, Sediment Basin, Dewatering Operations)
4. Establish stabilized construction exits (Stormwater Control Measure- Stabilized Construction Entrance/Exit)
5. Inspect and maintain controls (Stormwater Control Measure- Inspection and Maintenance)



Pollution Prevention Principles

1. Provide for waste management (Stormwater Control Measures- Solid Waste Management, Hazardous Waste Management)
2. Establish proper material handling and staging areas (Stormwater Control Measures- Material Delivery and Storage, Material Use)
3. Designate paint and concrete washout areas (Stormwater Control Measure- Concrete Waste Management)
4. Establish proper equipment/vehicle fueling and maintenance practices (Stormwater Control Measures- Vehicle and Equipment Fueling, Vehicle and Equipment Maintenance)
5. Control equipment/vehicle washing and allowable non-stormwater discharges (Stormwater Control Measure- Vehicle and Equipment Cleaning)
6. Develop a spill prevention and response plan (Stormwater Control Measure- Spill Prevention and Control)



2.5 APPLYING THE PRINCIPLES

Multiple highway design and construction project participants are responsible for project erosion and pollution control from planning to maintenance and although each has a defined role and is responsible for a specific work product (e.g. *Erosion and Pollution Control Plans and Details*, SWPPP, maintenance plan). The ultimate goal is to prevent stormwater pollution. Each party will apply the principles and use this Manual as a guide to develop the erosion and pollution control measures for which he or she is primarily responsible.

The following section presents each principle and provides example suggestions for planners, designers and contractors on selecting and/or developing erosion, pollution and Pollution Prevention control measures that support each principle. These control measures may include planning and design considerations as well as construction and post-construction Stormwater Control Measures. The examples are not all inclusive, but are intended to generate thought and discussion of project planning and design, erosion control plans and details, SWPPP preparation and Stormwater Control Measure selection.

Stormwater management requirements during maintenance activities are discussed in *The Maintenance and Facilities Best Management Practices Manual*. That ADOT manual identifies which maintenance activities require the use of stormwater protection Stormwater Control Measures. ADOT Maintenance actions occur only after the contractor has closed out their Notice of Intent (NOI).

Erosion Control Principles

Erosion controls include non-structural and structural practices to keep sediment in place and are the primary means to minimize stormwater pollution. Non-structural practices include strategic planning such as scheduling to limit soil disturbance. Structural practices protect slopes and direct stormwater-flow through the site. Effective erosion control is the foundation for the most successful stormwater pollution prevention plans. Use the following discussion of erosion control principles as a guide in selecting the best erosion control Stormwater Control Measures for the SWPPP.

Erosion Control Principle #1:

Minimize disturbed area and protect natural features and soil



Limiting disturbed areas to those only required for the construction of the highway project and preservation of natural vegetation beyond the limits of slope rounding and warping are two cost- saving erosion control methods (Stormwater Control Measures).

Planner/Designer:

- Select highway corridor alignment to limit impact on existing vegetation and natural features
- Design to balance cut and fill and to reduce the length and steepness of slopes and the extent of grading
- Preserve vegetation within transition areas of cuts or fills and outside of clear zones (specify in plans and Special Provisions)
- Specify location of temporary roads to avoid stands of significant vegetation and to follow existing contours
- Specify location of temporary roads within limits of area to be disturbed by permanent road construction
- Establish construction limits to maximize preservation of existing vegetation and natural features
- Assess site conditions for preservation and/or salvage of topsoil

**The AZCGP states:
“clearly mark vegetation
before clearing activities
begin. Locations of
trees and boundaries of
environmentally sensitive
areas and buffer zones
to be preserved shall be
identified on the SWPPP
site map.”**

Contractor:

- Develop SWPPP to include Stormwater Control Measures that support this principle
 - Construction Sequencing, Preserve Existing Vegetation, Soil Binders
- Retain existing vegetation as long as possible where activity is scheduled to occur later in the construction process
- Schedule to limit extent of disturbed areas
- Properly delineate and enforce construction limits and access control
- Delineate and enforce areas to be preserved prior to start of soil-disturbing activities
- Locate temporary roads within limits of area to be disturbed by permanent road construction
- Inspect Stormwater Control Measures per applicable CGP requirements and/or construction documents
- Adjust and maintain Stormwater Control Measures

Erosion Control Principle #2:

Phase construction activity



Use construction scheduling or sequencing to minimize the amount of soil that is exposed at any one time. Well planned and defined construction schedules contribute to successful erosion and sediment control as measures are taken to limit exposed soil and duration without ground cover.

Contractor:

- Submit a construction schedule per Standard Specifications Section 108.03
- Schedule construction activities to limit area of exposed soil area at any one time; ADOT specification 104.09 limits that exposed area amount to 750,000 square feet (~17.25 acres)
- Include the Construction Sequencing Stormwater Control Measures specifying phased final stabilization (stabilize disturbed soils "as you go") in the SWPPP

Exposing a lot of area at one time increases the areas control measures will be needed, maintained, and repaired. Schedule to phase ground clearing to leave as much undisturbed area as possible.

Erosion Control Principle #3:

Control stormwater flowing onto and through the project



Diversion of and slowing of flows from upstream locations onto and through the project site can assist significantly in preventing or reducing erosion.

Design may increase the amount of impermeable surface area resulting in increased runoff quantities from the project site. Design may also increase the velocities of existing offsite runoff flows by concentrating those flows into smaller drainage structures. Consequently, storm events may result in greater peak runoff rates and discharges into existing drainages than those drainages may have historically received.

Planner/Designer:

- Calculate pre- and post-construction impervious area percentages to evaluate increased runoff flows
- Consider the following to assist in addressing increased runoff rates and quantities:
 - Bridges typically affect offsite run-off less significantly than do culverts and may be less visually intrusive

- Live fascines or pole plantings
- Protect receiving drainages by means of vegetation, geotextile mats, rock or riprap
- Energy/velocity dissipation devices at culvert outlets
- Smooth transitions between culvert inlets/outlets and drainages to reduce turbulence and scour
- Detention facilities to reduce peak discharges
- Spread run-off flows across channel outlet structures to mimic natural drainage channels
- Specify run-on/diversion control Stormwater Control Measures to divert run-on from exposed soil areas and run-off control Stormwater Control Measures to control flows through the site in the Erosion and Pollution Control Plans
- Use ditches and dikes to intercept and direct surface run-off into a drain and/or into an existing drainage. Ditch and dike design considerations:
 - Calculate peak flows, velocities and volumes for all drainage structures; provide erosion control measures where erodible velocities occur
 - Use riprap to prevent down-cutting on all ditches and dikes that exceed five percent slope
 - Install rock check dams to reduce run-off velocity and capture sediment
 - Install crown ditches at tops of slopes to divert run-off from the slope face; provide access for maintenance
 - Install slope ditches at bottom and mid-slope locations to intercept sheet flow and convey concentrated flows
 - Utilize embankment curbs on cut and fill slopes to intercept sheet flow from roadway surfaces
- Protect cut-to-fill slope transitions
- Culvert and structural channel outlets are typically areas of high concern for erosion. Considerations include:
 - Review of inlet invert elevation; if lower than the existing natural channel, protect channel backslope to avoid headcutting by run-off
 - Use of flared end sections at inlets and outlets to help prevent scour
 - Install velocity/energy dissipation devices to protect outlets from scour
 - Protect soil/drainage structure interface with rock or other protective measure to prevent erosion

Most designed stormwater control measures for slopes will withstand a rain event, yet fail when run on is not addressed and diverted away from a cut, fill, or even spoil piles.

Contractor:

- Develop SWPPP to include combinations of Stormwater Control Measures that support this principle
 - Crown Ditch, Earth Dikes/Drainage Swales and Lined Ditches, Check Dam, Sediment Trap, Slope Drains
- Inspect Stormwater Control Measures per applicable Construction General Permit (CGP) requirements and/or construction documents
- Adjust and maintain Stormwater Control Measures

Using a combination of control measures is the best choice for mitigating erosion, sediment transfer, and pollution discharge. It is also a CGP requirement.

“Design, install and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants.”

Erosion Control Principle #4:

Stabilize soils promptly



Minimize erosion by stabilizing exposed soils where grading activities have temporarily stopped or are complete. Select construction and/or post-construction Stormwater Control Measures to achieve temporary or permanent stabilization depending on specific project conditions.

Planner/Designer:

- Require soil testing to evaluate soil type and horticultural properties to support vegetation; specify amendments as necessary to improve revegetation success
- Include soil stabilization Stormwater Control Measures in Erosion and Pollution Control Plans

Contractor:

- Develop SWPPP to include slope and channel stabilization Stormwater Control Measures
 - Seeding, Minibenches/Slope Roughening, Mulch Cover, Geotextile/Erosion Control Blankets, Soil Binders
- Protect soil stockpiles from erosion; use Silt Fence, Sediment Log, Soil Binder Stormwater Control Measures
- Achieve phased final stabilization in areas where construction is complete.
- Inspect Stormwater Control Measures per applicable CGP requirements and/or construction documents
- Adjust and maintain Stormwater Control Measures

The less area disturbed means less contract time and cost to stabilize.

Erosion Control Principle #5:

Protect slopes



Use combinations of Stormwater Control Measures for the most effective control of slope erosion. Minimize stormwater flow onto slopes with diversion techniques, supplement protection with sediment wattles installed along contours, preserve vegetation in place, seed disturbed slopes and use erosion control blankets to protect slopes from direct rainfall.

Vegetated and/or hard surfaces may be used to protect slopes. Vegetated surfaces offer several advantages to hard surfaces including lower runoff volumes, slower runoff velocities, increased times of concentration and lower cost. However, where site-specific conditions would prevent adequate establishment and maintenance of a vegetative cover, hard surfacing should be considered.

Hard surfaces consist of placing concrete, rock or rock and mortar. Typically, these permanent measures are considered where vegetation will not provide adequate erosion control and/or where vegetation will be difficult to maintain. The designer should consider the downstream effects of increased runoff volumes and velocities from hard surfaces. Typical applications include bank protection and bridge abutments. Refer to the *ADOT Slope Erosion Control for Urban Freeways in Arid Climates* poster at:

Use of concrete to convey stormwater will increase run off speed and volume.

Follow proper design standards.

http://www.azdot.gov/Highways/Roadway_Engineering/Roadside_Development/Resources.asp for information on 1-1/4 inch granite mulch used for slope erosion control.

Planner/Designer:

- Evaluate project site topography, soil type and conditions to support vegetation; specify amendments as necessary to improve revegetation success
- Evaluate existing native vegetation
- Design slopes to maximize rainfall infiltration and minimize concentrated runoff flows and velocity
- Consider salvage of existing project site topsoil and vegetation during clearing and grubbing operations. Use salvaged topsoil as part of surface preparation prior to seeding.
- Include diversion and slope stabilization BMPs in *Erosion and Pollution Control Plans and Details*
 - Install crown ditches at tops of slopes to divert run-off from slope face; provide access for maintenance
 - Install slope ditches at bottom and mid-slope locations to intercept sheet flow and convey concentrated flows

- Protect cut-to-fill slope transitions
- Install slope (over-side) drains
- Prepare slopes for revegetation success- use mini-benching and roughening
- Use vegetation as long-term (permanent) slope protection

Contractor:

- Develop SWPPP to include diversion and slope stabilization BMPs
- Geotextile/Erosion Control Blankets, Seeding, Minibenches/Slope Roughening, Sediment Wattle
- Inspect BMPs per applicable CGP requirements and/or project Special Provisions
- Adjust and maintain BMPs

Sediment Control Principles

Sediment controls include structural practices to keep sediment in place and are the “2nd Line of Defense” to minimize stormwater pollution. Properly selected, designed and installed sediment controls, implemented in combination with effective erosion controls, provide the most successful results in stormwater erosion and sediment control. There are numerous structural practices that can be used to retain sediment on the construction site. Use the following discussion of sediment control principles as a guide in selecting the appropriate sediment control Stormwater Control Measures for the SWPPP.

Sediment Control Principle #1:

Protect storm drain inlets



Storm drain inlet protection both within and outside the project area is an ongoing sediment control measure from project start through project completion. Inspection and maintenance of inlet protection Stormwater Control Measures is very important to successful sediment control. Never use storm inlet protection as a primary Stormwater Control Measure; use erosion control techniques to prevent erosion, and sediment control Stormwater Control Measures to backup erosion control Stormwater Control Measures. Storm drain inlet protection is one construction Stormwater Control Measure that should be removed at project completion, upon approval of the Engineer.

Planner/Designer:

- Include Storm Drain Inlet protection Stormwater Control Measures in *Erosion and Pollution Control Plans and Details* together with other upstream erosion and sediment control Stormwater Control Measures to minimize sediment transport to inlets
- Design inlet protection to handle the volume of water from the area being drained
- Design inlet protection to handle anticipated trapped sediment

Contractor:

- Develop SWPPP to include Stormwater Control Measures that support this principle
 - Storm Drain Inlet Protection and other upstream erosion and sediment control Stormwater Control Measures to minimize quantity of sediment reaching inlets
- Install storm drain inlet protection as soon as inlets are installed and before soil-disturbing activities begin in areas with existing storm drain systems
- Install storm drain inlet protection for storm drains outside the construction area that may receive stormwater runoff from the project
- Inspect Stormwater Control Measures per applicable CGP requirements and construction documents
- Adjust and maintain Stormwater Control Measures

Sediment Control Principle #2:

Establish perimeter controls



Install sediment controls on project perimeter downslopes to stop sediment transport from the site.

Planner/Designer:

- Clearly define limits of disturbance on plans
- Specify Stormwater Control Measures in *Erosion and Pollution Control Plans*
 - Check Dams to reduce run-off velocity and capture sediment before reaching project perimeter
 - Sediment Log, Compost Sock, Silt Fence

Contractor:

- Develop SWPPP to include Stormwater Control Measures that support this principle
 - Check Dam, Silt Fence, Sediment Log, Compost Sock
- Enforce construction limits and perimeter controls
- Inspect Stormwater Control Measures per applicable CGP requirements and construction documents
- Adjust, maintain Stormwater Control Measures

Sediment Control Principle #3:

Retain sediment on-site and control dewatering practices



Sediment basins or traps detain runoff allowing sediment to settle before the runoff is discharged. Sediment basins should be used for drainage locations where 10 or more acres are disturbed at any one time. Dewatering methods are used to remove ground water or rain water from work areas to prevent the discharge of muddy water into storm drains and waters of the United States.

Planner/Designer:

- Specify Stormwater Control Measures in *Erosion and Pollution Control Plans*
 - Sediment Basins or Sediment Traps as site conditions dictate and to supplement other sediment controls discussed earlier in this section
 - Dewatering Operations

Contractor:

- Develop SWPPP to include Stormwater Control Measures that support this principle
 - Sediment Basin, Sediment Trap, Silt Fence, Sediment Log, Compost Sock, Dewatering Operations, Curb Inlet Protection
- Inspect Stormwater Control Measures per applicable CGP requirements and construction documents
- Adjust and maintain Stormwater Control Measures

Sediment Control Principle #4:

Establish stabilized construction exits



Designate construction entrances and exits and apply/install tracking controls to stabilize these areas. Use wheel (vehicle) washing and street sweeping Stormwater Control Measures to supplement stabilized construction exits.

Planner/Designer:

- Specify Stormwater Control Measures in *Erosion and Pollution Control Plans*
 - Stabilized Construction Entrance/Exit

Contractor:

- Develop SWPPP to include Stormwater Control Measures that support this principle
 - Stabilized Construction Entrance/Exit, Stabilized Construction Roadway

- Supplemental Stormwater Control Measures: Vehicle and Equipment Cleaning, Street Sweeping and Vacuuming
- Inspect Stormwater Control Measures per applicable CGP requirements and construction documents
- Adjust and maintain Stormwater Control Measures

Sediment Control Principle #5:

Inspect and maintain controls

Establish routine inspection schedules of control measures per the applicable stormwater discharge permit and, at a minimum, maintain Stormwater Control Measures per permit requirements. Routine and spot inspections will identify if Stormwater Control Measures are performing as intended and timely maintenance will correct deficiencies to ensure compliance with water quality goals.

Contractor:

- Per applicable permit requirements- inspect, maintain, adjust and /or replace with alternate Stormwater Control Measure(s) that may be more effective based on specific site conditions

All stormwater control measures require inspection and maintenance. The job of stormwater control measures is to mitigate stormwater impacts from acres of land at only a few locations and will be damaged.

Consider replacement stormwater control measures quantities when bidding.

Pollution Prevention Principles

The contractor must implement Pollution Prevention procedures to prevent contamination of stormwater from litter, construction debris, construction materials and chemicals and/or other construction-related waste or operations. Stormwater Control Measures designed to prevent pollution through the use of Pollution Prevention measures must be included in the SWPPP. Employee training is a key element of construction site pollution prevention.

Training programs should discuss proper material and waste storage, handling, inventory and cleanup techniques for construction sites. Training is a Non-Structural control measure that must be incorporated at each construction project. Contractors and sub-contractors must know where the SWPPP is, the site specific requirements outlined in the SWPPP, what control measures are to be used on the project (per phase), and how the control measures should operate. If no one on the project knows what is in the SWPPP, the conditions will not be followed. Use the following as a guide in selecting Pollution Prevention Stormwater Control Measures for the SWPPP.

Pollution Prevention Principle #1:

Provide for waste management



Effective construction site waste management procedures and practices can help to prevent or reduce pollution of stormwater. Designated collection areas for trash, recyclables and hazardous waste; and timely and proper litter clean up are critical to successful construction site waste management.

- Develop SWPPP to include Stormwater Control Measures that promote proper waste management
- Solid Waste Management, Hazardous Waste Management, Contaminated Soil Management, Concrete Waste Management, Liquid Waste Management

Pollution Prevention Principle #2:

Establish proper construction material handling and staging areas



Well-defined management and handling of materials, especially hazardous or toxic substances must be included in the SWPPP. Store hazardous materials in designated, preferably covered areas incorporating secondary containment techniques to prevent the spread of spills throughout the site.

- Include the following Stormwater Control Measures in the SWPPP
 - Material Delivery and Storage, Material Use, Stockpile Management

Pollution Prevention Principle #3:

Designate paint and concrete washout areas.



Washout areas for concrete, paint or stucco must be provided on-site if contractors cannot utilize facilities at their own plants. Washout water can be highly polluted and must be contained and allowed to evaporate before recycling the solid washout waste. Locate washout areas at least 50 yards away from storm drains and watercourses whenever possible.

- Include the following Stormwater Control Measures in the SWPPP
 - Concrete Waste Management
- Comply with the requirements of the Arizona Aquifer Protection Permit.

Vehicle fueling and maintenance is a potential source of stormwater pollution. Establish on-site fueling and maintenance areas that are clean, dry and have spill kits readily

available to address spill control and containment. Perform fueling and maintenance of equipment and vehicles at an off-site facility if possible.

- Include the following Stormwater Control Measures in the SWPPP
 - Vehicle and Equipment Fueling, Vehicle and Equipment Maintenance

Pollution Prevention Principle #4:

Control equipment/vehicle cleaning and allowable non-stormwater discharges



Use off-site facilities to wash equipment and vehicles. Alternatively, provide designated cleaning areas with proper containment methods to prevent discharge to storm drains or off-site. Non-stormwater discharges include fire hydrant flushing, dust control water and landscape irrigation, all of which can infiltrate into the ground or be routed to sediment ponds, detention basins or other Stormwater Control Measure treatment.

- Include the following Stormwater Control Measures in the SWPPP
 - Vehicle and Equipment Cleaning

Pollution Prevention Principle #5:

Develop a spill prevention and response plan



Discharge permits require inclusion of a spill prevention and response plan in the SWPPP Pollution Prevention procedures. At a minimum the plan will identify ways to reduce, contain and clean up spills, and specify training methods for employees responsible for spill prevention and response.

- Include the following Stormwater Control Measures in the SWPPP
 - Spill Prevention and Control

2.6 CONSTRUCTION STORMWATER CONTROL MEASURE SELECTION GUIDE

Proper Stormwater Control Measure design, selection and installation are essential to achieve the goals of this manual. As discussed earlier in this chapter, Stormwater Control Measure selection begins during the design phase but must be continued by the contractor and ADOT throughout the life of the project. The most effective way to reduce erosion, transportation of soil and sedimentation, and to prevent the contamination of stormwater is to select and install Stormwater Control Measures that best fit the specific site conditions.

The following Stormwater Control Measure selection process suggests a step-by-step approach to facilitate selecting the Stormwater Control Measures that will provide the best erosion and pollution control for each project.

1. Identify and evaluate potential erosion and pollutant sources impacting your project.
2. Use the Erosion and Sediment Control Principles and the Pollution Prevention Principles as guides to develop effective erosion and pollution control for the project.
3. Based upon the sources identified in step 1 above, determine which Stormwater Control Measures should be used to reduce erosion and to reduce or eliminate pollutant discharges from the project site. Develop the list of Stormwater Control Measures from the Stormwater Control Measure tool box in Chapter 5 of this manual and/or design additional control measures to meet project-specific needs.
 - a. Further evaluate site factors: specific conditions, limitations (physical constraints) to assist in the selection of Stormwater Control Measures.
 - b. Narrow (edit) the initial list using the Stormwater Control Measure information sheets in Chapter 5 Best Management Practices. Start with the AT A GLANCE section, then read the Appropriate Applications, Advantages and Limitations sections on each Stormwater Control Measure sheet to confirm or eliminate chosen Stormwater Control Measures. Read the other sections for additional knowledge that may influence choices.
 - c. Analyze costs (design, installation and maintenance) to further edit the list.
4. Verify that Stormwater Control Measure combinations have been selected for the most effective control.
5. Finalize the Stormwater Control Measure list for the work product (*Erosion and Pollution Control Plan and Details*, SWPPP, Maintenance Plan, etc.).
6. Be prepared to select alternate or replacement Stormwater Control Measures based upon dynamic construction site conditions and Stormwater Control Measure performance.
7. Thoroughly read each control measure information sheet in Chapter 5 Stormwater Control Measures for the combinations selected to ensure the application, location and use of each control meets the need. For example, a silt fence or straw wattle are not the correct application of sediment controls on a substrate that cannot be trenched or staked.

Remember:

The use of combinations of Stormwater Control Measures is a CGP (EPA and ADEQ) requirement as well as the best approach to most effectively control stormwater erosion and pollution.

CHAPTER 3

INSTRUCTIONS FOR OBTAINING STORMWATER DISCHARGE PERMIT AUTHORIZATION FOR ADOT CONSTRUCTION PROJECTS



3.1 INTRODUCTION

ADOT is authorized to discharge treated/filtered stormwater to Waters of the United States under a Statewide Stormwater Discharge Permit issued by the Arizona Department of Environmental Quality (ADEQ) under the Arizona Pollutant Discharge Elimination System (AZPDES) program. This permit, effective August 17, 2015 through August 16, 2020, is authorized statewide, except for "Indian Country", and covers stormwater and other specified discharges to waters of the United States. Specific coverage includes:

- Activities associated with ADOT operated Municipal Separate Storm Sewer Systems (MS4)
- Facilities associated with industrial and maintenance activities owned and operated by ADOT

All owner/operators meeting the conditions of the NPDES/AZPDES permits are authorized to discharge treated stormwater, provided all conditions of the permit are met (i.e. control measures are employed, operational, installed correctly, and adequately designed for addressing the pollutants.

The ADOT MS4 Permit no longer covers activities associated with construction. Both ADOT and contractors working under contract to ADOT must obtain authorization to discharge stormwater under the AZPDES Arizona Construction General Permit (AZCGP) for each construction project meeting the criteria of CGP coverage. Special attention must be given to coordinate contractor CGP filling efforts with ADOT to ensure both parties are covered under a CGP accurately.

This chapter describes the steps that operators follow to comply with the AZCGP and the steps ADOT (owner) will follow to comply with the ADOT Statewide Stormwater Discharge Permit requirements. The EPA Construction General Permit (EPA-CGP) instructions, applicable to projects in Indian Country in Arizona, are described at the end of this chapter.

Requirements in each step are discussed briefly and individual responsibilities identified in a chart with each step. Applicable discharge permit citations are listed in *italics* immediately after the step title. **Erosion and pollution control is a shared obligation among ADOT, the general contractor and subcontractors to protect the environment. We all act as one team and all share in the responsibility to comply with AZCGP, EPA-CGP or ADOT Statewide Stormwater Discharge Permit requirements to protect and restore the environment we work and live in. This is our State!**

3.2 STEP 1: PREPARE A STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

AZCGP Part 2.3 SUBMITTING AN NOI

EPA-CGP Part 7.

Per ADOT Specification 104.09, a complete SWPPP shall be developed by the contractor's Erosion Control Coordinator (ECC) and approved by ADOT in accordance with the Standard Specifications and Special Provisions. Refer to Chapter 4 for information on developing a SWPPP. Two copies of the draft SWPPP shall be submitted to the ADOT Resident Engineer at the preconstruction conference if possible, but no later than 14 calendar days after ADOT approval of the contractor's ECC.

The contractor erosion control coordinator shall have successfully completed the two-day (16 hour) "Erosion Control Coordinator" training class provided by the Associated General Contractors (Arizona Chapter). In addition, the proposed erosion control coordinator shall have documented experience for the development and implementation of Stormwater Pollution Prevention Plans (SWPPP's), or experience in re-vegetation or restoration of disturbed areas in environments similar to those on the project.

The contractor's ECC experience documentation has to provide details indicating the types of relevant work and length of time each task was performed by the ECC. A current (not expired) certificate proving the ECC has completed the ECC training, or Refresher ECC training for consideration for approval by ADOT.

Some ADOT projects, deemed "sensitive" by ADOT Roadside Development, will require a higher level of certification in addition to the ECC training; State of Arizona registered Landscape Architect, State of Arizona registered Professional Engineer, or a Certified Professional in Erosion and Sediment Control (CPESC).

Eligibility

The ADEQ CGP covers stormwater discharges associated with "construction activities", as defined in Appendix A of the permit that will disturb one or more acres of land, or will disturb less than one acre, but is part of a common plan of development or sale that will ultimately disturb one acre or more.

The ADEQ CGP is also applicable to stormwater discharges associated with support activities from temporary plants or operations set up to produce concrete, asphalt, or other materials exclusively for the permitted construction project. See 40 CFR 122.26(b) (14)(x) and (15).

STEP 1 RESPONSIBILITIES	
ADOT	Contractor
Provide supporting documents to complete the SWPPP	Designate a qualified ECC who will prepare the SWPPP
Review credentials of ECC selected by the contractor	Prepare and submit the SWPPP
Review draft SWPPP submitted by the contractor and provide comments	Maintain and update the SWPPP as needed to reflect construction effects on the environment and permit conditions

Coverage under a CGP (EPA or ADEQ) must be obtained when the eligibility for coverage will be met at any time during a proposed construction activity. This is normally triggered when disturbance from construction activities will ≥ 1 acre. OAW and Impaired waters have the same acreage threshold and SWPPP development is a condition of the CGP that is written prior to filing a Notice of Intent (NOI). On ADOT projects, after the Engineer approves both documents (SWPPP and NOI), the contractor shall finalize the SWPPP, file a NOI (Stored Specification 104.09)

3.2.1 Project Document Stormwater Control Measures

During the project design process, ADOT and the project design team will utilize Stormwater Control Measures from this Manual and Stormwater Control Measures developed for unique project conditions to prepare:

- Erosion and pollution control plans, entitled "*Erosion and Pollution Control Plans*"
- Erosion and pollution control details, entitled "*Erosion and Pollution Control Details*"
- Special Provisions to Section 810 of the Standard Specifications

The project documents will provide direction and specific expectations to the contractor regarding erosion control and stormwater pollution prevention. However, these documents do not equal a complete SWPPP and at no time replace the contractor's SWPPP. The project documents are prepared assuming typical construction practices and may not reflect the contractor's actual methods of construction, access requirements or project phasing. Instead, the contractor shall use the project documents as a guide in developing the project SWPPP.

3.3 STEP 2: CERTIFY THE SWPPP

AZCGP Part 6.1.3., Appendix B, Subsection 9.
EPA-CGP Part 7.2.10., Appendix I, Part I.11.

ADOT, the general contractor and any subcontractors that are responsible for constructing the erosion and pollution controls must certify the SWPPP. In the case of ADOT local government projects involving federal aid reimbursement, the appropriate municipality must also certify the SWPPP. Specific certification and signatory requirements are defined in the AZCGP and EPA-CGP citations listed above. The certifications shall occur after award

INSTRUCTIONS FOR OBTAINING STORMWATER DISCHARGE PERMIT AUTHORIZATION FOR ADOT CONSTRUCTION PROJECTS

of the contract and before construction begins. AZPDES and/or NPDES Index Sheets in a project bid set also require signature. CMIS Sheets do not have a signature line.

As described earlier, it is the obligation of all personnel involved in the construction process to protect the environment. The certification requirement reinforces the fact that it takes a team effort to properly control stormwater pollution and that responsibility is shared equally among ADOT and its contractors and subcontractors.

The following certification is required by ADEQ and is included on the ADOT Control Measure Index Sheet. Refer to Attachment C for sample Index Sheets.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

STEP 2 RESPONSIBILITIES	
ADOT	Contractor
Certify the SWPPP	Certify the SWPPP

Note: The EPA-CGP and the AZCGP define authorized signatories for the SWPPP and other permit-required documents. Refer to the Permit citations listed on the previous page directly below '3.3 STEP 2: CERTIFY THE SWPPP' to ensure compliance with the signatory requirements.

3.4 STEP 3: SUBMIT NOTICE OF INTENT (NOI) ADEQ JURISDICTIONS

ADOT Statewide Stormwater Discharge Permit Section 7.2
AZCGP Part 2.2

Coverage under AZCGP may be authorized to discharge under this permit only if the stormwater discharge is associated with construction activities from the project site. Prior to submission of an NOI, an applicant seeking authorization to discharge under this general permit shall:

1. Meet the eligibility requirements under Part 1.2
2. Develop a SWPPP that meets the requirements of Part 6 of this permit and that covers either the entire site or all portions of the site for which the person is an operator
 - a. The SWPPP shall be prepared prior to submission of the NOI and shall be implemented prior to the start of construction
 - b. The SWPPP is not required to be submitted to ADEQ (unless the project is within ¼ mile of an Impaired water or OAW as described in Parts 1.5(3) and 1.5(4)) but shall be retained and made available in accordance with Part 6.7

Note: Emergency-related construction activities (see Part 2.4) are automatically authorized to discharge under this permit (see Appendix A or the AZCGP).

The NOI electronic submittal serves as a notice to ADEQ and certifies that the operator(s) will comply with the AZCGP conditions. ADOT will also file an NOI and coordination with the Engineer for proper NOI population is required. Prior approval from the Engineer to file a NOI to ADEQ is specification required. Contractors, sub-contractors, and consultants will also meet specific construction related components of and comply with regulations under the ADOT Statewide Stormwater Discharge Permit. ADOT shall submit separate, accurate and complete Notices of Intent (NOIs) to ADEQ for construction activities, for which ADOT meets one or both of the definitions of "operator" in the CGP.

A complete and accurate NOI using the MyDEQ system will result in a printable form that must be prepared by a construction site owner or operator and signed by a qualified signatory as defined in AZCGP, Appendix A Definitions and Acronyms receive coverage under the AZCGP.

"Qualified person" or "Qualified personnel"

Qualified personnel are those (either the operator's employees or outside personnel) who are knowledgeable in the principles and practice of erosion and sediment controls and pollution prevention, who possess the skills to assess conditions at the construction site that could impact stormwater quality, and the skills to assess the effectiveness of any control measures selected to control the quality of stormwater discharges from the construction activity.

An operator(s) is any person associated with the project that has control over the construction plans or specifications or day-to-day operational control of the site (the Contractor, the ECC, and any Subcontractor directly associated with installation or maintenance of Stormwater Control Measures). Part III.B.1 of the AZCGP provides a complete definition of operator.

The NOI must be submitted to ADEQ electronically using the "MyDEQ" system. If payment is made using a valid credit card, CGP authorization will be immediate. Before any construction activities occur at the site, an Authorization Letter must be issued by ADEQ, reflected online.

If the project is located within or has the potential to discharge to an MS4, a copy of the Authorization Letter reflecting permit coverage must also be submitted to the MS4 or local jurisdiction(s) that have potential to receive any discharge from the construction site, including off-site staging. A list of

MS4 municipalities in Arizona is located on the legacy ADEQ website <http://www.azdeq.gov/environ/water/permits/stormwater.html#ms4>. Also, contractors operating under an approved local erosion and pollution control plan, grading plan, or stormwater management plan shall send a copy of the certificate authorizing permit coverage to the local authority(s).

Projects located within ¼ mile of Outstanding Arizona Waters (OAWs), or Impaired waters, will have to submit the NOI for a 30 calendar day review period for ADEQ. Additional Sampling and Analysis Plan (SAP) for Monitoring discharges will be required to be submitted with the SWPPP as required by ADEQ.

INSTRUCTIONS FOR OBTAINING STORMWATER DISCHARGE PERMIT AUTHORIZATION FOR ADOT CONSTRUCTION PROJECTS

Additional fees are required for ADEQ review (see the table below for ADEQ NOI filing fees).

ADEQ NOI Filing Fees

Number of Acres Disturbed	Fee Amount
Less than or equal to 1	\$250.00
Greater than 1, but less than or equal to 50	\$350.00 ¹
Greater than 50	\$500.00 ¹
CGP Waiver	
Waiver	\$750.00
Stormwater Pollution Prevention Plan (SWPPP)	
SWPPP Review ³	\$1,000.00 ²

Annual Fees are the same, minus the SWPPP Review, for projects that last longer than one year.

¹ = The permittee is assessed an annual fee in the same amount until the Notice of Termination (NOT) form is submitted to ADEQ to terminate permit coverage.

² = SWPPP review fee is assessed only if the SWPPP is submitted to ADEQ for review.

³ = SWPPP re-review fee is assessed when a SWPPP is determined to be deficient and must be resubmitted.

A SWPPP that satisfies the conditions of the AZCGP must be completed with certifying signature prior to submitting the NOI to ADEQ. It is not necessary that the SWPPP be included with the NOI, but the SWPPP must always be available for ADEQ review. The SWPPP with a Sampling and Analysis Plan, if required by ADEQ or the AZCGP must be submitted to ADEQ with the NOI if the construction site is located within ¼ mile of an OAW or Impaired water.

The current method for filing the NOI is to use the ADEQ MyDEQ online program at <http://www.azdeq.gov/mydeq>

ADEQ new digital system is available 24 hours a day, 7 days a week and has Frequently Asked Questions (FAQ) links, tutorials, user guides, videos, and help desk contact information.

Registration with the MyDEQ system is an ADEQ requirement to obtain coverage under many of the general permits ADEQ administers:

- Air Quality General Permit for Concrete Batch Plant (CBP)
- Air Quality General Permit for Crushing & Screening Plant (C&S)
- Air Quality General Permit for Hot-Mix Asphalt Plant (HMAP)
- AZPDES Notice of Intent (NOI) for De Minimis General Permit (DMGP)
- AZPDES Stormwater NOI for Construction General Permit (CGP)
- AZPDES Stormwater NOI for Multi-Sector General Permit (MSGP)
- Drywell Registration

Obtain an account with ADEQ using the following steps:

- Step 1: Request an account (must be completed by the Responsible Corporate Officer (RCO), who is someone authorized to legally bind the organization)
- Step 2: Verify your identity online or by submitting a notarized Subscriber Agreement by mail
- Step 3: Complete account setup by adding a password and security questions
- Step 4: Authorize additional users to access the account (optional)

Users may request an account at any time by visiting the myDEQ Registration Portal and registering here: <https://my.azdeq.gov/registration/account>

MyDEQ User Roles:

In order to submit and NOI, Notice of Termination (NOT), file a Discharge Monitoring Report (DMR), or even submit a waiver from AZCGP coverage, users must first register with MyDEQ and establish an account. For any entity, whether it be a corporation, LLC, municipality, or private operation, the MyDEQ system operates with established “Roles” based on a corporate structure that are linked to regulatory and legal definitions. The Roles established on the MyDEQ system include:

Responsible Corporate Officer (RCO)

The RCO is the main account holder with the ability to manage one or more companies. The RCO has the authority to legally bind the organization and is responsible for certifying the Subscriber/Signature Agreement and submitting all the necessary documents for setting up a myDEQ account. An RCO can delegate their authority for each of their company by adding one or more Delegated Responsible Officers (DROs) to their myDEQ account.

Delegated Responsible Officer (DRO)

A DRO acts on the behalf of the Responsible Corporate Officer (RCO) to assist overseeing all myDEQ account activities. The RCO receives email records of all myDEQ activities certified by the DRO and assumes all responsibilities for any and all activities completed within their myDEQ account.

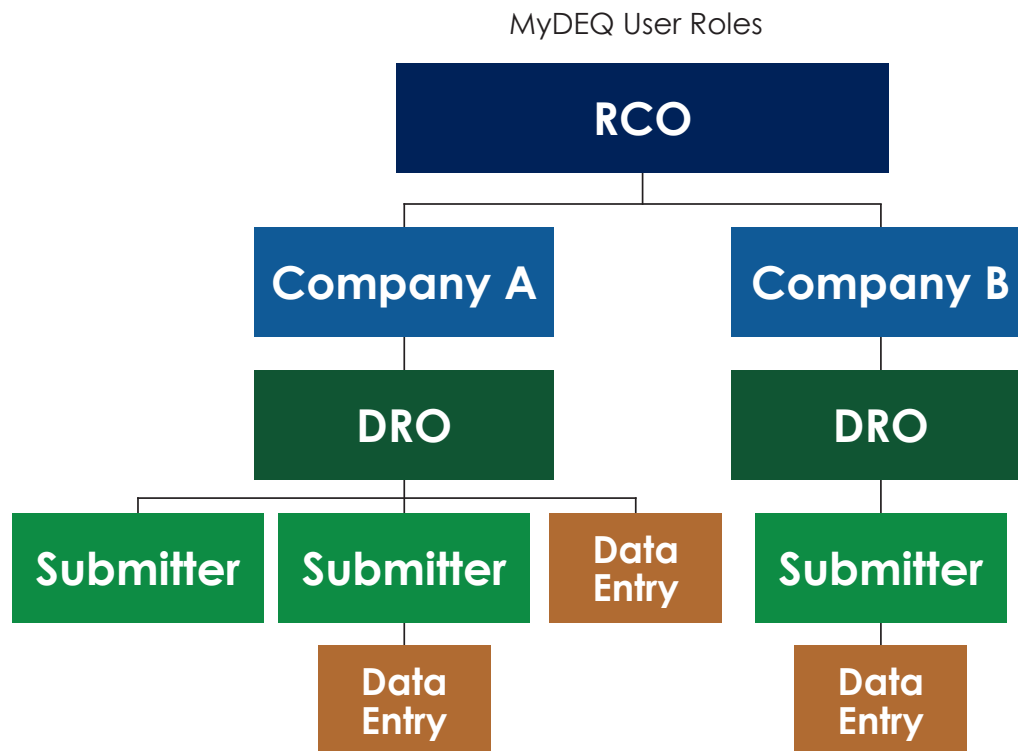
Submitter

The RCO or DRO can assign a Submitter to submit compliance reports on their behalf for any permit they choose to allow.

Data Entry

The RCO or DRO can assign a Data Entry user to prepare permit/registration applications for the RCO and/or DRO to review and submit to ADEQ. A Data Entry user can also prepare compliance reporting data for the Submitter, DRO or RCO to view and submit to ADEQ.

For each “Company”, you must have at least one RCO. While you may or may not have an established DRO, only one is allowed per “Company”. There may be several Submitter and Data Entry personnel established for each company, yet each role and named personnel must be registered under the DRO of a “Company”.



Establishing a MyDEQ account may take more than one day to verify Company tax ID, etc. Do not wait until the last minute to register. Registration and merging project information into MyDEQ must take place for existing and open NOIs previously established using the old “ADEQ Smart NOI system” prior to January 2018 and before a NOT is filed.

ADEQ e-Payments

ADEQ has established the “QuickPay” system for NOI processing fees and SWPPP review fees. Payment of fees using the MyDEQ system will be processed online by electronic check, Visa, Mastercard or American Express:

<https://my.azdeq.gov/myDeqQuickPay/home>

Receipt and acceptance of an NOI is documented by issuance of an authorization letter and LTF number (formally AZCON number). Refer to section 3.14.1 for EPA-CGP (Indian Country only) NOI filing information.

STEP 3 RESPONSIBILITIES	
ADOT	Contractor
Review contractor's(s') NOI	Prepare an NOI after certification of the SWPPP
File an NOI	File an NOI

3.5 STEP 4: RETAIN DOCUMENTS AT THE JOB SITE

ADOT Statewide Stormwater Discharge Permit Section 7.2

AZCGP Part 2.2

The table below lists documents that must be kept with the SWPPP and retained on the job site, or a location easily accessible to the project site during normal business hours, throughout the construction process.

STEP 4 RESPONSIBILITIES	
ADOT	Contractor
The Engineer/Inspector will keep document copies at the construction office or in their vehicles at the project site	Post the authorization # 'AZCON-_____' at main entrance to construction site Keep copy of authorization certificate in the SWPPP Keep SWPPP and all attachments in the construction office or in the contractor's vehicle at the project site

3.6 STEP 5: IMPLEMENT THE SWPPP

ADOT Statewide Stormwater Discharge Permit Section 7.1.1.c

AZCGP Part 6.1.2

EPA-CGP Part 7

After the NOI is accepted and an authorization number received, construction may begin that will require implementation of the SWPPP. The erosion and pollution controls (i.e., the Stormwater Control Measures) shall be constructed in accordance with the SWPPP.

The SWPPP is intended to be a dynamic plan that must be revised for normal, planned site changes, as well as in response to unanticipated or changing conditions during construction. Making changes to the SWPPP where site conditions have proven ineffective is also a requirement of the CGP. Any changes to the plan shall be noted and dated in the plan.

STEP 5 RESPONSIBILITIES	
ADOT	Contractor
Monitor and record weekly-extended weather forecasts Discuss weather forecasts at scheduled weekly progress meetings	Monitor and record weekly-extended weather forecasts Discuss weather forecasts at scheduled weekly progress meetings If probability of precipitation is high for the project area, verify that Stormwater Control Measures are properly installed and maintained If probability of precipitation is high for the project area, install additional erosion control measures as directed by the Engineer Within 14 days, install stabilization measures where construction activities have temporarily or permanently ceased.

The ADOT Engineer and the contractor are jointly responsible for implementing the SWPPP and maintaining dated records of:

- Major grading activities
- Areas where construction activities have temporarily or permanently stopped
- Installation of stabilization measures (Stormwater Control Measures)
- Delays and reasons for delays in installation of stabilization measures
- Stormwater Inspections
- Inspections triggered by rain events

These records must be included in the SWPPP. A copy of a 'Grading and Stabilization Record' used to track grading and stabilization activities is located in Attachment C of this Manual and Attachment 16: Corrective Action/Maintenance Log of the ADOT SWPPP Template, <https://azdot.gov/business/environmental-planning/water-resources/section-402-forms>

3.7 STEP 6: INSPECT STORMWATER CONTROL MEASURES REGULARLY

ADOT Statewide Stormwater Discharge Permit Section 7.1.1
 AZCGP Part 4.0
 EPA-CGP Part 4

Regular site inspections are required to ensure that Stormwater Control Measures are functioning properly and that the SWPPP is properly maintained. Inspections must be performed by the approved ECC and meet the CGP definition of a "qualified personnel" as described in the AZCGP and the ADOT Statewide Stormwater Discharge Permit.

Routine inspection is required every 7 calendar days OR once every 14 calendar days and also within 24 hours after a rainfall event of 0.50 inch or greater. Reduced inspection frequency may apply under certain permit-specified conditions. Refer to the applicable permit for additional information on reduced inspection frequency. The operator may reduce inspection if the entire site has been temporarily stabilized, discharges are unlikely based on seasonal rainfall patterns, or runoff is unlikely due to winter conditions (e.g., site is covered with snow, ice, or frozen ground exists).

Should the contractor requests a reduced inspection frequency, the Engineer must be notified and agree prior to any changes to the inspection frequency identified in the project special provisions. An approved change order process may be triggered as a change to the specification and all changes approved must also be documented in the SWPPP within 7 calendar days.

Inspections must include all areas of the site, especially those disturbed by construction activity, staging areas and areas used for storage of materials that are exposed to precipitation. A minimum list of inspection items is provided in AZCGP Part 4.3

For each inspection, the operator shall complete an inspection report on a form provided by the ADEQ: https://static.azdeq.gov/forms/cgp_inspection_corrective_action_report.zip

The Report and records of any follow-up actions taken shall be retained as part of the SWPPP. Complete inspection reports must be kept on site, in the SWPPP, in order, and must have proper signatures and dates on each report.

The AZCGP also allows for a reduced inspection schedule for Inactive and Unstaffed Sites. A site is inactive and unstaffed that will have an anticipated period of no construction activity for at least six consecutive months. Inactive and unstaffed sites within ¼mile of an Impaired water or OAW are not eligible for this reduced inspection frequency unless they have undergone temporary stabilization.

Within 7 calendar days of completing the inspection, the corresponding inspection report shall be placed with previous reports (in chronological order) and kept with the SWPPP.

AZCGP Part 4.4

STEP 6 RESPONSIBILITIES	
ADOT	Contractor
Inspections of Stormwater Control Measures Approval of follow-up actions deemed necessary following inspections	Inspections of Stormwater Control Measures and inspection reports Installation and maintenance of all Stormwater Control Measures Required follow-up actions within time limits described in the permit and project specifications

3.8 STEP 7: ADJUST THE SWPPP TO FIT SITE CONDITIONS

ADOT Statewide Stormwater Discharge Permit Section 7.1.1.c

AZCGP Part 6.5.1

EPA-CGP Part 7.4.1.

The operator shall complete follow-up actions based on results of the inspection process within 4 calendar days or by the next anticipated storm event following the inspection, whichever is sooner, per ADOT Standard Specification Paragraphs 104.09.F.2, or as required by the project Special Provisions.

STEP 7 RESPONSIBILITIES	
ADOT	Contractor
Approval of changes or additions to the SWPPP based upon specific site conditions	Installation and adjustment of Stormwater Control Measures necessary as a result of inspections Update SWPPP to reflect adjustments

3.9 STEP 8: MAINTAIN AN UPDATED SWPPP

ADOT Statewide Stormwater Discharge Permit Section 5.2.6

AZCGP Part III.E, Part IV.H.5.

EPA-CGP Part 7.4.

It is imperative that the SWPPP be kept current with the changes and adjustments made in the field. Failure to update the SWPPP is considered a violation of AZCGP, EPA-CGP, the ADOT Statewide Stormwater Discharge Permit and the Clean Water Act conditions, and is grounds for enforcement action, permit termination, revocation and reissuance, modification, or denial of permit renewal application.

The SWPPP shall be updated within 15 calendar days if changes in design, scheduling or maintenance activities have a significant effect on the discharge of pollutants or it is determined that discharges from the construction site are causing or contributing to water quality exceedances.

STEP 8 RESPONSIBILITIES	
ADOT	Contractor
Retain copies of updated SWPPP in the construction office or vehicle	Maintain an updated SWPPP

3.10 STEP 9: MAINTAIN THE STORMWATER CONTROL MEASURES

ADOT Statewide Stormwater Discharge Permit Section 5.2.4

AZCGP Part IV.I.

EPA-CGP Part 5.

All erosion and pollution control measures and other protective measures identified in the SWPPP must be maintained in effective operational condition.

Should the Engineer determine that routine maintenance of the project's erosion control measures is not being adequately performed, the contractor will be notified in writing. Within three working days, the contractor's erosion control coordinator shall demonstrate, to the satisfaction of the Engineer, that such steps have been taken to correct the problem.

STEP 9 RESPONSIBILITIES	
ADOT	Contractor
Inspections and approval of Stormwater Control Measure maintenance activities	Maintenance of all erosion and pollution control measures (Stormwater Control Measures)

3.11 STEP 10: EVALUATE JOB SITE TO DETERMINE FINAL STABILIZATION

AZCGP Part 3.1.2.2

EPA-CGP Part 2.2.14.b

Final Stabilization means all soil-disturbing activities have been completed; all construction materials, waste and temporary erosion and pollution control Stormwater Control Measures have been removed and properly disposed of and either of the two following criteria has been met:

1. A uniform (i.e., evenly distributed, without large bare areas) perennial vegetative cover with a density equivalent to 70% of the native background vegetative cover has been established on all unpaved areas and areas not covered by permanent structures. Where perennial vegetation is not yet fully established, temporary erosion control devices are properly installed and fully operational.
2. Permanent stabilization measures (e.g., riprap, decomposed granite, gabions or geotextiles) have been employed and are fully operational.

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Many ADOT construction projects will not meet the CGP conditions of "Final Stabilization" while the contract is still open. ADOT may allow the contractor to file a NOT and be effectively released from the CGP when all contractual elements have been met to the satisfaction of the Engineer. This meeting of all contractual elements and project acceptance by the Engineer is referred to as "Final Acceptance". Upon final acceptance by the Engineer in accordance with Subsection 105.20, and as written in Special Provision, the contractor shall electronically populate and submit a copy to the Engineer for review, approval prior to submitting a NOT to terminate CGP coverage.

After approval of the Engineer and when contractors complete work and interim stabilization is in place, they may file a NOT and ADOT may assume responsibility for the project area until final stabilization definition of the CGP is reached. The contractor must have approval from the Engineer to file the NOT. Upon approval from the Engineer to submit a NOT, a contractor will populate the NOT as a Transfer to ADOT's Permit ACZON/LTF number. In this case, a contractor would not mark "Final Stabilization has been Achieved".

A NOT submitted to the Engineer by the contractor includes a certification statement which must be signed and dated by an authorized representative of the contractor, as defined in Appendix B, Part 9 of the AZCGP.

Attachment C includes a copy of the ADOT Methodology for Determining Final Stabilization document. Check for updates at [https://apps.azdot.gov/files/roadway-engineering/roadside-dev/methodology-for-determining-final-stabilization-\(not-criteria\).pdf](https://apps.azdot.gov/files/roadway-engineering/roadside-dev/methodology-for-determining-final-stabilization-(not-criteria).pdf)

STEP 10 RESPONSIBILITIES	
ADOT	Contractor
Determine final acceptance in accordance with project specifications	Request inspections to determine if final stabilization has been achieved

3.12 STEP 11: SUBMIT NOTICE OF TERMINATION (NOT)

*ADOT Statewide Stormwater Discharge Permit Section 5.3.1.1, Section 5.3.2 AZCGP Part II.C.
EPA-CGP Part 8.*

The operator must submit a complete and accurate NOT to ADEQ after it has been reviewed and accepted by the Engineer and it has been determined that the project has met the submittal criteria as described project special provisions. **Note: Fulfilling meeting a project contract and obtaining final acceptance does not necessarily mean the NOT can be filed; final stabilization criteria must be**

Under ADOT's Statewide Permit; After approval of the RE and when contractors work in the contract has been completed, interim stabilization is in place, a contractor may file a NOT and ADOT will assume responsibility until final stabilization defined in the CGP is achieved. The contractor must coordinate and have approval from ADOT to file the NOT!

met before filing the NOT. Whether final stabilization is met by the contractor, or ADOT is identified in the project Special Provisions.

Submission of the NOT form constitutes notice that the party identified on the form is terminating coverage under the AZCGP. Termination is effective at midnight on the day the NOT is received by ADEQ. ADOT will file NOT of the CGP coverage for the project once Final Stabilization is met.

When filing an NOT for this scenario, indicate that another operator has assumed control over all areas of the site that have not been finally stabilized. Do not mark "Final Stabilization has been achieved"

The approved method for filing the NOT is to use the MyDEQ system online at <http://www.azdeq.gov/mydeq>.

STEP 11 RESPONSIBILITIES	
ADOT	Contractor
Approve contractor's intent to submit the NOT	Obtain approval from the ADOT Engineer to file the NOT Submit NOT form to ADEQ and one copy to the ADOT Engineer

3.13 STEP 12: RETENTION OF RECORDS

ADOT Statewide Stormwater Discharge Permit Section 14.16.1.3

AZCGP Part 8.2.3 and Appendix B 11.b

EPA-CGP Appendix I.15

The Contractor shall retain copies of SWPPPs and all documentation required by the applicable permit, including records of all data used to complete the NOI to be covered by this permit, for at least 3 years from the date of NOT filing.

ADOT shall retain copies of SWPPPs for the permit term and copies of the *Stormwater Management Plan (SWMP)* and other documents for at least five years from the permit expiration date.

3.14 SPECIAL CONDITIONS, REQUIREMENTS AND EXCEPTIONS

The following pages summarize special conditions, requirements and exceptions for obtaining construction general permit authorization.

3.14.1 Permit Requirements for Indian Country

EPA-CGP Part 1.4., Part 1.4.2., Part 1.4.3.

Much like seeking coverage under the AZPDES System for CGP, the EPA also has permitting jurisdiction in the State of Arizona on Tribal Lands under the National Pollutant Discharge Elimination System (NPDES).

Coverage under EPA-CGP may be authorized to discharge under this permit only if the stormwater discharge is associated with construction activities from the project site on tribal jurisdictions and when projects are located on both tribal and non-tribal lands.

Prior to submission of an NOI, an applicant seeking authorization to discharge under this general permit shall:

1. Meet the eligibility requirements under Part 1.1;
2. Develop a SWPPP that meets the requirements of Part 7 of this permit and that covers either the entire site or all portions of the site for which the person is an operator.

The SWPPP shall be prepared prior to submission of the NOI and shall be implemented prior to the start of construction. The SWPPP is not required to be submitted to EPA, but shall be retained and made available in accordance with Part 7.3.

The NOI electronic submittal serves as a notice to EPA and certifies that the operator(s) will comply with the EPA-CGP conditions. ADOT will also file an NOI and coordination with the Engineer for proper NOI population is required. Prior approval from the Engineer to file a NOI to EPA is specification required. Contractors, sub-contractors, and consultants will also meet specific construction related components of and comply with regulations under the ADOT Statewide Stormwater Discharge Permit. ADOT shall submit separate, accurate and complete Notices of Intent (NOIs) to ADEQ for construction activities, for which ADOT meets one or both of the definitions of "operator" in the CGP.

Follow the steps listed below and described in detail at the EPA website <https://cdxnodengn.epa.gov/oeca-cgp-web/action/login> and refer to the ADOT Stored Specification 104SWEPA and project special provisions for proper means to obtain coverage.

- Step 1: Read the EPA-CGP and fact sheet.
- Step 2: Determine if project is eligible for coverage under the EPA-CGP.
- Step 3: Develop and implement SWPPP (follow instructions in Chapter 4 of this Manual).
- Step 4: Complete and submit an NOI.

A complete and accurate NOI using the NPDES E-reporting Tool (NeT) system will result in a printable form that must be prepared by a construction site owner or operator and

Stormwater discharge authorization must be obtained for each jurisdiction in which the project is located. For example, AZCGP and EPA-CGP authorization must be obtained for projects located in both Indian Country and non-Indian Country in Arizona (Tribal and Non-Tribal).

Note: Emergency-related construction activities (see Part 1.4.3) are provisionally covered to discharge under this permit (see EPA-CGP).

signed by a qualified signatory as defined in EPA-CGP, Appendix I, Part 11 Standard Permit Conditions receive coverage under the AZCGP.

The NOI must be submitted to EPA electronically using the “NeT” system. No payment for coverage under the EPA-CGP is required. Before any construction activities occur at the site, an Authorization Letter must be issued by EPA, reflected online. EPA-CGP will take 14 calendar days, unless EPA determines further information is required by the Agency.

You must use EPA’s NPDES E-reporting Tool (NeT) to electronically prepare and submit your NOI for coverage under the 2017 CGP, unless you received a waiver from your EPA Regional Office.

To access NeT, go to <https://www.epa.gov/npdes/stormwater-discharges-construction-activities>.

Like the ADEQ MyDEQ system, preregistration of a signatory is required. In order to submit and NOI, Notice of Termination (NOT), file a Discharge Monitoring Report (DMR), or even submit a Low Erosivity Waiver (LEW) from EPA-CGP coverage, users must first register with NeT and establish an account. The EPA NeT webpage can be located here: <https://www.epa.gov/npdes/stormwater-discharges-construction-activities>.

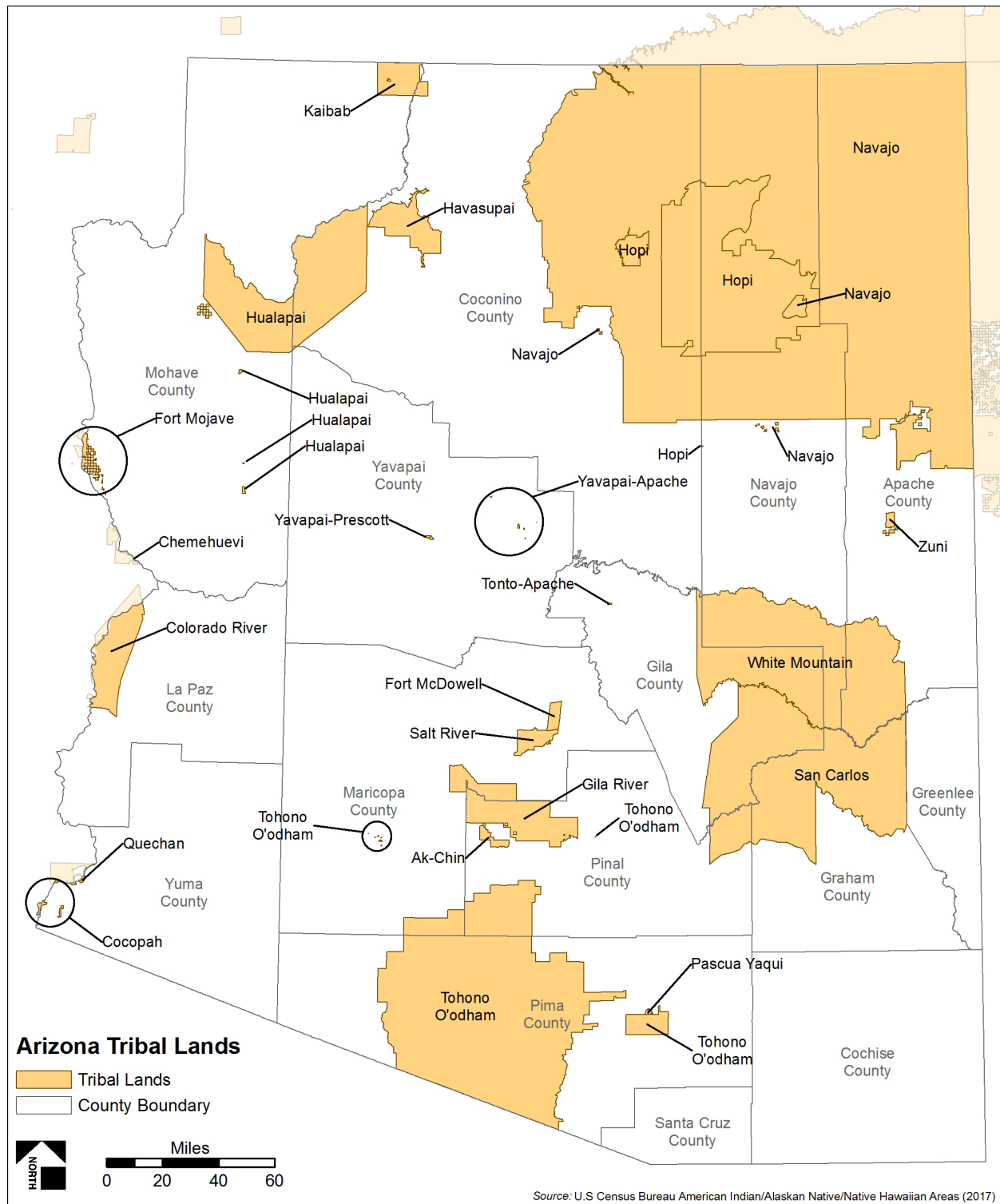
Establishing a NeT account may take more than one day to verify “Certifier” and “Preparer” accounts. Do not wait until the last minute to register.

EPA has provided an online user guide that provides step-by-step instructions that explain how to register in NeT here: <https://cdx.epa.gov/About/UserGuide>

Different than the ADEQ MyDEQ System, EPA NOI population will have more questions pertaining to Species and Cultural clearances. A submitting operator will have to demonstrate that one of the criteria listed in Appendix D of the EPA-CGP with respect to protection of threatened or endangered species listed under the Endangered Species Act (ESA) and federally designated critical habitat has been met. Similarly a submitting operator will have to demonstrate a screening process in Appendix E of the EPA-CGP relating to the protection of historic properties has been completed. Both documents proving proper clearance (at least the title pages or clearance memos) will have to be uploaded to the NeT system in the NOI. These clearance documents may be obtained through the Engineer if they have not already been provided in project documents.

A SWPPP that satisfies the conditions of the EPA-CGP must be completed with certifying signature prior to submitting the NOI to EPA. It is not necessary that the SWPPP be included with the NOI, but the SWPPP must always be available for EPA review.

In the State of Arizona and under EPA Region 9, the EPA-CGP offers coverage for stormwater discharges from construction activity under Permit No. AZR12000I. This CGP covers Indian country within the State of Arizona, as well as Navajo Reservation lands in New Mexico and Utah. NPDES/AZPDES CGP coverage distinguishes land in Arizona as “Tribal” or Non-Tribal”. Federal lands is not a term to use for stormwater compliance as “Federal lands” may be located on both jurisdictions (i.e. forests, BLM, BOR, DOD, etc.). The map on the following page illustrates current Tribal and Non-Tribal lands.



Tribal Land in Arizona

Document ID	Reference	Link Notes
ADOT Stormwater Website	http://www.azdot.gov/business/environmental-planning/water-resources	Includes links to other ADOT documents
ADOT Construction Bulletins	https://www.azdot.gov/business/engineering-and-construction/construction/construction-bulletins	Includes ADOT Engineer Construction Bulletins on important changes to policy and new policies to follow
ADOT Construction SWPPP Template	https://www.azdot.gov/docs/default-source/business/swppptemplate.dotx	A downloadable version to make specific to your project.
ADOT Erosion and Pollution Control Manual	https://www.azdot.gov/business/engineering-and-construction/roadway-engineering/roadside-development/erosion-and-pollution-control-manual	Provides guidance in SWPPP/control measure implementation.
ADOT Erosion/Sediment and Water Quality Protection Best Management Practices (BMP) Details and maps	https://www.azdot.gov/business/engineering-and-construction/roadway-engineering/roadside-development	Maps and control measure details are updated often.
Outstanding Arizona Waters (OAW) Maps	http://gisweb.azdeq.gov/arcgis/emaps/?topic=oaw	For determining proximity to Outstanding Arizona Waters
Impaired, and Not-Attaining Waters Maps	http://gisweb.azdeq.gov/arcgis/emaps/?topic=impaired	For determining proximity to Impaired, or Not-Attaining Waters
ADOT Maintenance and Facilities BMP Manual	http://www.azdot.gov/docs/planning/maintenance-and-facilities-best-management-practices-(bmp)-manual.pdf?sfvrsn=0	BMP guidance for maintenance and facilities operations. May provide additional guidance for control measures for construction projects.
ADOT Post-Construction BMP Manual	http://www.azdot.gov/docs/planning/post-construction-best-management-practices-(bmp)-manual.pdf?sfvrsn=0f	Guidance for selection and design of permanent control measures.
ADOT Stormwater Monitoring Sampling and Analysis Plan Template	https://www.azdot.gov/docs/default-source/business/monitoringsaptemplate.dotx	Template for preparing monitoring programs for projects within ¼ mile of OAW, Impaired, and Not-Attaining Waters. Based on the 2013 AZPDES CGP.

Links to Helpful References

Alternatively, with prior approval from the Regional Office, submit a the paper NOI form per the 'How to File Forms' section at https://www.epa.gov/sites/production/files/2017-02/documents/2017_cgp_final_appendix_j_-_noi_fillable_508.pdf

NOI form and instructions are available at: http://www.epa.gov/npdes/pubs/cgp2008_appendix.pdf

For project sites located on the White Mountain Apache Reservation (WMAR), the NOI shall be sent to:

Tribal Environmental Planning Office
P.O. Box 2109 Whiteriver, AZ 85941

Forms may also be faxed to WMAR at 928-338-5195.

3.14.2 Post-Construction Discharges

The AZCGP does not authorize stormwater discharges that originate from the site after construction activities have been completed and the site, including any temporary support activity site, has achieved final stabilization and an NOT has been filed. Post-construction stormwater discharges from industrial sites may need to be covered by a separate AZPDES permit.

3.14.3 Discharges Mixed with Non-Stormwater

The AZCGP does not authorize discharges that are mixed with non-stormwater sources except as allowed in Part I.3.2.

3.14.4 Discharges Covered by Another AZPDES Permit

The AZCGP does not authorize stormwater discharges associated with construction activities that are covered under an individual permit or construction activities that are required to obtain coverage under an alternate general permit.

3.14.5 Permit Requirements for projects located within ¼ mile of Impaired or Outstanding Waters

If the project site is located within ¼ mile of Outstanding (R18-11-112) or Impaired (Section 303(d) of the CWA) waters, the NOI and the SWPPP must be submitted to ADEQ at least 30 calendar days before any construction activities occur at the site, per AZCGP Part 2.3.3.b. This time frame allows ADEQ to review the SWPPP and a Sampling and Analysis Plan (SAP) to determine whether selected Stormwater Control Measures are sufficiently protective of water quality and stormwater monitoring for determined impairments will be performed and recorded.

The SWPPP must include a site specific monitoring plan, SAP per AZCGP Part 7.

3.14.6 Permit Requirements for Batch Plants, Borrow Pits and Material Pits

Discharges from support activities such as concrete or asphalt batch plants, equipment staging yards, material storage areas, screening and crushing plants, excavated material disposal areas and borrow areas are covered under the AZCGP if the conditions of the permit are followed per AZCGP Part I.C.1. The contractor must obtain coverage under

a separate Multi-Sector General Permit (MSGP) for activities that do not fall under the allowable discharges of the AZCGP.

3.14.7 Waivers for Small Construction Activities

Both the AZCGP and EPA-CGP specify conditions for a Rainfall Erosivity Waiver on small construction projects which disturb between one and five acres. per the ADOT Statewide Stormwater Discharge Permit, if waivers have been identified as an option while using the MyDEQ system or the EPA NeT systems for NOI submittal, an operator may choose such an option. Coordination with the Engineer and ADOT Water Quality will occur prior to electing to choose the waiver(s).

Waivers are for small construction projects. Check The Environmental Clearance Documents They determine if a SWPPP is required or not. Even if no coverage under the CGP/SWPPP is required, ADOT approved Control Measures are still to be used!

WAIVERS

- **Small construction defined as <5 acres but equal to or more than 1 acre**
- **This includes smaller than 1 acre projects that are part of common plan of development <5 but ≥1 acres**
- **Waivers are allowed for projects where:**
 - **Low potential for soil erosion – requires certification**
 - **Rainfall erosivity factor must be less than 5 during the entire construction activity**

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CHAPTER 4

STORMWATER POLLUTION PREVENTION PLANS

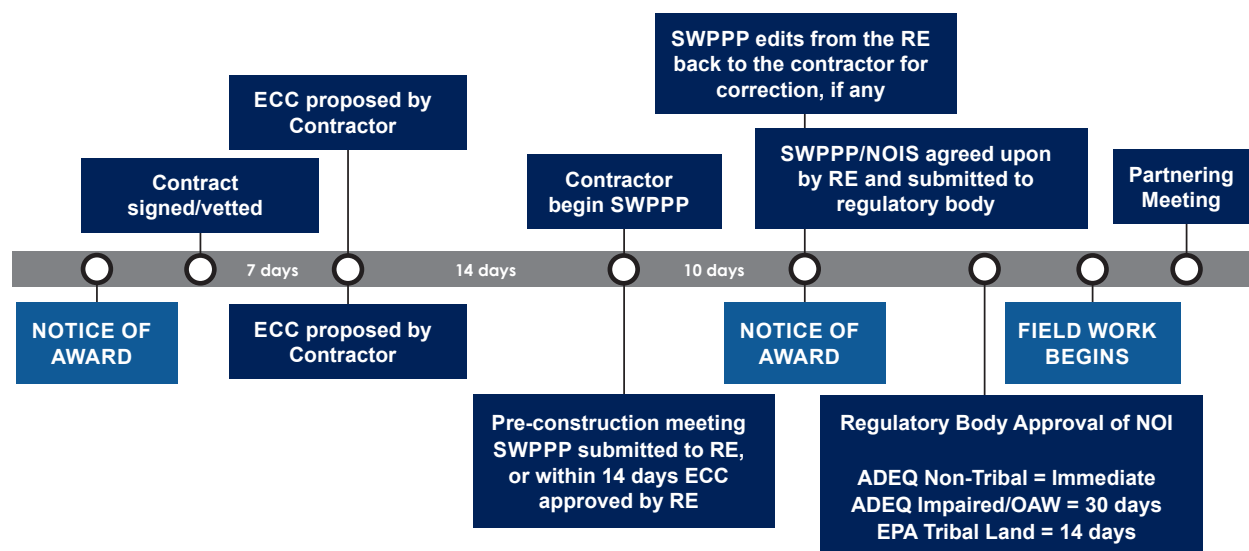


4.1 INTRODUCTION

Stormwater Pollution Prevention Plans (SWPPPs) are project-specific documents that identify potential sources of stormwater pollutants; describe pollutant mitigations, operational activities, physical controls (Stormwater Control Measures); and describe pollutant monitoring that will be used to prevent the discharge of pollutants into the waters of the United States for the duration of a construction project. On ADOT construction projects, the contractor prepares the SWPPP as a first step in obtaining Arizona Construction General Permit (AZCGP) or Federal Construction General Permit (EPA-CGP) authorization. The SWPPP is a living document that requires continual updating to document changes in the project and/or Stormwater Control Measures, inspections and other pertinent information.

SWPPP preparation time varies depending upon project size and complexity. Typical preparation time is about 3 days, but could take much longer (e.g. 2 weeks). ADOT Standard Specification 104.09.B.3 requires submittal of a draft SWPPP within 14 days of the designated Erosion Control Coordinator (ECC) approval. Accordingly, the contractor is advised to allow sufficient time to prepare the SWPPP and apply for AZCGP authorization to meet project start dates.

The contractor is strongly encouraged to use the ADOT Construction SWPPP Template and the instructions available at <https://www.azdot.gov/docs/default-source/business/swppptemplate.dotx?sfvrsn=2>. This template provides detailed, step-by-step instructions for preparing an SWPPP including suggested text and example text of the information required. A Construction SWPPP Checklist is included in Appendix A of the Template. The SWPPP Template Table of Contents is shown below as an introduction to the SWPPP Template and the information necessary to complete the template.



4.2 ADOT CONSTRUCTION SWPPP TEMPLATE TABLE OF CONTENTS

List of Attachments

List of Figures

Incorporated References

List of Abbreviations

Contact Information / Responsible Parties

Operator

Stormwater Team

Subcontractor

Site Evaluation, Assessment, and Planning

Project Name and Location

Discharge Information

Receiving Waters

Nature of Construction Activity

General Description of the Project

Sequence and Estimated Dates of Construction Activities

Installation of Stormwater Control Measures

Construction Disturbance Area

Site Soils and Potential for Erosion

Site Description

Intended Use after the Notice of Termination Is Filed

Summary of Potential Pollutant Sources

Allowable Non-Stormwater Discharges

Documentation of Compliance with Other Federal Requirements

Threatened and Endangered Species

Historic Preservation

Safe Drinking Water Act Underground Injection Control Requirements

Erosion and Sediment Controls

Natural Buffers or Equivalent Sediment Controls

Stormwater Control Measures

Erosion Controls

Sediment Controls

Run-On Management

Pollution Prevention (Formerly, Good Housekeeping)

Non-Stormwater Discharges

Waste Management

- Minimization of Dust
- Minimization of Disturbance to Steep Slopes
- Topsoil
 - Soil Compaction
- Chemical Treatment
- Dewatering Practices
- Site Stabilization
- Inspections
 - Inspection Report Form
 - Scope of Inspections
- Corrective Actions
 - Requirements for Taking Corrective Action
 - Corrective Action Deadlines
 - Corrective Action Report
- Documentation and Reporting Requirements
- Posting, SWPPP Review, and Making SWPPPs Available
- Monitoring
- Erosion Control Coordinator (ECC)
- Certification and Notification

LIST OF ATTACHMENTS

- Attachment 1: Control-Measure Detail Sheets
- Attachment 2: Project Site Maps (Design Segment) / Construction Sequence Schedule
- Attachment 3: Copy of [Select Permit Type.]
- Attachment 4: Notice of Intent Form Submitted to EPA/ADEQ
- Attachment 5: [Select Agency.] Authorization
- Attachment 6: Notice of Termination Form
- Attachment 7: Construction Site Inspection Report
- Attachment 8: Contractor Certification/Agreements
- Attachment 9: Rain Event Log
- Attachment 10: Spill Log
- Attachment 11: SWPPP Amendment Log
- Attachment 12: [Select Seed-Mix Records Are Applicable/Included.]
- Attachment 13: Endangered Species Documentation
- Attachment 14: Historic Preservation Documentation
- Attachment 15: Inspector's Certification Delegation of Authority

Attachment 16: Corrective Action/Maintenance Log

Attachment 17: Training Log

Attachment 18: Field Contacts/Subcontractor List

Attachment 19: U.S. Army Corps of Engineers [Select Permit Type.] Documentation

Attachment 20: [Select Whether or Not Monitoring Sampling Analysis Plan Is Applicable/
Included.]

LIST OF FIGURES

Figure 1. State Location Map

Figure 2. Project Vicinity Map

Refer to Chapter 3 of this manual, "Documents to be Retained on the Job Site with the SWPPP" for a list of permit related documents to include with the SWPPP.

CHAPTER 5

STORMWATER CONTROL MEASURES



5.1 INTRODUCTION

Stormwater Control Measures (Best Management Practices) are operational activities or physical controls that reduce the discharge of pollutants and minimize potential impacts upon receiving waters. In order to complete the Stormwater Pollution Prevention Plan (SWPPP) for ADOT approval, the contractor is required to select those Stormwater Control Measures which will best control stormwater pollution. Chapter 2 Project Planning and Design Guide of this manual offers one approach for selecting construction Stormwater Control Measures.

This chapter discusses Stormwater Control Measure implementation factors and provides a toolbox of Stormwater Control Measures. Each highway construction project has unique conditions that may require new or custom Stormwater Control Measures to be designed or developed to meet water quality goals. Refer to the ADOT Post-Construction Best Management Practices Manual for a list of permanent Stormwater Control Measures for use in highway design and construction.

The design standards, details and material specifications for Stormwater Control Measures in this manual are subject to change. Stormwater erosion and pollution control Stormwater Control Measures are rapidly evolving and should be periodically checked for updates in design methods, specifications or materials.

5.2 IMPLEMENTING CONSTRUCTION SITE STORMWATER CONTROL MEASURES

Throughout the highway project development process each responsible participant will have identified Stormwater Control Measures to be used to prevent stormwater pollution. Successful implementation of these Stormwater Control Measures depends on many factors including:

- Thorough project site assessment prior to Stormwater Control Measure installation and start of construction.
- Comprehensive review of plans, details and specifications.
- Development of the SWPPP including accurate maps of Stormwater Control Measure locations.
- Identification of strategies to limit the extent of disturbance throughout the entire project timeline.
- Properly sized Stormwater Control Measures (flows typically increase down the watershed).
- Use of combinations of Stormwater Control Measures for most effective erosion and pollution control.
- Inspection, maintenance and repair or replacement of Stormwater Control Measures.
- Use of alternative Stormwater Control Measures.
- Proper employee training.
- Diligent record keeping to document Stormwater Control Measure inspection, performance and maintenance.

Construction Stormwater Control Measures

CP	Construction Site Planning and Management	SC-10	Stabilized Construction Entrance/Exit
CP-1	Construction Sequencing	SC-11	Stabilized Construction Roadway
CP-2	BMP Inspection and Maintenance	SC-12	Compost Sock
EC	Erosion Control	SC-13	Rock Berm
EC-1	Preserve Existing Vegetation	SC-14	Pipe Inlet Protection
EC-2	Minibench/Slope Roughening	PP	Pollution Prevention
EC-3	Mulch Cover	PP-1	Vehicle and Equipment Cleaning
EC-4	Seeding	PP-2	Vehicle and Equipment Fueling
EC-5	Geotextiles/Erosion Control Blankets	PP-3	Vehicle and Equipment Maintenance
EC-6	Soil Binders	PP-4	Street Sweeping and Vacuuming
EC-7	Crown Ditch	PP-5	Material Delivery and Storage
EC-8	Rock Cover	PP-6	Material Use
RC	Runoff Control	PP-7	Stockpile Management
RC-1	Earth Dikes/Drainage Swales and Lined Ditches	PP-8	Spill Prevention and Control
RC-2	Cut to Fill Slope Transitions	PP-9	Portable Toilet
RC-3	Erosion Protection at Structures	NS	Non-Stormwater
RC-4	Rock Outlet Protection/ Velocity Dissipation Devices	NS-1	Water Conservation Practices
RC-5	Slope Drains	NS-2	Dewatering Operations
RC-6	Check Dam	NS-3	Paving and Milling Operations
SC	Sediment Control	NS-4	Temporary Watercourse Crossing
SC-1	Sediment Control Berm	NS-5	Water Diversion
SC-2	Silt Fence	NS-6	Structure Demolition/Removal Over or Adjacent to Water
SC-3	Sediment Trap	NS-7	Material and Equipment Use In/Over Watercourses
SC-4	Sediment Basin	WM	Waste Management
SC-5	Sediment Wattle	WM-1	Solid Waste Management
SC-6	Sediment Log	WM-2	Hazardous Waste Management
SC-7	Gravel Bag Protection	WM-3	Contaminated Soil Management
SC-8	Storm Drain Inlet Protection	WM-4	Concrete Waste Management
SC-9	Curb Inlet Protection	WM-5	Liquid Waste Management

The contractor is advised to consider these factors as he or she prepares to implement project Stormwater Control Measures, both those specified in plans and details, and those he has included in the SWPPP.

Stormwater erosion and pollution control is a dynamic process that requires continuing effort to meet water quality goals.

Construction sites that disturb less than one acre are exempt from permit coverage, **however, operators are required to apply stormwater quality and erosion/sediment control Stormwater Control Measures as part of ADOT's compliance practices and pollution prevention measures.** The exemption of NPDES or AZPDES permit coverage for sites under one acre of soil disturbance could be canceled if the operator violates water quality standards by not correctly implementing Stormwater Control Measures.

The table on page 56, "Construction Stormwater Control Measures", lists the Stormwater Control Measure categories and the Stormwater Control Measures included in this manual. Post-Construction Stormwater Control Measures are discussed in the *ADOT Post-Construction Best Management Practices Manual For Highway Design and Construction* (July 2009). Use both manuals to assist in developing effective erosion and pollution controls for highway projects.

Stormwater Control Measure Categories and Sheets

The Stormwater Control Measure sheets that follow are organized by category. Each Stormwater Control Measure sheet includes a definition, purpose, and the AT A GLANCE section which provides brief information to assist in the selection of Stormwater Control Measures applicable to your project. Photographs and specific information on appropriate applications, limitations, planning/design considerations, material specifications, design standards and inspection and maintenance requirements complete each sheet. ADOT Erosion/Sediment Control and Water Quality Protection Details listed on individual Stormwater Control Measure sheets are available at the ADOT Roadside Development Section website: <https://azdot.gov/business/engineering-and-construction/roadway-engineering/roadside-development>

References and Resources

- *Arizona Department of Environmental Quality – Aquifer Protection Permit*
- *Arizona Department of Environmental Quality Arizona Department of Transportation Statewide Permit for Discharges to Waters of the United States under the Arizona Pollutant Discharge Elimination System Program, August 2015*
- *Arizona Department of Environmental Quality Arizona Pollutant Discharge Elimination System General Permit for Discharge from Construction Activities to Waters of the United States, 2013*
- *Environmental Protection Agency National Pollutant Discharge Elimination System General Permit for Discharge from Construction Activities to Waters, February, 2017*
- *ADOT Erosion and Pollution Control Manual: for Highway Design and Construction, 2018*
- *ADOT Maintenance and Facilities Best Management Practices Manual, 2010*
- *ADOT Post-Construction Best Management Practices Manual June 2009*
- *ADOT Statewide Storm Water Management Plan, February 2017 (3rd revision)*
- *ADOT SWPPP Template, June 10, 2010*
- *Environmental Protection Agency Developing Your Stormwater Pollution Prevention Plan, A Guide for Construction Sites, May, 2007*

Additional references and sources are listed on each Stormwater Control Measures sheet as applicable.

Construction Site Planning & Management (CP)

Stormwater Control Measures



Construction site planning and management can reduce erosion and sediment loss by limiting the amount of disturbed area on the site at any one time, through proper implementation, inspection and maintenance of Stormwater Control Measures, through achievement of final stabilization of disturbed areas as the project progresses and by implementation of other considerations described in the Construction Sequencing Stormwater Control Measure.

- CP-1 Construction Sequencing
- CP-2 Stormwater Control Measure Inspection and Maintenance

Section 104.09 of the ADOT Stored Specifications states:

"Unless otherwise approved by the Engineer, the contractor shall not expose a surface area of greater than 750,000 square feet (17.22 acres) to erosion through clearing and grubbing, or excavation and filling operations within the project limits until temporary or permanent erosion control devices for that portion of the project have been installed and accepted by the Engineer.

The contractor shall indicate each 750,000 square-foot (17.22 acres) sub-area in the draft SWPPP, along with proposed erosion control measures for each sub-area. The draft SWPPP shall also include the sequence of construction for each sub-area, and installation of the required temporary or permanent erosion control measures."



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CP-1 Construction Sequencing



DEFINITION

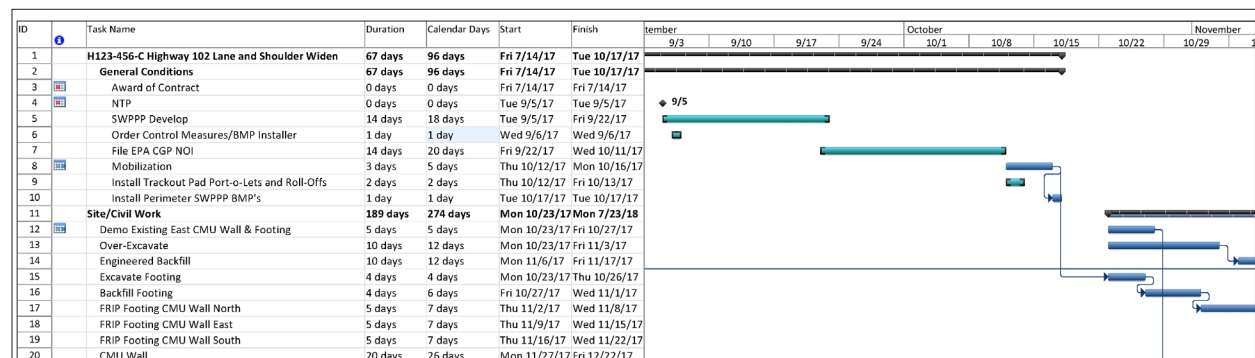
The development of a work schedule for every project that includes sequencing of construction and land disturbing activities in conjunction with the implementation of construction site Stormwater Control Measures.

PURPOSE

- Reduce the amount and duration of soil exposed to erosion by construction activities.
- Reduce the amount of rework.
- Ensure installation of erosion and sediment control Stormwater Control Measures per a planned schedule.

AT A GLANCE

RATINGS	
Associated Costs	
Design	○
Construction	○
Maintenance	◐
Stormwater Control Measure Objectives	
Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	◐
Non-Stormwater	○
Waste Management	○



2-Week Look Ahead Schedule Example

**APPROPRIATE APPLICATIONS**

- All construction projects.

LIMITATIONS

- Weather and other variables might affect construction schedules. The schedule should be updated to reflect changes due to these variables.

PLANNING/DESIGN CONSIDERATIONS

- Plan and schedule construction activities to minimize the amount of disturbed land exposed to erosive conditions.
- Schedule clearing and grubbing to allow existing vegetation to remain as long as possible.
- Several mobilizations for clearing and grading may prevent additional costs of control measure repair and maintenance.
- Install and maintain stabilization measures as work progresses, not just at the completion of construction.
- Schedule the installation of construction (temporary) and post-construction (permanent) controls as specified in the applicable stormwater discharge permit (EPA-CGP, AZCGP, ADOT Statewide).
- The schedule of construction activities and concurrent application of construction and post-construction Stormwater Control Measures is developed as part of the SWPPP.
- Stabilize non-active or construction-delayed areas as specified in the CGP.
- Monitor weather forecast and adjust the construction schedule to allow for the implementation of soil stabilization and sediment controls on all disturbed areas prior to the onset of rain.
- Schedule trash dumpsters, portable toilets, concrete washout bins, etc. prior to trade mobilization.
- Use schedules supplied by estimators, planners, etc. and update them to match a SWPPP with permit filing and document development included.
- Complete schedules to incorporate infield trainings, non-structural practices and prohibitions, as well as anticipated dates to begin temporary stabilization per the applicable permit conditions.
- As slopes are completed, schedule for temporary and permanent stabilization (mulch, seed) and install Sediment Controls at toe of slopes.
- Schedule for maintenance of perimeter and Inlet controls as storm drains and utilities are completed, and protect each new inlet constructed.

DESIGN STANDARDS

- The contractor shall not expose more than 750,000 ft² in any location until construction or post-construction Stormwater Control Measures have been installed and accepted by the Engineer.



- Prior to and during Grading, schedule for Installation of sediment basins or sediment traps
- Develop the project construction schedule per the applicable permit requirements and ADOT specifications
- The schedule should:
 - clearly define where and when Stormwater Control Measures will be installed.
 - include dates for installation of permanent drainage systems and runoff diversion devices. Install these devices as early as possible in the construction process.
 - include Pollution Prevention, non-stormwater and waste management Stormwater Control Measures.
 - include dates for significant long-term operations or activities that may have planned non-stormwater discharges such as dewatering, saw-cutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, bridge cleaning, installation of perimeter controls, protection of existing inlets.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow the schedule as written; monitor and modify as needed prior to implementing changes in construction activities. Until Permanent Controls are completely installed, maintain Sediment Controls at the toe of slopes, maintain storm drain inlets, and maintain all perimeter controls.



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CP-2 Stormwater Control Measure Inspection & Maintenance



DEFINITION

Stormwater Control Measure inspection and maintenance are critical to successful construction site stormwater management. Routine (planned) and non-routine (repair) inspection and maintenance help identify potential problems and can reduce the need for Stormwater Control Measure replacement or major repair.

PURPOSE

- Ensure proper Stormwater Control Measure installation and functionality.
- Minimize potential impacts of stormwater erosion and pollution through early detection, repair and replacement of ineffective Stormwater Control Measures.

AT A GLANCE

	• Frequency of inspection and type of maintenance may vary for each
	• N/A
	<ul style="list-style-type: none"> • CP-1 Construction Sequencing • All Stormwater Control Measures
	• Refer to the applicable stormwater discharge permit and individual Stormwater Control Measures for requirements

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	◐

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	●
Non-Stormwater	●
Waste Management	●

PARTICLE LENGTH: $\frac{1}{2}'' \pm \frac{1}{4}''$
 BAG SIZE: 11 x 17 x 34
 CORE MATERIALS: CERTIFIED WEED FREE WHEAT STRAW
 WOOD FIBER

APPLICATIONS

The nominal mulch application per acre is 2,000 lbs achieved with an application rate of 1 lbs of mulch to 2 gallons of water ($\pm 10\%$ depending upon application method). In a heavy erosion control environment increasing the application to 3000-4000 lbs is recommended. This will provide the maximum benefit for erosion control without inhibiting germination of seed being employed for final stabilization. The material should be applied uniformly and evenly, beginning application on the windward side of treatment area.

BENEFITS

AQUASTRAW is an all natural biodegradable product.



Weed Free Certification.

Seed and Wattle inspection.



APPROPRIATE APPLICATIONS

- All construction site Stormwater Control Measures
- Inspection and maintenance must be performed at a minimum per the applicable stormwater discharge permit requirements on all highway construction and/or maintenance projects.

LIMITATIONS

- Stockpiles of materials for timely Stormwater Control Measure repair and/or replacement may be necessary.

PLANNING/DESIGN CONSIDERATIONS

- Develop and adhere to a routine inspection schedule per the applicable stormwater discharge permit requirements.
- Erosion Control Coordinators must conduct inspections and identify Stormwater Control Measures in need of repair or replacement.
- Inspection and maintenance of Control Measures are critical to successful construction site stormwater management.
- Ensure proper installation and functionality.
- Minimize potential impacts of stormwater erosion and pollution through early detection, repair and replacement of ineffective Control Measures.
- All stormwater control measures require maintenance.

MATERIAL SPECIFICATIONS

- N/A

DESIGN STANDARDS

- Maintain Stormwater Control Measures per individual Stormwater Control Measure sheet design and maintenance sections, ADOT Erosion/Sediment Control and Water Quality Protection Details and project Special Provisions.
- Per ADOT Specification, initiate temporary or final stabilization Control Measures within 14 days in portions of the site where construction activities have been temporarily suspended or permanently ceased, unless meeting an exception outlined in the permit.
- AZDEQ: Temporary stabilization timeframes depend on project location (I.e. OAW and Impaired projects require stabilization initiated within 7 calendar days.
- EPA-CGP: Temporary stabilization is dependent on project size (I.e. projects under 5 acres in disturbance have a longer timeframe to initiate stabilization than a project with a disturbance of 5 or more acres of disturbance).

EPA-CGP requires temporary and/or permanent efforts of stabilization to begin immediately (as soon as practicable, but no later than the end of the next business day).

INSPECTION AND MAINTENANCE REQUIREMENTS

- Refer to the applicable stormwater discharge permit and individual Stormwater Control Measure sheets for requirements.

Erosion Control (EC) Stormwater Control Measures



Erosion control (soil stabilization) consists of preparing the soil surface and applying Stormwater Control Measures or combinations thereof to disturbed soil areas. Temporary soil stabilization shall be applied to disturbed soil areas of construction projects per plans, details, specifications, and applicable Construction General and/or ADOT permits.

Erosion control Stormwater Control Measures are the first line of defense, rely on them to retain soil in place.

- EC-1 Preserve Existing Vegetation
- EC-2 Minibenchs/Slope Roughening
- EC-3 Mulch Cover
- EC-4 Seeding
- EC-5 Geotextiles/Erosion Control Blankets
- EC-6 Soil Binders
- EC-7 Crown Ditch
- EC-8 Rock Cover



Preservation of existing vegetation prior to any earth moving.



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EC-1 Preserve Existing Vegetation



DEFINITION

The carefully planned protection of in-place, undisturbed trees and natural vegetated areas within the construction site right-of-way.

PURPOSE

- Minimize the amount of bare soil exposed to erosive factors.
- Reduce soil erosion, sediment transport and tracking.
- Reduce maintenance.
- Provide buffers, screens and aesthetic values.
- Provide stormwater detention, biofiltration and fully developed habitat for wildlife.

AT A GLANCE

- Implement landform grading practices required for slope rounding per plans
- Identify and clearly mark vegetation to preserve
- Fence preservation areas
- Locate temporary roads and staging areas to avoid vegetation
- Maintain pre-construction drainage patterns

- N/A

- Slope Rounding Standard Drawing C-02 Series
- RC-2 Cut to Fill Slope Transitions

- Maintain fencing
- Evaluate vegetation for signs of stress and address as necessary
- Repair or replace damaged vegetation immediately



Vegetation isn't protected, leading to costly replacements

RATINGS	
Associated Costs	
Design	○
Construction	○
Maintenance	○
Stormwater Control Measure Objectives	
Erosion Control	◐
Runoff Control	◐
Sediment Control	◐
Pollution Prevention	
Non-Stormwater	
Waste Management	



Specimen Saguaro preserved-in-place

**APPROPRIATE APPLICATIONS**

- Protect trees and natural areas not in direct conflict with construction zones and activities.
- Stage clearing and grubbing and grading operations to maximize preservation of existing vegetation.
- Especially beneficial for floodplains, wetlands, stream banks, steep slopes and areas where other erosion controls may be difficult to establish, install or maintain.

LIMITATIONS

- Difficult on sites with restricted access.
- May limit area available for construction activity.

PLANNING/DESIGN CONSIDERATIONS**TIMING**

- Evaluate existing vegetation early in the planning process and adjust grading limits around high quality natural areas.
- Identify areas to be preserved in place on the project plans; clearly mark and fence these on site.
- Conform to scheduling requirements set forth in the Special Provisions.
- Do not begin clearing and grubbing, grading and other soil-disturbing construction activities prior to marking and fencing of existing vegetation.
- Specify a regular watering schedule or install a temporary irrigation system.
- Clearly Mark areas to be preserved.



Mature trees preserved in place. Notice sediment wattles, erosion control blanket, seeding and mulch cover Stormwater Control Measures used in combination to achieve the most effective erosion control for these site conditions.



- Soil disturbance not permitted prior to preservation of existing vegetation.
- Immediately repair damage to irrigation systems.
- Locate materials/equipment/waste away from trees and roots.
- Repair damage following guidelines.

DESIGN AND LAYOUT

- Mark areas to be preserved with highly visible, non-metallic, temporary fencing as described in the project Special Provisions.
- Place temporary fencing beyond the canopy of vegetative cover by a distance that is 1½ times the radius.
- Construct temporary roads within limits of disturbance of permanent road to minimize disturbance to existing vegetation.
- Do not locate construction materials, parking areas and/or store equipment within fenced preservation areas.
- Do not store waste materials or vegetation to be removed within the fenced preservation areas.

- Preserving existing vegetation as possible is an advantage for any construction project. Benefits include:

- Shielding the soil surfaces from rainfall impact to reduce erosion.
- Root systems remaining in place will reduce erosion and sediment loss by holding soil in place.
- Reduces runoff velocities and helps drop sediment out of suspension.
- Maintains the soil's capacity to absorb water.

CRZ for some jurisdiction can be tree species and/or tree health dependent.



Vegetation has not been preserved and the trees will die or become diseased. Restoration or replacement of damaged vegetation often is the contractor's expense.

**CONSTRUCTION ACTIVITIES**

- Cover disturbed tree roots with soil as soon as possible and consult a certified arborist.
- Cleanly cut damaged roots and limbs.
- Consult a certified arborist to examine seriously damaged trees.
- Remove and replace trees if they are damaged seriously enough to affect their survival.
- Aerate soil compacted by construction activity.
- Immediately repair damage to irrigation systems and flush soil from lines.
- Remove fencing from around preserved areas and trees during final site cleanup.

MATERIAL SPECIFICATIONS

- Refer to project Special Provisions for fencing material requirements or other preservation material requirements

DESIGN STANDARDS

- Conform with Arizona Native Plant Law and local jurisdiction requirements.
- The ADOT Guidelines for Highways on Bureau of Land Management and U.S. Forest Service Lands contains additional information pertaining to design and construction, landscape respiration, stormwater and pollution control and guidance on protection of existing vegetation. <https://apps.azdot.gov/files/roadway-engineering/standards/guide-blm-usfs/landscape-restoration.pdf>

Many local jurisdictions have ordinances, agreements and specifications pertaining to vegetation and landform protection. Be aware of the local requirements pertaining to marking off vegetated and natural areas to be preserved as some requirements are more stringent, including:

- Vegetation shall be preserved to include a buffer area of the dripline.
- Vegetation shall be preserved to include a buffer area of the dripline or the Critical Root Zone (CRZ).
- Vegetation and natural areas shall be repaired and or replaced at the expense of the contractor.

Both the AZCGP and the EPA-CGP have permit language pertaining to the establishment of vegetation preservation and buffer areas.

- **EPA-CGP:** Part 2.2.1 states *"Provide and maintain natural buffers and/or equivalent erosion and sediment controls when a water of the U.S. is located within 50 feet of the site's earth disturbances."*



- **AZCGP:** Part 3.1.1.3.1. Preserving Natural Vegetation states: “Where practicable, existing vegetation should be preserved. If natural vegetation can be preserved, the operator shall clearly mark vegetation before clearing activities begin. Locations of trees and boundaries of environmentally sensitive areas and buffer zones to be preserved shall be identified on the SWPPP site map.”

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect the preservation fencing to ensure that it is intact and that there has been no encroachment into the preservation area.
- Evaluate preserve-in-place vegetation for signs of stress.
- Address unhealthy and declining vegetation as described in project Special Provisions.
- Maintain preservation fencing as needed.



Not enough room has been provided to protect this barrel cactus and will more than likely suffer mortality. Notice the upturned roots.



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EC-2 Minibenches/Slope Roughening







DEFINITION

Increasing the relief of a bare soil surface by creating horizontal grooves, parallel contours, furrows, terraces, serrations or stair-steps on the soil surface.

PURPOSE

- Reduce the speed of runoff, trap sediment and improve water infiltration.
- Improve seed retention, germination and thus revegetation.
- Increase effectiveness of construction and post-construction soil stabilization practices.
- Improve water infiltration and reduce runoff.

AT A GLANCE

	<ul style="list-style-type: none"> • Apply to all constructed slopes • Evaluate slope type and equipment availability to determine method of roughening • Seed roughened areas as soon as possible
	• N/A
	<ul style="list-style-type: none"> • EC-3 Hydraulic Mulch • EC-4 Seeding • EC-7 Crown Ditch • Slope Rounding, ADOT Standard Drawing C-02 series
	<ul style="list-style-type: none"> • Monitor vegetation establishment • Inspect and repair after storm events

RATINGS	
Associated Costs	
Design	○
Construction	○
Maintenance	○
Stormwater Control Measure Objectives	
Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Compare benching effectiveness on the same slope. Unbenched portion failed in the same rain event.

**APPROPRIATE APPLICATIONS**

- All constructed slopes.
- Soils prone to erosion.
- Where there is a large area of undisturbed slope above a constructed slope.
- Prior to application of permanent seeding.

LIMITATIONS

- Not appropriate on rocky or sandy slopes.
- Must be constructed as slope is cut from top down.
- Must follow the contour and may need a level to ensure horizontal elevation is maintained the entire bench.

PLANNING/DESIGN CONSIDERATIONS

- Construct minibenches from the top of a cut slope down during slope construction.
- Construct minibenches, terraces, furrows and other horizontal roughening techniques parallel to the contours along the entire length.
- Apply seeding for revegetation and permanent erosion control as the slope is being constructed to conform to the application limits of the seeding/mulching equipment.
- Where horizontal roughening falls away from the contour, additional Stormwater Control Measures may be required to protect the slope.
- Use with other Stormwater Control Measures and run-on diversion measures to prevent scour.
- At the end of a crown ditch or run on protection control, velocity dissipation is required at each discharge point.

MATERIAL SPECIFICATIONS

- N/A

DESIGN STANDARDS

- ADOT Erosion/Sediment Control and Water Quality Protection Detail: Slope Minibenching.
- ADOT Standard Specifications for Road and Bridge Construction Section 805-3.02(B).
- ADOT Erosion/Sediment Control and Water Quality Protection Detail: Slope Rounding.
- Benches should be cut in with a 5% grade towards the slope face to pond water on each bench to prevent increased velocities.
- Benching and roughening on a slope will require the use of a run-on prevention control measure (i.e. Crown Ditch or Slope Drain).

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.



Notice benching is spaced and contours of the slope have been followed as each cut was made, top to bottom.



Seven years of growth on this slope demonstrates successful benching, revegetation, no slope failures, and lack of temporary stormwater control measures left on site.



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EC-3 Mulch Cover







DEFINITION

The placement of a layer of organic material on slopes and other disturbed roadside areas by either incorporating it into the soil through mechanical means (e.g., a drill or studded roller) or by a tackifier that adheres the material to the soil surface. Types of mulch cover include hydraulic mulch, straw mulch, compost mulch and bonded fiber matrix.

PURPOSE

- Reduce soil erosion through temporary stabilization.
- Improve infiltration.
- Protect exposed soil from erosion by raindrop impact or wind.
- Aid in plant and seeding establishment.
- Prevent surface compaction or crusting.

AT A GLANCE

	• Select type of mulch material based on soil type
	• N/A
	<ul style="list-style-type: none"> • CP-1 Construction Sequencing • EC-2 Minibench/Slope Roughening • EC-7 Crown Ditch
	<ul style="list-style-type: none"> • Inspect for firm continuous contact of material with soil • Inspect and repair until vegetation is established

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	◐

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Wood Fiber mulch cover with a psyllium tack.



Straw mulch cover used in combination with approved seed mix.



APPROPRIATE APPLICATIONS

- Disturbed areas to temporarily stabilize soils until permanent measures are installed and final stabilization is achieved.
- Sensitive areas can be mulched if rain is predicted at the end of a day's operations.

LIMITATIONS

HYDRAULIC MULCH

- Wood fiber hydraulic mulches are typically short-lived (less than a growing season).
- Hydraulic tackifiers typically require 24 hours of cure time to be effective; therefore, they should not be applied prior to an anticipated storm event.
- Subject to wind and erosion during large storm events.
- May delay seed germination due to changes in soil surface temperature.

STRAW MULCH

- Where mechanical straw blowers are used, application areas are typically limited to within approximately 150 feet of equipment. Therefore, for large slopes frequent mobilizations and applications are necessary.
- Application of straw mulch by hand is typically expensive.
- Potential for accidental introduction of undesirable weed species.
- Blown straw becomes an air quality issue when applied in urban areas, if not prewetted.
- Apply straw as specified in Special Provisions.
- Straw must be certified weed free.

COMPOST/WOOD MULCH

- The contractor shall coordinate with the Engineer to ensure that vegetation removal is in compliance with the Arizona Native Plant Law, Arizona State Department of Agriculture (ASDOA) if transport/export or removal of woody vegetation away from the project site, and approved methods of disposing or spreading of woody materials.
- Susceptible to wind disturbance; therefore must be anchored to the soil by:
 - crimping, tracking, disking or punching.
 - hydraulic bonding using organic or acrylic tackifiers.
 - covering with netting and stapled.
- Potential for accidental introduction of undesirable weed species and/or insects.
- Must be accessible to equipment used for application of mulch.

- Soil surface must be loose
- Most types need 24 hours to dry before rainfall occurs
- Apply as specified in project documents or by manufacturer
- Must be approved by Engineer
- Most mulches and spray-on applications will not properly cover slopes of 2:1 or greater and should be used in combination with sediment control measures (SC-1, SC-5, SC-12)



Chipped wood spread out.



Chipped wood piles.

- Will not withstand significant concentrated flows and is prone to sheet erosion.
- Wood is **not** acceptable as final cover over seeding.
- Wood may be used as Wind Erosion Control in the ADOT EPCM p. 70 and shredded wood may be available from existing materials at low cost. Prior to use, coordinate with the Engineer and local jurisdictions (tribal/forest service) for restrictions of spreading chipped wood and vegetation.
- Wood mulch can float in an overland and concentrated flow scenarios and should not be applied in these areas.
- Chipped wood, if used, shall be spread evenly with a maximum thickness of one to two inches. No piles (picture on the right) should be staged for more than a 24-hour period.

BONDED FIBER MATRIX

- Higher application rates required for steeper slopes may inhibit germination of seed and establishment of long-term vegetation.
- Surface treatment only - unlikely to improve compacted, nutrient depleted, or poorly draining soils necessary to ensure vigorous long term vegetative cover.
- Inefficient technique to treat disturbed areas less than 0.5 acres.

PLANNING/DESIGN CONSIDERATIONS

- Required as grading proceeds.
- Mulch cover may or may not require a binder, netting or tacking.
- Hydraulic matrices are typically effective for longer periods of time.
- Avoid overspray as any of the spray on control measures are easily sprayed on roadways, traffic signs, vehicles and equipment.
- Ensure that the applicator addresses the site or the slope from more than one direction to achieve adequate and correct coverage.
- Reapply when more than 20% of ground is exposed.

**MATERIAL SPECIFICATIONS**

- Natural mulches should be used when possible.
- All mulch material should be free of seed.
- Organic soluble powder adhesive, derivative of plant material psyllium or Guar should be used as tackifier.
- Thermally refined wood fiber.
- Compost must meet the requirements Section 810-2.02 of the ADOT Standard Specifications.
- Refer to Standard Specification Section 805-2.03 for types of mulching materials.
- Comply with applicable jurisdictions' regulations and guidelines.

DESIGN STANDARDS

- Crimp or tack mulch material.
- Requires adequate coverage to prevent erosion, washout and poor plant establishment.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Maintain an unbroken ground cover throughout the period of construction if the soils are not being reworked.
- Repair, reseed and/or reapply mulch on each surface if washout, breakage or erosion occurs.
- Install anchors if needed.
- Reapply mulch when more than 20% bare ground is exposed in application areas.

EC-4 Seeding



DEFINITION





The ADOT seeding process includes tillage and amending the soil prior to seed application and straw mulching after seed application to protect exposed soils from erosion by water and wind.

PURPOSE

- Reduce erosion through establishing adequate vegetative cover and/or soil stabilization.
- Meet Final Stabilization as required by Section 402 of the Clean Water Act.
- Meet Final Acceptance requirements of Special Provisions.
- Minimize long-term maintenance costs.

The EPCM Seeding Control Measure outlines spray-on applications with wood fiber, tackifier, and fertilizers (Hydroseeding). Seeding Class II, as established in Specification will have exacting directions and specific contractual timeframes, rates, and materials (see Specification 805 and 807).

AT A GLANCE

	<ul style="list-style-type: none"> • Follow approved seed species and rate of application based on project conditions, including soils and climate as established by ADOT • Protect adjacent areas from over-spray • Adherence to Section 805 of the ADOT Standard Specifications
	<ul style="list-style-type: none"> • EC-3 Mulch Cover • EC-5 Geotextiles/Erosion Control Blankets • EC-6 Soil Binders
	<ul style="list-style-type: none"> • EC-2 Minibench/Slope Roughening • EC-3 Mulch Cover • SC-5 Sediment Wattles
	<ul style="list-style-type: none"> • Repair and reseed areas if damaged from flooding or erosion

Hydraulically applied compost may be used on slopes steeper than 3:1 or where broadcast application is not feasible.

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	





Successful wildflower seed germination on properly prepared slope.

APPROPRIATE APPLICATIONS

- Where permanent, long-lived vegetation cover is the most economical or practical.

LIMITATIONS

- Vegetative establishment is affected by dry or cold weather and rain availability.
- Application cannot occur during windy conditions.
- Seeded areas cannot be driven over by mechanical equipment.
- Requires time for seed to establish; immediate results are not seen.

PLANNING/DESIGN CONSIDERATIONS

- Additional seeding mobilizations have the potential to save time and costs in temporary erosion & sediment control structural replacement, and rework.
- Site conditions must be evaluated prior to determining suitable species selection and application rates. Attributes such as soil types, topography, local climate and season, maintenance requirements, proximity of sensitive areas (e.g., live streams), and existing native vegetation types are factors.



- Follow the seeding steps to achieve the most successful vegetative cover:
 - **Tillage:** till areas to be seeded per the project specifications; soil shall be loose and friable prior to application.
 - **Amending the Soil:** apply low solubility/slow release fertilizers, sulfur and compost over rough, ripped soils prior to final tillage per the specifications.
 - **Seed Application:** apply seed by drilling, hydroseeding or broadcasting as soon as possible after grading is completed.
 - **Straw Mulching:** mulch with certified, weed-free straw that is crimped and tacked or hydraulically applied.
 - **Rain and Time:** with rain and time, vegetation will establish if steps 1-4 are implemented properly and in the correct sequence.
- Prior to use, ADOT shall approve application rates for mulches, tackifier, soil amendments and seed mixtures per specifications.
- Avoid overspray as any of the spray on control measures are easily sprayed on roadways, traffic signs, vehicles and equipment.
- Ensure that the applicator addresses the site or the slope from more than one direction to achieve adequate and correct coverage.
- Reapply when more than 20% of ground is exposed and as directed by the Engineer.
- Always follow Special Provisions Seeding specifications. Seeding may be included as part of a landscape project as specified in Section 807, or used for erosion control as part of a SWPPP as specified in Subsection 104.09 of the specifications, or both.
- After coordination with the Engineer, tillage shall be performed as the slope is being constructed. On slope areas, all tillage shall be horizontal and parallel to the contours of the areas involved in order to create a roughened surface condition. All seeded areas suitable for tillage shall be pre-tilled to promote on-site stormwater infiltration and alleviate stormwater surface runoffs. Cut slopes can be addressed with ridges and deep tillage, or mini-benching. On fill slopes, the operations shall be conducted in such a manner as to form minor ridges thereon to assist in retarding erosion and favor germination of the seed.

MATERIAL SPECIFICATIONS

- All seed shall be in conformance with requirements of the project specifications.
- ADOT Standard Specifications for Road and Bridge Construction Section 805-2.

DESIGN STANDARDS

- ADOT Standard Specifications for Road and Bridge Construction Section 805-3.

**INSPECTION AND MAINTENANCE REQUIREMENTS**

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Identify areas that need to be reseeded or where additional Stormwater Control Measures are necessary.
- The contractor is responsible for maintaining all slopes to prevent erosion and reduce sediment loss.

REFERENCES AND SOURCES

- ADOT Standard Specifications for Road and Bridge Construction Section 805.

EC-5 Geotextiles/Erosion Control Blankets







DEFINITION

A natural (excelsior, straw, coconut, etc.) or synthetic (usually polyethylene) material manufactured by weaving or bonding fibers, installed to reduce soil erosion by wind or water.

PURPOSE

- Reduce rainfall impact and improve infiltration.
- Provide a microclimate to promote seed establishment.
- Protect exposed soil from wind and rain.
- Reduce erosiveness of concentrated flows.
- Hold mulch, seed, fertilizer and topsoil in place.

AT A GLANCE

	<ul style="list-style-type: none"> • Obtain prior approval from ADOT Roadside Development Section • Select appropriate geotextile material for site conditions • Properly prepare site • Must be properly anchored
	<ul style="list-style-type: none"> • Erosion Control Stormwater Control Measures: EC-1-EC-4, EC-6-EC-7
	<ul style="list-style-type: none"> • EC-4 Seeding • EC-7 Crown Ditch
	<ul style="list-style-type: none"> • Inspect to ensure blanket maintains continuous contact with the ground • Repair or replace if rilling under blanket occurs



Erosion Control Blanket (coir with plastic netting).

RATINGS

Associated Costs

Design	○
Construction	●
Maintenance	●

Stormwater Control Measure Objectives

Erosion Control	◐
Runoff Control	◐
Sediment Control	◐
Pollution Prevention	
Non-Stormwater	
Waste Management	



Turf Reinforcement Mat (TRM) - Note vegetation growing through open weave.

**APPROPRIATE APPLICATIONS**

- Concentrated flow areas such as ditches and channels with flows exceeding 3.3 ft./sec. (refer to ADOT Hydraulic Manual for channel lining criteria).
- Stockpiles.
- Slopes with highly erosive soils and slopes adjacent to bodies of water, when recommended by ADOT.

Fill slope installation of staples is an easier installation vs. cut slopes and hard pack soils.

LIMITATIONS

- Erosion Control Blanket (ECB) material, installation and maintenance costs are typically high.
- Not suitable for excessively rocky sites or rough slopes.
- Not suitable for all soil types. Each soil type may vary in staple or anchor material/design.
- Not suitable for areas where vegetation will be mowed.
- Some geotextiles disintegrate when exposed to light.
- May be properly anchored (turn-down); some geotextiles may increase runoff or blow away.
- May trap wildlife. Review project Special Provisions pertaining to environmental mitigation.
- Effectiveness depends on strength of fabric and proper installation. Each manufacture will may have a separate overlay pattern and staple/anchor pattern. Adherence to the manufacturer recommendation for each product, soil type, slope gradient, and length of slope is critical for adequate performance.

PLANNING/DESIGN CONSIDERATIONS

- Proper selection, design and installation of the appropriate geotextile is critical to its effectiveness. Like many stormwater control measures, ECBs are only as good as the installation and maintenance.
- Must be properly anchored to reduce undermining
- Proper site preparation is essential for adequate contact with soil. Many soils in Arizona are rocky and may have roots, branches, or other obstructions preventing direct soil contact.
- ECB is installed incorrectly, and it rains, water will get underneath.
- Use only in limited areas to address a specific site condition.
- May be used in temporary ditches to prevent scour, or on bridge abutments scheduled for final treatment.

- **Soil surface must be loose**
- **Most types need 24 hours to dry before rainfall occurs**
- **Apply as specified in project documents or by manufacturer**
- **Must be approved by Engineer**
- **Most mulches and spray-on applications will not properly cover slopes of 2:1 or greater and should be used in combination with sediment control measures (SC-1, SC-5, SC-12)**



MATERIAL SPECIFICATIONS

- Select geotextile material based on soil conditions.
- Many geotextiles are available; select the geotextile fabric to match specific project needs.
- Erosion control blanket materials include:
 - Straw
 - Jute fiber
 - Wood fiber (Excelsior)
 - Coconut fiber (Coir)
- Refer to Standard Specifications and the project Special Provisions.

DESIGN STANDARDS

- Woven geotextiles are used for filter and separation applications.
- Non-woven geotextiles are used for stabilization, reinforcement and filtration, and separation applications.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect regularly for cracks or tears in the fabric.
- Repair or replace damaged fabric immediately.
- Maintain contact between geotextile and the ground at all times.
- Remove trapped sediment after storm events.

MAT/BLANKET					
Temporary	Erosion Control Blanket (ECB)	Typically made from natural fibers (straw, coir (coconut fiber, excelsior wood shavings, or a combination) Open-weave Lightweight	Together with natural jute or synthetic netting made of geo- synthetic plastic, such as biodegradable polyethylene	Used right after hydroseeding to keep the seed from blowing or washing away and will allow vegetation to grow through (weave must be loose)	
	Wood fiber (Excelsior)				
	Coconut fiber (Coir)				
	Straw				
	Jute Fiber				
	Coconut bonded blanket	Not an open-weave	Non-woven	Not loose enough (no weave) for vegetation to grow through	
Permanent	Plastic Sheeting	Fully synthetic Man-made plastics.	Will withstand higher velocity flows	Will withstand higher velocity flows	
	Turf Reinforcement Mat (TRM)	Also made from natural fibers heavier-duty Designed for slope stabilization	May include natural materials More strongly reinforced with geosynthetics All or part may be non-biodegradable	More permanent solution for disturbance areas that an ECB may not be strong enough to withstand time and weather	Used right after hydroseeding to keep the seed from blowing or washing away



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EC-6 Soil Binders



DEFINITION

The application of dust palliatives (water, polymeric, psyllium or Guar stabilizers or emulsions) to temporarily prevent wind-induced erosion of exposed soils on construction sites.

PURPOSE

- Reduce the movement of soil particles through temporary soil stabilization.
- Reduce the movement of soil particles by the wind, which causes air pollution and eventual sediment release into waters of the U.S.

AT A GLANCE

- Ensure measures are in place before large earth moving occurs
- Select appropriate soil binder type based on soil type, slope ratio, topography and wind velocity
- Protect adjacent vegetation, vehicular ways and structures from overspray

- N/A

- CP-1 Construction Sequencing
- EC-1 Preserve Existing Vegetation
- EC-2 Minibench/Slope Roughening
- EC-4 Seeding
- SC-5 Sediment Wattles

- Inspect prior to forecast of rain, after rain events and per the applicable permit
- Reapply if erosion occurs



Wind erosion is common and increases with disturbed or exposed soil areas.

RATINGS

Associated Costs

Design	○
Construction	◐
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Application of soil binder.



APPROPRIATE APPLICATIONS

- All soil surfaces exposed to wind.
- Temporary protection of disturbed areas until permanent measures are installed.
- Temporary protection of disturbed areas that must be re-disturbed following a period of inactivity.
- In areas where grading activities will soon resume because binders can often be incorporated back into the soil.
- Where vegetation is not appropriate
- Material stockpiles.

LIMITATIONS

- Temporary in nature and may require reapplication, especially after heavy or prolonged rainfall.
- Some products may be expensive for a limited use.
- Ensure chemical use on soils are benign to surrounding vegetation and grazing animals.
- Chemical palliatives typically require a cure time of approximately 24 hours
- Easily disturbed by vehicular or pedestrian traffic.
- Do not adhere well to compacted or dense (clay) soils.
- May not perform well under conditions of low relative humidity or low temperatures.
- May be slippery if oversprayed onto vehicular travelways.
- If not properly applied, can create impervious surfaces where water cannot infiltrate.
- Soils that will have pavement or asphalt eventually may not work well with a hydrophilic (attracts water) chemical treatment areas, and may create a slip-layer. *"Asphalt moisture damage is commonly manifested in the form of stripping as a result of detachment, displacement, spontaneous emulsification, pore pressure and hydraulic scour."* -- Oregon Department of Transportation Investigating Premature Pavement Failure Due to Moisture (Final Report SPR 632).

PLANNING/DESIGN CONSIDERATIONS

- Contact ADOT Transportation Planning Division, Air Quality Policy Section for the most up to date information about air quality control on construction projects.
- Use dust control treatments that conserve water wherever feasible.
- Site conditions (soil type, temperature, humidity) must be evaluated prior to determining appropriate soil binder type.
- Consider where soil binder will be applied and length of time stabilization will be needed.
- Frequency of application.

Soil Binders

- **Must be environmentally benign (Magnesium Chloride is a salt)**
 - Forest Service
 - Tribal Community
 - Impacting animals
- **Soil type will dictate which kind of soil binder to use**
- **Are temporary and may require reapplication**
- **Do not apply during or immediately before a rainfall**
- **See table pg 89**



- Must be non-toxic to plants and wildlife.
- Investigate products other than those lists below; new products are being continuously developed.
- Avoid overspray as any of the spray on control measures are easily sprayed on roadways, traffic signs, vehicles and equipment.
- Ensure that the applicator addresses the site or the slope from more than one direction to achieve adequate and correct coverage.
- Reapply when more than 20% of ground is exposed and as directed by the Engineer.

MATERIAL SPECIFICATIONS

POLYMERIC EMULSION BLEND

- Acrylic Copolymers and polymers.
- Liquid polymers of methacrylates and acrylates.
- Poly-acrylamide and copolymer of acrylamide.
- Hydro-colloid polymers

PLANT-MATERIAL BASED (short-lived)

- Guar
- Psyllium
- Starch

PLANT-MATERIAL BASED (long-lived)

- Pitch and rosin emulsion.

DESIGN STANDARDS

- Comply with federal, state and local air quality regulations and guidelines.
- ADOT Standard Specifications for Road and Bridge Construction.
- Follow manufacturer's recommendations for application rates, pre-wetting of area and cleaning of equipment after use.
- Different application rates of the same product may result in a different result (i.e. stronger, longer lasting at higher rates).
- Add chemicals to water trucks, hydroseeding equipment and sprayers at the rate and order identified in manufacturer's product direction.



**INSPECTION AND MAINTENANCE REQUIREMENTS**

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Check areas that have been protected to ensure coverage.
- Daily inspection of high traffic areas and weekly inspection of lower traffic areas.
- Reapplication of binder may be required.
- SDS sheets for any chemical must be presented to the Engineer prior to use on the project.



EC-7 Crown Ditch







DEFINITION

Structures that intercept, divert and convey surface run-on, usually sheet flow over slopes, to prevent erosion.

PURPOSE

- Intercept and divert direct runoff to minimize sheet flow on to a slope.
- Direct runoff to a stabilized channel, protecting a cut slope or slope temporary erosion and sediment control measures.

AT A GLANCE

 <ul style="list-style-type: none"> • Determine stormwater flow, velocity and volume when designing crown ditch • Evaluate top of slope vegetation and soil infiltration rates to properly design crown ditch • Periodically divert water by warping ditch into undisturbed slopes
 <ul style="list-style-type: none"> • RC-1 Earth Dikes/Drainage Swales and Lined Ditches
 <ul style="list-style-type: none"> • EC-1 Preserve Existing Vegetation • EC-2 Minibenching/Slope Roughening • SC-5 Sediment Wattles • Slope Minibenching Detail • Slope Rounding, ADOT Standard Drawing C-02 series
 <ul style="list-style-type: none"> • Inspect for erosion, deterioration or breaches • Repair as necessary



Crown ditch installed early in construction to protect landscape and materials.

RATINGS

Associated Costs

Design	○
Construction	●
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Gabion-style crown ditch used for extreme drainage conditions and slope retrofits.

**APPROPRIATE APPLICATIONS**

- At the top of cut and fill slopes, but primarily cut slopes.

LIMITATIONS

- Not suitable as sediment trapping structures.
- Provide potential for disturbing existing vegetation and soil.

PLANNING/DESIGN CONSIDERATIONS

- Consider stormwater flow, velocity, volume and slope of the proposed ditch.
- Consider protection of installed erosion and sediment control features already installed on slopes.
- Provide stabilized outlets. Velocity dissipaters are required at each discharge point (AZCGP).
- Requires warping of ditch periodically into undisturbed areas.
- Consider ditch alignment and outlets carefully. Do not direct uncontrolled flows on off-site properties.
- Stake ditch layout in the field prior to construction to evaluate visibility and avoid existing vegetation where possible.
- Consider maintenance access.
- Consider safety standards for obstructions above grade within traffic clear zones/recovery areas (Roadway Design Guidelines 303.2 to 303.3).
- Urban projects may require grouted or wire-tied rock.

MATERIAL SPECIFICATIONS

- N/A

DESIGN STANDARDS

- Warp crown ditch into undisturbed slopes where ditch slope exceeds 5%.
- Design ditches to daylight into existing drainages. Discharges off ADOT Right-of Way require velocity dissipation.
- ADOT Erosion/Sediment Control and Water Quality Protection Detail: Slope Minibenching.
- ADOT Erosion/Sediment Control and Water Quality Protection Detail: Slope Rounding.
- ADOT Roadway Standard Drawing C-03.10.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.

EC-8 Rock Cover







DEFINITION

A non-erodible element of small diameter gravel, recycled asphalt, or other suitable material, installed to reduce soil erosion by wind or water.

PURPOSE

- Reduce rainfall impact and improve infiltration.
- Protect exposed soil from wind and rain.
- Reduce erosiveness of concentrated flows.
- Reduce sediment laden runoff and prevent tracking out of sediment on paved areas (not a Trackout Pad or stabilized construction entrance/exit).

AT A GLANCE

	<ul style="list-style-type: none"> • Apply to flat areas, or areas having a slight to moderate slope • Evaluate slope type and equipment availability to determine method of roughening
	<ul style="list-style-type: none"> • SC-5 Sediment Wattle
	<ul style="list-style-type: none"> • CP-1 Construction Sequencing • EC-1 Preserve Existing Vegetation • EC-4 Seeding • EC-6 Soil Binders • RC-1 Earthen Dikes/Drainage Swales and Lined Ditches • SC-10 Stabilized Construction Entrance/Exit • SC-11 Stabilized Construction Roadway • PP-4 Street Sweeping and Vacuuming
	<ul style="list-style-type: none"> • Monitor for low areas holding water • Inspect and repair after storm events and frequent traffic of vehicles and equipment

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	◐

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Millings on slight slopes may wash away and increase erosion and run off.



APPROPRIATE APPLICATIONS

- Slopes with no gradient to slight gradient (less than 6:1).
- Level soils that are prone to erosion from wind and rain.
- Where areas of construction are used for parking and staging equipment
- Prior to application of permanent seeding.
- Used to prevent or minimize transport of dust and sediments. This stormwater control measure is temporary and should be used with other Engineer approved stormwater control measures that may include and are not limited to:
 - Use of appropriate dust suppressants (EC-6, SC-10, SC-11).
 - Stabilizing with Vegetation (EC-4).
 - Phasing and/or altering the access of vehicles and equipment and/or using structural control measures to reduce wind and water erosion onto areas accessible to equipment, vehicles, and the public (CP-1, EC-1, RC-1, SC-12).

LIMITATIONS

- Not appropriate on rocky or sandy slopes.
- Not used as Trackout Pad material or Stabilized Construction Entrances/Exits.
- May be required to be removed prior to Final Stabilization/Final Acceptance.
- Not considered a permanent erosion control measure.
- Asphalt millings installed with a surfactant and water compaction may provide moisture to start germination of noxious and invasive plant species.
- Compacted asphalt milling material and small rock (less than 2" in diameter) has a limited resistance to eroding and allows stormwater runoff, bring too small and not angular in shape.



Proper rock cover application on relatively flat soils to prevent wind and stormwater erosion at a construction laydown yard.



PLANNING/DESIGN CONSIDERATIONS

- If used on edge of pavement shoulders during construction, more permanent erosion control may be identified in project special provisions/plan set such as curb and gutter/scuppers.
- Install on flat soil surfaces keeping terraces, furrows and other horizontal roughening techniques in place and parallel to the contours along the entire length.
- Use with other Stormwater Control Measures and run-on diversion measures to prevent scour.

MATERIAL SPECIFICATIONS

- N/A

DESIGN STANDARDS

- ADOT Standard Specifications for Road and Bridge Construction Section 203-303(B).
- ADOT Standard Specifications for Road and Bridge Construction Section 805-3.02(B).
- ADOT Erosion/Sediment Control and Water Quality Protection Detail: Guardrail/End Treatment Slope Protection.
- Pavement Structural/Shoulder Build-Up Detail.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.



Rock cover applications may carry invasive and noxious weeds and seeds.



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Runoff Control (RC) Stormwater Control Measures



Erosion control (soil stabilization) consists of preparing the soil surface and applying Stormwater Control Measures or combinations thereof to disturbed soil areas. Temporary soil stabilization shall be applied to disturbed soil areas of construction projects per plans, details, specifications, and applicable Construction General and/or ADOT permits.

Erosion control Stormwater Control Measures are the first line of defense, rely on them to retain soil in place.

- RC-1 Earth Dikes/Drainage Swales and Lined Ditches
- RC-2 Cut to Fill Slope Transitions
- RC-3 Erosion Protection at Structures
- RC-4 Rock Outlet Protection/Velocity Dissipation Devices
- RC-5 Slope Drains
- RC-6 Check Dam





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RC-1 Earth Dikes/Drainage Swales/ Lined Ditches







DEFINITION

Structures and grading techniques that intercept, divert, and convey surface runoff, usually sheet flow, to a desired location.

PURPOSE

- Divert runoff away from erodible surfaces and toward sediment trapping devices.

AT A GLANCE

	<ul style="list-style-type: none"> • Construct and fully stabilize before any major land disturbance • Consider volume and velocity of runoff to be diverted • Consider erodibility of soils • Recovery area/Safety Zone compliance
	<ul style="list-style-type: none"> • EC-7 Crown Ditch • RC-6 Check Dam
	<ul style="list-style-type: none"> • CP-1 Construction Sequencing • RC-4 Rock Outlet Protection/Velocity Dissipation Devices
	<ul style="list-style-type: none"> • Maintain height of dikes for effectiveness • Inspect for erosion or deterioration



Uncompacted berms will breach and yield a sediment discharge. Sandy soils will not compact well.

RATINGS

Associated Costs

Design	○
Construction	●
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Gabion mattress designed for anticipated high PP velocity flows.

**APPROPRIATE APPLICATIONS**

- Base of fill slopes where runoff begins to concentrate.
- Top of slopes to control rill and gully erosion. Refer to Stormwater Control Measure EC-7 Crown Ditch.
- Bottom and mid-slope locations to intercept sheet flow and convey concentrated flows.
- Divert runoff toward a stabilized watercourse or drainage structure.
- Divert sediment laden water to sediment trapping device.
- Divert stormwater around construction staging areas.
- Divert flow away from erodible slopes.

LIMITATIONS

- Runoff must be diverted into existing or stabilized drainages or sediment basins.
- High runoff velocities may scour and erode dikes and swales.
- Within the ditch, combine with other Stormwater Control Measures such as EC-5 Geotextiles/Erosion Control Blankets, RC-6 Check Dam and/or SC-6 Sediment Log.
- Only controls erosion and scour in a ditch or swale and does not remove sediment.
- At the end of each ditch/swale, used in conjunction with erosion/sediment control measures such as SC-3 Sediment Traps, SC-4 Sediment Basins, and RC-4 Velocity Dissipation Devices.



Rock lined ditch.



PLANNING/DESIGN CONSIDERATIONS

- Hydrologically size rock for expected flows.
- Line ditches where high runoff velocities are expected.
- Stabilize dikes by compaction or other means such as erosion control blankets or riprap.
- Provide stabilized outlets to divert sediment-laden flow into sediment traps.
- Where installed at construction traffic crossings, the top width may be wider and side slopes may be flatter compared to other applications.
- Install early in the construction process, when possible.
- Must conform to local floodplain management regulations and not adversely impact adjacent properties.
- Seed earthen dike and ditch immediately after construction if diversion measure will be used longer than 15 days.
- Dikes and swales need to be lined or stabilized.
- Provide stabilized outlets (velocity dissipation).
- Rock lined ditches and swales must be keyed in when installed and the surrounding grade shall be higher than rock lining.

MATERIAL SPECIFICATIONS

- ADOT Standard Specifications for Road and Bridge Construction Section 810-2.03 and Section 913.
- Project plans, details and Special Provisions.

DESIGN STANDARDS

- ADOT Erosion/Sediment Control and Water Quality Protection Detail: Sediment Control Berm.
- ADOT Erosion/Sediment Control and Water Quality Protection Detail: Rock Protection for Cut & Fill Transition and Channel Lining.
- Rock within the traffic Clear Zone/Recovery Area must conform to the requirements of Section 810-2.03 and be embedded into the finished grade so no portion of the exposed rock is 4" above grade.



Earthen Dike has compacted berm.



Rock lined ditch installed incorrectly. Rock is not keyed in and stormwater flows will erode the sides, causing failure and rework.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect for washouts and erosion.
- Check outlet stabilization for signs of erosion.
- Repair where damaged by construction equipment.
- Properly re-compact material added to repair the dike.
- Maintain as described in Stormwater Control Measure SC-3 Sediment Trap where flows are directed into sediment traps.



RC-2 Cut to Fill Slope Transitions





DEFINITION

Rock riprap/rock mulch placed along cut-fill slope transitions.

PURPOSE

- Stabilize and reduce erosion at cut-fill transitions.
- Convey concentrated flows to stabilized drainage.

AT A GLANCE

	<ul style="list-style-type: none"> • Properly prepare subgrade • Size rock riprap based on flow velocity • Rock riprap must be 1-2 inches below adjacent finish grade
	• N/A
	<ul style="list-style-type: none"> • RC-1 Earth Dikes/Drainage Swales and Lined Ditches • RC-4 Rock Outlet Protection/Velocity Dissipation Devices
	• Inspect for erosion and sedimentation in rock riprap

RATINGS

Associated Costs

Design	○
Construction	●
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



No rock lined cut to fill transition ditch has caused fill slope failure and rework costs.

**APPROPRIATE APPLICATIONS**

- Where concentrated surface flows must be conveyed from a cut ditch, down to the toe of the adjoining downstream fill slope.
- The cut/fill transition is usually the first place water will exit the road alignment from installed v-ditches and has great potential to erode and head-cut into engineered fill slopes.

LIMITATIONS

- Reduce erosion only when they have been sized and constructed properly.
- Must match width of roadside ditch at beginning and increase in width 50% greater at the base.

PLANNING/DESIGN CONSIDERATIONS

- Proper subgrade preparation.
- Embed rock riprap into grade so the top is 1" – 2" below finished grade and must be keyed in by at least one foot deep.
- Field adjust to meet existing roadside ditch as in field conditions are not necessarily correctly indicated on plan sets.

MATERIAL SPECIFICATIONS

- Rock riprap should conform to Gradations A or B, as defined by Section 810 of the ADOT Standard Specifications for Road and Bridge Construction.
- Rock mulch should conform to Gradations C, as defined by Section 810 of the ADOT Standard Specifications for Road and Bridge Construction.
- River run materials are not allowed.



Rock line cut to fill transition ditch properly installed and over-seeded. Riprap should blend with landscape.



DESIGN STANDARDS

- Refer to ADOT Erosion/Sediment Control and Water Quality Protection Detail: Rock Protection for Cut & Fill Transition and Rock Riprap/Mulch Channel Lining.
- Cut-to-fill transition shall terminate at a planned or existing stabilized drainage.
- Size of rock used must be large enough to withstand expected design flow through the transition.
- Rock within the traffic Clear Zone/Recovery Area must conform to the requirements of Section 810-2.03 and be embedded into the finished grade so no portion of the exposed rock is 4" above grade.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect for signs of slope erosion under and around the rock protection, check for erosion and displacement of rock at the outlet. Replace rock and repair as needed.



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RC-3 Erosion Protection at Structures



DEFINITION

Rock riprap placed along the soil interface of concrete and metal structures such as spillways, pipes or drainage structures.

PURPOSE

- Reduce or eliminate the potential for undercutting and erosion at structures.

AT A GLANCE

	<ul style="list-style-type: none"> • Size rock riprap based on volume of runoff expected and slope characteristics • Consider wire-tied riprap if installed on steep slopes • Prevent scour and reduce velocity of exiting flows • Sediment trap further downstream may be necessary if runoff is sediment laden • Loose rock may be washed away • Grouted or wire-tied rock can minimize maintenance
	<ul style="list-style-type: none"> • SC-7 Gravel Bag Protection
	<ul style="list-style-type: none"> • SC-2 Silt Fence • SC-5 Sediment Wattle
	<ul style="list-style-type: none"> • Inspect after storm events; repair if damaged or eroded

RATINGS

Associated Costs

Design	○
Construction	●
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	

Rock is missing at along conveyance ditch to new drop inlet. Silt fence should not be used as a filter.





The same drop inlet (different angle) with rock properly installed, protecting structures from erosion and sediment loss.

APPROPRIATE APPLICATIONS

- At structures that abut a soil surface and where concentration and/or velocity of stormwater is great enough to cause erosive flows.
- At pipe headwalls.
- Used to reduce undercutting and scour of installed pipes, culverts and inlets as well as prevent scour from end of pipe discharges.
- Use sound, durable and angular rock designed and size as specified or as directed by the Engineer.

LIMITATIONS

- Riprap loss may occur due to erosion and sliding if rock riprap is placed on slopes greater than 2:1.
- Can increase erosion if installed improperly.

PLANNING/DESIGN CONSIDERATIONS

- Rock interface protection is very effective only when the rock is sized and placed properly.
- Embed rock riprap so that the top is 1 to 2 inches below adjacent finish grade.
- Rock within the traffic Clear Zone/Recovery Area must conform to the requirements of Section 810-2.03 and be embedded into the finished grade so no portion of the exposed rock is 4" above grade.



MATERIAL SPECIFICATIONS

- Use angular, crushed rock material.
- River run materials are not allowed.

DESIGN STANDARDS

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect for signs of erosion and undercutting around the structure.



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RC-4 Rock Outlet Protection/Velocity Dissipation Devices



DEFINITION

Rock riprap, grouted or wire-tied riprap placed at outlet ends of culverts, conduits, or channels.

NOTE: By definition this is a post-construction Stormwater Control Measure. Refer to the ADOT Post-Construction Best Management Practices Manual, Outlet Protection Stormwater Control Measure for additional information.

PURPOSE

- Prevent scour and reduce velocity of concentrated stormwater flows.

AT A GLANCE

	<ul style="list-style-type: none"> Use only angular rock Size rock based on velocity of flows and per drainage design
	<ul style="list-style-type: none"> N/A
	<ul style="list-style-type: none"> RC-3 Erosion Protection at Structures RC-5 Slope Drains
	<ul style="list-style-type: none"> Inspect after storm events and repair promptly to prevent a progressive failure May need to control weed growth

RATINGS

Associated Costs

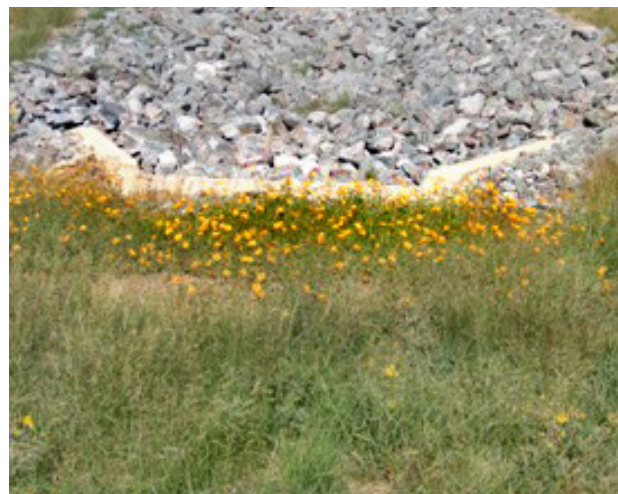
Design	○
Construction	◐
Maintenance	◐

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Protection around drainage pipe needs to be addressed.



Proper sizing of rock riprap is essential to design effectiveness. Backfilled and seeded properly.

**APPROPRIATE APPLICATIONS**

- Where discharge velocities and energies at the outlets of culverts, pipes or channels are sufficient to erode the downstream channel and/or undermine and create turbulence at the outfall area.
- At discharge outlets that carry continuous flows of water.
- At points where lined conveyances discharge to unlined conveyances.
- Wherever ADOT discharges offsite.

LIMITATIONS

- Loose rock may be washed away during high flows.
- Freeze/thaw cycles may break up grouted riprap.

PLANNING/DESIGN CONSIDERATIONS

- Grouted or wire-tied rock riprap can minimize maintenance requirements.
- Rock must be sized and installed properly to be effective. Refer to ADOT Drainage Manual and project drainage plans.
- A sediment trap below the outlet may be required.

MATERIAL SPECIFICATIONS

- Section 810 of the ADOT Standard Specifications.
- Use sound, durable, angular rock.
- River run material is not allowed.

DESIGN STANDARDS

- Refer to ADOT Erosion/Sediment Control and Water Quality Protection Detail: Rock Protection for Inlets, Outlets and Headwall Transition.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect for displacement of riprap or damage to underlying fabric
- Inspect for signs of scour beneath the riprap or around the outlet.
- Replace rock and repair apron and slopes as needed.



RC-5 Slopes Drains

DEFINITION

A temporary rigid pipe or flexible conduit drain used to intercept and convey runoff into a stabilized drainage. Slope drains are broadly used to protect cut or fill slopes. Slope drains are typically constructed from pipe and used direct surface runoff down to a stabilized sediment control measure, or stabilized area.

PURPOSE

- Prevent sheet flow erosion over fill slopes.
- Prevent channelized flows from eroding slopes.

AT A GLANCE

	<ul style="list-style-type: none"> • Pipe size depends on velocity and volume of flow • Pipe must daylight at a stable drainage
	<ul style="list-style-type: none"> • RC-4 Rock Outlet Protection/Velocity Dissipation Devices
	<ul style="list-style-type: none"> • RC-1 Earth Dikes/Drainage Swales and Lined Ditches • RC-3 Erosion Protection at Structures • RC-4 Rock Outlet Protection/Velocity Dissipation Devices • SC-3 Sediment Trap
	<ul style="list-style-type: none"> • Inspect after storm event; repair as needed

RATINGS

Associated Costs

Design	○
Construction	◐
Maintenance	◑

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Slope Drain Installed at the edge of impervious pavement to control slope erosion from run on.



End of slope drains are directed to a stabilized, rock-lined transition ditch.

APPROPRIATE APPLICATIONS

- Install where slopes may be eroded by surface runoff.
- Where final road grades are completed but remain unpaved.
- May be used as emergency spillway for sediment basin.
- On construction sites with large slopes and grade changes.
- Used in combination with temporary and/or permanent erosion control measures.

LIMITATIONS

- Volume of runoff to be conveyed must not exceed capacity of structure and stormwater volume should be calculated by an engineer, or hydrologist to prevent overloading the pipe diameter.
- Larger areas require a paved spillway, rock lined channel or additional pipes.
- May become clogged or overcharged during large storms forcing water around pipe.
- Failure causes extreme slope erosion.



PLANNING/DESIGN CONSIDERATIONS

- Most effective when used in combination with temporary embankment curb, earthen berms, gravel bag or compost socks, all directing stormwater into the slope drain.

MATERIAL SPECIFICATIONS

- Slope drain types:
- Rigid pipe.
- Flexible pipe.

DESIGN STANDARDS

- Pipe inlet may need additional stabilization to prevent undercutting.
- Refer to Erosion/Sediment Control and Water Quality Protection Detail: Downslope Drain.
- Install slope drains perpendicular to slope face.
- Compact the soils around and under entrance, outlet, and along length of pipe.
- Securely anchor and stabilize pipe entrance.
- The of slope drain outlet should be reinforced with rock outlet Protection, RC-4.
- Refer to the ADOT Drainage Manual for further guidance if necessary

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect for structural integrity, blockage and stability at the inlet and outlet.
- Inspect for downstream scour.
- Ensure water does not pond in open traffic areas, or construction laydown areas with material/chemical storage.
- Repair if scour occurs.
- Reinforce inlet with compacted soil or sandbags if undercutting occurs.
- If outlet flow is directed to a sediment-trapping device, sediment should be removed as required for that device.



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RC-6 Check Dam

DEFINITION

A small dam constructed across a roadside ditch or channel, installed at properly spaced locations, to reduce flow velocities and scour potential. Check dams reduce velocities of flow, scour, and sediment loss. Check dams promote stormwater infiltration, sediment deposition on site, and seed establishment. Check dams may be constructed of rock, gravel bags, compost socks, or sediment logs.

PURPOSE

- Reduce the velocity of concentrated water flows.
- Reduce channel erosion.
- Allow sediment to settle.

AT A GLANCE



- Calculate acreage that channel is draining
- Base of upstream dam to be at same elevation as top of next downstream dam
- Rock material must be placed, not dumped into the channel and may require geotextile fabric to be installed underneath.
- Remove dams only after contributing drainage area is stabilized and at the direction of the Engineer



- SC-6 Sediment Log
- RC-4 Velocity Dissipation
- SC-12 Compost Sock
- SC-5 Sediment Wattle
- RC-1 Lined Ditches



- EC-5 Geotextiles/Erosion Control Blankets
- RC-4 Rock Outlet Protection/Velocity Dissipation Devices
- SC-6 Sediment Log



- Remove large debris, trash and leaves that have built up behind dam
- Remove sediment that has built up to 1/2 the height of the dam

RATINGS

Associated Costs

Design	●
Construction	●
Maintenance	●

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Series of check dams in roadside ditch.



APPROPRIATE APPLICATIONS

- Small channels which drain 10 acres or less.
- Channels constructed in erosive soils.
- Channels constructed with steep profile grades (greater than 5%).
- In temporary ditches or swales that, because of their short length of service, will not receive permanent protection.
- In permanent ditches or swales that will not receive permanent non-erodible linings.
- In ditches that need protection during the establishment of vegetative cover.



Compost sock check dam.

LIMITATIONS

- Not for use in live streams washes (dry or flowing).
- Do not use in channels that have already been lined or vegetated unless erosion is expected.
- Promotes sediment trapping, which can be re-suspended during subsequent storms or removal of check dam.
- Installation may be affected if installed within Clear Zone.

PLANNING/DESIGN CONSIDERATIONS

- Must be designed and constructed with adequate spillways, dissipater aprons and tie-ins to the channel banks and/or bed to protect the channel and structure during times of peak flow.
- In locating the check dam, consideration shall be given to the effects and the reach of the impounded water and sediment.
- If installation is to be permanent, the final depth of the silted ditch must be considered in the original design of the ditch.
- Rock shall be large enough to stay in place given the expected design flow through the channel.
- Check dams shall be installed in a manner that creates pooling of water behind (upstream) of the check dam.
- Check dams are a designed redundant system and installation spicing should be based on the upstream check dam toe will be the same elevation as the top of the next downstream check dam.
- Check dams may be required to be removed once sufficient vegetative cover has been established, at the final acceptance walkthrough, or at the direction of the Engineer.



- Not to be constructed from a silt fence.
- Rock within the traffic Clear Zone/Recovery Area must conform to the requirements of Section 810-2.03 and be embedded into the finished grade so no portion of the exposed rock is 4" above grade.

MATERIAL SPECIFICATIONS

- Check dams shall be constructed of angular rock.
- River run material is not allowed.
- Rock shall be sized as specified in the contract documents or as stated in the ADOT Hydraulics Manual.
- Refer to the ADOT Erosion/Sediment and Water Quality Protection Stormwater Control Measure Detail: Rock Check Dam.

DESIGN STANDARDS

- Rock shall be placed to achieve complete coverage of the channel or swale.
- The center of the dam shall be lower than the edges.
- Check dams shall be with a middle spillway or wier that is one-third lower than the sides to protect the v-ditch from scour and erosion for a localized 2-year/ 24-hour storm event peak flow.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Remove sediments when depth reaches one-third of check dam height. Removed sediment shall be incorporated into the project at locations approved by the Engineer or removed from the right-of-way.
- Erosion caused by high flows around the edges of the dam should be corrected immediately.



Sediment Wattle Check dam.



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Sediment Control (SC) Stormwater Control Measures



Sediment control Stormwater Control Measures are back-up control measures to erosion control Stormwater Control Measures to keep sediment from leaving the construction site. Construction (temporary) sediment control practices include those measures that intercept and slow or detain the flow of stormwater to allow sediment to be trapped and settle.

Sediment control Stormwater Control Measures are the second line of defense, rely on them to capture sediment on site.

- SC-1 Sediment Control Berm
- SC-2 Silt Fence
- SC-3 Sediment Trap
- SC-4 Sediment Basin
- SC-5 Sediment Wattle
- SC-6 Sediment Log
- SC-7 Gravel Bag Barrier
- SC-8 Storm Drain Inlet Protection
- SC-9 Curb Inlet Protection
- SC-10 Stabilized Construction Entrance/Exit
- SC-11 Stabilized Construction Roadway
- SC-12 Compost Sock
- SC-13 Rock Berm
- SC-14 Pipe Inlet Protection





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SC-1 Sediment Control Berm







DEFINITION

A temporary sediment barrier consisting of compacted salvaged topsoil, surface soils pushed into a small berm at top or toe of fill slopes installed along the contour and at a constant elevation.

PURPOSE

- Intercept sediment-laden sheet flow runoff, allowing runoff to infiltrate and sediment to drop out of suspension.
- Stockpiling of surface soil for future plating on slopes.

AT A GLANCE

	<ul style="list-style-type: none"> • Construct using topsoil prior to placement of roadway embankment • Construct along contour and allow for a minimum 2' sediment loading zone • Place outside of vehicle recovery area • Must be compacted
	<ul style="list-style-type: none"> • SC-2 Silt Fence • SC-5 Sediment Wattle • SC-6 Sediment Log • SC-7 Gravel Bag Protection • SC-12 Compost Sock
	<ul style="list-style-type: none"> • EC-2 Minibench/Slope Roughening • RC-6 Check Dam
	<ul style="list-style-type: none"> • Inspect berm for signs of erosion, particularly after storm events • Remove sediment when 50% capacity is reached

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Sediment Berms that are not compacted will lead to failure.



APPROPRIATE APPLICATIONS

- Below the toe or at top of exposed and erodible slopes or soil stockpiles.
- May be utilized in place of silt fence or sediment wattles or logs.
- May be constructed in conjunction with topsoil salvage operations. Soil may be reincorporated into adjacent slopes upon completion of final slope geometry.

LIMITATIONS

- Can create a temporary sedimentation pond on the upstream side of the berm.
- Must be graded out prior to application of Stormwater Control Measures and seeding of final slopes.
- Additional Stormwater Control Measures are required where profile slopes exceed 3% and/or where concentrated flows occur.

PLANNING/DESIGN CONSIDERATIONS

- Berm shall be stabilized to prevent erosion.
- Engineered percent compaction is required.
- Sandy soils are not to be used as percent compaction may not be met.
- Salvage topsoil as directed in the project plans or by the Engineer.
- May require additional Control Measures where there are concentrated flows.
- Create a stabilized weir for runoff to pond and control water overtopping the berm.
- Ponded water behind the berm must have a stabilized conveyance to direct ponded water out of the berm. Water cannot be held behind earthen berms for more than 72 hours.



Signage helps make everyone aware of policy.

MATERIAL SPECIFICATIONS

- Surface materials i.e. soil, rock, branches, leaves, slash and chips.

DESIGN STANDARDS

- Construct a minimum 2'-0" sediment loading zone between toe of slope and sediment berm.
- Compact sediment control berms per ADOT Erosion/Sediment Control and Water Quality Protection Detail: Sediment Control Berm.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect for breaks and erosion in berms.
- Repair as necessary.
- This control measure may require removal when the adjacent slope area has been permanently stabilized. Grade area to blend in with existing ground.



Fully compacted berm protecting surrounding undisturbed areas



Berm about to be compacted. Will require a stabilized weir and outlet after compaction.



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SC-2 Silt Fence



DEFINITION

A temporary sediment barrier consisting of a filter fabric, wire mesh, and T-Post that is entrenched into the soil for perimeters of disturbed areas, around soil stockpiles and for the base of slopes.

PURPOSE

- Intercept and pond sediment-laden sheet flow runoff, allowing sediment to drop out of suspension.

AT A GLANCE

- Locate at low or down-slope areas of relatively small disturbance/ construction sites
- Properly trench bottom of silt fence for maximum functionality
- Overlap ends of silt fence where a continuous length of fence is not possible
- Do not use silt fence across ditches, washes, or drainage channels.
- Not practical for large flows >0.5 cfs

- SC-1 Sediment Control Berm
- SC-6 Sediment Log
- SC-12 Compost Sock

- EC-2 Minibench/Slope Roughening
- SC-5 Slope Drains

- Inspect for sediment build-up behind silt fence or for breaks in fence; repair immediately
- Remove accumulated sediment when 1/3 fence height is reached
- Maintenance for silt fence may be higher than alternative control measures as sun, wind, and vehicle/equipment damage occurs frequently.

RATINGS

Associated Costs

Design	○
Construction	◐
Maintenance	●

Stormwater Control Measure Objectives

Erosion Control	○
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Proper wire mesh support for fabric.



APPROPRIATE APPLICATIONS

- At downstream perimeter of disturbed site.
- Below the toe of exposed slopes and soil stockpiles.
- Above active riparian areas as a last line of defense.

LIMITATIONS

- Not for use in live streams or in areas of concentrated flow
- Silt fence shall not be cut or altered in width.
- Do not use in channels that have already been lined or vegetated unless erosion is expected.
- Not practical where large flows or large areas of disturbance are involved.
- Not suitable for areas where large amounts of concentrated runoff are likely.
- Can create a temporary sedimentation pond on the upstream side of the fence and cause temporary flooding.
- Typical fabric lifespan is between five and eight months.
- Only effective if used in combination with upstream Stormwater Control Measures.
- Limited sediment capture area.



Silt fence has no wire mesh, not trenched in, did not use T-Post, and is installed on the wrong side of the flow.

PLANNING/DESIGN CONSIDERATIONS

- Do not install silt fence at the toe of the slope. Standard Drawings and Specifications require at least 2-feet of sediment loading area between the toe of the slope and the fence.
- Consider equipment access and what will be used to clean and remove sediment from behind the fence when installing.
- Use in areas where flows do not exceed 0.5 cfs and drainage area for the fence does not exceed 0.25 acre per 100 feet of fence length.
- Do not install silt fence across streams, ditches or waterways.
- Trenches for silt fence installation may be deep and wide (6' deep, 8" wide) and underground features such as utilities, fiber optics, water, and sewage pipes may be damaged. Proper and recent staking of underground utilities is required.

Silt fence does not operate well and was not designed for long, straight lines. Smaller curves of fence should be used to meet the flow limitations of less than 0.5 cfs and drainage area and less than 0.25 acre per 100 feet of fence length.



- Do not use where rocky or hard areas will prevent uniform installation of posts and entrenching of the fabric.
- Must be removed following final approved stabilization of disturbed area.

MATERIAL SPECIFICATIONS

- Refer to Standard Specification Section 1014-8 for fabric requirements.
- Refer to Standard Drawing C-12.10 for additional requirements.

DESIGN STANDARDS

- Install per ADOT Erosion/Sediment Control Water Quality Protection Detail: Silt Fence.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect for
 - depth of accumulated sediment
 - splits or tears in fabric
 - fabric attachment to fence posts
 - post stability
 - undercutting
- Remove sediment when it reaches one-third the height of the fence. Removed sediment shall be incorporated into the project at locations approved by the engineer or removed from site.
- Remove fence when up-slope area has been permanently stabilized. Fill and compact post holes and fabric trench, remove accumulated sediment, grade area to blend in with adjacent ground and stabilize area disturbed due to fence removal.



Silt fence operates like a dam and not a filter. Frequent maintenance and use of proper erosion control will assist in preventing failure. Concrete washout shall not be located outside of proper washout facilities and not near project boundaries (see WM-4).



Ⓢ ALTERNATIVES

- SC-1 Sediment Control Berm
- SC-6 Sediment Log
- SC-12 Compost Sock
- Tension Fence



Tension fence is a silt fence alternative made from heavy-duty, structurally enhanced fabric to eliminate the need for reinforced wire-fence backing. Because no wire backing is necessary, installation cost may be lower than wire-backed fencing. Tension fence provides containment of sediment-laden runoff and is manufactured with post-tensioning cables the entire length of the fabric. This fencing is engineered to withstand the hydrostatic pressures of ponded water and must be trenched in at a depth of at least 10 inches.

Consider the fabric material apparent opening size (AOS) to match soil characteristics. Clays and fine particle may not be removed with all fence material. This product shall not be placed or situated within surface waters or stream/wash bank areas, unless approved under a CWA section 404 permit. This product works well in combination with a vegetated area as secondary sediment capture.



Tension Fence.



Maintenance for silt fence may be higher than alternative control measures as sun, wind, and vehicle/equipment damage occurs frequently.

SC-3 Sediment Trap



DEFINITION

A small impoundment formed by excavation and/or constructing an embankment so that sediment-laden runoff is temporarily detained.

PURPOSE




- Allow sediment to settle out of construction runoff before the water is discharged.
- Simplify stormwater management on a construction site by trapping small amounts of sediment at multiple spots.

AT A GLANCE







	<ul style="list-style-type: none"> • Soils need to be appropriate for infiltration • Locate to minimize potential for groundwater contamination • Use for drainage areas of 5 acres or less
	<ul style="list-style-type: none"> • SC-1 Sediment Control Berm
	<ul style="list-style-type: none"> • RC-1 Earth Dikes/Drainage Swales and Lined Ditches • RC-4 Rock Outlet Protection/Velocity Dissipation Devices • RC-5 Slope Drain • SC-5 Sediment Wattle • SC-7 Gravel Bag Protection
	<ul style="list-style-type: none"> • Inspect after storm events to ensure functionality • Repair eroded areas or re-evaluate placement if erosion occurs frequently or install additional Stormwater Control Measures. • Remove accumulated sediment when 50% capacity is reached

RATINGS

Associated Costs

Design	
Construction	
Maintenance	

Stormwater Control Measure Objectives

Erosion Control	
Runoff Control	
Sediment Control	
Pollution Prevention	
Non-Stormwater	
Waste Management	



Small sediment trap.



Trap situated to collect sediment laden water prior to discharge.

APPROPRIATE APPLICATIONS

- Projects under construction during the rainy season.
- At the outlets of stormwater diversion structures, channels, slope drains, construction site entrance/exit wash racks or any other runoff conveyance that discharges waters containing sediment and debris.
- At outlets of disturbed soil areas less than 5 acres in size.

LIMITATIONS

- Life span is usually 24 months.
- May only remove sediment particles that are medium to large in size and detention period is too short for removing fine silt and clay particles.
- Ponded water may create vector control problems.
- Use of stabilized outlet structure or spillway is required, such as riprap.

PLANNING/DESIGN CONSIDERATIONS

- Use for drainage areas of 5 acres or less.
- Install prior to the project boundaries, where overland flows concentrate and may discharge off-site.
- Traps are small (4' – 6' in diameter and less than 1' in depth) and no loading calculations may be required unless directed by the Engineer.
- Note natural drainage patterns and place traps in areas of highest erosion potential.
- Locate for ease of maintenance and inspection.



- Traps are formed by excavating an area and placing an earthen embankment across a low area or drainage swale.
- Most effective when used in combination with other Stormwater Control Measures that stabilize upland soils.
- Water cannot be held in traps for more than 72 hours.
- Sediment traps must be situated outside of surface waters and any natural buffers, unless approved under a CWA section 404 permit.
- Design traps for public safety or use alternative sediment controls

MATERIAL SPECIFICATIONS

- Use Gravel Bags or 8-inch diameter compost socks to construct small sediment traps.

DESIGN STANDARDS

- Design to minimize surface area for infiltration and sediment settling.
- Bottom of sediment trap should be flat.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect after each rainfall to ensure trap is draining properly.
- Inspect for damage from erosion.
- Verify that depth of spillway is maintained at a minimum of 1.5 feet below the low point of the trap embankment.
- Remove accumulated sediment when 50 percent sediment capacity is reached (capacity does not always equal depth.).



Small, rock-lined sediment trap installed prior to the project boundaries, where overland flows concentrate and may discharge off-site.



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SC-4 Sediment Basin



DEFINITION

A temporary or permanent basin formed by excavation and/or constructing an embankment so that sediment- laden runoff is temporarily detained. Sediment basins are calculated to contain local rain events per the acres drained volume.

PURPOSE

- Capture sediment from stormwater runoff before it leaves the construction site.
- Slow the velocity of runoff through detention.

AT A GLANCE



- Soils must be appropriate for infiltration
- Use for drainage areas less than 75 acres
- Locate to minimize groundwater contamination potential
- Properly designed basins require large area of a project that cannot be used otherwise.



- SC-3 Sediment Trap



- RC-1 Earth Dikes/Drainage Swales and Lined Ditches
- RC-4 Rock Outlet Protection/ Velocity Dissipation Devices
- RC-5 Slope Drain
- SC-2 Silt Fence
- SC-5 Sediment Wattle



- Inspect after storm events to ensure functionality.
- Repair eroded areas or re-evaluate placement if erosion occurs frequently or install additional Stormwater Control Measures.
- Remove accumulated sediment when 50% capacity is reached.



A large area allows sediment to settle out.

RATINGS

Associated Costs

Design	●
Construction	●
Maintenance	●

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Basin is too small to provide adequate retention for acres drained. A stabilized outlet is required.



APPROPRIATE APPLICATIONS

- Only as necessary, and as designed by a professional engineer, hydrologist, CPESC, and as approved by the Engineer.
- Where sediment-laden water may enter the drainage system or watercourses.
- At outlets of disturbed soil areas measuring less than 75 acres.

LIMITATIONS

- Require large surface areas to permit settling of sediment.
- Not appropriate in live streams.
- Basins require protective fencing around the perimeter.
- Size may be limited by availability of right-of-way.
- Ground water contamination, soils and obstructions are concerns.
- Basins should be designed to drain, or infiltrate as to not hold water for more than 72 hours for vector control.



Never situate a basin (or silt fence) in surface waters or any natural buffers, unless approved under a CWA section 404 permit. Basin has no designed outlet and trash is in the ponded water.

PLANNING/DESIGN CONSIDERATIONS

- Require a large area to be effective.
- Soils must be adequate for infiltration.
- Use in combination with other Stormwater Control Measures for best effectiveness.
- Prevent erosion of all basins using erosion controls (e.g., erosion control blankets or riprap).
- Inlets and outlets must use erosion controls and velocity dissipation devices.
- An operator that uses polymers, flocculants, or other cationic treatment chemicals in a sediment basin shall select and use these chemicals in accordance with manufacturers' instructions so as to provide for adequate settling time and minimize or eliminate these chemicals in the discharge. Furthermore, the operator shall comply with the requirements in Part 6.3(10).
- When discharging, utilize outlet structures that withdraw water from the surface in order to minimize the discharge of pollutants, unless infeasible.
- A EPA-CGP or AZCGP SWPPP shall provide sizing and calculation requirements and indicate whether the basin(s) will be temporary or permanent.
- Use outlet structures (velocity dissipaters).
- Must be designed for public safety and emergency egress.

MATERIAL SPECIFICATIONS

- Dependent on material chosen to construct the basin. Refer to applicable material spec, i.e. rock mulch.
- Any use of polymers, flocculants, or other cationic treatment chemicals in a sediment basin shall select and use these chemicals in accordance with manufacturers' instructions so as to provide for adequate settling time and minimize or eliminate these chemicals in the discharge. See the AZCGP Part 6.3(10) requirements.

Some sediment basins/traps are able to capture large particles. Sands, silts, clays are smaller particles (suspended) and terminal velocity of these particles must be considered with design.



DESIGN STANDARDS

- Bottom of sediment basin should be flat.
- EPA-CGP Part 2.1.3.2 requires a sediment basin to be designed to provide storage for either:
 - The calculated volume of runoff from a local 2-year, 24-hour storm, or 3,600 cubic feet per acre drained.
- Shall be designed for public safety or use alternative sediment controls such as:
 - Fence
 - Rope
 - Floatation device
- Sediment basins must be situated outside of surface waters and any natural buffers, unless approved under a CWA section 404 permit.
- Maximize travel distance from inlet to outlet .
- Long and linear design for net effectiveness of the basin is required. Basin dimensions, based on local soil types, are typically 5-6 times longer than wide.
- Sediment basins shall, at a minimum, be designed for a 80% reduction of suspended soil particles having a diameter of 0.02 mm or large.
- The following equations are an example of how to determine the appropriate surface area and length to width ratio to achieve the target 80% reduction.
- The net effectiveness of the basin is calculated by:
 - Equation: $NEff = AEff \times PEG$
- Where:
 - $NEff$ = Net effectiveness of basin (80%)
 - $AEff$ = Apparent effectiveness = $20(L/We) - (L/We)^2$ (L and We are the particle flow distance and effective basin width, respectively (ft))
 - PEG = Percent of particles that are equal to or greater than the design size particle (%)
- Use defendable data for a local 2-year, 24-hour event and rainfall Intensity (i).
- California Best Management Practice Construction Handbook (available at www.cabmphandbooks.com)

**INSPECTION AND MAINTENANCE REQUIREMENTS**

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect after each rainfall to ensure trap is draining properly.
- Inspect for damage from erosion.
- Verify that depth of spillway is maintained at a minimum of 1.5 feet below the low point of the trap embankment.
- Keep in effective operating condition and remove accumulated sediment to maintain at least ½ of the design capacity of the sediment basin at all times.
- Capacity does not equal depth.

**Ⓢ ALTERNATIVES**

- **Filtration tanks:** Able to be purchased or rented, providing sediment filtration. This alternative saves space vs. a large basin. Costs are to be considered.
- **Dewatering Bags:** Sediment bags are a cheaper alternative to basins and filtration tanks, yet maintenance and replacement cost can be higher, depending on the application. Consider location and how to dispose of sediment contents. Consider the bag material apparent opening size (AOS) to match soil characteristics. Clays and fine particle may not be removed with all bag material. This product shall not be placed or situated within surface waters or stream/wash bank areas, unless approved under a CWA section 404 permit. This product works well in combination with a vegetated area as secondary sediment capture.
- **Sediment tubes:** Sediment tubes are a cheaper alternative to basins and filtration tanks, yet maintenance and replacement costs can be higher depending on the application. Consider location and how to dispose of sediment contents. Consider the bag material apparent opening size (AOS) to match soil characteristics. Clays and fine particle may not be removed with all bag material. This product shall not be placed or situated within surface waters or stream/wash bank areas, unless approved under a CWA section 404 permit. This product works well in combination with a vegetated area as secondary sediment capture.

SC-5 Sediment Wattles







DEFINITION

Weed-free wheat, oat, rice straw, or excelsior wood fiber bound into tight tubular rolls encased in biodegradable natural fiber netting or UV-degradable polypropylene netting used primarily in slope stabilization and in unlined ditches.

PURPOSE

- Use along the top, face, and at grade breaks of exposed and erodible slopes.
- Used on flat ground around spoil piles, drop inlets, catch basins, and lay-down yards.
- Intercept runoff, reduce flow velocities, and promote infiltration.
- Release runoff as sheet flow.
- Reduce sediment transport from runoff.
- Promote (improve) native or specified seed germination.
- Slow the velocity of runoff through detention.

AT A GLANCE

	<ul style="list-style-type: none"> • Spacing and wattle diameter depend on slope ratio • Adjacent wattles to be tightly abutted without gaps • Must maintain continuous contact with ground and be trenched in • Place along contours perpendicular to slope
	<ul style="list-style-type: none"> • EC-2 Minibenches/Slope Roughening • SC-12 Compost Sock • SC-7 Gravel Bag Protection • RC-6 Check Dams
	<ul style="list-style-type: none"> • Erosion Control Stormwater Control Measures: EC-3 through EC-7
	<ul style="list-style-type: none"> • Inspect for rilling or erosion underneath wattles; repair as necessary • Inspect to ensure wattles are properly anchored and have not been damaged or overtopped

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	●

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Proper staking of wattles.



Sediment wattles spaced on a slope.

APPROPRIATE APPLICATIONS

- At the top, face and at grade breaks of exposed slopes.

LIMITATIONS

- Not for use in live streams.
- Do not use in channels that have already been lined or vegetated unless erosion is expected.
- Have a limited sediment capture area.
- Proper staking and entrenchment are critical to wattle effectiveness and to reduce potential movement by high velocity flows.
- Subgrade preparation is essential, and must make ground contact. Wattles that are not trenched in or properly staked have high potential to "float" and sediment laden water will subvert under the wattle.

PLANNING/DESIGN CONSIDERATIONS

- Not for use at toe of slope; use 20" diameter sediment logs instead.
- Do not use where creeping, slumping or sliding of the slope may occur.
- Readily shaped to fit slope contours.
- Must be trenched per project plans, specifications and details to be effective.
- Turn terminal ends of wattles upslope 45° to prevent channeling.
- Typically left in place on slopes after Final Stabilization.
- Must be weed free materials
- Excavated materials for trenching will be tamped against the upstream side of the wattle to prevent undermining.

MATERIAL SPECIFICATIONS

- Refer to ADOT Standard Specifications for Road and Bridge Construction section 810-2.06 for requirements.



DESIGN STANDARDS

- Refer to ADOT Erosion/Sediment Control and Water Quality Protection Detail: Sediment Wattle.
- Adjust wattle spacing based on soil erosivity; decrease spacing on more erosive soils, increase spacing on less erosive soils.

Weed free materials must be accompanied with a certification from the manufacture or supplier and provided to the Engineer prior to use.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Ensure stakes are installed properly installed with a 12-inch minimum depth under the wattle and only a 2-inch reveal on top of the wattle.
- Wattle diameter determines length of stake (a 24-inch stake is required for 9-inch diameter wattles and a 33-inch stake is required for 18-20 inch wattles).
- Wooded stakes shall not be cut off when substrate is difficult to fully install.
- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect to ensure that wattles remain firmly anchored and have not been damaged by traffic.
- Inspect for tears and splits in wattles and evidence of erosion.
- Repair rills or gullies promptly, re-stake wattle as necessary.
- Remove accumulated sediment when 50 percent sediment capacity is reached prior to seeding and mulching operations. **DO NOT REMOVE SEDIMENT AFTER SEEDING AND MULCHING HAS BEEN COMPLETED, especially on slopes**
- Inspections beyond those called for in CGP(s) may be required to ensure no biological resources (species of concern) have been encumbered or trapped by mesh casings.

Subgrade preparation is essential, and must make ground contact. Wattles that are not trenched in or properly staked have high potential to "float" and sediment laden water will undermine under the wattle.



Wattles have been trenched in, staked properly and slope has been roughened prior to installation.



Wattles still in place and maintaining the slope. ADOT approved seed mix has been held in place and adequate vegetative coverage percentages have been reached.



Ⓢ ALTERNATIVES

Some alternatives may be required when the substrate can neither be staked nor trenched. Many soils in Arizona are shallow with a caliche layer less than a few inches from the surface, or are rocky. Sediment control measures must match the application for use. For instance, wattles that must be both staked and trenched may not be the correct application of hard soils.

Hard wood stakes are becoming increasingly difficult to obtain.

- **SC-2 Minibenches/Slope Roughening:** May not require wattles if constructed properly.
- **SC-12 Compost Sock:** No staking or trenching is necessary (for sock diameters 8" or greater).
- **SC-7 Gravel Bag Protection:** No trenching or staking necessary.



Minibenches.



Compost Sock.



Gravel Bag.

SC-6 Sediment Log



DEFINITION

Excelsior wood fiber that has been bound into a tight tubular roll secured with long-term biodegradable natural fiber netting or UV-degradable polypropylene netting.

PURPOSE

- Intercept runoff and reduce flow velocities.
- Reduce sediment transport from runoff.
- Use along the base of exposed and erodible slopes.
- Used on flat ground around spoil piles, drop inlets, catch basins, and lay-down yards.
- Intercept runoff, reduce flow velocities, and promote infiltration.
- Release runoff as sheet flow.
- Reduce sediment transport from runoff.
- Promote (improve) native or specified seed germination.

AT A GLANCE



- Trenching or burial is not necessary except when used at toe of slope
- Must maintain continuous contact with ground



- RC-6 Check Dam
- SC-2 Silt Fence (for perimeter applications)
- SC-12 Compost Sock



- RC-6 Check Dam
- SC-8 Storm Drain Inlet Protection



- Inspect for rilling or erosion around sediment logs
- Inspect to ensure logs are properly anchored and have not been damaged

Sediment logs used as a perimeter control measure. Note the ground contact and staking on the downstream side of the log.

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	





APPROPRIATE APPLICATIONS

- As check dams for small runoff volumes in roadway ditches and channels downstream of disturbed soils.
- At toe of exposed slopes.
- Along the perimeter of a project.
- Around temporary stockpiles.
- Around storm drain inlets associated with disturbed areas.
- Outfall of small drainage channels or structures.



Sediment logs used as check dams. Notice the last log has become dislodged due to poor staking.

LIMITATIONS

- Not for use in live streams.
- Do not use in channels that have already been lined or vegetated unless erosion is expected.
- Should not be used in place of linear sediment barrier such as silt fence.
- Not practicable where large flows are involved.
- Not suitable for rock sub-grades where stakes cannot be securely installed.

PLANNING/DESIGN CONSIDERATIONS

- Trenching or burial is not necessary except when used at toe of slope.
- When staking is required, ensure stakes are installed properly installed (opposite of flow direction) with a 24 inch minimum depth under the log and only a 2 inch reveal on top of the log.
- Wooden stake length of 46 inches is required for 18-20 inch logs.
- Wooded stakes shall not be cut off when substrate is difficult to fully install.
- This control measure must be overlapped and not abutted to prevent gaps between logs.
- Fractured/angular rock wedge (12-inches high x 5-inches wide) will be tamped against the upstream and downstream sides of the log to prevent undermining.

Subgrade preparation is essential, and must make ground contact. Logs that are not trenched in or properly staked have high potential to “float” and sediment laden water will undermine under the log.

MATERIAL SPECIFICATIONS

- Refer to ADOT Standard Specifications for Road and Bridge Construction section 810-2.06 for requirements.

DESIGN STANDARDS

- Refer to ADOT Erosion/Sediment Control and Water Quality Protection Detail: Sediment Log.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect to ensure that logs remain firmly anchored and have not been damaged by traffic.
- If used as check dam, remove sediment, prior to seeding, when it reaches one-third the height of the log.
- Inspect for tears and splits in logs and evidence of erosion.
- Remove sediment when it reaches 1/2 the height of the log.
- Repair rills or gullies promptly, reposition and/or re-stake log as necessary.
- Remove after Final Stabilization.
- Inspections beyond those called for in CGP(s) may be required to ensure no biological resources (species of concern) have been encumbered or trapped by mesh casings.



Ⓢ ALTERNATIVES

Some alternatives may be required when the substrate can neither be staked nor trenched. Many soils in Arizona are shallow with a caliche layer less than a few inches from the surface, or are rocky. Sediment control measures must match the application for use. For instance, logs that must be both staked and trenched may not be the correct application of hard soils.

- RC-6 Check Dam
- SC-2 Silt Fence (for perimeter applications)
- SC-12 Compost Sock (8-18 inch diameter)



Check Dam.



Silt Fence.



Compost Sock.



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SC-7 Gravel Bag Protection



DEFINITION

Bags made of a woven burlap or geotextile material, filled with angular gravel.

PURPOSE

- To slow the velocity of concentrated flow and allow sediment to settle before entering drainage structures or leaving a construction site.
- Used on flat ground around spoil piles, drop inlets, catch basins, and lay-down yards.
- Intercept runoff, reduce flow velocities, and promote infiltration.
- Release runoff as sheet flow.
- Reduce sediment transport from runoff.

AT A GLANCE



- Adjacent construction traffic may limit use
- Ponding may occur for a short time around bags
- Stack bags in an overlapping, pyramid configuration



- SC-8 Storm Drain Inlet Protection
- SC-12 Compost Sock
- SC-5 Sediment Wattle



- SC-2 Silt Fence
- SC-5 Sediment Wattle
- SC-6 Sediment Log
- PP-4 Street Sweeping and Vacuuming



- Follow schedule specified in the applicable stormwater permit
- Replace bags if deteriorated due to extended sunlight exposure
- Replace damaged bags

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Gravel bags (one stack) used at the perimeter.



APPROPRIATE APPLICATIONS

- Drainage structures or at downslope perimeter of construction areas where staking Sediment Wattles is not possible due to soil or ground conditions.
- Where flows are moderately concentrated to divert and/or detain flows.

LIMITATIONS

- Tendency of bag material to tear if subjected to heavy traffic.
- Water can pond at gravel bag barrier until enough time has passed to allow water to filter through.
- Not for use in ditches or as check dams.
- Gravel bags should not be used to anchor sediment wattles, sediment logs, or in areas accessible to vehicular traffic for safety reasons.
- Gravel bags have a high UV Deterioration rate and therefore maintenance costs.
- While gravel bags have a limited sediment storage, there is a low initial cost for installation and gravel may be or incorporated into the project as ground cover at the discretion of the Engineer.
- Bag materials may encumber biological resources (species of concern) and often provide a habitat for nuisance insects and scorpions.



Notice the sediment and water retention held on site (no discharge) allowing seeding to establish quickly.

PLANNING/DESIGN CONSIDERATIONS

- Adjacent construction traffic and within Safety/Recovery zones may prohibit the use of gravel bags.
- Amount of time gravel bags are needed, as bags exposed to sunlight will need to be replaced every two to three months.
- Contributing drainage area to a gravel bag barrier should not exceed 1 acre.
- Use in areas where flows do not exceed 0.5 cfs and drainage area for the fence does not exceed 0.25 acre per 100 feet of length.
- Gravel bag barriers being more than one bag high, will be installed in "pyramid" fashion (i.e two bag base row with one bag for the top row).

Gravel bags are not sand bags. Sand bags operate as a dam causing rapid failure and sediment loss. Sand bags are not to be used for erosion or sediment control purposes.



Gravel bag protection may be used to protect stormdrain entrances where no public access is allowed.

MATERIAL SPECIFICATIONS

- Bags should be woven polypropylene, polyethylene or polyamide fabric. Refer to standard Specification Section 810-1017 for characteristics of fabric material.
- Burlap material may be used at the discretion of the Engineer.
- Bag dimensions approximately 24 inches long by 16 inches wide and 4 inches thick.
- Fill material to be clean and washed decomposed granite (DG) free of silt/dust, or other equivalent clean and washed angular shape aggregate/gravel material as approved by the Engineer. All gravel/aggregate materials shall be cleaned and washed by the manufacturer/producer prior to final delivery to the project site. Refer to Standard Specification Section 810-1017 for gradation requirements.

Sizing gravel larger than grate openings prevents costly clean up and keeps gravel out of inlets.

DESIGN STANDARDS

- Use in conjunction with other soil stabilization controls up-slope to provide the most effective erosion and sediment control.
- Stack gravel bags using an overlapping, stair-stepped approach where the upper rows overlap the joints of the lower rows. Ends of adjoining gravel bags to abut tightly.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect Stormwater Control Measures prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.



Gravel bag perimeter control for paved areas (where no staking or trenching is possible).

- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.
- Ensure bags have been fully abutted and no gaps exist between each bag.
- Reshape or replace gravel bags as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates in the Stormwater Control Measure must be periodically removed in order to maintain Stormwater Control Measure effectiveness. Sediment should be removed when the sediment accumulation reaches 1/2 of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove gravel bag barriers when no longer needed. Remove sediment accumulation and clean, re-grade, and stabilize the area. Removed sediment should be disposed of properly or incorporated into the project.
- Inspections beyond those called for in CGP(s) may be required to ensure no biological resources (species of concern) have been encumbered or trapped by fabric casings.

SC-8 Gravel Bag Protection



DEFINITION

Fabric filter, rock mulch and/or riprap surrounding or placed in a storm drain inlet.

PURPOSE

- Serve as a final protection measure to filter sediment and debris from entering the storm drain.
- Reduce erosion along the soil interface at the entrance to the drainage structure
- Reduce flow velocity before entering the storm drain system.

AT A GLANCE



- Identify inlets to be protected and implement before disturbance occurs
- Select type of protection based on site conditions and construction sequencing
- Typically used for areas draining 1 acre or less



- SC-7 Gravel Bag Protection



- SC-3 Sediment Trap
- SC-4 Sediment Basin
- SC-6 Sediment Log
- SC-12 Compost Sock



- Check all storm drain inlets after each storm event; remove sediment or debris clogging inlet protection

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	●

Stormwater Control Measure Objectives

Erosion Control	○
Runoff Control	○
Sediment Control	◐
Pollution Prevention	
Non-Stormwater	
Waste Management	



Rock mulch and sediment logs used to protect storm drain inlet.



APPROPRIATE APPLICATIONS

- Disturbed drainage areas that have not yet been permanently stabilized.
- Where stormwater surface runoff can enter a drain inlet.

LIMITATIONS

- Ponding can occur at the inlet with possible short term flooding.
- Frequent maintenance may be required in areas susceptible to high flow.
- Effectiveness decreases rapidly if not properly maintained.
- Gravel and log installation must meet safety standards for obstructions above grade within traffic clear zones/recovery areas (Roadway Design Guidelines 303.2 to 303.3).



Proper Installation is critical. Logs should be trenched, staked and completely surrounding the rock mulch.

PLANNING/DESIGN CONSIDERATIONS

- Identify existing and/or proposed storm drain inlets that must be protected and determine which method of protection to use.
- Use for areas of less than 1 acre; route stormwater to other sediment trapping devices for areas larger than 1 acre.
- Ensure that ponding will not encroach into highway traffic.
- Verify applicable Municipal Separate Storm Sewer System (MS4) ordinances and product requirements.

MATERIAL SPECIFICATIONS

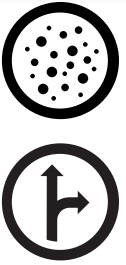
- Refer to Section 810 of the ADOT Standard Specifications for Road and Bridge Construction for material specifications of inlet protection.

DESIGN STANDARDS

- Calculate anticipated flow volumes and velocities to determine the size of rock to use.
- Use geotextile as a separator between the soil and graded rock.
- Refer to ADOT Erosion/Sediment Control and Water Quality Protection Details: Inlet Protection Combined Stormwater Control Measures, Median Inlet Protection and Gravelbag Protection. Refer to ADOT construction standard drawings C-13.60 and C-13.65 for slotted drain details.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect for:
 - damage.
 - failure to filter sediment.
 - accumulation of sediment or debris.
 - damage from temporary flooding after a storm event.
- Repair as necessary.
- Replace filter fabric if it becomes clogged.
- Remove sediment:
 - after each rainfall event.
 - as specified in the contract documents.
 - as directed by the Engineer.
- Remove all inlet protection devices within 30 days after the site is stabilized or when inlet protection is no longer needed.
- If necessary, regrade and stabilize disturbed areas after inlet protection is removed.



Ⓢ ALTERNATIVES

Some alternatives to rock mulch and sediment log combination may be required when the substrate can neither be staked nor trenched (paved areas or areas open to public traffic). The control measures listed in these alternative will require Engineer approval for use, prior to installation. Many mats, fabrics, and filters can fill up and clog easily. Clogged filters or mats will cause ponding and flooding. Frequent maintenance is required and pre-storm event inspection and maintenance will be complete prior to an anticipated rain event. Fabrics which surround a grate with material, or installed below grate will need ADOT and/or municipality authorization prior to use.



Matting vary from manufacture and application.



Fabric protections designed to not clog or block a drain are a good application for this drop inlet



- **Mattings:** Mattings vary from manufacture and application. Ensure manufacture specifications are fully read and understood for peak performance. This mat filter is low profile for open traffic areas. Cleaning will be required prior to anticipated rain events, per the CGP, and as directed by the Engineer.
- **Fabric Protections:** Fabric protections are not designed to clog or block a drainage is a good application for this drop inlet. Notice the overflow stand to reduce the potential for ponding and flooding. Cleaning will be required prior to anticipated rain events, per the CGP, and as directed by the Engineer.
- **Compost sock:** Compost socks can also be used to protect inlets. Compost socks are designed to allow for flow and filtration. However, many sediments can rapidly clog the fabric material in large rain events. Cleaning will be required prior to anticipated rain events, per the CGP, and as directed by the Engineer.
- **Coconut Fiber (Coir) Mats:** Coir mats are an effective alternative for stormdrain inlet protection and filter water at a faster rate than some fabrics. Coir mats can be driven over and swept clean after rain events. Plastic ties holding the mats to drains can be broken with vehicular traffic and frequent inspection is required. Cleaning will be required prior to anticipated rain events, per the CGP, and as directed by the Engineer.



Compost socks are designed to allow for flow and filtration.



Storm drain inlet has not been protected.



Coir (Coconut fiber) matting has been installed and pavement has been swept.

SC-9 Curb Inlet Protection



DEFINITION

A temporary filtering device placed in the flow line of completed curb inlets before final stabilization has been achieved. This filtration device is designed to intercept sediment, gravel and trash from entering a storm drain as a last defense.

PURPOSE

- Prevent sediment and debris from entering the stormwater system by filtering runoff.

AT A GLANCE

	<ul style="list-style-type: none"> This measure is a filter and should not hinder flows, cause or contribute to ponding or flooding Verify appropriate product(s) with any affected municipal entity prior to use Identify inlets to be protected and install before disturbance occurs Select type of protection based on site conditions and construction sequencing Typically used for areas draining 1 acre or less
	<ul style="list-style-type: none"> SC-7 Gravel Bag Protection SC-8 Storm Drain Inlet Protection
	<ul style="list-style-type: none"> SC-3 Sediment Trap SC-4 Sediment Basin SC-6 Sediment Log SC-12 Compost Sock
	<ul style="list-style-type: none"> Inspect all storm drain inlets prior to each anticipated rain event and after each rain event; remove sediment or debris clogging inlet protection

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	●

Stormwater Control Measure Objectives

Erosion Control	○
Runoff Control	○
Sediment Control	○
Pollution Prevention	
Non-Stormwater	
Waste Management	

A variety of inlet protection products are available.





APPROPRIATE APPLICATIONS

- Where completed curb inlets are exposed to sediment-laden runoff from adjacent areas that have not been permanently stabilized.

LIMITATIONS

- Requires consistent maintenance to keep accumulated sediment and debris out of vehicular travel lanes and storm sewer system.
- Are easily damaged on roads open to the public.
- Typically ineffective on slopes steeper than 5%: runoff bypasses the inlet and continues downhill.
- Use other sediment trapping methods first (AZCGP).
- Use for active drains prior to permanent stabilization.
- Appropriate for drainage areas less than an acre.
- Ensure ponding will not encroach into highway traffic.
- Not for concentrated flows; use other methods in combination.



While this inlet protection is identified by many manuals and specifications other than ADOT, cinder blocks and gravel socks will cause a traffic obstruction and typically is destroyed, resulting in blocked drainages and remediation efforts.

PLANNING/DESIGN CONSIDERATIONS

- Consider traffic conditions when designing curb inlet protection; roadways open to public traffic may require different protection than construction sites with limited access.
- Must be used in combination with upslope Stormwater Control Measures.
- Verify applicable Municipal Separate Storm Sewer System (MS4) ordinances and product requirements.
- Optimal application is for in-road, saw cut or utility work with no other options for sediment control.

MATERIAL SPECIFICATIONS

- Many materials are available depending on site conditions. All should be UV resistant.
 - Non-woven polyester filter fabric.
 - Natural fiber matting or roll.
 - Woven polypropylene.
 - High density polyethylene fabric.
 - Tightly rolled wood excelsior encased in polyethylene netting.

DESIGN STANDARDS

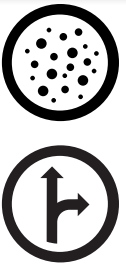
- Avoid ponding in travel lanes.
- Firmly anchor in place with manufactured provided anchors (no gravel bags or sand bags shall be used as anchors, especially in open lanes of travel).

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect for:
 - damage.
 - failure to filter sediment.
 - accumulation of sediment.
 - damage from temporary flooding after a storm event.
- Repair as necessary.

THE AZCGP ALSO ALLOWS FOR THIS CONTROL MEASURE APPLICATION TO BE REMOVED.

Protection measures can be removed in the event of flood conditions that may endanger the safety of the public. Such actions are allowable only under extreme conditions and shall be documented on the SWPPP. The operator shall evaluate alternatives to be used in the future to prevent a recurrence of this problem."



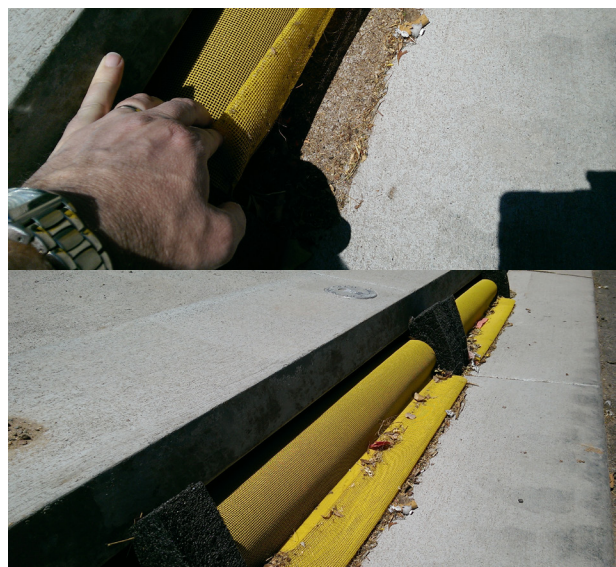
Ⓢ ALTERNATIVES

There are many alternatives to filter fabric or rock mulch. Combinations of products are often used for grate/drain inlets. City and municipal entities (flood control districts) may have stringent limitations on the use of any product placed in front of inlets, as blocking the hydraulic flow may cause damage to their system or surrounding property. Many county design manuals have Inlet Grate Type clogging factors establishing designed hydraulic volumes to be maintained.

Many new filtration mats or materials can also capture hydrocarbons (oils, greases, fuels) as well as other contaminants such as metals, bacteria and nutrients.

The control measures listed in these alternative will require Engineer approval for use, prior to installation. Many mats, fabrics, and filters can fill up and clog easily. Clogged filters or mats will cause ponding and flooding. Frequent maintenance is required and pre-storm event inspection and maintenance will be complete prior to an anticipated rain event. Fabrics which surround a grate with material, or installed below grate will need ADOT and/or municipality authorization prior to use. Manufacture supplied anchors shall be used. Gravel bags, sand bags will cause traffic safety problems, and adhesives may be prohibited.

- **Tubular Inlet Filter:** Tubular inlet filters are an effective alternative for storm drain inlet protection and filter water





at a faster rate than some fabrics and mats.

Tubular filters may be used several times have have a higher longevity of effectiveness as they are installed to sit just within the curb inlet (zero profile). Vehicular traffic should not be impeded. Cleaning will be required prior to anticipated rain events, per the CGP, and as directed by the Engineer. Notice the fine particles captured at the base flap and the overflow gap at the top of the filter.

- **Grate mats:** Grate mats are also designed to filter water at a faster rate than fabric options. Mats may be used several times have a higher longevity of effectiveness. Mats do sit above the grate and are subject to breakdown with traffic. Mats sit very thin on top of the pavement (low profile) and should not impeded vehicular traffic. Cleaning will be required prior to anticipated rain events, per the CGP, and as directed by the Engineer. Always use manufacture supplied anchors.
- **Curb inlet filters:** Curb inlet filters also sit very thin on top of the pavement (low profile) and should not impeded vehicular traffic. Small holes are provided on the vertical portion to allow overtopping in case of clogging and ponding of water. Cleaning will be required prior to anticipated rain events, per the CGP, and as directed by the Engineer. Always use manufacture supplied anchors. Aluminum anchors frequently go missing in urban settings.
- **Compost Socks:** Compost socks can be used in areas where no vehicular traffic will occur. Socks can work well in this application due to no staking or trenching (wattles shall not be used for inlet protection). Ensure the sock is installed well away from the inlet and will not block or be washed into the inlet. This sock has been run over with traffic and is now lodged in the storm drain inlet. This can result in a violation, and additional cost for remediation efforts.



SC-10 Stabilized Construction Entrance/Exit



DEFINITION

Temporary placement of gravel or gravel in combination with shaker plates or rumble strips or track mats where traffic will enter and exit a construction site.

PURPOSE

- Remove mud and sediment from construction vehicle tires.
- Minimize amount of mud and sediment leaving the area on vehicle tires.
- Stabilize entry/exit area to prevent tire rutting.

AT A GLANCE

- Stabilize all entrances prior to construction disturbance
- Geotextile fabric underlay may be required by the Engineer
- Size the gravel pad to accommodate all vehicles
- Install filter fabric between gravel and soil
- Multiple stabilized entrances/exits may be needed
- Removal of pads may be required by the Engineer at the end of the project

- PP-1 Vehicle and Equipment Cleaning
- PP-4 Street Weeping and Vacuuming

- PP-1 Vehicle and Equipment Cleaning
- PP-4 Street Sweeping and Vacuuming

- Add gravel or stone as needed
- Remove sediment regularly from shaker plates, rumble strips and corrugated steel
- Sweep soil tracked onto paved surfaces
- Construct new stabilized entrances/ exits as construction progresses and as necessary
- Equipment on-site to maintain entrance/ exit

Rumble strips and gravel provide more effective track-out control than gravel alone.

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	●

Stormwater Control Measure Objectives

Erosion Control	○
Runoff Control	
Sediment Control	○
Pollution Prevention	◐
Non-Stormwater	
Waste Management	





APPROPRIATE APPLICATIONS

- Whenever traffic will be leaving a construction site and moving directly onto a public road or paved area.
- Entrance/exit should be constructed on level ground.
- Site specific, conditions will dictate need.

LIMITATIONS

- Entrance/exit must be planned and reviewed as part of the project traffic control plan.
- Does not remove all soil from vehicle tires; washing and street sweeping may be necessary.
- County and municipal coordination may be necessary when approaching separate jurisdictions.
- County Air Quality permits and rules may require variations or more stringent limitations on dimensions (gravel size, depth, length and width).

PLANNING/DESIGN CONSIDERATIONS

- Consider soil type, rain conditions and type of construction traffic.
- Entrances are more effective if designed in conjunction with a fire wash area (prior approval is required and a water source must be provided).
- Dimensions of stabilized entrance/exit must be adequate and appropriate for all types of construction vehicles using it, and long enough for the largest vehicle tires to complete 4 revolutions.
- Make entrance wide enough for two vehicles to pass, if anticipated amount of traffic is heavy.
- Dimensions not regulated by County Air Quality Rules permits are to be 6" thick minimum, use 1"—3"



Fencing ensures vehicles enter / exit over the entire length of the trackout device.



This rock is round "river-rock". Ensure track rock is per specification prior to delivery. Once the truck tilts, you own it.



Some jurisdictions will require "cold mix" asphalt to join the gravel pad to the roadway. Coordinate with County and municipalities prior to installing gravel at their edge of pavement.



diameter fractured rock (gradation C), be a minimum of 50 feet in length by 30 feet in width, and be designed for heaviest equipment.

- Provide a bridge or culvert if entrance/exit crosses a depression, swale or stream. Refer to Stormwater Control Measure NS-4 Temporary Watercourse Crossing.
- Install section of shaker plates or rumble strips, corrugated steel strips, or track mats between gravel areas to increase effectiveness, particularly if exists/ entrances need to be moved several times during construction. Shaker plates, rumble strips or corrugated steel strips may be used solely instead of gravel.
- Some gravel can contain large amounts of fines upon delivery. Inspect track rock delivery prior to acceptance.
- Having additional, staged track rock at the gravel pad assist with rapid refreshment of a pad.

MATERIAL SPECIFICATIONS

- Adequately sized fractured, angular gravel placed at least 6" in thickness.
- When silt conditions warrant and as directed by the Engineer, use nonwoven, high survivability geotextile filter fabric underlay to prevent mud and sediment from being pushed up through the pad and to keep rock in place.

DESIGN STANDARDS

- Refer to ADOT Erosion/Sediment and Water Quality Protection Detail: Stabilized Construction Entrance/Exit Gravel Pad.
- Comply with local air quality permit and Rule conditions for specific dimensions and inspection frequencies.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Daily inspection on working days and adherence to inspection schedule(s) specified in the applicable stormwater discharge and air quality permits.
- Inspect for sediment tracked onto roadway and sidewalks.
- Verify that gravel is clean and not filled with sediment.
- Add gravel over time to maintain effectiveness.
- Sweep soil, gravel, and other debris that is tracked onto paved surfaces. Refer to Stormwater Control Measure PP-4 *Street Sweeping and Vacuuming*.
- Remove sediment from shaker plates, rumble stripes and corrugated steel strips to maintain maximum effectivity.
- Remove stabilized construction entrance/exit upon completion of construction and stabilize disturbed areas.

County air quality Rules and permit requirements for fugitive dust vary. Ensure full understanding of design requirements and obtain Engineer approval prior to installation of track out devices in ADOT Right of Way.



Ⓢ ALTERNATIVES

There are several alternatives to filter fabric and rock pads for trackout. Combinations of products are often used for to yield a more effective means of dirt and mud removal. City and municipal entities may have limitations on the use of any obstruction placed within rights of way, may cause damage to a road, or be kicked out into the lane of travel.

The control measures listed in these alternative will require Engineer approval for use, prior to installation. Many mats, rumble strips and shake plates can fill up and clog easily. Daily inspection on working days and maintenance is required. Regardless of the trackout system used, physical barriers must be used to direct travel of all equipment and vehicles over the entire device. Travel onto or from the project outside of the approved exit/entrance is prohibited.

Track Mats: Track Mats are high density plastic mats that may be rented or purchased. These device work for a ong tiem with relative low maintenance, sweeping and street sweeping are still required. They can be effective alternative for gravel and geotextile fabric alone. Used in combination with rock will prolong the life of gravel pads under high traffic scenarios. Mats are required to be staked in place and vehicular traffic should not be impeded. Approval by the Engineer is required prior to use and removal must occur prior to the end of the project.

Shaker Strips: Shaker strips are highly effective when muddy/clay soils exist. The large rails shake larger mud and debris from tires and effectiveness is greatly increased when combined with gravel pad. Shaker strips are installed at the approach of the gravel pad, not the pavement end. This allows the gravel pad to remove smaller amounts of mud and dirt not removed off by the shaker strip.



Track mat with gravel pad combination.



Track mat.



Shaker strips.

SC-11 Stabilized Construction Roadway



DEFINITION

A temporary access road which may connect existing public roads to a construction area, or provide stable access through dusty or muddy conditions of a project site.

PURPOSE




- Control dust, erosion and sediment transport created by vehicular tracking.
- Stabilize access roadways to prevent tire rutting.

AT A GLANCE







	<ul style="list-style-type: none"> • Design to support heaviest vehicles and equipment • Use of this Stormwater Control Measure may not be applicable to very short duration projects
	• N/A
	• PP-4 Street Sweeping and Vacuuming
	<ul style="list-style-type: none"> • Keep all temporary roadway ditches clear • Periodically apply aggregate on gravel roads

RATINGS

Associated Costs

Design	
Construction	
Maintenance	

Stormwater Control Measure Objectives

Erosion Control	
Runoff Control	
Sediment Control	
Pollution Prevention	
Non-Stormwater	
Waste Management	



Aggregate-stabilized roadway.

**APPROPRIATE APPLICATIONS**

- Construction roadways and short-term detour roads:
 - Where mud tracking is a problem during wet weather.
 - Where dust is a problem during dry weather.
 - Adjacent to watercourses.
 - Where poor soils are encountered.

LIMITATIONS

- Remove prior to final project grading and stabilization.
- Site conditions will dictate design and need.
- May not be applicable to very short duration projects.
- Removal at the project end may be required by the Engineer.
- Not for use in dry washes, or in jurisdictional waters, nor is it considered a Temporary Watercourse Crossing.

PLANNING/DESIGN CONSIDERATIONS

- Limit speed of vehicles to control dust.
- Properly grade roadway to prevent runoff from leaving the construction site.
- Design stabilized access to support heaviest vehicles and equipment that will use it.
- Stabilize roadway using aggregate, asphalt concrete, or concrete based on longevity, required performance, and site conditions.
- Control rock aggregate migration with perimeter control measures (e.g. sediment logs) and to prevent bypass travel of equipment and vehicles.

MATERIAL SPECIFICATIONS

- The use of cold mix asphalt or asphalt concrete (AC) millings for stabilized construction roadway is not allowed.
- If aggregate is the chosen material, use crushed aggregate greater than 3 inches, but smaller than 6 inches.

DESIGN STANDARDS

- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 inches depth, or place aggregate to a depth recommended by a geotechnical engineer.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect for damage and repair as needed.
- Remove when no longer needed, or as directed by the Engineer and regrade and repair disturbed areas.

SC-12 Compost Sock



DEFINITION

Tubular netting filled with composted material that is placed perpendicular to sheet-flow runoff to control erosion and retain sediment in disturbed areas.

PURPOSE

- Intercept runoff, reduce flow velocities, and promote infiltration.
- Release runoff as sheet flow.
- Reduce sediment transport from runoff.
- Improve soil quality from nutrients in compost.
- Prevent sediment and debris from entering the stormwater system by filtering runoff.

AT A GLANCE



- Manufacturer's specifications for anchoring are minimum requirements - site conditions may mandate additional staking / securing of socks
- Place along contours of slope and/or perpendicular to stormwater runoff
- Compost must meet ADOT Project Specifications for compost material
- Trenching is not necessary
- Must maintain continuous contact with ground surface



- Perimeter Applications:
 - SC-1 Sediment Control Berm
 - SC-2 Silt Fence
- Slope Protection:
 - SC-5 Sediment Wattle
 - SC-6 Sediment Log
- Check Dam:
 - RC-6 Check Dam
 - SC-6 Sediment Log
- Inlet Protection:
 - SC-8 Storm Drain Inlet Protection
 - SC-9 Curb Inlet Protection



- Refer to appropriate Stormwater Control Measures, above



- Inspect for rilling or erosion underneath and/or around socks
- Inspect to ensure socks are properly anchored
- Ensure there is adequate sediment capture area

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	●
Non-Stormwater	
Waste Management	



Compost socks used on slope face and as check dams (top), and as inlet protection (bottom).



APPROPRIATE APPLICATIONS

- PERIMETER CONTROL
 - In place of silt fence at downslope perimeter of disturbed site.
 - At toe of exposed slopes.
 - Around temporary stockpiles.
 - Around hydrocarbon bearing materials (petroleum and hydrocarbon absorbent sock only)
- SLOPE PROTECTION
 - Place at regular intervals at the top, face and at grade breaks of exposed slopes.
- CHECK DAMS
 - For small runoff volumes in roadway ditches and overland flow areas, upslope and downslope of disturbed soils.
- INLET PROTECTION
 - Drain Inlet /Curb Inlet Protection with proper anchoring and upslope Stormwater Control Measures.

LIMITATIONS

- Socks must have uniform and complete contact with the ground.
- Proper staking/anchoring is critical to sock effectiveness and to reduce potential movement of sock by high velocity flows.
- Limited sediment capture area.
- Not for use in live streams.

Removal of compost sock may require cutting sock material and spreading compost on site. Valid Weed-Free/Seed-Free certification is required. Sock used for hydrocarbon capture may not be cut open and spread. Materials must be disposed at an approved facility.

PLANNING/DESIGN CONSIDERATIONS

- Greater surface area in contact with the ground than for silt fence and sediment logs, reducing the potential for rilling downslope of the sock.
- Weight of sock (8-inch diameter or greater) reduces potential for subverting the control.
- Can be used where other erosion control Stormwater Control Measures are not feasible, such as laid directly on pavement (no staking is required on pavement, although anchoring may be necessary).
- Anchoring method is dependent upon slope gradient and surface conditions. Refer to manufacturer specifications for minimum requirements. Additional anchoring may be necessary contingent on site conditions.
- Installation does not require trenching, thereby reducing soil surface disturbance.
- Soil surface to receive sock must be uniform to ensure continuous contact between the ground and compost sock.



- Consider using instead of silt fence where fencing may impede wildlife movement.
- Consider sock mesh size to prevent ensnaring/entrapping wildlife (Project Special Provisions will identify areas with wildlife species of concern).
- Weed-free/Seed-free certifications are required to be produced to the Engineer prior to use.
- Sock material disposal must be considered.

TABLE – 1

Carbon : Nitrogen Ratio (C : N)	Less than 100 : 1
PH (of extract)	5.0—8.5
Organic Matter Content	Greater than 30%
Maturity Index	Greater than 50% on Maturity Index at a 10 : 1 ratio
Stability Indicator, CO2 Evolution: Biologically Available C (BAC)	Less than 4mg CO2-C/g OM/day is desirable. From 4 through 8mg CO2-C/g OM/day is acceptable. Greater than 8mg CO2-C/g OM/day is not acceptable.
Pathogens (Fecal coliform)	PASS/FAIL: per US EPA Class A standard, 40 CFR § 503.32(a)*

**Fecal Coliform needs to be <1000 MPN/gram of dry compost (MPN=Most Probable Number)*

MATERIAL SPECIFICATIONS

- Compost must meet the requirements for compost Table – 1, or those identified in the Project Specifications.
- All compost material shall be free of seed.
- Particle size of compost material shall conform to the following:
 - 2 in. (51 mm) Screen, 100% passing
 - 0.375 in. (10 mm) Screen, 10% to 30% passing



When the project is complete and/or the use is no longer needed, Compost Sock is often cut open and the compost spread evenly on flat soils with little to no contributing drainage. For this reason, compost material must have valid Seed-free/Weed free certification.



- The material and color of the filter sock shall be selected based on required longevity and site conditions. Filter sock material shall be photodegradable or biodegradable and sock material must be of a thickness, strength, and material appropriate to selected use and project duration.
- Engineer determines approval of compost and/or mesh size materials prior to use on the project, in keeping with Project Special Provisions.
- Sock material shall be of durable fabric or material.
- Compost material shall be randomly sampled for trash, or contaminants.

DESIGN STANDARDS

- Compost socks should be sized appropriately depending on use. Factors influencing diameter of sock to be used include slope ratio, anticipated flow volumes, and soil characteristics. Refer to manufacturer specifications for appropriate design diameter.

PERIMETER CONTROL

- When used in place of silt fence, place sock 5' or greater from toe of slope to maximize space available for sediment deposition between the toe of slope and the compost sock.

SLOPE PROTECTION

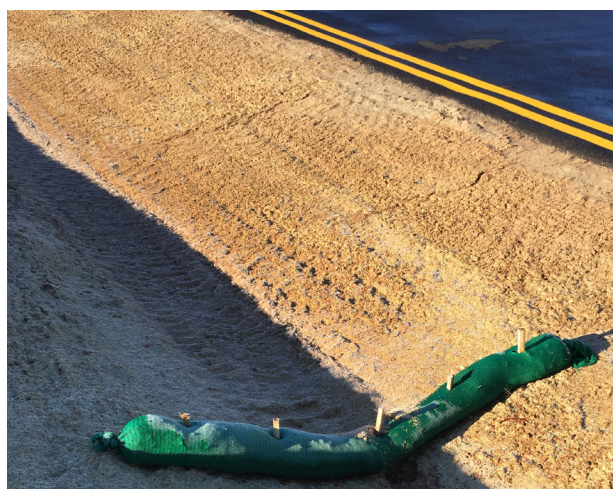
- Do not use where creeping, slumping, or sliding of the slope may occur.
- Spacing is dependent on the gradient of the slope, anticipated flow volumes, soil characteristics, and diameter of sock. Refer to manufacturer specifications for appropriate spacing.
- Place socks perpendicular to flow, aligned with slope contours.



Prior to delivery on site, compost material certifications are delivered and approved by the Engineer.



Compost sock used on asphalt to contain sediment loss from spoil piles. Gravel bags are securing the chain link fence supports.



Compost sock used in a V-ditch as a check dam. Notice how the sides of the check dam are at least one-third higher than the center and staking of the sock has been performed for this higher flow rate application.



- Turn terminal ends of sock upslope 45 degrees to prevent flow around ends of sock.
- Compost socks must be staked per manufacturer specifications.

DRAIN INLETS

- Compost sock should completely enclose drain inlet being protected.
- Always use in conjunction with upslope Stormwater Control Measures.
- Anchoring of compost sock may be necessary. Refer to manufacturer specifications.

CHECK DAMS

- Compost sock should extend sufficiently from either side of the flow line to ensure that water flows through the sock rather than around it.
- Diameter and spacing of compost socks to be per manufacturer specifications for the intended application.
- Compost socks must be staked per manufacturer specifications.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect to ensure socks remain firmly anchored and have not been damaged by traffic.



Compost sock manufactures and individual products will vary in color, compost material, mesh opening aperture, composition (cotton, high density polyethylene and polypropylenes), tensile strength and raw materials in the sock. Notice the sediment build up behind the sock and overlap method of joining ends of sock together.



- Inspect for tears and splits in socks.
- Repair rills or gullies promptly, reposition and/or re-anchor socks as necessary.
- For all applications EXCEPT slope protection, remove sediment from the upslope side of the compost sock when accumulation reaches one-third of the effective height of the sock.
- For inlet protection, check all storm drain inlets after each storm event; remove sediment or debris clogging inlet protection.
- When used as slope protection, compost socks shall be left in place as a post-construction Stormwater Control Measure. Following final stabilization, the netting on the compost sock may be cut the length of the sock, allowing the compost material to spread. Care shall be taken not to disturb the adjacent soil.
- For all applications EXCEPT slope protection, remove socks after Final Stabilization.
- Inspect mesh size and materials to meet Project Special Provisions and approval of the Engineer was issued prior to use on the project.
- Compost material shall be randomly sampled for trash, or contaminants.

SC-13 Rock Berm







DEFINITION

A stabilization method intended as a corrective measure on existing slopes exhibiting severe erosion, as well as new slopes with highly erosive soils. Rock berm consists of hydraulically sized angular riprap trenched into the slope face parallel to slope contours.

PURPOSE

- Stabilization for slopes that are unlikely to respond to other sediment control methods.
- Can be used as a corrective measure on existing slopes to stabilize slope while limiting disturbance of established vegetation (as compared to re-grading / minibenching).
- Intercept runoff, reduce flow velocities, promote infiltration and vegetative cover.
- Release runoff as sheet flow, and reduce sediment transport from runoff.

AT A GLANCE

 <ul style="list-style-type: none"> • Use for steep slope/high flow volume situations where alternate Stormwater Control Measures are inadequate • Use of rock berms must be approved by ADOT • Spacing and size of berm depend on slope ratio and soil conditions • Construct along contours of slope • Riprap must be trenched into slope • Use outside of clear zone
 <ul style="list-style-type: none"> • SC-5 Sediment Wattle • EC-2 Minibench/Slope Roughening • EC-7 Crown Ditch
 <ul style="list-style-type: none"> • Erosion Control Stormwater Control Measures: EC-1 through EC-7
 <ul style="list-style-type: none"> • Inspect for rilling or erosion downslope of berm; repair as necessary

RATINGS

Associated Costs

Design	●
Construction	●
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



Rock berms used as a corrective measure on an eroded slope. Due to vegetation establishment, areas with rilling were not regraded.

**APPROPRIATE APPLICATIONS**

- Slopes with highly erosive (granitic, low plasticity) soils that cannot be adequately stabilized with alternate Stormwater Control Measures or methods. Rock berms could be used at the top, face and at grade breaks of exposed slopes.

LIMITATIONS

- Less effective for fine-particle sediment removal than sediment wattles, but able to withstand higher flows than wattles.
- Trenching-in of rock berm essential to effectiveness.

PLANNING/DESIGN CONSIDERATIONS

- Use of rock berms must be approved by ADOT prior to installation.
- Geotechnical report must be available for areas where rock berm use is proposed – use of rock berms is dependent on soil type.
- Not for use at toe of slope or within vehicle clear zone.
- Care should be taken to preserve existing vegetation in place on existing slopes.
- Especially suitable for slopes with granitic, or other highly erosive, soils due to the difficulty / length of time required for vegetation establishment.
- Color of riprap used for rock berms should be selected to blend in with adjacent landscape.
- Remain in place on slopes after Final Stabilization.
- Typically a less expensive treatment than re-grading an existing slope.



Berms run parallel to slope contours and are trenched into slope face.



MATERIAL SPECIFICATIONS

- Rock berms shall be constructed of angular rock; river run material is not allowed.
- Rock size will vary based on height of slope and anticipated velocity and amount of water on slope face. Rock shall be sized as specified in the Project Plans or as stated in the Special Provisions.

DESIGN STANDARDS

- Refer to ADOT Erosion/Sediment Control and Water Quality Protection Detail: Rock Berm.
- Adjust berm spacing based on soil erosivity: decrease spacing if soils are more erosive, increase spacing if soils are less erosive.
- Slope preparation prior to installation of rock berms:
 - On existing slopes with established vegetation, vegetation should be preserved in place to mitigate erosion and slope treatments that would disturb the vegetation (such as minibenching / slope roughening) should not be used.
 - On new slopes, minibenching / slope roughening may be incorporated if appropriate for soil type. ADOT shall provide direction on compatible Stormwater Control Measures to be used with rock berms on a case-by-case basis.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect for rilling or erosion downslope of berms; repair rills or gullies promptly.
- Erosion caused by high flows around the edges of the berm should be corrected immediately.



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SC-14 Pipe Inlet Protection



DEFINITION

Filtration netting material that is placed perpendicular to sheet-flow to pipe openings in an effort to retain sediment in disturbed areas during interim construction.

PURPOSE

- Intercept runoff, reduce flow velocities, and promote infiltration.
- Protect newly installed or existing pipes from sediment loading.
- Reduce sediment transport from runoff.
- Prevent sediment and debris from entering the stormwater system by filtering runoff.
- Where completed pipe inlets are exposed to sediment-laden runoff from adjacent areas that have not been permanently stabilized.

AT A GLANCE

- Use for pipe entrances with moderate to high flow volume situations where alternate Stormwater Control Measures are inadequate or not installed due to active construction
- Use of pipe inlet protection must be approved by ADOT
- Spacing and size of inlet protection depend on pipe size, shape and soil conditions
- Filter fabrics and meshing are removable from plastic frames on some models for maintenance and replacement
- Allows for low-profile to zero-profile from pipe end reducing damage from equipment and vehicles

- SC-8 Storm Drain Inlet Protection
- RC-4 Rock Outlet Protection

- Erosion Control Stormwater Control Measures: EC-1 through EC-7

- Inspect for ponding, flooding or sediment blockage; clean and repair as necessary

Pipe Inlet Protection filter used as a sediment protection on an existing pipe. Note the bottom 1/3 is filtration and the top 2/3 is high flow mesh.

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	●

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	
Waste Management	



**APPROPRIATE APPLICATIONS**

- Disturbed drainage areas that have not yet been permanently stabilized.
- Where stormwater surface runoff can enter a drain inlet.

LIMITATIONS

- Ponding can occur at the inlet with possible short term flooding.
- Frequent maintenance may be required in areas susceptible to high flow.
- Effectiveness decreases rapidly if not properly maintained.

PLANNING/DESIGN CONSIDERATIONS

- Identify existing and/or proposed pipe inlets that must be protected and determine which method of protection to use.
- Use for areas of less than 1 acre; route stormwater to other sediment trapping devices for areas larger than 1 acre.
- Ensure that ponding will not encroach into highway traffic.
- Verify applicable Municipal Separate Storm Sewer System (MS4) ordinances and product requirements.

MATERIAL SPECIFICATIONS

- Refer to Section 810 of the ADOT Standard Specifications for Road and Bridge Construction for material specifications of inlet protection.

DESIGN STANDARDS

- Calculate anticipated flow volumes and velocities to determine the size and Apparent Opening Size (AOS) to use.
- Refer to ADOT Erosion/Sediment Control and Water Quality Protection Details: Inlet Protection Combined Stormwater Control Measures, Median Inlet Protection and erosion controls (EC 1-8) for upland protection and reduced sediment loading at pipe entrance.

MATERIAL SPECIFICATIONS

- Inlet Filters shall be constructed of fabric material (non-woven at the sediment filtration base / woven at the high-flow mesh).
- Nonwoven filter base will meet AOS 70 (212 microns).
- High flow mesh will meet and average flow rate between 1,000 and 1,200 (GPM/ft²).



Pipe inlet protection constructed of all mesh (High Flow) to capture large debris and floatable straw mulch.

- Pipe filter size will vary based on diameter of pipe and anticipated velocity and amount of water contributing to the opening.
- Some products are plastic frames with exchangeable filters for maintenance and replacement purposes.



DESIGN STANDARDS

- Select high flow and filtration fabric based on soils of contributing drainage: use filtration fabrics if soils are more erosive and have not been stabilized, use high flow meshing for stabilized and less erosive areas.
- ADOT shall provide direction on compatible Stormwater Control Measures to be used with pipe inlet protection devices on a case-by-case basis.



Sediment has accumulated at the filtration section and prevented sediment loss. Pipes must be clean prior to acceptance by ADOT.



Pipe Inlet filters are manufactured to fit most concrete and plastic pipe diameters. Flattened "Squash pipe" sizing is not available and filtration fabric may be an alternative.



Filtration fabric has been used in this application. Non-woven geotextile fabric may not provide adequate filtration and ponding or flooding can result rapidly.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect for clogging, ponding, and flooding; clean and repair after each discharge to the pipe (rain event, or non-stormwater discharge).
- Clogged or ripped fabric will be repaired at the time of discovery and made operational by the end of that same day, or as directed by the Engineer.
- Inspect internal sections after each discharge to the pipe to ensure sediment has not bypassed the filter and clogged the internal flow.
- Clean filters and pipes after each discharge and at the end of construction.
- This control measure is to be removed at the contractor's expense at the end of the project, or as directed by the Engineer.

Pollution Prevention (PP) Stormwater Control Measures



Pollution Prevention and Material Management Stormwater Control Measures are procedural and structural pollution prevention measures designed to prevent contamination of stormwater from a broad range of materials. Proper handling, storage and use of materials will ensure that construction site operations do not contribute to the degradation of stormwater runoff through added jobsite-related pollutants. These controls must be implemented for all applicable activities, material usage and site conditions.

- PP-1 Vehicle and Equipment Cleaning
- PP-2 Vehicle and Equipment Fueling
- PP-3 Vehicle and Equipment Maintenance
- PP-4 Street Sweeping and Vacuuming
- PP-5 Material Delivery and Storage
- PP-6 Material Use
- PP-7 Stockpile Management
- PP-8 Spill Prevention and Control
- PP-9 Portable Toilet





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PP-1 Vehicle and Equipment Cleaning



DEFINITION

Procedures and practices used to properly clean vehicles and equipment prior to or during use on project site.

PURPOSE

- Minimize or eliminate the discharge of pollutants from vehicle and equipment cleaning operations to storm drain or to watercourses.
- Reduce or eliminate spread of noxious weeds and invasive plant species from project site.

AT A GLANCE

	<ul style="list-style-type: none"> • Location of cleaning pit • Capacity of cleaning pit
	<ul style="list-style-type: none"> • N/A
	<ul style="list-style-type: none"> • Applicable Waste Management Stormwater Control Measures (WM-1 through WM-5)
	<ul style="list-style-type: none"> • Inspect designated cleaning eas for compliance • Verify that personnel are following proper procedures and practices

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	
Runoff Control	
Sediment Control	
Pollution Prevention	●
Non-Stormwater	
Waste Management	●



Uncontrolled cleaning water can cause sediment discharges and trackout problems.



Designated and contained equipment cleaning area.

APPROPRIATE APPLICATIONS

- All construction sites where vehicle and equipment cleaning is performed.

LIMITATIONS

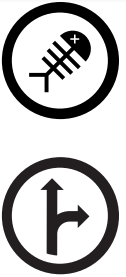
- Cleaning vehicles and equipment generates liquid, semi-solid and solid wastes which must be contained on-site and/or treated to prevent pollution.

PLANNING/DESIGN CONSIDERATIONS

- On-site vehicle and equipment washing with detergent, steam, or solvents are not allowed.
- Cleaning area shall be a preapproved by the Engineer excavated pit to contain wash waters and waste for proper disposal.
- Cleaning water shall not be discharged to storm drains, watercourses, or on bare soils.
- Locate cleaning areas close to the active construction site, but away from storm drain inlets, drainage facilities, open ditches and/or watercourses.
- On-site vehicle and equipment cleaning must be consistent with the applicable Arizona Aquifer Protection Permit requirements.
- Direct all wash water into a leak-proof container or leak-proof pit.
- Designate areas to be used for washing prior to commencement of construction activities (see Special Provisions when Vehicle washing is required).

MATERIAL SPECIFICATIONS

- Vehicle and equipment washing with soap, solvents or steam is not allowed on the project site unless the Engineer has approved in advance and the resulting wastes are fully contained and disposed of outside of the highway right-of-way in conformance with the Standard Specifications. Resulting wastes shall not be discharged or buried within the highway right-of-way. Obtain required applicable permits.



DESIGN STANDARDS

- The washout pit shall be sized to retain all cleaning and rinse water from vehicle cleaning operations.
- The container or pit must be designed to prevent overflows and contain precipitation from a local 2 year/24 hour event.
- Locate any washout or cleanout activities at least 100 feet from surface waters and stormwater inlets or conveyances.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Ensure appropriate practices are being implemented by qualified personnel as defined in the EPA-CGP and AZCGP.
- Inspection of vehicles and equipment may occur upon mobilization to the site and when being removed from the site. ADOT Special Provisions will have ADOT Inspector guidelines established for washing vehicles for noxious and invasive species.

Ⓢ ALTERNATIVES

- **Air Wash System:** This alternative control measure may be used in areas with scarce availability to water. This alternative is used on lands jurisdictions abutting or crossing over federal lands. An air compressor is used to “wash” seeds from undercarriages or vehicles and equipment. Check environmental Clearances in project Special Provisions.
- **Wheel Wash System:** This alternative is typically used when only a small area can be dedicated to vehicle washing. While effective, costs can be higher than standard control measures.



Air Wash System.



Wheel Wash System.



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PP-2 Vehicle and Equipment Fueling



DEFINITION

Procedures and practices to minimize or eliminate fuel spills, leaks and transfer accidents during fueling operations on site.

PURPOSE

- To prevent the pollution of soils, storm drain systems, or watercourses from fuel spills and leaks. This control measure may only be warranted when off-site, commercial fueling is infeasible.

AT A GLANCE

	<ul style="list-style-type: none"> Location of fueling area Design and size of fueling and containment area Compliance with federal, state and local requirements
	• N/A
	<ul style="list-style-type: none"> PP-8 Spill Prevention and Control PP-5 Material Delivery and Storage PP-6 Material Use
	<ul style="list-style-type: none"> Inspect vehicles and equipment daily for leaks Spill clean up Proper disposal of contaminated soil and clean up materials

RATINGS

Associated Costs

Design	●
Construction	◐
Maintenance	◐

Stormwater Control Measure Objectives

Erosion Control	
Runoff Control	
Sediment Control	
Pollution Prevention	●
Non-Stormwater	
Waste Management	●

Fueling site.



**APPROPRIATE APPLICATIONS**

- These procedures are implemented on all construction sites where vehicle and equipment fueling takes place.

LIMITATIONS

- Only use on-site vehicle and equipment fueling when it is impractical to send vehicles and equipment off-site to be refueled.

**PLANNING/DESIGN
CONSIDERATIONS**

- When fueling must occur on-site, the contractor shall select and designate an area to be used, subject to approval by the Engineer.
- Minimize mobile fueling of construction equipment throughout the site and use spill prevention containment methods wherever fueling occurs.
- Locate any washout or cleanout activities at least 100 feet from surface waters and stormwater inlets or conveyances.
- Fueling locations shall be established on level ground and protected with a physical barrier (earthen berms, dikes, or concrete) to prevent vehicle or equipment collision.

**EXAMPLE SECONDARY
CONTAINMENT CALCULATION:**

Storage requires a 1,000 gallon tank. Regardless of amount of fuel in the tank, there is a total volume of 1,000 gallons.

10% of the total of all the containers (1,000 gallons) is 100 gallons.

100% of the largest container stored is 1000 gallons.

1,000 gallons is greater than 100 gallons, so you would need to have secondary containment for 1,000 gallons.

This calculation will become more complex when multiple containers of varying sizes are kept in the same containment and city, municipal, and other jurisdictions (tribal, BLM, Forest Service, etc.) may have more stringent containment requirements (i.e. 110% containment of the largest container).



Cover for fueling areas on nights weekends and non-working hours prevents costly remediation of contaminated liquid waste (see WM-5).



MATERIAL SPECIFICATIONS

- Absorbent spill clean-up materials and spill kits shall be available in fueling areas and on fueling trucks and shall be disposed of properly after use.
- Safety Data Sheets (SDSs) are required to be submitted to the Engineer for materials stored at the project.



Even double walled cells or tanks will require secondary containment. Note transfer accidents occur regardless of how many walls the tank is constructed from.

DESIGN STANDARDS

- Federal, state and local requirements shall be observed for any stationary above-ground storage tanks.
- Spill prevention, containment and countermeasures (SPCC) shall be included in the SWPPP if the volume of project-site fuel in a single container exceeds 660 gallons, or if the total fuel storage volume at any one site exceeds 1,320 gallons.
- Containment area must be sized to meet Secondary Containment calculation. (see also PP-5 Material Delivery and Storage)
 - Secondary containment shall include a floor and wall constructed to be impervious to the materials contained therein for a minimum contact time of 72 hours.
 - Sizing shall meet Codes established in EPA 40 CFR 264.175.b.3 and shall have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container, whichever is greater. A SPCC (EPA 40 CFR 112) containing calculation for containment, approved by the Engineer is also acceptable in lieu of this calculation for fuel containment.
- Designated fueling areas shall be protected from stormwater runoff and shall be located at least 100 feet from downstream drainage facilities or watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and/or dikes to prevent run on, runoff and to contain spills.
- Drip pans or absorbent pads shall be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Nozzles used in vehicle and equipment fueling shall be equipped with an automatic shut-off to control drips. Fueling operations shall not be left unattended. Fuel tanks shall not be "topped off."
- Store fuels in water-tight containers, and provide cover (e.g., plastic sheeting or temporary roofs) on nights weekends and non-working hours to prevent these containment from coming into contact with rainwater or snowmelt.



- Spill clean-up materials shall be dry clean-up methods and dispose of used materials properly.
- Do not clean surfaces or spills by hosing the area down.
- Eliminate the source of the spill to prevent a discharge or a continuation of an ongoing discharge.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect vehicles and equipment daily for leaks.
- Ensure the Engineer has received all SDSs required for materials stored. Repair vehicle and equipment leaks immediately or remove problem vehicle or equipment from the project site.
- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.
- Immediately put small quantities of fuel-contaminated soils in an on-site container, such as a bucket, and follow State, federal, and/or local disposal regulations.
- Keep an ample supply of spill cleanup material on the site and verify weekly spill kits do not have expired equipment and are actionable.
- Mobile Refuelers are considered to be "on-site" and included in the SPCC calculation or secondary containment requirements for secondary containment when stationed at the project (i.e. in a fixed location in place of stationary containers such as a refueler that no longer can move or conduct transfers and is left only to serve as a bulk storage container).
- <https://www.epa.gov/oil-spills-prevention-and-preparedness-regulations/spcc-rule-amendments-streamlined-requirements>



Mobile refuelers.

PP-3 Vehicle and Equipment Maintenance



DEFINITION

A program of vehicle and equipment maintenance procedures and practices for the construction site.

PURPOSE

- To prevent the contamination of on-site soils and stormwater.
- To insure the proper disposal of equipment fluids, and other vehicle maintenance waste or debris.

AT A GLANCE

 <ul style="list-style-type: none"> • Location of maintenance area • Design of maintenance area • Compliance with federal, state and local requirements 	RATINGS	
 <ul style="list-style-type: none"> • N/A 	Associated Costs	
 <ul style="list-style-type: none"> • PP-8 Spill Prevention and Control • MM1 Solid Waste Management • MM-2 Hazardous Materials Management 	Design	○
	Construction	○
 <ul style="list-style-type: none"> • Inspect vehicles and equipment for leaks • Spill clean up • Proper disposal of contaminated soil, waste and clean up materials 	Maintenance	○
	Stormwater Control Measure Objectives	
	Erosion Control	
	Runoff Control	
	Sediment Control	
	Pollution Prevention	●
	Non-Stormwater	
	Waste Management	●



Practice routine maintenance.

**APPROPRIATE APPLICATIONS**

- On any construction site where heavy equipment and truck storage and maintenance yards are located on-site when approved by the Engineer.

LIMITATIONS

- Comply with local codes and ordinances regarding the disposal of fluids and consumable goods, and the on-site maintenance of equipment.

**PLANNING/DESIGN
CONSIDERATIONS**

- Plan for the proper recycling or disposal of used oils, hydraulic fluids, gear lubricants, batteries, and tires.
- Equipment maintenance and wash-out areas should be located at least 100 feet away from watercourses.
- Provide a contained wash-out area to wash down heavy equipment. Refer to Stormwater Control Measure PP-1 Vehicle and Equipment Cleaning.

MATERIAL SPECIFICATIONS

- Maintain Safety Data Sheets (SDS) sheets for all oils, hydraulic fluids, lubricants and other substances kept on-site and provide a copy to the Engineer.

DESIGN STANDARDS

- Use appropriate, leak-proof containers for fuels, oils and lubricants to provide for proper disposal.
- Use hiPP-pressure water instead of thinners and solvents to wash down equipment. Wash water and detergents can be disposed of in the sanitary sewer system after grit is removed, after checking with local authorities.
- Use drip pans or absorbent pads under equipment during storage and maintenance that involves fluids.
- Provide secondary containment areas around stored oil and chemical drums.
- Never clean or maintain vehicles over bare soil.



Use drip pans or absorbent pads under equipment during staging and maintenance that involves fluids.

Make everyone onsite aware of the location of maintenance, disposal and recycling areas and procedures to follow. Include mechanics and delivery personnel. No one will comply with policies they do not know.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect for:
 - Damaged hoses.
 - Leaky gaskets.
 - Container leaks.
- Repair all damages and leaks immediately.
- Keep an ample supply of spill cleanup material on the site and verify weekly spill kits do not have expired equipment and are actionable.



Drip pans and oil buckets work well to prevent accidental spills, but are only effective if used.



Earthen berms can be used in a quick response to an emergency until proper cleanup material can be used.



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PP-4 Street Sweeping and Vacuuming



DEFINITION

Practices to remove debris and sediment tracked from the project site onto public or private paved roads. Sweeping can include sidewalks or any other paved area accessible to the public.

PURPOSE

- To prevent tracking of sediment outside the project limits.
- To prevent sediment from entering a storm drain or watercourse.

AT A GLANCE

RATINGS	
Associated Costs	
Design	○
Construction	○
Maintenance	○
Stormwater Control Measure Objectives	
Erosion Control	
Runoff Control	
Sediment Control	●
Pollution Prevention	●
Non-Stormwater	
Waste Management	●

<ul style="list-style-type: none"> • Consider incorporating removed sediment that is debris-free back into the project
<ul style="list-style-type: none"> • N/A
<ul style="list-style-type: none"> • SC-10 Stabilized Construction Entrance/ Exit • SC-11 Stabilized Construction Roadway
<ul style="list-style-type: none"> • Proper disposal of sweeper waste



Dust Plan for proper disposal of waste collected.

**APPROPRIATE APPLICATIONS**

- Use where sediment is tracked from a project site onto paved area accessible to the public or private roads.

LIMITATIONS

- May be ineffective if soil is wet, sticky or compacted.
- Sweeper must operating at the recommended speeds and water application rates.
- High traffic areas may warrant alternative times for street sweeping (night) and/or traffic control.

PLANNING/DESIGN CONSIDERATIONS

- If not mixed with debris or trash, consider incorporating removed sediment back into project.
- Sweepers must meet all federal, state and local air quality regulations.
- Some jurisdictions require vacuum sweepers.

MATERIAL SPECIFICATIONS

- N/A

DESIGN STANDARDS

- Operate at speeds and water application rates per manufacturer's recommendations.



Street Sweeping minimizes dust trackout.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable permit(s).
- Inspect construction entrances, exits and other paved areas daily for sediment accumulation.
- Sweep and vacuum as required by applicable Dust Permit and as required by the Engineer.
- Dispose of sweeper waste properly and provide documentation of proper disposal.
- Street sweeping services will provide job tickets and invoices for services and should be kept with the SWPPP as a waste manifest indicating services rendered and no street sweeping waste were disposed of or buried on site.



JOB TICKET

JOB NUMBER: [REDACTED]

COMPANY NAME: [REDACTED]

CONTACT PERSON: [REDACTED]

DATE: Tuesday 7-10

JOB/SITE LOCATION: Parking lot at Rural & 8th st. in Tempe

Keeping the Valley Clean
P.O. Box [REDACTED]
Scottsdale, AZ 85261
Office and Fax (480) [REDACTED]

TIME IN: 11:00 am

TIME OUT: 12:00 pm
(PLEASE NOTE 1/2 HOUR
DRIVE TIME WILL BE ADDED
TO TOTAL TIME)

DUST CONTROL NUMBER: [REDACTED]

Keep invoices and waste manifest for SWPPP recordkeeping.



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PP-5 Material Delivery and Storage







DEFINITION

Procedures and practices for the proper handling, delivery, and storage of construction materials at the construction site.

PURPOSE

- To minimize the risk of discharge from leaks and spills of construction site materials into on-site soils, stormwater, storm drain system, or watercourses.

AT A GLANCE

	<ul style="list-style-type: none"> Covered storage for materials that are potential stormwater contaminants Location of storage areas Compliance with federal, state and local requirements including building and fire codes for storage shed Personnel training is important to successful material handling
	• N/A
	<ul style="list-style-type: none"> PP-6 Material Use PP-8 Spill Prevention and Control
	<ul style="list-style-type: none"> Inspect containers and storage areas for spills and damage Up-to-date inventory of on-site materials

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	
Runoff Control	
Sediment Control	
Pollution Prevention	●
Non-Stormwater	
Waste Management	●



Covered materials.



APPROPRIATE APPLICATIONS

- Every construction site shall implement material delivery and storage methods (practices) to properly receive, store and handle construction site material at the project site.
- Materials stored on the construction site include:
 - Soil.
 - Pesticides.
 - Fertilizers.
 - Detergents.
 - Plaster.
 - Petroleum products such as fuel, oil and grease.
 - Asphalt and bitumens.
 - Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds.
 - Concrete compounds.
 - Other materials that may be detrimental if released to the environment.

Simple in-field training meetings with employees and contractors as well as meeting delivery personnel for initial delivery ensures all persons on the site dealing with these products and materials understand proper staging and storage procedures.

LIMITATIONS

- Project site space limitations may preclude indoor storage.
- Secondary Containment facilities require calculation.



Material delivery locations at drainage features is prohibited.



PLANNING/DESIGN CONSIDERATIONS

- Train employees and subcontractors on the proper material delivery and storage practices.
- Temporary storage areas shall be located at least 100 feet from vehicular traffic, water courses, drainage features, storm drain inlets, curb inlets, drywells, or any other water conveyance.
- Storage sheds must meet building and fire code requirements.
- Secondary containment sizing shall have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container, whichever is greater and shall include a floor and wall constructed to be impervious to the materials contained therein for a minimum contact time of 72 hours.

MATERIAL SPECIFICATIONS

- Safety Data Sheets (SDS) shall be supplied to the Engineer for all materials stored.

MATERIAL DELIVERY STANDARDS

- Employees trained in emergency spill clean-up procedures shall be present when hazardous materials or liquid chemicals are unloaded.
- Keep an accurate, up-to-date inventory of material delivered and stored on-site.
- Chemical and material storage areas shall be located 100 feet away from drainages and stream banks, and outside the 100-year flood level.

MATERIAL STORAGE AREAS AND PRACTICES

- SDS should be centrally located, accessible at all times and all personnel informed of that location.
- Liquids and petroleum products shall be stored in approved containers and drums and placed in temporary containment areas for storage.
- Storage, preparation, and mixing shall be accomplished in secondary containment facilities. Each secondary containment shall have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container, whichever is greater and shall include a floor and wall constructed to be impervious to the materials contained therein for a minimum contact time of 72 hours.
- Sufficient separation shall be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, shall not be stored in the same temporary containment facility.
- To provide protection from wind, snowmelt, and rain, secondary containment facilities shall be covered during non-working days and prior to rain events.
- Secondary containment facilities shall be maintained free of accumulated rainwater and spills.

Wooden pallets on the ground only allows for visible confirmation a spill has already occurred.



- Materials shall be stored in their original containers and the original product labels shall be maintained in place in a legible condition. Damaged or otherwise illegible labels shall be replaced immediately.
- Bagged and boxed materials shall be stored on pallets in secondary containment, or designed for secondary containment and shall not be allowed to accumulate on the ground.
- Stockpiles shall be protected in accordance with Stormwater Control Measure PP-7 Stockpile Management.
- Minimize the material inventory stored on-site (e.g., only a few days' supply).
- Have proper storage instructions posted at all times in an open and conspicuous location.
- Keep hazardous chemicals well labeled and in their original containers.
- Keep ample supply of appropriate spill cleanup material near storage area.
- Use proper devices to transfer chemicals from one container to another.
- Follow manufacturer's instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.



Drums and materials on containment pallets (designed for 40 CFR compliance) are only useful when materials are centered and the capacity is not exceeded.



Commercially available containment pallets are designed to meet 40 CFR regulations for drums and totes.



SPILL CLEAN-UP

- Contain and clean up any spill immediately using dry cleanup methods
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose any hazardous material or contaminated soil to the satisfaction of the Engineer.
- Refer to Stormwater Control Measure PP-8 Spill Prevention and Control.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Containers and storage areas shall be inspected weekly for spills and damage.
- Storage areas shall be maintained to prevent rainfall and runoff from coming in contact with chemicals or materials.
- Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.
- Clean areas where materials have been removed to insure that no dust or spillage remains to be washed into stormwater.



Bagged and boxed materials stored neatly with walking room on containment pallets. Note the chemicals are also stored with cover (container) and SDS's are located on site.



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PP-6 Material Use



DEFINITION

Procedures and practices for use of construction material in a manner that minimizes or eliminates the discharge of these materials to on-site soils, stormwater, storm drain system or watercourse.

PURPOSE

- To minimize or prevent the discharge of construction material from the project site.

AT A GLANCE

	<ul style="list-style-type: none"> Personnel training is critical to ensure proper material handling Compliance with federal, state and local material use requirements
	• N/A
	<ul style="list-style-type: none"> PP-5 Material Delivery and Storage PP-8 Spill Prevention and Control
	<ul style="list-style-type: none"> Verify use of proper practices by all employees

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	
Runoff Control	
Sediment Control	
Pollution Prevention	●
Non-Stormwater	
Waste Management	●

Safety Data Sheets for Hazardous Chemicals Information Sheet

Updated October, 2015

In accordance with the REACH Regulation (Regulation (EC) No. 1907/2006), a safety data sheet (SDS) should be supplied with any hazardous chemical. Safety data sheets (SDSs) provide useful information on chemicals, describing the hazards the chemical presents, and giving information on handling, storage and emergency measures in case of an accident. Over the coming years, SDSs may include further information on safe handling, in the form of exposure scenarios. REACH requires users of hazardous chemicals to follow the advice on risk management measures given in the exposure scenario, where provided.

The Safety Data Sheet must contain the following 16 headings:

- | | | |
|---|--|-----------------------------|
| 1. Identification of the substance/mixture and of the company/undertaking | 6. Accidental release measures | 12. Ecological information |
| 2. Hazards identification | 7. Handling and storage | 13. Disposal considerations |
| 3. Composition/information on ingredients | 8. Exposure controls/personal protection | 14. Transport information |
| 4. First aid measures | 9. Physical and chemical properties | 15. Regulatory information |
| 5. Fire-fighting measures | 10. Stability and reactivity | 16. Other information |
| | 11. Toxicological information | |

Safety Data Sheets should be available at the project site.



APPROPRIATE APPLICATIONS

- All construction sites.
- Procedures apply when the following materials are used or prepared on site:
 - Pesticides.
 - Fertilizers.
 - Detergents.
 - Plaster.
 - Petroleum products such as fuel, oil, and grease.
 - Asphalt and other concrete components.
 - Hazardous chemical such as acids, lime, glues, adhesives, paints, solvents, and curing compounds.
 - Concrete compounds.
 - Other materials that may be detrimental if released to the environment.

LIMITATIONS

- Discharges of washout of concrete; washout and cleanout of stucco, paint, form release oils, curing compounds; fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; soaps or solvents used in vehicle and equipment washing and toxic or hazardous substances from a spill or other release other construction materials are not allowed under the AZCGP or the EPA-CGP and are considered "Prohibited discharges".

Pesticide Use Log Sheet

[illegible]

Pesticide logs must be maintained.



PLANNING/DESIGN CONSIDERATIONS

- Use recycled and safer alternative products when practical.

MATERIAL SPECIFICATIONS

- Safety Data Sheets (SDS) shall be supplied to the Engineer for all materials used or stored on the project site.

MATERIAL USE PRACTICES

- SDS should be centrally located, accessible at all times and all personnel informed of that location.
- Latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and no longer hazardous, may be disposed of with other construction debris.
- Do not remove the original product label, it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain or watercourse. Dispose of any paint thinners, residue and sludge(s), that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practical, and rinse to a drain leading to a sanitary sewer where permitted, or into a concrete washout pit or temporary sediment trap. For oil-based paints, clean brushes to the extent practical and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity.
- Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials on-site when practical.
- Do not over-apply fertilizers and pesticides. Prepare only the amount needed.
- Strictly follow the recommended usage instructions. Apply surface dressings in smaller applications, as opposed to large applications, to allow time for it to work in and to avoid excess materials being carried off-site by runoff.
- Application of pesticides shall be performed by a licensed applicator.
- Maintain logs for all pesticides applied, including brand name, formulation, EPA registration number, amount and date applied, exact location of application, vehicle calibration, and name, address, and certification number of applicator.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.
- Comply with all pertinent Federal Regulations.



INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Spot check employees and subcontractors monthly throughout the job to ensure appropriate practices are being employed.
- Chemical containers may require empty containers to be triple-hole punched and rinsed. Manifest shall be kept with the SWPPP demonstrating compliance. Reinstates shall never be disposed of on ADOT property or contribute to a discharge and will be disposed of properly according to the SDS associated with the chemical.

13. Disposal considerations:

Pesticide disposal:

Do not contaminate water, food or feed by storage or disposal. Open dumping is prohibited. Do not reuse empty container.

Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. If these cannot be disposed of by use according to label instructions, contact your state pesticide or environmental control agency, or the hazardous waste representative at the nearest EPA regional office for guidance.

Container disposal:

Less than or equal to 5 gallons: Non-refillable container. Do not reuse this container to hold materials other than pesticides or dilute pesticides (rinsate). After emptying and cleaning, it may be allowable to temporarily hold rinsate or other pesticide-related materials in the container. Contact your state regulatory agency to determine allowable practices in your state. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into the application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then offer for recycling, if available, or puncture and dispose of in a sanitary landfill, or by incineration. Do not burn unless allowed by state and local ordinances.

Over 5 gallons: Non-refillable container. Do not reuse this container to hold materials other than pesticides or dilute pesticides (rinsate). After emptying and cleaning, it may be allowable to temporarily hold rinsate or other pesticide-related materials in the container. Contact your state regulatory agency to determine allowable practices in your state. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into the application equipment or a mix tank. Fill the container ¼ full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. Then offer for recycling, if available, or puncture and dispose of in a sanitary landfill, or by incineration. Do not burn unless allowed by state and local ordinances.

SDS sheets often contain disposal information

PP-7 Stockpile Management







DEFINITION

Procedures and practices to reduce or eliminate stormwater contact with all piled construction site material including: soil, sand and paving materials such as concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate subbase or premixed aggregate, and asphalt minder ("cold mix" asphalt).

PURPOSE

- To reduce or eliminate stormwater pollution from construction site stockpiles.

AT A GLANCE

	<ul style="list-style-type: none"> Location of stockpiles Additional protection measures required if rain is predicted
	<ul style="list-style-type: none"> N/A
	<ul style="list-style-type: none"> EC-6 Soil Binders SC-1 Sediment Control Berm SC-2 Silt Fence SC-5 Sediment Wattles SC-6 Sediment Log WM-3 Contaminated Soil Management
	<ul style="list-style-type: none"> Repair and/or replace stockpile controls as needed



Small stockpiles in an urban area.

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	
Runoff Control	
Sediment Control	●
Pollution Prevention	●
Non-Stormwater	
Waste Management	●



Larger stockpiles in storage yard, surrounded with silt fence and covered with bonded fiber matrix.

**APPROPRIATE APPLICATIONS**

- All projects that stockpile soil, paving and other materials.

LIMITATIONS

- None identified.

PLANNING/DESIGN CONSIDERATIONS

- Locate stockpiles a minimum of 100 feet away from concentrated flows of stormwater, drainage courses, surface waters, stormwater conveyances, and inlets.
- Do not locate any piles within designated buffers established consistent with CGP coverage or environmental protection areas.
- Use temporary sediment barriers to protect from contact with stormwater (including run-on).
- Rinsing sediment, debris, or other pollutants accumulated on pavement or other impervious surfaces after the stockpile has been removed into any stormwater conveyance, storm drain inlet, or surface water is prohibited.
- County and AZGCP permits have wind-blown (fugitive dust) regulations pertaining to cover and wind screen.
- Temporary sediment control measures around soil stockpiles may be moved out of the way when they are being actively worked.

MATERIAL SPECIFICATIONS

- Bagged materials shall be placed on palettes and under cover.

DESIGN STANDARDS

- Protect all stockpiles from stormwater run-on using a temporary perimeter sediment barrier such as berms, dikes, silt fences, or gravel bags, compost logs.
- Cover or protect with soil stabilization measures if rain is predicted.
- Implement wind erosion control practices as appropriate; refer to Stormwater Control Measure EC-6 Soil Binders.
- "Cold mix" stockpiles shall be placed and stored per the project Special Provisions.
- Comply with local jurisdiction air quality requirements.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Repair and/or replace perimeter controls and covers as needed or as directed by the Engineer.

PP-8 Spill Prevention and Control



DEFINITION

Procedures and practices implemented to prevent and control spills.

PURPOSE

- To minimize or prevent discharges of spilled materials to the drainage system or watercourse.

AT A GLANCE



- Spill prevention and control is required whenever chemical and hazardous materials are stored
- Contractor must prepare and implement a spill prevention and control plan
- Employee education programs are key



- N/A



- Waste Management Stormwater Control Measures (WM-1 through WM-5)



- Verify weekly that spill control clean up materials are located properly
- Update spill prevention and control plan as necessary.



Spills onto soil require clean-up.

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	
Runoff Control	
Sediment Control	
Pollution Prevention	●
Non-Stormwater	
Waste Management	●



Spill containment with all materials in secondary containment.

**APPROPRIATE APPLICATIONS**

- Required for all construction activities.
- Spill control procedures are implemented wherever chemicals and/or hazardous substances are used and/or stored.

LIMITATIONS

- This Stormwater Control Measure description is very general. The contractor must identify additional appropriate practices for the specific materials used or stored on-site.

PLANNING/DESIGN CONSIDERATIONS

- The contractor shall prepare and implement a spill prevention and control plan. The plan should include procedures for :
 - Storage and use that will prevent spills.
 - Spill clean up including minor and significant/hazardous material spills.
 - The containment of spills.
 - The disposal of spilled materials and the material used for clean up.
 - Employee education programs that incorporate the following procedures :
 - Plainly labeling containers
 - Secondary containment provisions, and procedures for material storage and handling;
 - Rapidly stopping, containing, and cleaning up leaks, spills, and other releases.
 - Training employees who may cause or detect a spill or leak to know proper spill response and cleanup, and reporting established by ADOT and or EPA/ADEQ.
 - Notification of appropriate facility personnel and emergency response. hazardous substance or oil release in an amounts equal to or in excess of a reportable quantity established 40 CFR Part 110, 117, or 302.

MATERIAL SPECIFICATIONS

- Chemical and hazardous substances include, but are not limited to:
 - Soil stabilizers/binders.
 - Dust Palliatives.
 - Pesticides.
 - Fertilizers.
 - Deicing/anti-icing chemicals.
 - Fuels.
 - Lubricants.
 - Other petroleum distillates.
 - Blasting materials
 - Portable toilets.



DESIGN STANDARDS

- Water used for cleaning and decontamination shall not be allowed to enter storm drains nor watercourses and shall be collected and disposed of as described in Stormwater Control Measure WM-5 Liquid Waste Management.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Verify weekly that spill control clean up materials are located near material storage, unloading and use areas.
- Perform regular preventive maintenance on tanks and fuel lines.
- Update spill prevention and control plan if changes occur in the types of chemicals on site.
- Notify applicable agencies of spills per the permit and all federal, state, and local requirements.
- Within 7 calendar days of knowledge of the release of a hazardous substance or oil, operators shall provide a description in the SWPPP of the release; the circumstances leading to the release; and the date of the release.
- Local requirements may require additional reporting of spills or discharges to local emergency response, public health, or drinking water supply agencies.

ADDITIONAL INFORMATION AND RESOURCES

- ADEQ Emergency Response Duty Office, (602)-771-2330 or (800)-234-5677.
- ADEQ Waste Management Programs Division, <http://www.azdeq.gov/WPD>



Check Spill Kits weekly to ensure the appropriate material to address spills of chemicals present are intact and not expired.



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PP-9 Portable Toilet



DEFINITION AND PURPOSE

Procedures and practices to minimize or prevent the discharge of construction site sanitary/septic waste to the storm drain system or to receiving waters.

AT A GLANCE



- Place on a level surface
- Stake or weight into place



- N/A



- WM-1 Solid Waste Management
- WM-5 Liquid Waste Management



- Regular inspection for leaks and spills
- Periodic service to ensure proper function
- Regular waste collection by a licensed service

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	
Runoff Control	
Sediment Control	
Pollution Prevention	●
Non-Stormwater	
Waste Management	●



Spills and leaks can occur even when the portable toilet is secured in place.



Inspect sanitary locations after each servicing. Staking is the preferred method for securing portable toilets.

**APPROPRIATE APPLICATIONS**

- All construction sites that use temporary and/or portable sanitary/septic systems.

LIMITATIONS

- None identified.
- Water bodies listed on current Impaired water body lists (303 d List) or where a TMDL has been established for E. coli, Fecal Coliform, or Enterococcus may require additional control measures around sanitary facilities.

PLANNING/DESIGN CONSIDERATIONS

- Locate sanitary facilities in a convenient location.
- Educate employees, subcontractors and other users on sanitary/septic waste storage and disposal systems.
- Locate sanitary facilities a minimum of 100 feet away from concentrated flows of stormwater, drainage courses, surface waters, stormwater conveyances, and inlets.
- Do not locate any sanitary facilities within designated buffers established consistent with CGP coverage or environmental protection areas.
- Use temporary sediment barriers to protect from contact with stormwater (including run-on) as well as accidental contact and tipping from construction equipment and vehicles.



Frequent servicing and waste collection is required. Consider portlet location for the service trucks have access and stormwater control measures are not damaged in order to service or remove.

MATERIAL SPECIFICATIONS

- No Grated bottom portable toilets are to be used on ADOT properties/projects.



DESIGN STANDARDS

- Locate temporary sanitary facilities away from drainage facilities, watercourses, and from traffic circulation.
- Do not locate temporary sanitary facilities in areas that will collect water.
- Prepare level, gravel surface or place on concrete, and provide clear access for servicing and on-site personnel.
- Provide containment for spill or leak protection.
- Ensure that temporary septic systems treat wastes to appropriate levels before discharging.
- If using an on-site disposal system (OSDS) such as a septic system, comply with local health agency requirements.
- Properly connect temporary sanitary facilities that discharge to the sanitary sewer system.
- If discharging to the sanitary sewer, contact the local wastewater treatment plant for their requirements.
- Ensure that a licensed service maintains sanitary/septic facilities in good working order.
- Stake portable toilets or secure to a sturdy object (such as a fence or post) to create a stable environment and prevent overturning.



Sanitary facilities require a position at least 100 feet away from water conveyances and storm drain entrances. No other stormwater control measures are present in this photo.

**INSPECTION AND MAINTENANCE REQUIREMENTS**

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect regularly for leaks or spills.
- Repair leaks or replace facility immediately.
- Arrange for regular waste collection.



Sanitary facilities with grate floors are not allowed for use on ADOT properties or construction projects. Discharges will accumulate directly on the ground.

Non-Stormwater (NS) Stormwater Control Measures



Non-stormwater management Stormwater Control Measures are source control measures intended to prevent pollution by limiting or reducing potential pollutants at the source before they come in contact with stormwater. These practices involve day-to-day operations of the construction site and are usually under the control of the contractor.

- NS-1 Water Conservation Practices
- NS-2 Dewatering Operations
- NS-3 Paving and Milling Operations
- NS-4 Temporary Watercourse Crossing
- NS-5 Water Diversion
- NS-6 Structure Demolition/Removal Over or Adjacent to Water
- NS-7 Material and Equipment Use Over Watercourses

The following are the only non-stormwater discharges allowed under the CGPs (EPA or ADEQ). Other permits are available from ADEQ and have the potential to take additional time and filing fees. Water testing (laboratory) may also be included with additional permits.

Non-stormwater discharges are allowed under the CGPs provided they cannot be practicably eliminated, the operator shall install appropriate control measures to reduce or eliminate pollutants in the discharge.

1. Discharges from emergency fire-fighting activities.
2. Water used to control dust (no reclaimed water or other process wastewaters)
3. Routine external building wash down without detergents.
4. Water used to rinse vehicles and equipment (no reclaimed water or other process wastewaters, no soaps, solvents, detergents, oils, grease or fuels are present in the rinsate).
5. Pavement wash waters (where spills or leaks have not occurred).
6. Uncontaminated air conditioning or compressor condensate.
7. Uncontaminated and non-turbid groundwater or spring water.
8. Foundation or footing drains (not contaminated with process materials)
9. Water from firefighting system testing and maintenance (includes hydrant flushings).
10. Discharges related to installation and maintenance of potable water supply systems.
11. Hydrostatic testing of new pipes, tanks or vessels.
12. Water used for compacting soil (no reclaimed water or other process wastewaters).
13. Water used for drilling and coring where flows are not contaminated with additives.
14. Uncontaminated waters obtained from dewatering operations/ foundations, provided the discharge(s) are managed as specified in applicable permits



The permits (CGPs) do not prohibit the use of reclaimed or other process wastewaters on-site for dust control, soil compaction or for landscape irrigation. These purposes must be applied and managed in a way that they are not discharged off site or during rain events.

If the site is within ¼ mile of an outstanding Arizona water (OAW), the operator may not discharge any non-stormwater under this permit, except for emergency fire-fighting activities.



NS-1 Water Conservation Practices







DEFINITION

Procedures and practices that use water during construction in a manner to minimize erosion and the transport of pollutants.

PURPOSE

- To conserve water and reduce or eliminate non-stormwater discharges.
- To conserve a critical resource.

AT A GLANCE

	• Avoid using water to clean construction areas
	• N/A
	• Many Erosion, Sediment and Run-off Control are appropriate for use with this Stormwater Control Measure
	• Regularly inspect and repair water delivery equipment and systems for leaks

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	●

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	
Pollution Prevention	
Non-Stormwater	●
Waste Management	



Check dams slow the flow, allowing water to percolate into the ground, and enhancing seed germination.



APPROPRIATE APPLICATIONS

- Water conservation practices are implemented on all construction sites where water is used.
- Applies to all construction projects and use of water including piped, metered and trucked water.

LIMITATIONS

- None identified.

PLANNING/DESIGN CONSIDERATIONS

- Avoid using water to clean construction areas.
- Direct construction water to areas where it can infiltrate into the ground or be collected or reused.
- Use water harvesting techniques to water areas that are being revegetated.



Don't let this happen! Monitor water truck filling areas, tanks, pipes, and fittings to ensure overflow does not cause water quality and fugitive dust issues.



Leaking and broken irrigation can be a significant loss of water and pressurized systems can cause erosion and lead to high mortality rates of nursery plants.



Standing water tanks require inspection on every working day to ensure overfilling and leaks do not contribute to wasted resources, dry weather discharges of sediment, and trackout.

- Authorized non-stormwater discharges to storm drain systems, channels or receiving waters are acceptable with the implementation of appropriate Stormwater Control Measures.
- Verify allowable non-stormwater discharges applicable in each permit.
- Comply with Arizona Aquifer Protection Permit requirements.
- Keep water equipment in good working condition.
- Repair leaks promptly.
- Stabilize water truck filling area.
- Washing vehicles and equipment on site is discouraged.

MATERIAL SPECIFICATIONS

- N/A

DESIGN STANDARDS

- N/A

***INSPECTION AND MAINTENANCE REQUIREMENTS***

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect and repair water delivery equipment and systems regularly.
- Verify that appropriate Stormwater Control Measures are in place to assist with water conservation.
- Inspect: water trucks, hydrant connections, water reservoirs, irrigation systems

NS-2 Dewatering Operations



DEFINITION

Practices that manage the discharge of pollutants, in this case sediment, when accumulated precipitation (stormwater) and non-stormwater must be removed from a work location and or construction site.

PURPOSE

- Prevent discharge of sediment from the construction site during water removal.

AT A GLANCE



- Site conditions will dictate design and use of dewatering operations
- Discharges must comply with regional and watershed-specific discharge requirements



- N/A



- Several Erosion, Sediment and Run-off Control may be appropriate for use with this Stormwater Control Measure



- Inspect filtering device frequently and repair/replace to ensure proper operation

RATINGS

Associated Costs

Design	○
Construction	◐
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	
Non-Stormwater	●
Waste Management	



Dewatering during bridge work.



Sediment is retained in the basin during this dewatering operation.

APPROPRIATE APPLICATIONS

- Controlling sediment from dewatering operations is required on all projects that pump sediment-laden water from work areas and plan to discharge the pumped water into a conveyance system or watercourse. Dewatering discharges include but are not limited to:
- Removal of uncontaminated groundwater.
- Removal of accumulated rainwater from work areas.
- Removing water from cofferdams or diversions.

LIMITATIONS

- Site conditions will dictate design and use of dewatering operations.
- The controls discussed in this Stormwater Control Measure address sediment only. If the presence of polluted water is identified in the contract, the contractor shall implement dewatering pollution controls as required by the contract documents. If the quality of water to be removed by dewatering is not identified as polluted in the contract documents, but is later determined by observation or testing to be polluted, the contractor shall notify the Engineer and comply with Standards Specifications, "Differing Site Conditions."
- The controls detailed in this Stormwater Control Measure only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods.
- Dewatering operations will require and must comply with applicable federal, state and local permits.



- Avoid dewatering discharges where possible by infiltration in appropriate areas.
- Other permits are available from ADEQ and have the potential to take additional time and filing fees. Water testing (laboratory) may also be included with additional permits.

PLANNING/DESIGN CONSIDERATIONS

- Contractor shall notify the Engineer of planned discharges.
- The Engineer will coordinate monitoring and permit compliance.
- Discharges must comply with regional and watershed-specific discharge requirements.
- Dewatering treatment is designed to remove sediment only.
- Desilting basins may be required for higher flows.

MATERIAL SPECIFICATIONS

- N/A

DESIGN STANDARDS

- Ensure that dewatering discharges do not cause erosion at the discharge point.
- Sediment Control Treatment: Dewatering effluent (groundwater and accumulated precipitation) that is laden with suspended solids shall be treated to remove soil particles. Sediment basins are an example of a temporary treatment device.
- Filter bags may be used for small-scale dewatering operations.



Dewatering basin.

**INSPECTION AND MAINTENANCE REQUIREMENTS**

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect filtering device frequently and repair or replace when sediment build-up prevents the structure from functioning as designed.
- If adequate freeboard is not present, monitor weather forecast and discharge prior to the next event.
- Accumulated suspended solids removed from a dewatering device shall be spread on the project site and stabilized at locations designated by the Engineer.

**Ⓢ ALTERNATIVES**

There are means to address collected non-stormwater that would not meet the definition of a “discharge”. These examples provide alternative methods to eliminate a discharge:

- Dewatering effluent is kept on site, such as an evaporation pond or desilting basin, and where the opening is larger than depth (otherwise the retention may be categorized as a “Well” with APP permit requirements).
- Dewatering effluent is discharged to a sanitary sewer (must comply with local sewer requirements).
- Dewatering effluent is contained and transported offsite for disposal or treatment at an approved facility.

De Minimus Permit

The ADEQ provides an alternative general permit coverage for certain types of non-stormwater discharges to surface waters of the United States for the limited amount and limited time of an insignificant threat to water quality (De Minimus). The AZCGP contains fourteen allowable non-stormwater discharges while covered under and meeting the conditions of the CGP. The De Minimus permit coverage may be applied for in much the same way coverage under the CGP. Additional conditions, timeframes, permit conditions, water sampling, and permit fees are all the responsibility of the contractor. Prior to any planned discharge, coordination and approval from the Engineer is required.

Read more about the De Minimus General Permit here:

<http://www.azdeq.gov/AZPDES/DMGP>

NS-3 Paving and Milling Operations







DEFINITION

Practices that manage the discharge of pollutants, in this case sediment, when accumulated precipitation (stormwater) and non-stormwater must be removed from a work location and or construction site.

PURPOSE

- Prevent discharge of sediment from the construction site during water removal.

AT A GLANCE

 <ul style="list-style-type: none"> Site conditions will dictate design and use of dewatering operations Discharges must comply with regional and watershed-specific discharge requirements 	RATINGS	
 <ul style="list-style-type: none"> N/A 	Associated Costs	
 <ul style="list-style-type: none"> Several Erosion, Sediment and Run-off Control may be appropriate for use with this Stormwater Control Measure 	Design	○
	Construction	○
 <ul style="list-style-type: none"> Inspect filtering device frequently and repair/replace to ensure proper operation 	Maintenance	◐
		Stormwater Control Measure Objectives
		Erosion Control
		Runoff Control
		Sediment Control
		Pollution Prevention
		Non-Stormwater
		Waste Management



Saw-cutting.

**APPROPRIATE APPLICATIONS**

- Everywhere paving, surfacing, resurfacing, or saw-cutting operations may pollute stormwater runoff or discharge to the storm drain system or watercourses.

LIMITATIONS

- Finer solids are not effectively removed by filtration systems.
- Paving opportunities may be limited during wet weather to minimize discharge of pollutants.

PLANNING/DESIGN CONSIDERATIONS

- Clean equipment off-site whenever possible.
- If on-site cleaning is necessary follow Stormwater Control Measure PP-1 Vehicle and Equipment Cleaning.
- If on-site cleaning is necessary manage debris per Stormwater Control Measure WM-1 Solid Waste Management.
- Disposal of Portland Concrete Cement and Asphaltic Concrete waste will be in conformance with the Standard Specifications.
- Clean equipment off-site whenever possible.
- If materials cannot be recycled, transport back to approved storage site.
- AC grindings, chunks, pieces, must not be allowed to enter storm drain system.
- Certain saw cutting and even striping obliteration projects will require a Lead Based Paint Plan, or an National Emissions Standards for Hazardous Air Pollutants (NESHAP) Permit to address proper handling of Regulated Asbestos Containing Material (RACM)? Check the clearance documents.

MATERIAL SPECIFICATIONS

- Material used to coat asphalt transport trucks, asphalt trucks and asphalt spreading equipment shall not contain soap and be non-foaming and non-toxic.
- Reuse of saw-cutting water is permissible if settled and pH levels test in the normal range (6-9 pH) and water is not allowed to runoff the project site.

DESIGN STANDARDS**ASPHALTIC CONCRETE PAVING**

- Place drip pans or absorbent materials under paving equipment while not in use to catch or contain drips and leaks.
- Minimize the washing of sand or gravel from new asphalt into storm drains, streets, and receiving waters by sweeping where practical.
- Cover drainage inlet structures and manholes with filter fabric during application of seal coat, tack coat, slurry seal and/or fog seal.
- Do not apply seal coat, tack coat, slurry seal, or fog seal if rainfall is predicted to occur during the application or curing period.



Saw-cutting will produce a significant amount of liquid waste (WM-5). Note that this activity may not meet the definition of non-stormwater discharges allowed under the AZCGP of "Uncontaminated", "Non-turbid", or uncontaminated with process materials.

- Dispose old or spilled asphalt as approved by the Engineer. Do not allow AC millings, pieces or chunks used in embankments or shoulder backing to enter any storm drains or watercourses. Apply temporary Stormwater Control Measure perimeter controls until structure is stabilized or permanent controls are in place.
- Collect and remove all broken asphalt and recycle when practical; otherwise, dispose in accordance with special provisions or as directed by the Engineer.
- Place any AC chunks and pieces used in embankments above the water table and cover by at least 1 foot of material.
- Use only non-toxic substances to coat asphalt transport trucks and asphalt spreading equipment.

PORTLAND CEMENT CONCRETE PAVING

- Do not wash sweepings from exposed aggregate concrete into storm drain systems. Collect and return to aggregate base stockpile or dispose of properly.
- Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in Stormwater Control Measure WM-4 Concrete Waste Management or dispose of properly.
- Do not allow saw-cut Portland Concrete Cement (PCC) slurry to enter storm drains or watercourses.



- Residue from milling operations must not flow across pavement and nor be left on the surface of pavement. Refer to Stormwater Control Measures WM-4 Concrete Waste Management and WM-5 Liquid Waste Management.

THERMOPLASTIC STRIPING

- Inspect all thermoplastic striper and pre-heater equipment shutoff valves to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Fill the pre-heater carefully to prevent splashing or spilling of hot thermoplastic. Leave 6 inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move when the vehicle is deadheaded.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible recycle thermoplastic material. Thermoplastic waste shall be disposed of in accordance with project specifications.

RAISED/RECESSED PAVEMENT MARKER APPLICATION AND REMOVAL

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system or watercourses.
- Load melting tanks with care and do not fill beyond six inches from the top to leave room for splashing when vehicle is deadheaded.
- When servicing or filling melting tanks ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.
- Waste shall be disposed of in accordance with Standard Specifications.
- **INSPECTION AND MAINTENANCE REQUIREMENTS**
- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect and maintain machinery regularly to minimize leaks and drips.
- Ensure that employees and subcontractors are implementing appropriate measures during paving operations.
- Keep ample supplies of drip pans and absorbent materials on-site.

NS-4 Temporary Watercourse Crossing







DEFINITION

A structure placed across a watercourse allowing vehicles to cross during construction.

PURPOSE

- To provide a safe, stable way for construction vehicle traffic to cross a watercourse.
- To provide streambank stabilization.
- To reduce the risk of damage to the streambed or channel.
- To eliminate erosion and downstream sedimentation caused by vehicles moving through the streambed.

AT A GLANCE

 <ul style="list-style-type: none"> • May require additional permitting Design and install under direction of registered Civil or Structural Engineer • Select a location where erosion potential is low • Construct at natural elevation of the streambed
 <ul style="list-style-type: none"> • N/A
 <ul style="list-style-type: none"> • SC-3 Sediment Trap • NS-2 Dewatering Operations • NS-5 Water Diversion • NS-7 Material and Equipment Use Over Water
 <ul style="list-style-type: none"> • Inspect and maintain to ensure crossing, watercourse and banks are stable

RATINGS

Associated Costs

Design	○
Construction	●
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	
Runoff Control	
Sediment Control	
Pollution Prevention	
Non-Stormwater	●
Waste Management	



Temporary bridge.

**APPROPRIATE APPLICATIONS**

- In all cases where construction equipment or vehicles need to cross a waterway or as specified in ADOT Stored Specification 104SWDEQ or 104SWEPA.
- When alternative access routes are not feasible.
- When crossing perennial streams or waterways causes significant erosion.

ADOT Specification Section 104SWEPA: Unless otherwise approved in writing by the Engineer, fording of running streams with construction equipment will not be permitted; therefore, temporary bridges or other structures shall be used whenever an appreciable number of crossings is necessary.

LIMITATIONS

- Installation and removal will disturb the waterway.
- May require additional permitting such as U.S. Army Corps of Engineers 404 permit and environmental clearance.
- Installation may require dewatering or temporary diversion of the stream. Refer to Stormwater Control Measure
- NS-2 Dewatering Operations.
- Crossing structure may become a constriction in the waterway, which can obstruct flood flow and cause flow backups or washouts. If improperly designed, flow backups can increase the pollutant load through washouts and scouring.
- Unwashed riprap will add 10-15 % small particles (fines) in the water way.
- Rock must be hydraulically sized and placed on non-woven geotextile fabric.
- Flow Pipes must be hydraulically sized with stabilized inlets and outlets (RC-3).

PLANNING/DESIGN CONSIDERATIONS

- Consult with ADOT Office of Environmental Services, Water Quality Section, prior to installation of any temporary watercourse crossing.
- Select crossing site where erosion potential is low.
- Select areas where the runoff from highway side slopes will not spill into the crossing side slopes.
- All crossing designs must consider storm event-generated runoff.
- Design and installation require knowledge of stream flows and soil strength. Designs shall be under the direction of, and approved by, a registered civil and/or structural engineer. Both hydraulic and construction loading requirements shall be considered with the following:
 - Comply with the requirements for culvert and bridge crossings, as contained in the ADOT Highway Design Manual, particularly if the temporary stream crossing will remain through the rainy season.
 - Provide stability in the crossing and adjacent areas to withstand the design flow. The design flow and safety factor shall be selected based on careful evaluation of the risks due to over topping, flow backups, or washout.



- Install sediment traps immediately downstream of crossings outside of the drainage in order to capture sediments. Refer to Stormwater Control Measure SC-3 Sediment Trap.
- Avoid oil or other potentially hazardous waste materials for surface treatment.

• Types of temporary crossings to consider:

• Culverts

- Use on perennial and intermittent streams
- Able to support heavy loads
- Use of sand bags and HiPP-Density Polyethylene (HDPE) Pipe are not allowed.

• Fords

- Use on dry streams washes and ephemeral stream and low flow perennial streams during the dry season in arid areas.
- Least expensive of the crossing types with the maximum load limits.
- Temporary fords are not appropriate if construction will continue through the rainy season, if thunderstorms are likely or if the stream is perennial.

• Bridges

- Use on streams with high flow velocities, steep gradients and/or where temporary restrictions in the channel are not allowed.
- Generally more expensive to design and construct.
- Least disturbance to the stream bed.
- Least constrictive of waterway flows.



Section 404 and 401 CWA Permitting may be applicable for work in or through a Waters of the United States (WOUS).

MATERIAL SPECIFICATIONS

- N/A

DESIGN AND CONSTRUCTION STANDARDS

- Stabilize construction roadways, adjacent work area and stream bottom against erosion.
- Construct during dry periods to minimize stream disturbance and reduce costs.
- Construct at or near the natural elevation of the streambed to prevent potential flooding upstream of the crossing.
- Vehicles and equipment shall not be driven, operated, fueled, cleaned, maintained, or stored in the wet or dry portions of a water body where wetland



vegetation, riparian vegetation, or aquatic organisms may be destroyed, except as authorized by the Engineer as necessary to complete the work.

- Temporary water body crossings and encroachments shall be constructed to minimize scour. Cobbles used for temporary water body crossings or encroachments shall be clean, rounded river cobble.
- The exterior of vehicles and equipment that will encroach on the watercourse within the project shall be maintained free of grease, oil, fuel, and residues.
- Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. Precautions shall be taken to avoid damage to vegetation by people or equipment.
- Riparian vegetation, when removed pursuant to the provisions of the work, shall be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation shall be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble shall be removed upon completion of project activities.
- Any temporary artificial obstruction placed within flowing water shall only be built from material, such as clean gravel bags, which will cause little or no siltation.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect periodically to ensure that the bridge, streambed, and banks are maintained and not damaged.
- Maintenance shall be performed, as needed to ensure that the structure, streambed and banks are stable.
- Ensure proper permits (404, 401, and 402) have been secured and are available on site.



This constitutes an approved water crossing. Pipe and rock have been hydraulically sized, non-woven geotextile fabric exist under the rock, and 404/401 CWA permitting is available on site. The structure was removed and limited harm occurred to the river.

NS-5 Water Diversion







DEFINITION

A system of structures and measures that intercept clear surface water runoff upstream of a project site, transport it around the site, and discharge it downstream with minimal water quality degradation for either the project construction operations or the construction of the diversion. Structures commonly used as part of this system include diversion ditches, berms, dikes, slope drains, drainage, and interceptor swales.

PURPOSE




- Reduce sediment pollution from construction work in, over, or adjacent to the watercourse.

AT A GLANCE




	<ul style="list-style-type: none"> • Site conditions will dictate design and use of dewatering operations • Discharges must comply with regional and watershed-specific discharge requirements
	<ul style="list-style-type: none"> • RC-1 Earth Dikes/Drainage Swales and Lined Ditches • RC-4 Rock Outlet Protection/Velocity Dissipation Devices
	<ul style="list-style-type: none"> • CP-1 Construction Sequencing • NS-2 Dewatering Operations • NS-4 Temporary Watercourse Crossing
	<ul style="list-style-type: none"> • Inspect diversion structures before and after storms and at least once a week

RATINGS

Associated Costs

Design	
Construction	
Maintenance	

Stormwater Control Measure Objectives

Erosion Control	
Runoff Control	
Sediment Control	
Pollution Prevention	
Non-Stormwater	
Waste Management	



A flow bypass channel is used during placement of a multi-section culvert. Note the clear water in the diversion channel.

**APPROPRIATE APPLICATIONS**

- Implement where work must be performed in a running stream or watercourse after appropriate permits have been secured.

LIMITATIONS

- Diversion/encroachment activities will usually disturb the waterway during installation and removal of diversion structures.
- Diversion/encroachment activities may constrict the waterway, which can obstruct flood flows and cause flooding or washouts.
- Specific permit requirements or mitigation measures, such as Corps, Arizona Game and Fish Department, Federal Emergency Management Agency (FEMA), etc. May be included in contract documents because of clear water diversion/encroachment activities.

PLANNING/DESIGN CONSIDERATIONS**GENERAL**

- Where working areas encroach on live streams, barriers adequate to prevent the flow of muddy water into streams shall be constructed and maintained between working areas and streams. During construction of the barriers, muddying of streams shall be held to a minimum.
- Diversion structures must be adequately designed to accommodate fluctuations in water depth or flow volume due to storms, flash floods, etc.
- Heavy equipment driven in wet portions of a watercourse to accomplish work shall be completely clean of petroleum residue, and water levels are below the gear boxes of the equipment in use, or lubricants and fuels are sealed such that inundation by water shall not result in leaks.
- Mechanical equipment operated in the water shall not be submerged to a point above any axle of said mechanical equipment.
- Excavation equipment buckets may reach out into the water for the purpose of removing or placing fill materials. Only the bucket of an excavator/backhoe may operate in a water body. The main body of the crane/excavator/backhoe shall not enter water-covered portions of a water body, except as necessary to cross the stream to access the work site.
- Stationary equipment such as motors and pumps, located within or adjacent to a watercourse, shall be positioned over drip pans.
- When any artificial obstruction is being constructed, maintained, or placed in operation, sufficient water shall, at all times, be allowed to pass downstream to maintain aquatic life downstream.
- The exterior of vehicles and equipment that will encroach on a water body within the project shall be maintained free of grease, oil, fuel, and residues.
- Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. Precautions shall be taken to avoid damage to vegetation by people or equipment.



- Riparian vegetation, when removed pursuant to the provisions of the work, shall be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation shall be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble shall be removed upon completion of project activities. Drip pans shall be placed under all vehicles and equipment placed on structures over watercourses when the vehicle or equipment is planned to be idle for more than one hour.
- Where possible, avoid or minimize diversion/encroachment impacts by scheduling construction during periods of low flow or when the stream is dry. Refer also to the project Special Provisions for scheduling requirements.
- Scheduling shall also consider seasonal releases of water from dams, wastewater treatment plants, seasonal riparian wildlife, and water demands due to crop irrigation.
- Construct diversion structures with materials free of potential pollutants such as soil, silt, sand, clay, grease, or oil. If gravel bags are used, they shall be filled with clean materials free of silt, clay, and organic substances.

TEMPORARY DIVERSIONS/ENCROACHMENTS

- Construct diversion channels in accordance with Stormwater Control Measure RC-1 Earth Dikes/Drainage Swales and Lined Ditches.
- In high flow velocity areas, stabilize slopes of embankments and diversion ditches using an appropriate liner, in accordance with Stormwater Control Measure EC-5 Geotextiles/Erosion Control Blankets, or, use rock slope protection, as described in the Standard Specifications Section.
- Where appropriate, use natural streambed materials such as large cobbles and boulders for temporary embankment/slope protection, or other temporary soil stabilization methods.
- Provide for velocity dissipation at transitions in the diversion, such as the point where the stream is diverted to the channel and the point where the diverted stream is returned to its natural channel. Refer also to Stormwater Control Measure RC-4 Rock Outlet Protection/Velocity Dissipation Devices.

TEMPORARY DRY CONSTRUCTION AREAS

- When dewatering behind temporary structures to create a temporary dry construction area, such as coffer dams, pass pumped water through a sediment settling device, such as a portable tank or settling basin, before returning water to the water body. Refer also to Stormwater Control Measure NS-2 Dewatering Operations.
- If the presence of polluted water or sediment is identified in the contract, the contractor shall implement dewatering pollution controls as required by the contract documents. If the quality of water or sediment to be removed while dewatering is not identified as polluted in the contract documents, but is later determined by observation or testing to be polluted, the contractor shall notify the Engineer and comply with the Standard Specifications.



- Any substance used to assemble or maintain diversion structures, such as form oil, shall be non-toxic and non-hazardous.
- Any material used to minimize seepage underneath diversion structures, such as grout, shall be non-toxic, non-hazardous, and as close to a neutral pH as possible.

MATERIAL SPECIFICATIONS

- N/A

DESIGN STANDARDS

- N/A

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- At a minimum inspect diversion/encroachment structures before and after significant storms and at least once per week while in service.

NS-6 Structure Demolition/Removal Over or Adjacent to Water



DEFINITION

Procedures to protect watercourses from debris and wastes associated with structure demolition or removal operations over or adjacent to them.

PURPOSE

- Ensure prevention of pollution to waterways beneath or adjacent to structures during all demolition or removal activities.

AT A GLANCE

	• Acquire applicable permits prior to structure demolition or removal
	• N/A
	<ul style="list-style-type: none"> • PP-7 Stockpile Management • NS-7 Material and Equipment Use Over Water
	<ul style="list-style-type: none"> • Inspect equipment and debris catching devices daily • Inspect stockpile protection measures and repair as needed



Demolition over the San Carlos River where clean Water Diversion (NS-5) was used to keep the river clean and free of debris.

RATINGS

Associated Costs

Design	●
Construction	●
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	
Runoff Control	
Sediment Control	
Pollution Prevention	○
Non-Stormwater	●
Waste Management	●



The demolition of the Guthrie Bridge over the Gila River presented multiple sediment and pollution control challenges.



APPROPRIATE APPLICATIONS

- All construction projects with full or partial structure demolition or removal including, but not limited to bridge widening projects and concrete channel removal.

LIMITATIONS

- Specific permit requirements may be included in the contract documents.

PLANNING/DESIGN CONSIDERATIONS

- Refer to the Stormwater Control Measure NS-5 Clear Water Diversion to direct water away from the work area.
- Plan for and ensure the safe passage of wildlife.
- Demolition triggers National Emission Standards for Hazardous Air Pollutants (NESHAPS).



Great care must be taken when working adjacent to our waterways. One uncompacted earthen berm will not prevent direct discharges to waterbodies.

STANDARDS

- Do not allow demolished material to enter the watercourse.
- Use attachments on construction equipment such as backhoes to catch debris from small demolition operations.
- Use covers or platforms approved by the Engineer to collect debris.
- Stockpile accumulated debris and waste generated during demolition away from watercourses and per the Stormwater Control Measure PP-7 Stockpile Management.
- Report discharges to watercourses to the Engineer immediately upon discovery and a written discharge notification must follow within the time frame specified in the applicable permit.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect demolition areas over or near adjacent watercourses on a daily basis.
- Empty debris-catching devices regularly. Remove collected debris and store debris away from the watercourse and protect debris from run-on and runoff.

NS-7 Material & Equipment Use In/Over Watercourses



DEFINITION

Procedures for the proper use, storage, and disposal of materials and equipment on barges, boats, temporary construction pads, or similar locations.

PURPOSE

- Minimize or eliminate the discharge of potential pollutants to a watercourse.

AT A GLANCE



- Acquire and comply with all necessary permits



- N/A



- PP-3 Vehicle and Equipment Maintenance
- PP-5 Material Delivery and Storage
- PP-8 Spill Prevention and Control
- NS-6 Structure Demolition/Removal Over or Adjacent to Water



- Inspect equipment for leaks and spills daily; repair as necessary
- Inspect and maintain all associated Stormwater Control Measures

RATINGS

Associated Costs

Design	○
Construction	◐
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	●
Runoff Control	●
Sediment Control	●
Pollution Prevention	●
Non-Stormwater	●
Waste Management	●



Bridge repair.



Drill lubricant use below Ordinary Water Mark of a WOUS is common on bridge construction/repair. Insure perimeter control measures as well a filter tanks are on site, installed, and available prior to work.

**APPROPRIATE APPLICATIONS**

- Implement for construction materials and wastes (solid and liquid) and any other materials that may be detrimental if released.
- Applicable where materials and equipment are used on barges, boats, docks, and other platforms over or adjacent to a watercourse.

LIMITATIONS

- N/A

PLANNING/DESIGN CONSIDERATIONS

- Comply with all necessary permits required for construction within or near the watercourse.
- Secure all materials to prevent discharges to receiving waters via wind.
- Identify types of spill control measures to be employed, including the storage of such materials and equipment.
- Ensure that staff are trained regarding the deployment and access of control measures and that measures are being used.
- Prepare an Emergency Evacuation Plan that defines implementation procedures in the event of a sudden flood event.

STANDARDS

- Use drip pans and absorbent materials for equipment and vehicles and ensure that an adequate supply of spill cleanup materials is available.
- Drip pans shall be placed under all vehicles and equipment placed on docks, barges, or other structures over watercourses when the vehicle or equipment is expected to be idle for more than one hour.
- Discharges to waterways shall be reported to the Engineer immediately upon discovery. A written discharge notification must follow within the time frame specified in the applicable permit.
- Provide watertight curbs or toe boards to contain spills and prevent materials, tools, and debris from leaving the barge, platform, dock, etc.
- Ensure the timely and proper removal of accumulated wastes. Refer to Stormwater Control Measures WM-1 Solid Waste Management and WM-2 Hazardous Waste Management.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Inspect equipment for leaks and spills daily, repair as necessary.
- Ensure that employees and subcontractors implement appropriate measures for storage and use of materials and equipment.
- Inspect and maintain all associated Stormwater Control Measures and perimeter controls to ensure continuous protection of the watercourse.

Waste Management (WM) Stormwater Control Measures



Waste management Stormwater Control Measures are also source control measures to prevent pollution by limiting or reducing potential pollutants at the source before they come in contact with stormwater. These Stormwater Control Measures involve day-to-day operations of the construction site, are under the control of the contractor, and are additional "Pollution Prevention practices" that involve keeping a clean, orderly construction site.

- WM-1 Solid Waste Management
- WM-2 Hazardous Waste Management
- WM-3 Contaminated Soil Management
- WM-4 Concrete Waste Management
- WM-5 Liquid Waste Management

An EPA ID number provides the EPA with a general description of activities at sites that handle regulated wastes. The ID number is required for hazardous waste generators, transporters, recyclers, and treatment, storage and disposal facilities (TSDFs). It is site-specific and valid only for the physical location. Owners, operators, facilities and addresses may change, but the site's EPA ID will never expire.

If the site has no assigned EPA ID number, the facility must submit an initial notification through ADEQ's online portal, myDEQ. Any changes to the site, as outlined by federal law, require a subsequent notification through myDEQ. If the facility moves, it must obtain another EPA ID number that will be valid only for the new physical location.





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WM-1 Solid Waste Management



DEFINITION

Practices to use to minimize and prevent waste associated with construction activities from entering storm drains and watercourses.

PURPOSE

- Control a major cause of pollution on construction sites.
- Prevent the contamination of stormwater from stockpiled waste materials.
- Prevent the clogging of storm drain systems.

AT A GLANCE



- Clearly post guidelines on site
- Plan the frequency of disposal
- Properly store and cover in a convenient location
- Separate green waste for use as compost or mulch
- Recycle where possible



- N/A



- PP-6 Material Use
- PP-7 Stockpile Management
- NS-6 Structure Demolition/Removal Over or Adjacent to Water
- NS-7 Material and Equipment Use Over Water



- Regularly check for and remove litter and debris from drainage grates and other drainage structures
- Adhere to a regular, scheduled maintenance plan

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	○
Runoff Control	○
Sediment Control	○
Pollution Prevention	●
Non-Stormwater	●
Waste Management	●



Dumpsters must be watertight. If there is a drain, it must be plugged.

**APPROPRIATE APPLICATIONS**

- Required for all construction projects that generate solid waste such as construction wastes (brick, pavement, timber), vegetative material and litter.

LIMITATIONS

- May require extra management time to ensure all workers are following proper procedures.

PLANNING/DESIGN CONSIDERATIONS

- Proper solid waste procedures and practices are overseen and enforced by the Contractor's Erosion Control Coordinator.
- Plan the frequency of disposal to remove solid waste before it accumulates beyond the capacity of the on-site facilities.
- Place on-site facilities in convenient locations for ease of maintenance.
- Prohibit littering by employees, subcontractors and visitors. Collect litter from work areas within the construction limits of the project and place in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public or others.
- Notify trash-hauling contractors that only watertight dumpsters are permitted for use on project site.
- Coordinate disposal of construction debris and all domestic garbage with the local jurisdiction.
- Consider using inert waste material as fill, as directed by the Engineer.
- Consider separating green waste for compost or mulch.
- The 2017 EPA CGP states, "waste containers that do not have lids, provide either (1) cover (e.g., a tarp, plastic sheeting, temporary roof) to minimize exposure of wastes to precipitation, or (2) a similarly effective means designed to minimize the discharge of pollutants (e.g., secondary containment)".

MATERIAL SPECIFICATIONS

- Material that is to be stockpiled or disposed of offsite shall be in accordance with ADOT Standard Specifications for Road and Bridge Construction Section 107.11.

DESIGN STANDARDS

- Locate solid waste storage areas at least 50 feet from drainages and do locate in areas prone to flooding or ponding.
- Divert stormwater away from stored solid waste with temporary berms or dikes or by other means.
- Provide watertight trash receptacles in the contractor's yard, field trailer areas and other locations where workers congregate for lunch and break periods.
- Provide cover for dumpsters and waste containers.
- Dumpster washout on the project site is not permitted.

**INSPECTION AND MAINTENANCE REQUIREMENTS**

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Check for and remove litter and debris from drainage grates and other drainage structures.
- Provide regular on-site trash collection.
- Provide regular maintenance of trash containers and dumpsters.
- Provide cover for dumpsters and waste containers to prevent entry of rainwater and loss of contents by high winds.



This waste container should be emptied soon.



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WM-2 Hazardous Materials Management



DEFINITION

The planning and practice to meet the requirements for handling hazardous waste materials on a construction site.

Title 40 CFR § 116.4 Designation of hazardous substances. The elements and compounds appearing in Tables 116.4 A and B of Section 116 are designated as hazardous substances in accordance with section 311(b)(2)(A) of the Act. This designation includes any isomers and hydrates, as well as any solutions and mixtures, and common names of the designated substance containing these substances.

Title 40 CFR § 117.3 contains the determination of reportable quantities (RQ). A RQ is listed on SDS sheets for chemical compounds. Yet, many of the products we use contain a combination of many chemical compounds making RQ determinations difficult. Contact the District Environmental Coordinator (DEC) and Water Quality for questions in determining RQs of common products used on ADOT projects. National Response Center (800-424-8802) of spills of Federal reportable quantities.

Title 40 CFR part 302, assigns the RQs in Table 302.4 for that substance. Find out more here: <https://www.govinfo.gov/content/pkg/CFR-2004-title40-vol26/pdf/CFR-2004-title40-vol26-sec302-4.pdf>

PURPOSE

- Control the release of hazardous materials.
- Prevent the contamination of stormwater.
- Prevent a delay in the project schedule and additional costs and fees due to environmental investigations/enforcement actions.



- Clearly post guidelines on site
- Comply with all federal, state and local laws. Identify hazardous materials to be used on the construction site
- Maintain careful records of storage, handling and disposal of hazardous materials
- Locate away from storm drains or watercourses and away from moving vehicles and equipment; keep in appropriate containers



- Inspect all perimeter controls, containment structures, covers and liners; immediately repair and replace
- Dispose of waste material as directed by the Engineer and as specified in the project specifications and the applicable permits

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	○

Stormwater Control Measure Objectives

Erosion Control	○
Runoff Control	○
Sediment Control	○
Pollution Prevention	●
Non-Stormwater	●
Waste Management	●



• N/A



- PP-8 Spill Prevention and Control
- WM-1 Solid Waste Management
- WM-3 Contaminated Waste Management

**APPROPRIATE APPLICATIONS**

- Required for all construction activities that use hazardous materials and generate hazardous waste.

LIMITATIONS

- May require extra management time to ensure all workers are following proper procedures.
- Lifespan of the cover or structure.
- Additional training and education, or certification may be required for dealing with hazardous materials.
- Do not label containers without absolute knowledge of the content or in conflict with manufacture SDS information.

PLANNING/DESIGN CONSIDERATIONS

- Contractor must comply with all federal, state and local laws regarding hazardous materials on a construction site.
- Educate employees and subcontractors on hazardous material storage and disposal procedures.
- Identify hazardous materials that will be needed on the construction site and plan for storage, use and disposal.
- Maintain careful records of the storage, handling and disposal of hazardous materials.
- Limit inventories of hazardous materials and do not store “empty” or remaining products on the project site.
- Designate a secondary containment area/container for the staging of hazardous materials (i.e. batteries, oils, fuels, pesticides), include signage and educate personnel on the site as to the location and purpose.

MATERIAL SPECIFICATIONS

- Hazardous materials include waste generated from the use of:
 - Petroleum products.
 - Septic wastes.
 - Paints and stains.
 - Wood preservatives.
 - Asphalt products.
 - Pesticides.
 - Acids.
 - Solvents.
 - Roofing tar.
 - Any materials deemed hazardous waste in the state of Arizona.
- In the event of a spill of a hazardous material, the contractor shall follow the provisions of the ADOT Standard Specifications for Road and Bridge Construction Section 107.07.



These waste containers are a good example of clear labeling and covered storage.



Batteries, chemicals, and adhesives should be placed in secondary containment and disposed of or recycled as soon as they are no longer useable. These waste containers are a good example of clear labeling and covered storage.

DESIGN STANDARDS

- Designate hazardous material storage areas on site away from storm drains or watercourses and away from moving vehicles and equipment.
- Segregate hazardous material from non-hazardous construction site debris.
- Keep liquid or semi-liquid hazardous materials in appropriate containers (closed drum or similar), under cover, and within secondary containment.
- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Never mix waste types or combine container contents.
- In the event of a hazardous material spill, the Erosion Control Coordinator shall modify the SWPPP as necessary within 14 calendar days to include a description of the release, the circumstances leading to the release, and the date of the release.
- Maintain a clean and orderly work environment.
- Properly dispose of hazardous material meant for disposal within 90 days of being generated or as directed by the Engineer.
- The contractor shall assist in any efforts to clean up hazardous material spills, as directed by the Engineer or other authorities.
- Dispose of soil contaminated from spills according to applicable state and federal regulations.
- Notify the National Response Center (800-424-8802) of spills of Federal reportable quantities.

**INSPECTION AND MAINTENANCE REQUIREMENTS**

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- The contractor's Erosion Control Coordinator monitors on-site hazardous materials storage and disposal procedures.
- Inspect perimeter controls, containment structures, covers and liners on a weekly basis and immediately repair or replace as needed.

ADDITIONAL INFORMATION AND RESOURCES

- Information about the requirements for the handling of hazardous waste on construction sites is available from the Arizona Department of Environmental Quality (ADEQ) Waste Management Program, (602) 771-4153.
- 24-hour ADEQ Emergency Response Duty Office, (602) 771-2330 or (800) 234-5677.
- ADEQ Waste Management Programs Division: Hazardous Waste Management, [http:// www.azdeq.gov/environ/waste/hazwaste/index.html](http://www.azdeq.gov/environ/waste/hazwaste/index.html)



Drums should never be placed on their side out of secondary containment plastic sheeting will not capture 55 gallons of material and result in contaminated soils (WM-3).

WM-3 Contaminated Soil Management



DEFINITION & PURPOSE

Procedures and practices to minimize or eliminate the discharges of pollutants to drainage systems or to watercourses from contaminated soil.

AT A GLANCE



- Clearly post guidelines on site
- Follow appropriate agency practices and regulations
- Identify contaminated soils in planning stages
- Test suspected areas at a certified lab
- Require employees and subcontractors complete a safety training program



• N/A



- WM-2 Hazardous Waste Management



- Monitor on-site contaminated soil storage and disposal procedures
- Inspect hazardous waste receptacles and areas regularly



Evidence of contaminated soils.

RATINGS

Associated Costs

Design	○
Construction	○
Maintenance	●

Stormwater Control Measure Objectives

Erosion Control	○
Runoff Control	○
Sediment Control	○
Pollution Prevention	●
Non-Stormwater	●
Waste Management	●



Contaminated soils are not always this readily apparent. Past site uses and activities should be researched early in the project clearing NEPA process.

**APPROPRIATE APPLICATIONS**

- Construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, and leaks from underground storage tanks.
- Highway widening projects in older areas where median and shoulder soils may have been contaminated by aerially deposited lead (ADL).
- Construction personnel often find illicit discharges or evidence of an illicit discharge and must report any finding to the Engineer upon discovery.

LIMITATIONS

- The procedures and practices presented in this Stormwater Control Measure are general. The contractor needs to identify appropriate practices and procedures for the specific contaminants known to exist or discovered on site.
- May require extra management time to ensure all workers are following proper procedures.
- Proper training and Personal Protective Equipment (PPEs) are required for addressing many contamination scenarios. No one is to address contamination remediation alone and without prior Engineer notification.

The ADOT Environmental Planning includes a HazMat team that provides technical assistance and education to ADOT, ADOT Contractors, and its customers in support of ADOT's mission.

PLANNING/DESIGN CONSIDERATIONS

- Contaminated soils are often identified during project planning and development with known locations identified in the plans and specifications. The contractor shall review applicable reports and investigate appropriate call-outs in the plans and specifications.
- The contractor's SWPPP site maps must label demarcate environmental avoidance areas that are identified in the project special provisions and/or plans.
- The contractor may further identify contaminated soils by investigating:
 - Past site uses and activities.
 - Detected or undetected spills and leaks.
 - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris. Test suspected soils at a certified laboratory.
- Prior to performing any excavation work at the locations containing material classified as hazardous, employees and subcontractors shall complete a safety training program covering the potential hazards as identified.



- Coordination with ADOT HazMat and notification to the Engineer prior to performing contractor identified contamination remediation.
- Training records containing names, dates, and subject matter are kept with the contractor's SWPPP.
- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Vehicle and Equipment tires and exteriors of trucks and other earth-moving equipment may be required to be washed before leaving the site so that the soil is not tracked onto roads or adjacent properties.

HANDLING PROCEDURES

- Once a potentially contaminated area has been identified, untrained personnel must not be allowed to work, travel through, or enter such areas until professional personnel, trained/certified in remediation, have approved the area and the Engineer is notified.

MATERIAL AND AERIALY DEPOSITED LEAD (ADL)

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.
- Excavation, transportation, and placement operations shall result in no visible dust.
- Use caution to prevent spillage of lead containing material during transport.
- Monitor the air quality during excavation of soils contaminated with lead.
- Waste manifest including dates, material, amount and signatures will be kept with the contractors SWPPP.

CONTAMINATED SOILS

- Test suspected soils at an approved certified laboratory.
- If the soil is contaminated, work with the local regulatory agencies to develop options for treatment and/or disposal.
- Avoid temporary stockpiling of contaminated soils or hazardous material.
- If temporary stockpiling is necessary:
- Cover the stockpile with tarps.

Central Office

1611 W. Jackson St.
MD EM02
Phoenix, AZ 85007
Phone: 602.712.7767
Fax: 602.712.3066

Flagstaff Office

1801 S. Milton Rd.
MD F500
Flagstaff, AZ 86001
Phone: 928.774.1491
Fax: 928.774.0784

Tucson Office

1221 S. Second Ave.
MD T100
Tucson, AZ 85713
Phone: 520.388.4200
Fax: 520.388.4255



- Install a berm around the stockpile to prevent runoff from leaving the area.
- Do not stockpile in or near storm drains or watercourses.
- Remove and place contaminated material and hazardous material on exteriors of transport vehicles either into the current transport vehicle or the excavation prior to the vehicle leaving the exclusion zone.

The EPA has issued a “Citizens Guide to Excavation of Contaminated Soils:
https://www.epa.gov/sites/production/files/2015-04/documents/a_citizens_guide_to_excavation_of_contaminated_soil.pdf

- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.
- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.
- Collect water from decontamination procedures and treat and/or dispose of it at appropriate disposal site.
- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.
- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.
- Excavation, transport, and disposal of contaminated material and hazardous material shall be in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this Stormwater Control Measure):
 - U.S. Department of Transportation (USDOT).
 - U.S. Environmental Protection Agency (USEPA).
 - Arizona Department of Environmental Quality (ADEQ).
 - Arizona Division of Occupation Safety and Health Administration.
 - Local regulatory agencies.

**PROCEDURES FOR UNDERGROUND STORAGE TANK REMOVALS**

- Obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies which have jurisdiction over such work prior to commencing tank removal operations.
- Arrange to have tested, as directed by the Engineer, any liquid or sludge found in the underground tank prior to its removal to determine if it contains hazardous substances.
- Take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s) following the tank removal.
- Transport the underground storage tank, any liquid and/or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal to disposal facilities permitted to accept such waste.

WATER CONTROL

- Take all necessary precautions and preventive measures to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to: berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.
- Discharge contaminated water to clean, closed top, watertight holding tanks; treat, and dispose of in accordance with federal, state, and local laws.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- The Contractor's Erosion Control Coordinator and/or construction supervisor shall monitor on-site contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.
- Inspect hazardous waste receptacles and areas regularly.



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WM-4 Concrete Waste Management



DEFINITION

Methods and procedures for the management of concrete waste including concrete slurry, mortar mixing stations and on-site concrete washout facilities.

PURPOSE

- Prevent fresh concrete or cement-laden mortar from entering a storm drainage system and/or receiving water.

AT A GLANCE



- Clearly post guidelines on site
- Locate for convenient truck access, near pour site; not within 50' of storm drains
- Multiple washout facilities may be needed on sites with extensive concrete work



- SC-1 Sediment Control Berm



- SC-4 Sediment Basin
- SC-10 Stabilized Construction Entrance/ Exit
- SC-11 Stabilized Construction Roadway
- WM-1 Solid Waste Management
- WM-5 Liquid Waste Management



- Monitor on-site concrete waste per applicable permit requirements
- Remove and dispose of hardened concrete in washout areas

RATINGS

Associated Costs

Design	○
Construction	◐
Maintenance	●

Stormwater Control Measure Objectives

Erosion Control	○
Runoff Control	○
Sediment Control	○
Pollution Prevention	●
Non-Stormwater	●
Waste Management	●



This simple containment system is appropriate for small jobs.

**APPROPRIATE APPLICATIONS**

- Where concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Where slurries containing Portland cement concrete (PCC) or asphalt concrete (AC) are generated, such as from saw-cutting, coring, grinding, milling, grooving, and hydro- concrete demolition.
- Where concrete trucks and other concrete-coated equipment are washed on site, when approved by the Engineer.
- Coring and saw-cutting operations/locations.
- Mortar mixing stations.

LIMITATIONS

- May require extra management time to ensure all workers follow proper procedures.

PLANNING/DESIGN CONSIDERATIONS

- Locate concrete washout facilities a minimum of 50 feet from storm drains, open ditches, or watercourses.
- Locate concrete washout facilities for convenient truck access, near the pour site if possible.
- Provide multiple washout facilities on sites with extensive concrete work.
- Designate and post signage for each washout area.
- Educate employees, subcontractors and suppliers on the concrete waste management techniques described herein.



Slurry residue must be properly captured and contained.

**MATERIAL SPECIFICATIONS**

- N/A

DESIGN STANDARDS

- Temporary pit or bermed area or for washout of concrete trucks, tools, mortar mixers, etc.
- Concrete slurry waste.
- Place berms or sandbags or other Stormwater Control Measures around coring and saw-cutting locations to capture and contain slurry.
- Vacuum slurry waste or collect it in a temporary lined pit and allow to dry.
- Properly dispose of slurry residue.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- The contractor's Erosion Control Coordinator shall monitor on-site concrete waste storage and disposal procedures at least weekly.
- Maintain temporary concrete washout facilities to provide adequate holding capacity with a minimum freeboard of 4 inches for above grade facilities and 12 inches for below grade facilities. Maintenance shall include removing and disposing of hardened concrete and returning the facilities to a functional condition.



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WM-5 Liquid Waste Management

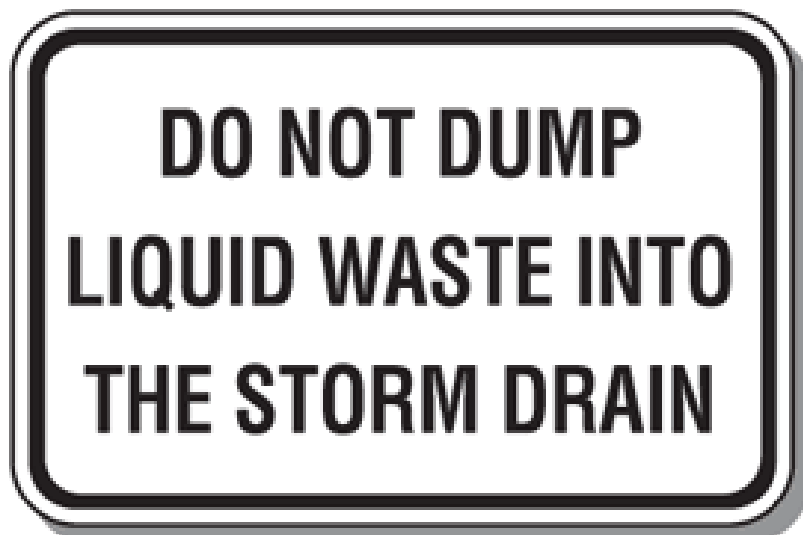


DEFINITION & PURPOSE

Procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

AT A GLANCE

 <ul style="list-style-type: none"> Clearly post guidelines on site Verify allowable non-stormwater discharges in applicable PDES permit Additional permits may apply 	RATINGS
 <ul style="list-style-type: none"> N/A 	Associated Costs
 <ul style="list-style-type: none"> SC-3 Sediment Trap PP-1 Vehicle and Equipment Cleaning PP-8 Spill Prevention and Control WM-2 Hazardous Waste Management WM-4 Concrete Waste Management 	Design ○
 <ul style="list-style-type: none"> Check employees and subcontractors monthly to ensure appropriate practices are employed Inspect containment areas and capturing devices frequently for damage and repair as needed 	Construction ○
	Maintenance ●
	Stormwater Control Measure Objectives
	Erosion Control ○
	Runoff Control ○
	Sediment Control ○
	Pollution Prevention ●
	Non-Stormwater ○
	Waste Management ●



Clear and appropriate signage can help achieve project goals.

**APPROPRIATE APPLICATIONS**

- Construction projects that generate any of the following non-hazardous by-products, residuals or wastes:
 - Drilling slurries and drilling fluids.
 - Grease-free and oil-free wastewater and rinse water.
 - Dredgings.
 - Concrete or stucco.
 - Paint or release oils or agents.
 - Curing compounds.
 - Other non-stormwater liquid discharges not permitted by separate permits.

LIMITATIONS

- Disposal of some liquid wastes may be subject to specific laws and regulations or to requirements of other permits secured for the construction project.
- Does not apply to dewatering operations, solid wastes, hazardous wastes, or concrete slurry residue. Refer to Stormwater Control Measures NS-2 Dewatering Operations, WM-1 Solid Waste Management, WM-2 Hazardous Waste Management and WM-4 Concrete Waste Management.
- Does not apply to non-stormwater discharges permitted by any ADEQ permit held by the pertinent ADOT District, unless the discharge is determined by ADOT to be a source of pollutants. Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and, discharges or flows from emergency fire fighting activities.
- May require extra management time to ensure all workers follow proper procedures.

PLANNING CONSIDERATIONS AND GENERAL PRACTICES

- The Contractor's Erosion Control Coordinator shall oversee and enforce proper liquid waste management procedures and practices.
- Instruct employees and subcontractors how to safely differentiate between nonhazardous liquid waste and potential or known hazardous liquid waste.
- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.
- Educate employees and subcontractors on liquid waste generating activities, and liquid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Verify which non-stormwater discharges are permitted by the ADOT Statewide AZPDES permit; different regions might have different requirements not outlined in this permit. Some listed discharges may be prohibited if ADOT determines the discharge to be a source of pollutants.



Training is a key part of ensuring compliance.

- Apply Stormwater Control Measure PP-1 Vehicle and Equipment Cleaning for managing wash and rinse water from vehicle and equipment cleaning operations.

CONTAINING LIQUID WASTES

- Drilling residue and drilling fluids are not allowed to enter storm drains and watercourses and shall be properly disposed of outside the highway right-of-way.
- Drilling residue and drilling fluids may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in Stormwater Control Measure WM-4 Concrete Waste Management if an appropriate location is available, as determined by the Engineer.
- Contain liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud; do not allow to flow into drainage channels or receiving waters prior to treatment.
- Contain liquid wastes in a controlled area, such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Containment devices must be structurally sound and leak free.
- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.
- Take precautions to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in Stormwater Control Measure PP-8 Spill Prevention and Control.
- Do not locate containment areas or devices where accidental release of the contained liquid can threaten health or safety, or discharge to watercourses, channels, or storm drains.

**CAPTURING LIQUID WASTES**

- Capture all liquid wastes running off a surface which has the potential to affect the storm drainage system such as wash water and rinse water from cleaning walls or pavement.
- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.
- If the liquid waste is sediment laden, use a sediment trap (refer to Stormwater Control Measure SC-3 Sediment Trap) for capturing and treating the liquid waste stream, or capture in a containment device and allow sediment to settle.

DISPOSING OF LIQUID WASTES

- Dewater the contained liquid waste using procedures such as described in Stormwater Control Measures
- NS-2 Dewatering Operations and SC-4 Sediment Basin and dispose of resulting solids per Stormwater Control Measure WM-1 Solid Waste Management or per Standard Specifications for off-site disposal.
- Method of disposal for some liquid wastes may be prescribed in Water Quality Reports, AZPDES permits, Environmental Impact Reports, 401 or 404 permits, local agency discharge permits, etc., and may be defined elsewhere in the Special Provisions.
- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined. For disposal of hazardous waste, refer to Stormwater Control Measure WM-4 Hazardous Waste Management.
- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

INSPECTION AND MAINTENANCE REQUIREMENTS

- Follow inspection schedule specified in the applicable stormwater discharge permit.
- Spot check employees and subcontractors at least monthly throughout the job to ensure appropriate practices are being employed.
- Remove deposited solids in containment areas and capturing devices as needed, and at the completion of the task. Dispose of any solids as described in the Stormwater Control Measure WM-1 Solid Waste Management.
- Inspect containment areas and capturing devices frequently for damage, and repair as needed.

ATTACHMENT A: ABBREVIATIONS & ACRONYMS



AASHTO	American Association of State Highway and Transportation Officials
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
APP	Aquifer Protection Permit
ARS	Arizona Revised Statutes
AZCGP	Arizona Construction General Permit
AZGFD	Arizona Game and Fish Department
AZPDES	Arizona Pollutant Discharge Elimination System
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practice
BOR	Bureau of Reclamation
CFR	Code of Federal Regulations
CGP	Construction General Permit
CORPS	United States Army Corps of Engineers
CRZ	Critical Root Zone
CWA	Clean Water Act
DEC	District Environmental Coordinator
DMGP	De Minimis General Permit
DOD	Department of Defense
ECC	Erosion Control Coordinator
EPA	Environmental Protection Agency
EPCM	ADOT Erosion and Pollution Control Manual
EPCP	Erosion and Pollution Control Plan (ESCP Erosion and Sediment Control Plans-2005 manual)

EPG	Environmental Planning Group (ADOT)
ENGINEER	ADOT Resident Engineer or Resident Landscape Architect
FCGP	Federal Construction General Permit
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
IDDE	Illicit Discharge Detection & Elimination
LID	Low Impact Development
MAG	Maricopa Association of Governments
MOU	Memorandum of Understanding
MS4	Municipal Separate Storm Sewer System
MSDS	Material Safety Data Sheet
MSGP	Multi-Sector General Permit
NEPA	National Environmental Policy Act
NESHAPS	National Emission Standard for Hazardous Air Pollutants
NOI	Notice of Intent
NOT	Notice of Termination
NPS	National Park Service
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
OES	Office of Environmental Services (ADOT)
PPE	Person Protective Equipment
PAG	Pima Association of Governments
ROW	Right-of-Way
SPCC	Spill Prevention, Containment and Countermeasures
SSWMP	Statewide Stormwater Management Plan
SWPPP	Stormwater Pollution Prevention Plan
SWAT	Stormwater Advisory Team
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load

TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
USDA	United States Department of Agriculture
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USDOT	United States Department of Transportation
USFS	USDA Forest Service
WMAR	White Mountain Apache Reservation

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ATTACHMENT B: DEFINITIONS OF TERMS



Arizona Construction General Permit (AZCGP)

Provides authorization to discharge under the Arizona Discharge Elimination System; specifically authorizes only discharges from construction activities in Arizona by those owners and operators who meet eligibility requirements and comply with the general permit terms and conditions.

ADOT

The Arizona Department of Transportation as the permittee, owner/operator and project manager of all its contractors and sub-contractors.

Arizona Pollutant Discharge Elimination System (AZPDES)

The Arizona Department of Environmental Quality Program by which permits are issued for allowable discharges to waters of the United States and authorization is granted to qualified candidates for coverage under the Arizona Construction General Permit.

Aquifer Protection Permit (APP)

The Arizona Department of Environmental Quality permit that covers discharge of pollutants directly or indirectly to an aquifer or to the land surface or vadose (the areas between the aquifer and the land surface) zone in such a manner that there is a reasonable probability that the pollutant will reach an aquifer.

Arizona Revised Statutes

Statutory laws in the state of Arizona.

Best Management Practice (BMP)

A technique, process, activity, or structure used to reduce the pollutant content of a storm water discharge minimizing the potential impacts upon receiving waters. These measure can either be structural devices or non-structural practices.

Clean Water Act (CWA)

Establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. "Clean Water Act" became the Act's common name with amendments in 1977.

Code of Federal Regulations (CFR)

The codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government.

Concentrated Flow

Runoff that accumulates or converges into well-defined channels with greater velocity than Sheet Flow.

Construction Site

The land or water area where construction activities will occur and where stormwater controls will be installed and maintained. The construction site includes construction support activities, which may be located at a different part of the property from where the primary construction activity will take place, or on a different piece of property altogether. The construction site is often a smaller subset of the lot or parcel within which the project is taking place. (NPDES definition)

Construction BMP

Temporary measures to manage (control) storm water quality during the construction process. Construction Support Activities A construction-related activity that specifically supports the construction activity and involves earth disturbance or pollutant-generating activities of its own, and can include activities associated with concrete or asphalt batch plants, equipment staging yards, materials storage areas, excavated material disposal areas, and borrow areas. (NPDES definition)

Contractor

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

Control Measure

In both the EPA-CGP and the AZCGP, the term control measure refers to any BMP or other method (including effluent limitations) used to prevent or reduce the discharge of pollutants to waters of the United States. These measure can either be structural devices or non-structural practices.

Corrective Action (EPA)

The current EPA CGP does consider routine maintenance or repairs as corrective actions. If any of the following conditions at the construction site occur resulting in or from a failure of a control measure, the operator shall implement new or modified control(s) and document correction according to the CGP:

- A stormwater control needs repair or replacement (beyond permit required routine maintenance)
- A stormwater control necessary to comply with the requirements of this permit was never installed, or was installed incorrectly
- Your discharges are causing an exceedance of applicable water quality standards
- A prohibited discharge has occurred

Corrective Action (ADEQ)

The current AZCGP does not consider routine maintenance or repairs as corrective actions. If any of the following conditions at the construction site occur resulting in or from a failure of a control measure, the operator shall implement new or modified control(s) and document correction according to the CGP:

- A necessary control measure was never installed, was installed incorrectly, or not in accordance with the requirements of the AZCGP
- A prohibited discharge is occurring or has occurred
- ADEQ or USEPA determines that modifications to the control measures are necessary to meet the requirements of the CGP

Crown Ditch

A swale installed at the tops of slopes to divert sheet flow from adjacent undisturbed slopes onto newly constructed cut slopes.

Cut Slope

A slope that is excavated. Contrast with Fill Slope.

De Minimis General Permit

Designed to cover point source discharges released to a stormwater sewer system. Discharges from potable or reclaimed water systems, subterranean dewatering, well development, aquifer testing, hydrostatic testing of pipelines, fire hydrants and tanks, residential cooling water, charitable car washes, building and street washing and dechlorinated swimming pool drainage are covered under this permit.

Detention / Retention Basin

Facilities typically constructed below the roadway shoulder where the appropriate footprint is available to hold runoff, and are also referred to as pond-in-place practices. Retention and detention basins are excavated in most any configuration to meet footprint restrictions and can be vegetated.

Discharge

Any addition of any pollutant to waters of the United States from any point source.

Embankment Curb

Installed on fill slopes at the edge of the roadway to intercept flow from paved surfaces. Openings in the curb are constructed to drain into a spillway or downdrain.

Environmental Clearance

Documentation that all relevant environmental factors have been appropriately addressed and mitigated in accordance with the National Environmental Policy Act. Primary documents include Categorical Exclusions, Environmental Assessments, or Environmental Impact Statements depending on the environmental impacts of the project.

Erosion

The process by which solids (sediment, soil, rock or other particles) are removed from the surface of the earth by the action of water, wind, glaciers or waves, etc.

Erosion Control Coordinator (ECC)

Hired by the contractor and approved by ADOT. The ECC shall be responsible for preparing, implementing, monitoring, and revising the approved SWPPP throughout the project, and for implementing any other permit requirements stipulated in the AZPDES general permit. The ECC shall be knowledgeable in the principles and practice of erosion and sediment controls, and possess the skills to assess conditions at the site that could impact stormwater quality and the effectiveness of the contractor's erosion control measures used to control the quality of the stormwater discharges. Specific required qualifications for the erosion control coordinator are specified in the ADOT Stored Specification 104SWDEQ and 104SWEPA.

Fascine

A bundle of live sticks or branches tied together into sausage like structures and then placed to provide slope stability or prevent erosion.

Final Stabilization

All soil disturbing activities at the site have been completed and the criteria specified in the ADOT Methodology for Determining Final Stabilization document have been met.

Federal Construction General Permit (FCGP)

Issued by the EPA this permit provides authorization to discharge from construction activities in Indian Country in Arizona.

Federal Highway Administration (FHWA)

Part of the U.S. Department of Transportation whose mission is to 'improve mobility on our nation's highways through leadership, innovation and program delivery'.

Fill Slope

An embankment created with excavated (borrow) material. Contrast with Cut Slope.

Impaired Water

A surface water that has been assessed by ADEQ of EPA under section 303(d) of the Clean Water Act, as not attaining a water quality standard for at least one designated use and is listed in Arizona's 2016 303(d) and Other Impaired Waters List.

Indian Country

All the land under supervision of the United States Government that has been set aside for the use of Native Americans including reservations and other areas under Federal jurisdiction and designated for Native Americans' use. Also considered "Tribal Land"

Low Impact Development

A stormwater strategy concerned with maintaining or restoring the natural hydrologic functions of a site to achieve natural resource protection objectives and fulfill environmental regulatory requirements. (Center for Environmental Excellence, AASHTO)

Municipal Separate Storm Sewer System (MS4)

A conveyance or system of conveyances that transport stormwater and are owned by a state, city, town, village or other public entity.

Multi-Sector General Permit (MSGP)

Specifically authorizes stormwater discharges associated with industrial activities by those owners and operators who meet the eligibility requirements of the permit and who comply with the general permit requirements and conditions.

National Pollutant Discharge Elimination System (NPDES)

The National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

Non-point Source Pollution

Occurs when rainfall, snow melt or irrigation runs over land or through the ground, picks up contaminants and deposits them into rivers, lakes and coastal waters or introduces them into ground water.

Notice of Intent (NOI)

The application to operate under the Arizona or Federal Construction General Permit.

Notice of Termination (NOT)

The application to terminate coverage under the Arizona or Federal Construction General Permit.

Operator

Operator means any person associated with a construction project that meets one or both of the following two criteria:

1. The person has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications
2. The person has day-to-day operational control of those activities at a project which are necessary to ensure compliance with a SWPPP for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions)

Outstanding Arizona Water (OAW)

A surface water that is classified as an outstanding state resource water under Arizona Administrative Code R18-11-112.

Point Source Pollution

Pollution that can be traced back to a single origin or source such as a pipe, culvert or sewage treatment plant discharge.

Pollutant

Sediment, fluids, contaminants, toxic wastes, toxic pollutants, dredged spoil, solid waste, substances and chemicals, pesticides, herbicides, fertilizers and other agricultural chemicals, incinerator residue, sewage, garbage, sewage sludge, munitions, petroleum products, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt (e.g., overburden material), and mining,

industrial, municipal and agricultural wastes or any other liquid, solid, gaseous or hazardous substances. [A.R.S. § 49-201(29)]

Paved Area Accessible to the Public

Any paved parking lot, paved roadway or sidewalk that can be entered or used for public travel primarily for purposes unrelated to construction operation.

Post-Construction BMP

Permanent measures to manage storm water quality both during and after construction of the project.

“Qualified person” or “Qualified personnel”

Qualified personnel are those (either the operator's employees or outside personnel) who are knowledgeable in the principles and practice of erosion and sediment controls and pollution prevention, who possess the skills to assess conditions at the construction site that could impact stormwater quality, and the skills to assess the effectiveness of any control measures selected to control the quality of stormwater discharges from the construction activity.

Receiving Waters

A water of the United States as defined in 40 CFR 122.2 into which the stormwater discharges.

Runoff

That portion of precipitation, snow melt or irrigation water that flows off the land into streams or other surface waters. It can carry pollutants from air and land into the receiving waters.

Section 401 of the Clean Water Act

Allows states to certify that the draft 404 permit complies with state law.

Section 402 of the Clean Water Act

Establishes the NPDES Permit Program by which authorization is granted for allowable discharges to waters of the United States.

Section 404 of the Clean Water Act

Regulates discharge of dredged or fill material to waters of the United States and establishes a permit program to authorize approved discharges.

Sediment

Soil, sand and minerals washed from land into water, usually after rain or snow melt.

Sedimentation

The process that deposits soils, sand, minerals and other materials either on the ground surface or in bodies of water or watercourses.

Sensitive Project

To be deemed “sensitive” a project must include at least 20 acres of ground disturbance

AND must discharge into the waters of the U.S. AND must meet at least one of the following conditions: -the project requires an Environmental Impact Statement, -the project is primarily on Federal lands, -the project construction has significant work requiring an individual 404 permit from the Corps of Engineers or an individual 401 water quality certification from ADEQ, -the project requires a Section 7 consultation with the U.S. Fish and Wildlife Service for potential impacts to aquatic endangered species.

Sheet Flow

Runoff that flows over the ground surface as a relatively thin and uniform layer, not concentrated in channels or pipes; also referred to as Overland flow.

Slope Ditch

Installed between the top and toe of a slope to intercept and carry sheet flow and convey concentrated flows.

Statewide Stormwater Management Plan (SSWMP)

A program to reduce the discharge of pollutants associated with the stormwater drainage systems that serve highways and transportation-related properties, facilities and activities. The plan identifies how ADOT complies with the Arizona Pollutant Discharge Elimination System stormwater program.

Stormwater

Stormwater runoff, snow melt runoff, and surface runoff and drainage; rainfall that does not infiltrate the ground or evaporate because of impervious land surfaces but instead flows onto adjacent land or watercourses or is routed into drain/sewer systems.

Stormwater Pollution Prevention Plan (SWPPP)

A site-specific, written document that identifies potential sources of stormwater pollution at the construction site; describes practices to reduce pollutants in stormwater discharges from the construction site; and identifies procedures the operator will implement to comply with the terms and conditions of a construction general permit.

Tribal Land

Defined at 18 U.S.C. § 1151 as “Indian Country” and means all land within the limits of any Indian reservation under the jurisdiction of the United States Government, including rights-of-way running through the reservation; all dependent Indian communities within the borders of the United States, and all Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same.

Top Soil

The upper, outermost layer of soil containing the highest concentration of organic matter.

Turbidity

A measure of the amount of material suspended in water expressed in Nephelometric Turbidity Units (NTU) as determined with a calibrated turbidimeter.

Vadose Zone

The area between an aquifer and the land surface.

Waters of the United States

40 CFR 230.3(s) The term waters of the United States means:

1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide
2. All interstate waters including interstate wetlands
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
 - a. Which are or could be used by interstate or foreign travelers for recreational or other purposes
 - b. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce
 - c. Which are used or could be used for industrial purposes by industries in interstate commerce
4. All impoundments of waters otherwise defined as waters of the United States under this definition
5. Tributaries of waters identified in paragraphs (1) through (4) of this section
6. The territorial sea
7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (1) through (6) of this section

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not waters of the United States

Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with the EPA.

ATTACHMENT C: REFERENCE FORMS AND CHECKLISTS



CONTROL MEASURE INDEX SHEET (CMIS)

PROJECT NO.	DATE	PAGE	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
		9			

TO BE COMPLETED FOR PROJECT WITH ONE (1) ACRE OR MORE OF SOIL/GROUND DISTURBANCE OUTSIDE OF JURISDICTIONAL WATERS OF THE U.S. (≥ 1 ACRE*)

* For projects that meet the definition of maintenance under AZPDES CDP, the permit threshold is five (5) Acres. Consult with ADOT EP Water Resources Management to define Jurisdictional Waters of the U. S.

CONTROL MEASURE INDEX SHEET (CMIS)

I. PROJECT DESCRIPTION

A. Owner Name and Address:
Arizona Department of Transportation
205 South 17th Avenue
Phoenix, Arizona 85007-3213

B. Project TRACS Number: _____

C. Project Name/Location (be consistent with the plan set cover sheet): _____

City: _____ County: _____

Beginning Latitude (NAD 83): _____

Beginning Longitude (NAD 83): _____

Ending Latitude (NAD 83): _____

Ending Longitude (NAD 83): _____

To obtain the project latitude/longitude data, refer to the Fish Earth web link below (bring Maps with labels):
<http://www.fishearth.com/>

D. Project Description: _____

II. HYDROLOGIC INFORMATION

A. Percentage of the site that is impervious before and after construction: _____

Percentage before Construction: _____

Percentage after Construction: _____

B. Receiving Water(s), refer to the plan set cover sheet and the NHD Plus HR Availability Map Web Link below:
<http://azdot.maps.arcgis.com/apps/MapSeries/index.html?appid=4155c2c4b4444b23f45d4a455245>
(If unnamed, state as unnamed) _____

III. SOIL STABILIZATION MEASURES

☐ All disturbed soil, which will not be paved, riprapped or otherwise covered to prevent erosion, will be revegetated and/or landscaped in accordance with the project plans and specifications.

IV. MEASURES TO CONTROL STORMWATER AND AIR QUALITY

A. Temporary Stormwater and Air Quality Control Measures (CMs) / Best Management Practices (BMPs)

- ☐ Temporary Diversion Dikes
- ☐ Temporary Rock Check Dams
- ☐ Stabilized Construction Entrance/Exit Gravel Pad
- ☐ Soil Stabilizer for Wind Erosion and Dust Control
- ☐ Rock Inlet/Outlet Protection
- ☐ Sediment Control Berms
- ☐ Silt Fences
- ☐ Wattles (Excelsior/Straw/Compost)
- ☐ Excelsior Logs / Sediment Logs
- ☐ Erosion Control Matings
- ☐ Seeding (Class II with final mulch cover)
- ☐ Gravelbag
- ☐ Catch Basin Temporary Fabric Filter
- ☐ Designated Washout Areas
- ☐ Protected Chemical and Material Storage Area
- ☐ Equipment Maintenance Procedures
- ☐ Others Describe: _____

B. Permanent and Post-construction Stormwater and Air Quality Control Measures (CMs) / Best Management Practices (BMPs):

- ☐ Crown Ditch/Dike
- ☐ Rock Protection
- ☐ Rock Riprap Channel Lining
- ☐ Sediment Basin
- ☐ Embankment Curb
- ☐ Spillways
- ☐ Downdrains
- ☐ Minibenching
- ☐ Solid Waste Management
- ☐ **Rock-filled Stormwater Infiltration CM/BMP as Infiltration Basin and/or Trench
- ☐ **Filtration Structures
- ☐ **Infiltration Basin and/or Trench
- ☐ **Retention and/or Detention Basins
- ☐ **Bioretention
- ☐ **Manufactured Treatment Devices
- ☐ Seeding established as a perennial vegetative cover with a density of 70% of the native background vegetative cover.
- ☐ Others Describe: _____

** Track and report to ADOT EP Water Resources Management:
ADOTWater@adot.gov

ECON	NAME	DATE	LOCATION	SHEET NO.	TOTAL SHEETS	RECORD DRAWING

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AZPDES SWPPP INDEX SHEET

ATTACHMENT

C

PART 1 - To be completed by the Landscape Architect or Design Engineer	PART 2 - To be completed by ADOT & CONTRACTOR
<p>I. PROJECT DESCRIPTION</p> <p>A. Owner Name and Address: Arizona Department of Transportation 205 South 17th Avenue Phoenix, Arizona 85007-3213</p> <p>B. Project TRACS Number: _____</p> <p>C. Project Location: City: _____ County: _____ Beginning Latitude (NAD 83): _____ Beginning Longitude (NAD 83): _____ Ending Latitude (NAD 83): _____ Ending Longitude (NAD 83): _____ To obtain the project latitude/longitude data, refer to the project location map on the project Maps with labels http://www.fishbase.org.</p> <p>D. Project Description: _____</p> <p>II. HYDROLOGIC INFORMATION</p> <p>A. Project Site Length (M): _____ Area (Ac.): _____</p> <p>B. Area to be Graded (Ac.) * * Blading of the shoulder build-up area is considered as grading and ground disturbance that requires grading, stormwater and/or other environmental regulations.</p> <p>C. Percentage of the site that is impervious before and after construction: Percentage before construction: _____ Percentage after construction: _____</p> <p>D. Receiving Water(s), refer to the Arizona Department of Water Resources Web Link below (USGS Topo): http://dswweb.azwater.gov/WetRegistry/Default.aspx</p> <p>III. PRESERVATION OF EXISTING VEGETATION</p> <p>A. In accordance with the specifications, existing vegetation will be preserved. Existing vegetation that require grading, Existing vegetation outside the boundaries of the cleared area shall be protected from damage by the area to be cleared shall be preserved and protected, wherever possible.</p> <p>IV. SOIL STABILIZATION MEASURES</p> <p>A. All disturbed soil which will not be paved, riprapped or otherwise covered to prevent erosion, will be revegetated and/or landscaped in accordance with the project plans and specifications.</p> <p>B. Scheduling of the revegetation effort can be determined by this sheet under SCHEDULE OF MAJOR ACTIVITIES.</p>	<p>V. MEASURES TO CONTROL EROSION AND SEDIMENT</p> <p>A. Temporary Erosion and Sediment Controls and Specifications for SWPPP Site Plan: Erosion Control Matings Check Dams Rock Inlet/Outlet Protection Sediment Control Berms Silt Fences Wattles (Excelsior/Straw) Sediment Logs (Segmented Logs) Sediment (Culvert with mesh) Others Describe:</p> <p>VI. MAINTENANCE AND INSPECTIONS</p> <p>A. Frequency of Inspections: At least once every 7 calendar days, OR Every 14 calendar days and within 24 hours of rainfall of 0.5 inches (12.7 mm) or more. NOTE: RAINFALL GAUGE TO BE KEPT ON-SITE TO DETERMINE DEPTH OF RAINFALL</p> <p>Inspection Procedure: ADOT's Contractor's Inspection Log and Compliance Evaluation Report (CER) will be completed by the contractor or this report will be completed by the contractor for 3 years. A signed copy of the CER will be sent to the ADOT resident engineer, if requested within 24 hours of the inspection report.</p>
<p>V. MEASURES TO CONTROL EROSION AND SEDIMENT</p> <p>A. Temporary Erosion and Sediment Controls and Specifications for SWPPP Site Plan: Erosion Control Matings Check Dams Rock Inlet/Outlet Protection Sediment Control Berms Silt Fences Wattles (Excelsior/Straw) Sediment Logs (Segmented Logs) Sediment (Culvert with mesh) Others Describe:</p> <p>VI. MAINTENANCE AND INSPECTIONS</p> <p>A. Frequency of Inspections: At least once every 7 calendar days, OR Every 14 calendar days and within 24 hours of rainfall of 0.5 inches (12.7 mm) or more. NOTE: RAINFALL GAUGE TO BE KEPT ON-SITE TO DETERMINE DEPTH OF RAINFALL</p> <p>Inspection Procedure: ADOT's Contractor's Inspection Log and Compliance Evaluation Report (CER) will be completed by the contractor or this report will be completed by the contractor for 3 years. A signed copy of the CER will be sent to the ADOT resident engineer, if requested within 24 hours of the inspection report.</p>	<p>V. MEASURES TO CONTROL EROSION AND SEDIMENT</p> <p>A. Temporary Erosion and Sediment Controls and Specifications for SWPPP Site Plan: Erosion Control Matings Check Dams Rock Inlet/Outlet Protection Sediment Control Berms Silt Fences Wattles (Excelsior/Straw) Sediment Logs (Segmented Logs) Sediment (Culvert with mesh) Others Describe:</p> <p>VI. MAINTENANCE AND INSPECTIONS</p> <p>A. Frequency of Inspections: At least once every 7 calendar days, OR Every 14 calendar days and within 24 hours of rainfall of 0.5 inches (12.7 mm) or more. NOTE: RAINFALL GAUGE TO BE KEPT ON-SITE TO DETERMINE DEPTH OF RAINFALL</p> <p>Inspection Procedure: ADOT's Contractor's Inspection Log and Compliance Evaluation Report (CER) will be completed by the contractor or this report will be completed by the contractor for 3 years. A signed copy of the CER will be sent to the ADOT resident engineer, if requested within 24 hours of the inspection report.</p>

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NPDES SWPPP INDEX SHEET

PART 1 - To be completed by the Landscape Architect or Design Engineer	PART 2 - To be completed by ADOT & CONTRACTOR
<p>I. PROJECT DESCRIPTION</p> <p>A. Owner Name, Address and IRS Employee Identification Number (EIN): Arizona Department of Transportation 205 South 17th Avenue Phoenix, Arizona 85007-3213 IRS Employee Identification Number (EIN) for ADOT: 86-6004791</p> <p>B. Project TRACS Number: _____</p> <p>C. Project Location: _____ County: _____ Beginning Latitude (NAD 83): _____ Beginning Longitude (NAD 83): _____ Ending Latitude (NAD 83): _____ Ending Longitude (NAD 83): _____</p> <p>To obtain the project latitude/longitude data, refer to the EPA's eNOL System (Central Data Exchange): https://cdex.epa.gov/ or Fish-Earth Web Link below (ing Maps with basis): https://www.fish-earth.com/</p> <p>D. Project Description: _____</p>	
<p>II. HYDROLOGIC INFORMATION</p> <p>A. Project Size: _____ Length (ft): _____ Area (ac): _____</p> <p>B. Area to be Graded (Ac.) #: _____ * Blading of the shoulder build-up area is considered as grading and ground disturbance and should be covered by the sewerer and/or other environmental regulations.</p> <p>C. Percentage of impervious area that is impervious before and after construction: _____ Percentage after Construction: _____</p> <p>D. Receiving Waters, refer to the AZ Department of Water Resources Web Link below (USGS Topo): https://dwrweb.dwr.state.az.us/Wellhead/Detail.aspx?ID=16592</p>	
<p>III. PRESERVATION OF EXISTING VEGETATION</p> <p>A. In accordance with the specifications, existing trees will be preserved. Existing limits shall be confirmed on areas that require grading. Existing vegetation outside the boundaries of the cleared construction activities. Existing trees within the area to be cleared shall be preserved and protected, wherever possible.</p> <p>IV. SOIL STABILIZATION MEASURES</p> <p>A. All disturbed soil, which will not be paved, riprapped or otherwise covered to prevent erosion, will be revegetated and/or landscaped with the project plans and specifications.</p> <p>B. Scheduling of the revegetation effort can be found on PART 2 of this sheet under SCHEDULE OF MAJOR ACTIVITIES.</p>	
<p>V. MEASURES TO CONTROL EROSION AND SEDIMENT</p> <p>A. Temporary Erosion and Sediment Controls (Refer to the SWPPP Site Plan and Specifications)</p> <p>_____ Erosion Control Matings</p> <p>_____ Check Dams/Outlet Protection</p> <p>_____ Sediment Control Berms</p> <p>_____ Silt Fences</p> <p>_____ Wattles (Excelsior/Straw)</p> <p>_____ Excelsior Logs / Sediment Logs</p> <p>_____ Seeding (Class II with mulch)</p> <p>_____ Others Describe: _____</p> <p>B. Permanent Erosion and Sediment Controls and Post-construction Storm Water Management Measures (Refer to SWPPP Site Plan and Specifications)</p> <p>_____ Rock Riprap Channel Lining</p> <p>_____ Sediment Basin</p> <p>_____ Embankment Curb</p> <p>_____ Spillways and Downdrains</p> <p>_____ Minbenching</p> <p>_____ Seeding established as a perennial vegetative cover with a density of 70% of the native background vegetative cover.</p> <p>_____ Others Describe: _____</p>	
<p>VI. MAINTENANCE AND INSPECTIONS</p> <p>A. Frequency of Inspections: Regular Inspection Frequency: _____ — At least once every 7 calendar days (weekly), OR — At least 14 calendar days (biweekly) and within 24 hours of a rainfall of 0.25 in. or greater. Impaired (Sensitive) Waters Inspections — Every 7 calendar days and within 24 hours of a rainfall of 0.25 in. or greater. NOTE: RAINFALL GAUGES TO BE KEPT ON-SITE TO DETERMINE DEPTH OF RAINFALL</p> <p>B. Inspection Procedure: The Inspection Report (CER) will be completed by the contractor or his representative and will be kept CER will be sent to the ADOT resident engineer. If repairs are necessary, they shall be initiated within 24 hours of the inspection report.</p>	
<p>V. SCHEDULE OF MAJOR ACTIVITIES</p> <p>A. Project Schedule: Start Date: _____ End Date: _____</p> <p>B. Construction Sequencing Schedule (Attach Additional Sheets) Construction Activities: _____</p>	
<p>VI. POLLUTION PREVENTION PLAN CERTIFICATION</p> <p>A. I certify under penalty of law that I have personally and directly supervised the implementation of this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in this application, I believe and I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, applies to VI. B., C., and D).</p> <p>B. The operator/contractor as defined in NPDES should sign the SWPPP in accordance with CDP Part 72.15 and retain the copy of the signed SWPPP at the construction site or other location easily accessible during business hours.</p> <p>Signature of operator/contractor: _____ Date: _____ Name: _____ Title: _____</p> <p>C. ADOT Resident Engineer Signature (owner): _____ Date: _____ Name: _____ Title: _____</p> <p>D. MUNICIPALITY for Municipal Separate Storm Sewer System (MS4) Signature: _____ Date: _____ Name: _____ Title: _____ Municipality: _____</p>	
<p>VII. OTHER REQUIREMENTS</p> <p>A. A copy of the General Permit and NOI should be attached.</p> <p>B. A copy of the page from the environmental clearance that lists species endangered or threatened species should be attached.</p> <p>C. Use the process in NPDES General Permit Appendix C (ESA Review Procedures) to determine eligibility prior to submittal of the Notice of Intent (NOI) for Endangered and Threatened Species and Critical Habit Protection.</p> <p>D. A seven-day waiting/review period between NOI submittal and authorization to begin construction will be used by U.S. Fish and Wildlife Service and National Marine Fisheries Service to screen for potential impacts on endangered species.</p>	
<p>III. POLLUTION CONTROL MEASURES</p> <p>A. Other Best Management Practices: — Erosion and Sediment Control — Equipment Maintenance Procedures — Designated Concrete Washout Areas — Leak proof pits/containers are included. — Stabilized Construction Entrance — Protected Chemical and Material Storage Area Other, Describe: _____</p>	
<p>IV. SPILL PREVENTION AND RESPONSE</p> <p>A. Spill Prevention: The procedures outlined in the Best Management Practices listed under Pollution Control Measures will be followed to prevent spills of hazardous materials. These preventative action include BMPs for spill prevention, storage and disposal of chemicals and materials. All manufacturer's recommendations for handling, storage and disposal shall be followed.</p> <p>B. Spill Response: In the event of any accidental spill of chemicals or hazardous materials, the contractor shall follow the procedures outlined in the National Response Center at 800-378-7001. If a reportable quantity is discharged into the storm water, ADOT shall contact the National Response Center to document the spill to the EPA. ADOT's Hazardous Materials Specialist shall provide instructions.</p>	

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ENVIRONMENTAL, PERMITS, ISSUES, AND COMMITMENTS (EPIC) SHEET

<p>1. SURFACE WATER POLLUTION PREVENTION – (CWA) SECTION 402</p> <p><input type="checkbox"/> No CWA Section 402 Action Required; See Std. Spec. 104.09 and 104.10 for General Requirements</p> <p>Project Disturbed Area (choose one)</p> <p><input type="checkbox"/> Five Acres or Greater</p> <p><input type="checkbox"/> Less Than Five Acres; Ultimate Common Plan greater than 5 disturbed Acres</p> <p><input type="checkbox"/> Equal To or Greater Than One Acre and Less than Five 5 Acres</p> <p><input type="checkbox"/> Less Than One Acre of Total Area; Ultimate Common Plan less than 5 disturbed Acres</p> <p>1. <input type="checkbox"/> National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) coverage applies (104SWFPA needed)</p> <p>a. Endangered Species (information attached; NPDES CGP Appendix D)</p> <p>Criterion <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> F</p> <ul style="list-style-type: none"> For Criterion C attach a copy of site map to the Notice of Intent (NOI) For Criterion D, E, or F, attach to the NOI any communications between ADOT and the US Fish and Wildlife Service (USFWS) <p>b. Historic Properties (information attached; NPDES CGP Appendix E)</p> <p>Project located on a property of religious or cultural significance to an Indian tribe</p> <p><input type="checkbox"/> No <input type="checkbox"/> Yes Name of Tribe: _____</p> <p>Will any stormwater controls require subsurface earth disturbance?</p> <p><input type="checkbox"/> No <input type="checkbox"/> Yes</p> <p>If yes, have prior surveys or evaluations conducted on the site already determined historic properties do not exist, or that prior disturbances have precluded the existence of historic properties?</p> <p><input type="checkbox"/> No <input type="checkbox"/> Yes</p> <p>If no, have you determined that your installation of subsurface earth-disturbing stormwater controls will have no effect on historic properties?</p> <p><input type="checkbox"/> No <input type="checkbox"/> Yes</p> <p>If no, did the State Historic Preservation Office (SHPO), Tribal Historic Preservation Office (THPO), or other tribal representative (whichever applies) respond to you within the 15 calendar days to indicate whether the subsurface earth disturbances caused by the installation of stormwater controls affect historic properties?</p> <p><input type="checkbox"/> No <input type="checkbox"/> Yes; describe the nature of their response: _____</p> <p>2. <input type="checkbox"/> Arizona Pollutant Discharge Elimination System (AZPDES) permit coverage applies (104SWFPA needed)</p> <p><input type="checkbox"/> Project within Municipal Separate Storm Sewer System (MS4):</p> <p><input type="checkbox"/> Project is within 1/4 mile of Outstanding Arizona Water or impaired water Name of Water: _____</p> <p><input type="checkbox"/> Sampling and Analysis Plan (SAP) needed</p> <p>Pollutant(s) to be sampled: _____</p> <p>3. <input type="checkbox"/> De Minimis General Permit (DMGP) needed (Environmental Commitments)</p> <p>4. <input type="checkbox"/> Surface Disturbance expected to be less than one acre; temporary BMP may be required.</p>	<p><input type="checkbox"/> Flagging needed for cultural resource, contact Environmental Planning at least 10 business days prior to ground disturbing activities.</p> <p><input type="checkbox"/> Qualified monitor needed, contact Environmental Planning at least 10 business days prior to ground disturbing activities.</p> <p><input type="checkbox"/> Avoid all flagged and/or otherwise designated sensitive resource areas within or adjacent to the project area.</p> <p>Location (MP): _____</p> <p><input type="checkbox"/> Data Recovery Activity and Final Report, contact Environmental Planning at least 10 business days prior to ground disturbance</p> <p>7. HAZARDOUS MATERIALS PROGRAM</p> <p>General (applies to all projects); See Std. Spec. 107.07 For General Requirements</p> <p>The contractor shall be responsible for the proper containment and cleanup of all product spills.</p> <p>Contact the Engineer if any of the following are detected:</p> <ul style="list-style-type: none"> Trash piles, drums, canisters, barrels, or other containers Evidence of leaching or seepage of substances <p>Asbestos present? <input type="checkbox"/> No <input type="checkbox"/> Yes (202ASB needed)</p> <p>Asbestos containing material: _____ estimated quantity: _____</p> <p>Location (MP): _____</p> <p>Lead-based paint present? <input type="checkbox"/> No <input type="checkbox"/> Yes (202LEAD needed)</p> <p>Color of paint: _____ estimated quantity: _____</p> <p>Location (MP): _____</p> <p>8. NOISE PROGRAM</p> <p><input type="checkbox"/> No Noise Program Specific Project Action Required; See Std. Spec. 104.08 for General Requirements</p> <p>Will any noise mitigation or noise walls be present? <input type="checkbox"/> No <input type="checkbox"/> Yes</p> <p>Date of noise study/verify no design changes: _____</p> <p>Design changes? <input type="checkbox"/> No <input type="checkbox"/> Yes</p> <p>9. AIR QUALITY PROGRAM</p> <p><input type="checkbox"/> No Air Quality Specific Project Program Action Required; See Std. Spec. 104.08 for General Requirements</p> <p><input type="checkbox"/> Dust Permit needed (Maricopa, Pinal, Pinal Counties)</p> <p><input type="checkbox"/> Open Burn Permit needed (ADEQ, Maricopa, Pinal, Pinal Counties)</p> <p>10. OTHER ENVIRONMENTAL ISSUES</p> <p><input type="checkbox"/> No Further Action Required</p> <p>Project specific actions: _____</p> <p>11. DESIGN MITIGATION MEASURES</p> <p>Information excerpted from Environmental Commitments</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;"> TEMPLATE DESIGNER M. TRAUBERT RECOMMENDED FOR APPROVAL </td> <td style="width: 50%; text-align: center;"> GROUP MANAGER P. O'BRIEN, P.E. APPROVED </td> </tr> <tr> <td colspan="2" style="text-align: center;"> STANDARDS COMMITTEE APPROVED FOR DISTRIBUTION dd mm yy </td> </tr> <tr> <td colspan="2" style="text-align: center;"> R.E. NAME: _____ R.E. SIGNATURE: _____ </td> </tr> </table>	TEMPLATE DESIGNER M. TRAUBERT RECOMMENDED FOR APPROVAL	GROUP MANAGER P. O'BRIEN, P.E. APPROVED	STANDARDS COMMITTEE APPROVED FOR DISTRIBUTION dd mm yy		R.E. NAME: _____ R.E. SIGNATURE: _____	
TEMPLATE DESIGNER M. TRAUBERT RECOMMENDED FOR APPROVAL	GROUP MANAGER P. O'BRIEN, P.E. APPROVED						
STANDARDS COMMITTEE APPROVED FOR DISTRIBUTION dd mm yy							
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ADOT METHODOLOGY FOR DETERMINING FINAL STABILIZATION

ADOT Roadside Development Section

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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 NOT 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.

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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 ($0.70 \times 0.50 = 0.35$) would require 35 percent total cover for final stabilization. On a beach with no natural vegetation, no stabilization is required.
3. In arid and semi-arid areas only, all soil disturbing activities at the site have been completed and both of the following criteria have been met:
 - a. Temporary erosion control measures (e.g., degradable rolled erosion control product) are selected, designed, and installed along with an appropriate seed base to provide erosion control for at least three years without active maintenance by you,
 - b. The temporary erosion control measures are selected, designed, and installed to achieve 70 percent vegetative coverage within three years.

A methodology for determining final stabilization for native seeded/unpaved areas is described below.

Within seeded areas, sample plots with a nominal size of 100 square feet shall be used for projects that occur within low rainfall areas (defined as locations receiving 20 inches or less average annual rainfall). Sample plots with a nominal size of 25 square feet shall be used for all other project locations. The rationale for the larger plot size in low rainfall areas is that a larger sample size is necessary to accurately measure the vegetative cover, which is expected to be less dense than in areas of higher rainfall. As an option, data may be gathered at the 100-square-foot plot locations by means of four 25 square foot sub-plots established at that same location.

Multiple sample plots may be required on a project site; the number of samples shall be determined by the total disturbance area of the project. The total area represented by the sample plots shall be approximately 0.1% (.001) of the total site disturbance for areas of 1 to 20 acres, 0.08% (.0008) for areas of 20.1 to 40 acres, and 0.05% (.0005) for areas of 40.1 acres or more. The sample plot area shall be rounded to the nearest 100 square feet. For example, a project in a low rainfall area with 18 acres of disturbance would require eight sample plots (for a total sample area of 800 square feet) representing 0.1% of the total disturbance area.

The sample areas shall represent the variety of conditions found on a project. A project that has both cut and fill slopes, for example, should have roughly the same number of sample plots on cut as on fill. Final design plans should be utilized to identify each cut and fill slope. Each slope shall be assigned a number by the evaluator (e.g., C1, C2, C3; F1, F2, F3). The slopes to be sampled shall be randomly selected. The sample plot locations within each sampling area should be predetermined, either by selecting a point on the plans prior to going into the field, or by using the same selection method in the field for each plot. For example, on a roadway project, the midpoint (longitudinally) of

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the cut or fill could be identified in the field, and from that point a set number of paces could be taken from the edge of road to arrive at the sampling location. If conditions at the predetermined sample plot location are not typical of the project site the location of the sample plot may be adjusted.

In order to determine if a reseeded site has achieved 70% of the vegetative coverage of the surrounding, undisturbed landscape, it is necessary to conduct sample plot measurements for those undisturbed areas in a manner similar to the reseeded portions of the project site. A corresponding undisturbed sample plot shall be established for each project site sample plot, the location of which should be determined before going into the field. In the above roadway project example, the location for the undisturbed plot could be along an extension of the same theoretic line as the project site sample plot (perpendicular to the roadway) at a set number of paces beyond the limit of construction disturbance.

A sampling frame of either a circular or square shape should be utilized to delineate the sample plot. When a single 25 square foot sample is used, the frame shall be dropped at the sample location. If four 25 square foot sub-plots are required to obtain a total sample of 100 square feet, the sub-plots shall be established in each ordinal direction and within a few feet of the intended sample location.

The cover provided by perennial vegetation and inert material (gravel, cobble, boulders) shall be documented. The percentage of vegetative cover shall be determined as noted below. The percentage of inert material shall be estimated by the evaluator.

All perennial plants encompassed by the sampling frame should be counted. If the frame overlaps a portion of a plant that is rooted either inside or outside the frame, only the amount of vegetative cover within the frame (aerial cover) should be counted. Dividing the frame into quadrants may make counting the plants easier. The species and canopy diameter of each plant shall be recorded. The area covered by the plant can be calculated based on the recorded canopy diameter. The sum of the canopy area of all perennial plants shall be used to calculate the vegetative cover percentage within the sample plot area. If multiple sample plots are required for a single project, the average cover percentage of all plots shall constitute the reseeded/unpaved cover percentage. Inert material cover should be visually estimated as a percentage of the total area within the sampling frame.

A photograph should be taken of each sample plot. The photograph should include the area encompassed by the sampling frame and a label identifying the plot.

The sum of the perennial vegetation and/or inert material coverage percentages will be used to determine if final stabilization has been achieved. As the AZPDES permit stipulates, "A uniform perennial vegetative cover with a density of 70% of the native background vegetative cover" or "equivalent permanent stabilization measures" must occur before final stabilization is considered to have been achieved. In a situation where

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neither perennial vegetative cover nor inert material cover individually meet the 70% coverage requirement, the two types of cover may be combined. For example, if the perennial vegetation provides cover equivalent to 50% of the background cover, and the inert material provides 25% cover, the combined coverage (75%) would exceed the minimum requirement of 70% for final stabilization.

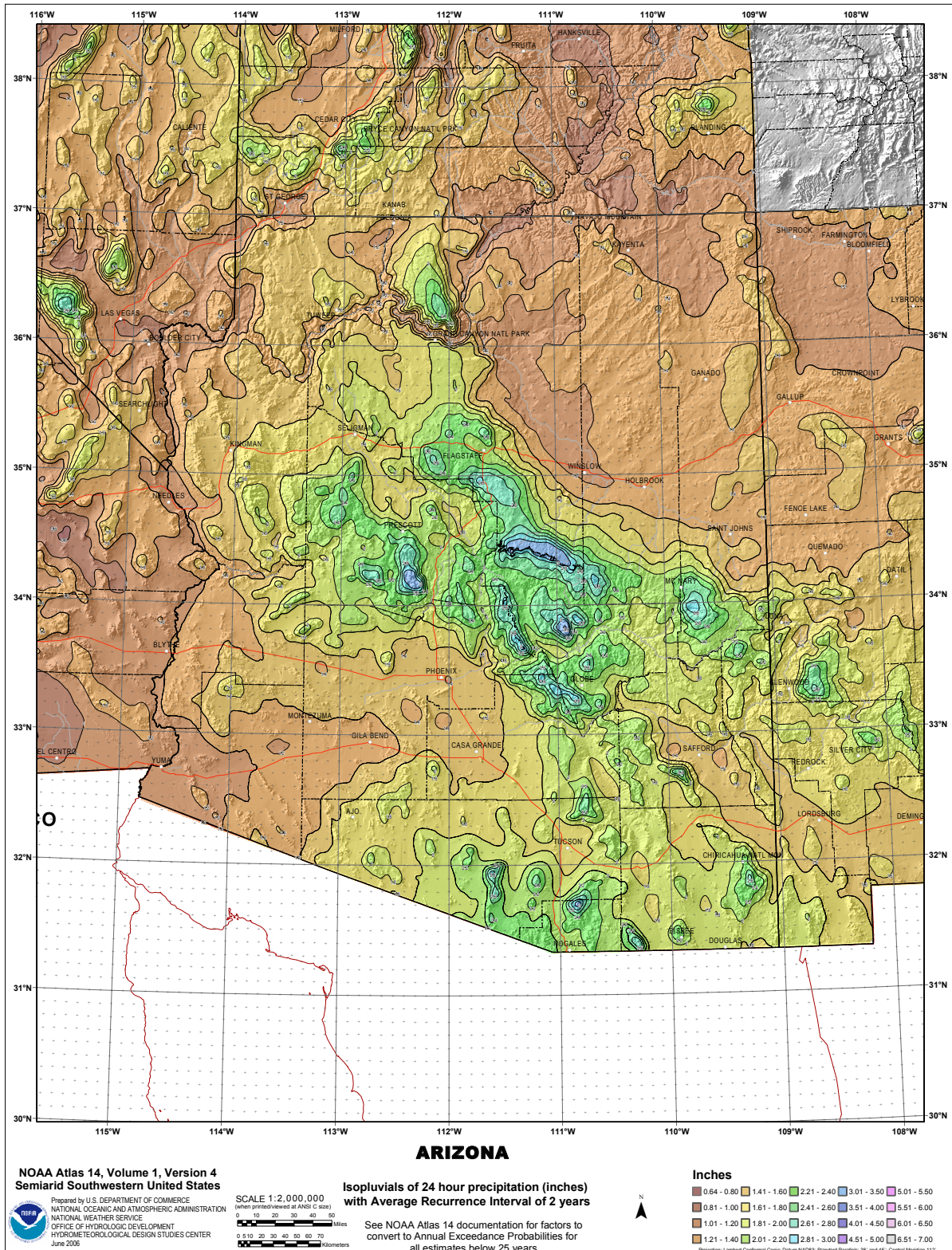
In addition to the determination of 70% cover, the temporary and permanent erosion control measures placed throughout the project shall be inspected for their effectiveness. Temporary erosion control measures such as sediment logs and straw bales shall be between 90% and 100% intact. Permanent erosion control measures such as rip rap at cut/fill transitions, drainage structures and swales shall be fully functional, with no evidence of sediment generation.

The draft results of the above analysis shall be provided to the project Resident Engineer with a copy to ADOT Roadside Development Section (Roadside). The results shall be presented in a memo format, with appropriate backup documentation and calculations to support the memo conclusions. At a minimum, a declarative statement similar to the following shall be provided: "The _____ project has achieved ____% coverage in unpaved areas and has/has not achieved final stabilization as defined by AZPDES/NPDES." Once the results have been agreed to by the project Resident Engineer, 5 copies of the memo shall be submitted to the Resident Engineer for distribution.

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ATTACHMENT D: 2-YEAR, 24-HOUR PRECIPITATION ISOPLUVIALS



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ATTACHMENT E: REFERENCES AND RESOURCES



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**ATTACHMENT F:
DOCUMENT REVISION HISTORY**



This table describes changes to the Arizona Department of Transportation Erosion and Pollution Control Manual for Highway Design and Construction, 2018.

Date	Chapter	Page	Brief Description of Change

Erosion and Pollution Control Manual

For Highway Design and Construction



Updated by
Logan Simpson

under the Direction of
**ADOT Erosion and Pollution
Control Review Committee**

for the
**Arizona Department of
Transportation,
Intermodal Transportation Division**



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Produced and Published by
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