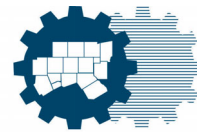




STORMWATER POLLUTION PREVENTION PRACTICES DURING CONSTRUCTION FOR PLAN REVIEWERS



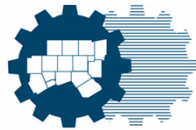
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GOAL

To train municipal personnel preparing or reviewing plans for stormwater pollution prevention requirements



COURSE OUTLINE



North Central Texas
Council of Governments

- Why Construction is Identified as a problem?
- Erosion & Sedimentation Control Theory
- Calculating Disturbed Land Area
- Local vs. State Permit Requirements
- Integrated Construction Criteria
 - Erosion Control
 - Sediment Control
 - Material and Waste BMPs
- Construction Stormwater Regulations
 - Operator Definitions & Requirements
 - SWPPP Requirements
- BMP Effectiveness
- Permanent/Post Construction BMPs

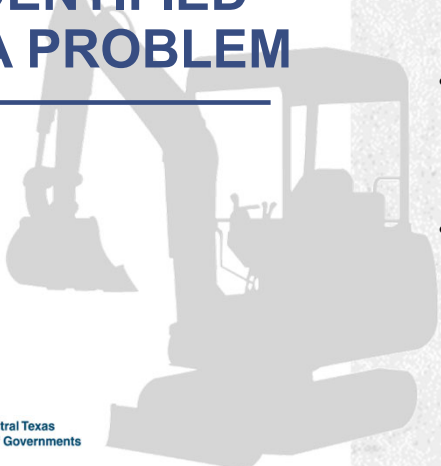
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ACRONYMS

- **BMP** – Best Management Practice
- **CGP** – Construction General Permit (TXR150000)
- **CSN_{SM}** – Small Construction Site Notice
- **CSN_{LG}** – Large Construction Site Notice
- **EPA** – Environmental Protection Agency
- **MS4** – Municipally Separate Storm Sewer System
- **NOI** – Notice of Intent
- **NOT** – Notice of Termination
- **NPDES** – National Pollutant Discharge Elimination System
- **SWPPP (aka SW3P, SWP3)** – Storm Water Pollution Prevention Plan
- **TCEQ** – Texas Commission on Environmental Quality
- **TPDES** – Texas Pollution Discharge Elimination System
- **TXR150000** – General Permit to Discharge Under the TPDES (AKA the CGP)
- **TXR15xxxx** – TCEQ authorization number issued to primary operators with an NOI on a project

4

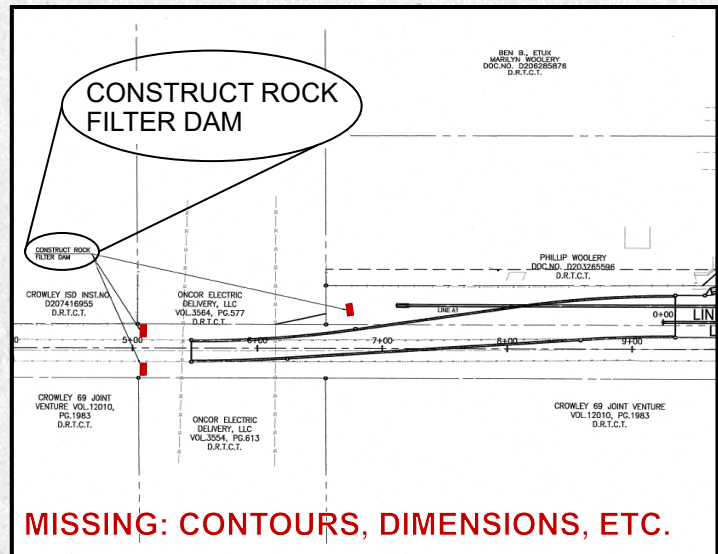
WHY CONSTRUCTION IS IDENTIFIED AS A PROBLEM



- Construction is a specialized type of industrial activity.
- Intense, varied activities occur in a limited area.
- Erosion and sedimentation are the largest potential problems from these sites.
- Potential exists for other pollutants, such as debris and on-site chemicals, to reach waterways.

IMPORTANCE OF EROSION AND SEDIMENTATION CONTROL PLANS

- Erosion control plans are generally given low priority as part of site design.
- The importance of a carefully considered plan is not often communicated to the design team.



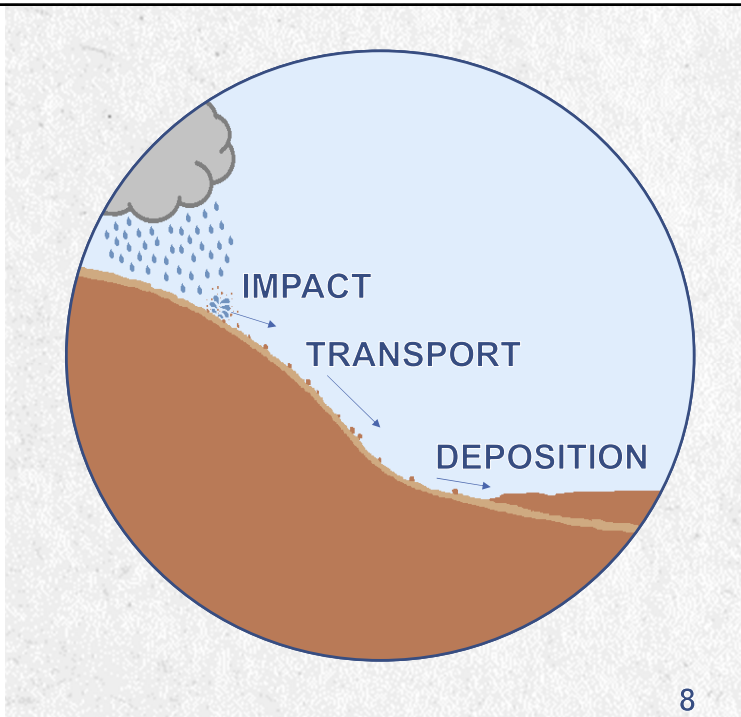
EROSION AND SEDIMENTATION THEORY



- To implement effective erosion and sedimentation controls and enforce requirements, we need to understand the following:
 - The process of erosion and sedimentation
 - Factors affecting the rate of erosion
 - Effects and costs of erosion and sedimentation
 - Ways to reduce and control stormwater pollution from erosion and sedimentation

EROSION AND SEDIMENTATION: A THREE-PART PROCESS

1. **IMPACT** – Erosion is the wearing away of the soil by forces such as water and wind.
2. **TRANSPORT** – Surface flow or wind carries loose soil particles away.
3. **DEPOSITION** – Sedimentation occurs when the velocity of wind or water slows to allow eroded material to settle out.



FACTORS AFFECTING EROSION RATE

- Type and amount of energy (rainfall rate and flow)
- Length and steepness of slope
- Erodibility of soil
- Management of land



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IMPACTS OF EROSION AND SEDIMENTATION



- Suspended solids from erosion are the largest source of pollutants in waterways and have two types of impacts:
 - Economic
 - Environmental
- Erosion and sedimentation not only have immediate impacts near the site, but they impact stream hydraulics, damage to water resources and water quality downstream.

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IMPACTS OF EROSION AND SEDIMENTATION

- Economic Impact
 - Increased maintenance cost to remove sediment
 - Increase in flood hazard and severity
 - Property damage due to flooding
 - Loss of reservoir capacity



IMPACTS OF EROSION AND SEDIMENTATION

- Economic Impact – Increased maintenance cost to remove sediment



IMPACTS OF EROSION AND SEDIMENTATION

- Economic Impact – Increase in maintenance costs



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IMPACTS OF EROSION AND SEDIMENTATION

- Economic Impact – Increase in flood hazard and severity



14

IMPACTS OF EROSION AND SEDIMENTATION

- Economic Impact – Property damage due to flooding



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IMPACTS OF EROSION AND SEDIMENTATION

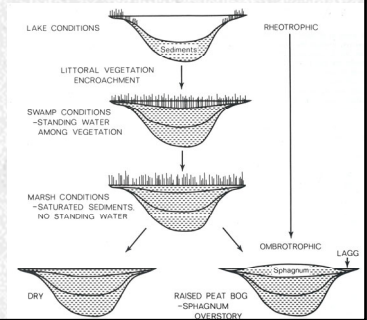
- Economic Impact – Loss of reservoir capacity



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IMPACTS OF EROSION AND SEDIMENTATION

- Environmental Impacts
 - Smothering of aquatic life
 - Transportation of pollutants
 - Loss of water resources



North Central Texas
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IMPACTS OF EROSION AND SEDIMENTATION

A37

- Environmental Impact – Smothering of aquatic life



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Slide 18

A37 Insert this slide after existing slide 13.

Author, 10/2/2019

IMPACTS OF EROSION AND SEDIMENTATION

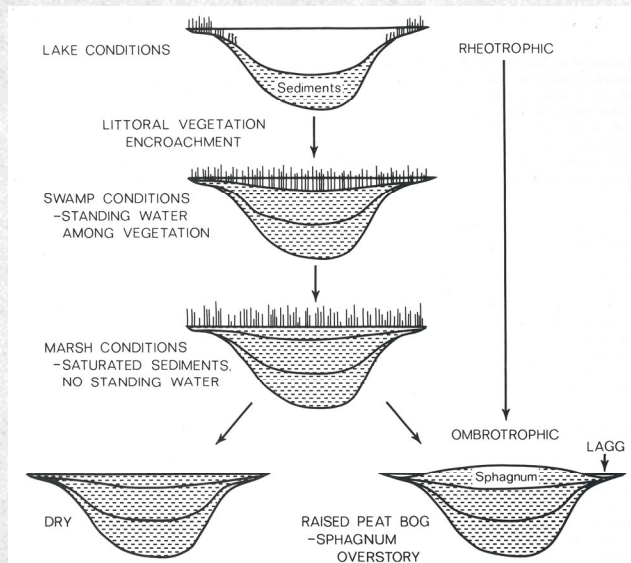
- Environmental Impact – Transportation of pollutants



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IMPACTS OF EROSION AND SEDIMENTATION

- Environmental Impact – Loss of water resources



LAKE
(SEDIMENTATION
BEGINS)



SWAMP



MARSH



DRY LAND
OR
BOG

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CALCULATE DISTURBED AREA

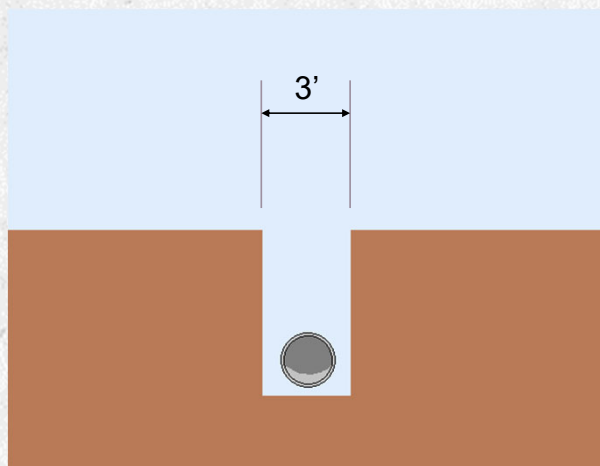
- Underground pipeline from point A to point B extends across 1,000 feet of open ground
- 12" diameter pipe, 8-foot trench depth, 3-foot trench width
- What is a reasonable estimate for the disturbed land area for construction?
 - A. 3,000 square-feet (0.7 acres)
 - B. 71,800 square-feet (1.65 acres)

CALCULATE DISTURBED AREA

- ANSWER A

$$3' \times 1,000' = 3,000' \text{ square-feet}$$

✗ INCORRECT



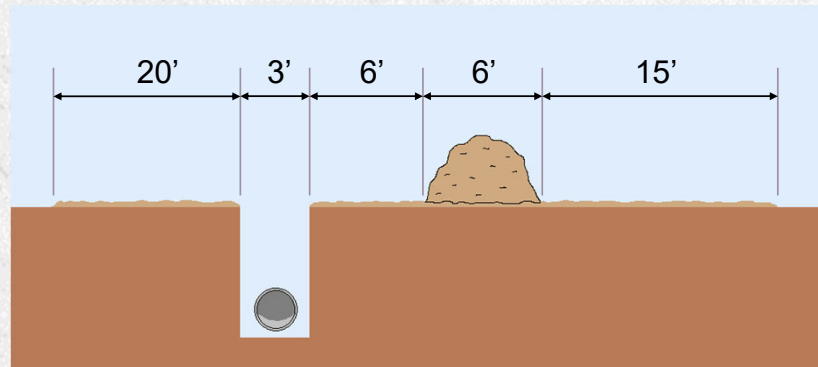
CALCULATE DISTURBED AREA

- ANSWER B

$$(50' \times 1,000') + 21,800 = 71,800' \text{ square-feet}$$

Add 0.5 acre for the undefined staging storage area

✓ CORRECT



CALCULATING DISTURBED LAND AREA

- Disturbed land area drives all erosion and sediment control permitting
- Erosion and sediment control plans should contain information required for SWPPP site maps
- Limits of disturbed land area for a project should be clearly shown on plans
- Consider space for:
 - Site access route(s)
 - Staging
 - Work areas and equipment
 - Spoil and stockpiles

CALCULATING DISTURBED LAND AREA



LOCAL vs. STATE PERMIT REQUIREMENTS - REGULATIONS -

MS4 REGULATIONS

- Locally adopted and enforced erosion and sediment control ordinance

TPDES CONSTRUCTION GENERAL PERMIT

- TPDES Construction General Permit (TXR150000) adopted March 5, 2023

LOCAL vs. STATE PERMIT REQUIREMENTS - PLAN APPROVAL -

MS4 REGULATIONS

- Construction erosion control & sedimentation plan required
- MS4 reviews & releases construction plans for construction

TPDES CONSTRUCTION GENERAL PERMIT

- SWPPP coordinated with MS4 requirements when land disturbing activity ≥ 1 acre
- Operator(s) notify MS4 of permit coverage (NOI or CSN_{SM})

LOCAL vs. STATE PERMIT REQUIREMENTS - CONSTRUCTION -

MS4 REGULATIONS

- MS4 inspects site for compliance with local regulations
- MS4 enforces local ordinance & advises Operator(s) of any CGP deficiencies (May advise TCEQ)

TPDES CONSTRUCTION GENERAL PERMIT

- Operator(s) implement SWPPP
- Operator(s) inspect site for compliance with SWPPP requirements
- TCEQ enforces CGP outside of MS4 jurisdiction*

*The MS4 does not have authority to enforce the requirements of the CGM unless the requirement is specifically written into their MS4 permit and local ordinance(s)

LOCAL vs. STATE PERMIT REQUIREMENTS - PERMIT TERMINATION -

MS4 REGULATIONS

- MS4 continues inspections until site is accepted

TPDES CONSTRUCTION GENERAL PERMIT

- Operator(s) complete project
- Operator(s) terminate CGP coverage when appropriate (NOT or CSN_{SM})
- Operator(s) notify MS4 of CGP permit termination via copy of NOT or CSN_{SM}

WHAT IS INTEGRATED CONSTRUCTION CRITERIA?

A methodology and temporary BMP criteria to assist project design and construction teams in the preparation of erosion and sediment control plans and SWPPPs for the construction phase of projects

INTEGRATED CONSTRUCTION CRITERIA

• iSWM Criteria Manual Section 4.0

Link – http://iswm.nctcog.org/Documents/iSWM_Criteria_Manual_01142015.pdf

iSWMTM Criteria Manual

4.0 Integrated Construction Criteria

The chapter lays out the criteria and methods to be employed during construction to limit erosion and the discharge of sediment and other pollutants from construction sites.

4.1 Applicability

Requirements for temporary controls during construction are applicable to the following projects:

- Land disturbing activity of one acre or more or
- Land disturbing activity of less than one acre, where the activity is part of a common plan of development that is one acre or larger.

A common plan of development refers to a construction activity that is completed in separate stages, separate phases, or in combination with other construction activities.

Local Provisions:

4.2 Introduction

iSWM requires the use of temporary controls during construction to prevent or reduce the discharge of sediment and other pollutants from the construction site. The temporary controls are known as Best Management Practices (BMPs). BMPs may be activities, prohibitions, maintenance procedures, structural controls, operating procedures and other measures to prevent erosion and control the discharge of sediment and other pollutants.

Construction BMPs shall be considered when developing the Preliminary iSWM Plan and shall be coordinated with the Final iSWM Plan. Construction BMPs fall into three general categories: Erosion Control, Sediment Control and Material and Waste Control. The first category prevents erosion and the second catches soil from erosion that does occur. It is generally more effective and less expensive to prevent erosion than to treat sediment control. Material and waste controls are for other sources of sediment pollutants on construction sites.

The following practices shall be applied to the selection of construction BMPs:

- Retain native topsoil and natural vegetation in an undisturbed state by incorporating natural drainage features and buffer areas into the site design.
- Limit the area of disturbance and vehicle access to the site.
- Limit the extent of clearing operations, and phase construction operators to minimize the area disturbed at any one time.
- Stabilize disturbed areas as soon as possible (at the end of construction), particularly in channels and/or runoff slopes.
- Minimize the disturbance of steep slopes during construction, and minimize slope length and steepness.

December 2009
Revised 12/2015 11

iSWMTM Criteria Manual

4.3 Criteria for BMPs during Construction

The direct construction BMPs include, but shall not be limited to, the following:

- Topography;
- Limits of all areas to be disturbed by construction activity, including off-site staging areas, utility lines, land drains, and spot-treatment areas;
- Location and types of erosion control, sediment control, and material and waste control BMPs;
- Construction methods and notes for erosion control, sediment control, and material and waste control BMPs; and
- Inspection and maintenance notes.

BMPs and notes shall be provided for all the elements listed in this section, unless site conditions render an element not applicable. BMPs shall be specified and designed according to the standards criteria in the Construction Criteria Technical Manual. Site data gathered and analyzed in Step 2 of the Integrated Development Process shall be the basis for selecting BMPs.

The minimum design storm for temporary BMPs is the 2-year, 24-hour duration storm event.

Plans for temporary BMPs shall be prepared by a Certified Professional in Erosion and Sediment Control (CPESC) or a licensed engineer or registered landscape architect in the State of Texas who has documented experience in hydrology and hydraulics and erosion and sediment control.

December 2009
Revised 12/2015 12

iSWMTM Criteria Manual

4.3.1 Erosion Controls

Erosion control is that line of defense and the primary means of preventing stormwater pollution. They shall be designed to reduce soil erosion and to minimize the amount of sediment that has to be removed from stormwater runoff by other types of BMPs. Fast Slopes for different types of Erosion Control BMPs are in Section 2 of the Construction Control Technical Manual.

Limits of Disturbance

On the overall Construction Plans, clearly show the limits of the area to be disturbed.

Design Criteria

- Minimize the disturbance of steep slopes.
- Conserve the disturbed area to the maximum necessary to construct the project.
- Specify the contractor's staging area, borrow/pit area, utilities and any other areas on or off site that will be disturbed in support of the construction activity.
- Specify construction fencing or similar protective measures to prevent disturbance of natural drainage features, trees, vegetative buffers and other existing features to be preserved.

Slope Protection

Slope protection shall be provided for disturbed or cut/fill slopes that are one vertical on three horizontal (3H:1V) or steeper, 20 feet in length or longer, or on highly erodible soils. Show the location and type of BMPs to be on the plans.

Design Criteria

- Where feasible, add notes that prohibit disturbing the slope until final site grading.
- Where a stabilized discharge point is available, provide temporary berms or walls to direct stormwater away from the slope until the slope is stabilized.
- Check berms shall be used unless walls that are not down a slope.
- Temporary berms, vegetative strips, or equivalent erosion controls shall be specified at regular intervals to break-up slopes longer than 50 feet until the slope is stabilized.
- Specify that stabilization measures to be related immediately upon completing work on the slope.
- Hydro-mulch is prohibited for slope stabilization unless the slope is one vertical on five horizontal (1V:5H) or less.

Channel Protection

Show the location and type of BMPs used to prevent the erosion of channels, drainage ways, streambeds, and outfalls until permanent structures and final distribution measures are installed.

Design Criteria

- Provide temporary energy dissipaters at discharge points.
- If final channel stabilization consists of vegetation, anchored erosion control blankets, turf reinforcement mats, or an equivalent BMP that is resistant to channel flow shall be installed until

December 2009
Revised 12/2015 13

WHAT IS INTEGRATED CONSTRUCTION CRITERIA?

- Erosion Controls
- Sediment Controls
- Material and Waste Controls



EROSION CONTROLS

- **Measures used to retain soil in place**
 - Limits of Disturbance – Minimize disturbed area
 - Slope Protection – Protect steep or erodible slopes
 - Channel Protection - Energy Dissipaters, Turf Reinforcement Mats, etc.
 - Temporary Stabilization – Required for disturbed areas where work stops for 14 days or more.
 - Final Stabilization – Established vegetation and permanent BMPs meeting contract requirements

SEDIMENT CONTROLS

- **Measures used to trap sediment after transport has started**
 - Sediment Barriers – Linear controls, sediment basins, etc.)
 - Perimeter Controls – Linear BMP at all down slope boundaries
 - Storm Drain Inlet Protection
 - Construction Access Controls
 - Dewatering Controls – all pumped water should be discharged through a BMP prior to leaving site

EVALUATING TEMPORARY BMPS

- Is the BMP effective in controlling/trapping sediment?
- Can the BMP be maintained during construction?
- Can the BMP safely allow overflow or bypass of runoff from a major storm event?
- Will the BMP completely go dry or drain within 48 to 96 hours after a rain event?

CONTROLLING POLLUTION FROM CONSTRUCTION ACTIVITY

Best Management Practices (BMPs):
Effective and practical techniques used
to reduce pollution

Erosion Prevention BMPs

Protect the soil to reduce erosion
because of rainfall and overland flow

Sediment Loss Prevention BMPs

Reduce soil loss from the site by
sedimentation or filtration of runoff

Materials and Waste Management BMPs

Reduce pollution from chemicals, trash
and construction waste

MATERIAL & WASTE BMPS

- Chemical Management
- Concrete Sawcutting Waste Mgmt.
- Concrete Waste Mgmt.
- Debris and Trash Mgmt.
- Hyperchlorinated Water Mgmt.
- Sandblasting Waste Mgmt.
- Sanitary Waste Mgmt.
- Spill & Leak Response Procedures
- Sub-grade Stabilization Mgmt.
- Vehicle & Equipment Mgmt.

EROSION & SEDIMENT CONTROL PLAN REQUIREMENTS:

- Proposed drainage patterns and approximate slopes
- Areas where soil disturbance will occur
- Locations of all existing and proposed BMPs and buffers (Include phasing)
- Locations where temporary or permanent stabilization will be used
- Locations of construction support activities
- Show surface waters adjacent or close to site and indicate if impaired
- Locations where stormwater discharges to surface waters or an MS4 system
- Vehicle wash areas
- Designated locations where vehicles will exit from the site on to paved roads

CONSTRUCTION STORMWATER REGULATIONS



- Mandated by Clean Water Act of 1987
- Texas Commission on Environmental Quality (TCEQ) issues stormwater regulations in Texas
- Construction activities regulated by overlapping permit requirements:
 - Construction General Permit (TXR150000)
 - Municipal Separate Storm Sewer System (MS4) Permits

MS4 PERMITS: CONSTRUCTION SITE RUNOFF



Phase I MS4 Permits

- Dallas, Fort Worth, Arlington, Plano, Mesquite, Irving, Garland
- In effect since 1990s
- Applicable to all projects disturbing equal to or more than 1 acre
- Program administered and enforced by the MS4; requirements vary by jurisdiction

Phase II MS4 Permits

- All other cities/counties in urbanized area (100+ in D/FW area)
- In effect since 2008
- Applicable to all projects disturbing >1 acre
- Program administered and enforced by the MS4; requirements vary by jurisdiction

OVERVIEW: CONSTRUCTION GENERAL PERMIT TXR150000

- Statewide 5 year permit administered and enforced by TCEQ*
- Original TPDES Construction General Permit issued March 5, 2003; latest revision effective March 5, 2023
- Regulates stormwater discharges from small and large construction activities
- “Operators” of construction activities must meet applicable permit requirements

*TCEQ may refer complaints from the public to the MS4 for enforcement

CONSTRUCTION GENERAL PERMIT DEFINITION PRIMARY OPERATOR

The person or persons associated with construction activity that meets either of the following criteria:

- On-site operational control over construction plans and specifications, including the ability to make modifications
- Day-to-day operational control over construction site activities that are necessary to ensure compliance with a Stormwater Pollution Prevention Plan (SWPPP) for the site or other permit conditions
- If there is not a primary operator at the construction site, then the secondary operator is defined as the primary operator and must comply with the requirements for primary operators.

CONSTRUCTION GENERAL PERMIT DEFINITION SECONDARY OPERATOR

The person or entity (often the property owner) whose operational control is limited to the following:

- Employment of other operators, such as a general contractor, to perform or supervise construction activities
- Ability to approve or disapprove of changes to construction plans and specifications, but who does not have day-to-day on-site operational control over construction activities at the site
- Secondary operators must either prepare their own SWP3 or participate in a shared SWP3 that covers the areas of the construction site, where they have control over the construction plans and specifications.

CONSTRUCTION GENERAL PERMIT

SMALL CONSTRUCTION ACTIVITY

- Construction activities that result in land disturbance of greater than or equal to 1 acre, but less than 5 acres
- Includes individual sites with less than 1 acre of disturbed land if part of a larger Common Plan of Development, i.e., lot within subdivision, shopping center out-parcel

LARGE CONSTRUCTION ACTIVITY

- Construction activities that result in land disturbance of greater than or equal to 5 acres
- Includes individual sites with less than 5 acres of disturbed land if part of a larger Common Plan of Development, i.e., lot within subdivision, shopping center out-parcel

CONSTRUCTION GENERAL PERMIT: OBTAINING AUTHORIZATION

Prior to construction, operators are required to:

- Develop and implement the Stormwater Pollution Prevention Plan
- For large sites - Submit Notice of Intent (NOI) and post their large Construction Site Notice
- For small sites – Post a copy of their small Construction Site Notice
- Provide a copy of their signed NOI or their small Construction Site Notice to the MS4 Operator(s)

SWPPP REQUIREMENTS: SITE/PROJECT INFORMATION

- Description of the construction activity
- List of potential pollutants and their sources
- Intended schedule of construction activities including estimated start and end dates
- The total acreage of the site and the total disturbed land area acreage
- Description of the soils on site
- Location map of the site
- A detailed site map(s)** (AKA erosion & sediment control plan) for the project
- Location and description of all support activities covered by the SWPPP
- Name of receiving waters that may receive discharges from the site

SWPPP REQUIREMENTS: SITE/PROJECT INFORMATION



- A copy of the TPDES general permit (TXR150000)
- For large sites - a copy of the NOI(s), the TXR authorization form with permit number and a copy of any secondary operator notices
For small sites – a copy of the construction site notices (small)
- Storm drain inlets and discharge points from the project site and support activities
- The location of all pollutant generating activities at the site
- A description of the BMPs that will be used
- A description of permanent stormwater controls

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SWPPP REQUIREMENTS: SITE/PROJECT INFORMATION



- Other required controls and BMPs
 - To minimize dust and off-site tracking of mud
 - A description of construction and waste materials to be stored and BMPs to minimize pollutants from these materials
 - A description of support activities with their potential pollutants
 - The installation of velocity dissipation devices at discharge locations and along outflow channels
 - Appropriate controls for pumped or channelized standing water from the site; daily inspection and documentation of dewatering operations are required.
- Other controls required by the general permit
- Minimize exposure of PCBs on older demolition sites when required
- Document compliance with approved State and local plans

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SWPPP REQUIREMENTS: SITE/PROJECT INFORMATION

- Provide maintenance requirements for BMPs to used on the project
- Provide SWPPP operator inspector information, inspection requirements and inspection frequencies for the project
- Provide information required by other parts of the TPDES general permit as necessary

INSPECTION

Types of construction site inspections:

- SWPPP required inspections
- MS4 inspections

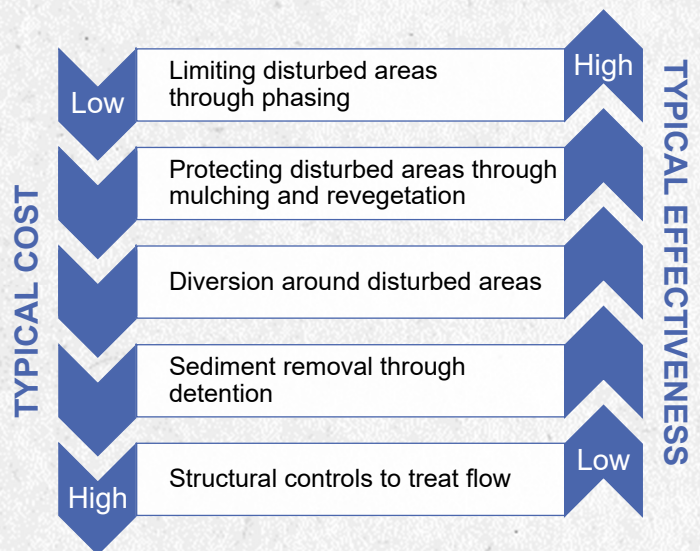


BMP EFFECTIVENESS

Design a **site-specific solution** that uses a combination of erosion prevention and sediment loss prevention BMPs.



BMP EFFECTIVENESS



PERMANENT / POST CONSTRUCTION BMPS

- Installed during construction to control pollutants in discharges after construction operations have been completed
- Includes bioretention areas, wet ponds, constructed wetlands, buffer strips and grass swales



iSWM TECHNICAL MANUAL

- **Construction Controls**
 - Erosion Control – i.e. check dam, erosion control blankets, filter berm, vegetation
 - Sediment Control – i.e. inlet protection, stabilized construction exit, silt fence
 - Material and Waste Controls

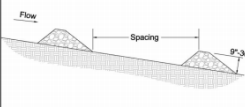
Link – http://iswm.nctcog.org/Documents/technical_manual/Construction%20Controls_9-2014.pdf

iSWM TECHNICAL MANUAL

iSWM™ Technical Manual Construction Controls

2.0 Erosion Controls

2.1 Check Dam



Description: Check dams are small barriers consisting of loose rock, rock bags, or organic fiber tubes placed across a drainage swale or ditch. They reduce the velocity of small concentrated flows, provide a limited barrier for sediment and reduce the potential for erosion of the swale or ditch.

Erosion Control

KEY CONSIDERATIONS

DESIGN CRITERIA:

- Heights between 9 inches and 36 inches
- Top of the downstream dam should be at the same elevation as the toe of the upstream dam

ADVANTAGES / BENEFITS:

- Reduced velocities in long drainage swales or ditches
- May be used with other channel protection measures
- Provides some sediment removal

DISADVANTAGES / LIMITATIONS:

- Cannot be used in live stream channels
- Minor ponding upstream of the check dams
- Extensive maintenance or replacement of the dams required after heavy flows or high velocity flows
- Mowing hazard from loose rocks if all rock is not removed at end of construction

MAINTENANCE REQUIREMENTS:

- Inspect regularly
- Remove silt when it reaches approximately 1/2 the height of the dam or 12 inches, whichever is less

TARGETED POLLUTANTS

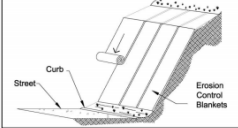
- Sediment
- Nutrients & Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Construction Wastes

Check Dam
Revised 04/10

CC-12

iSWM™ Technical Manual Construction Controls

2.3 Erosion Control Blankets



Description: An erosion control blanket (ECB) is a temporary, degradable, rolled erosion control product that reduces soil erosion and assists in the establishment and growth of vegetation. ECBs, also known as soil retention blankets, are manufactured by many companies and are composed primarily of processed, natural, organic materials that are woven, glued, or structurally bound together with natural fiber netting or mesh on one or both sides.

Erosion Control

KEY CONSIDERATIONS

DESIGN CRITERIA:

- ECB selected based on slope, flow rate and length of service
- Specify preparation of soil surface to ensure uniform contact with blanket
- Installation and anchoring according to manufacturer's recommendations

ADVANTAGES / BENEFITS:

- Holds seed and soil in place until vegetation is established
- Effective for slopes, embankments and small channels

DISADVANTAGES / LIMITATIONS:

- Not for use on slopes greater than 2:1 or in channels with shear stresses greater than 2.0 pounds per square foot

MAINTENANCE REQUIREMENTS:

- Replace or re-anchor loosened blankets
- Remove sediment deposited on blankets

TARGETED POLLUTANTS

- Sediment
- Nutrients & Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Construction Waste

Erosion Control Blankets
Revised 04/10

CC-25

INTEGRATED STORM WATER MANAGEMENT (iSWM)



- iSWM Criteria Manual for Site Development and Construction
 - Widely used in North Central Texas
 - Adopted by several local governments
- iSWM Technical Manual
 - Construction Stormwater Controls fact sheets
 - Information on the selection, installation and maintenance of temporary and permanent BMPs
- www.iswm.nctcog.org