March 29, 2018
AVO 35308.001

Texas Commission on Environmental Quality
Stormwater Team Leader (MC-148)
12100 Park 35 Circle
Austin, Texas 78753

RE: Phase II Year 5 MS4 Annual Report Transmittal for the Town of Double Oak, TX
TPDES Permit Authorization: TXR040573

Dear Team Leader:

This letter serves to transmit the Year 5 Annual Report (January 1, 2018 – December 31, 2018) for the Texas Pollutant Discharge Elimination System Small Municipal Separate Storm Sewer System General Permit, Authorization Number TXR040573 for Double Oak, TX.

Due to no proposed BMP changes for the permit year, a Notice of Change will not be submitted for the next permit year.

Sincerely,

HALFF ASSOCIATES, INC.

Leah M Hodge

Leah Hodge, PE, CFM
Project Manager

C: Tony Walker
TCEQ Region 4 Director
2309 Gravel Drive
Fort Worth, TX 76118-6951

HALFF ASSOCIATES, INC.
4000 FOSSIL CREEK BOULEVARD
FORT WORTH, TX 76137-2720
TEL (817) 847-1422
FAX (817) 232-9784
WWW.HALFF.COM

Stormwater Policy Notebook Permit Year 5 (2018)

for

TOWN OF DOUBLE OAK

Texas Commission on Environmental Quality
Texas Pollutant Discharge Elimination System
General Permit TXR040000

March 2019

Prepared By

4000 Fossil Creek Blvd.
Fort Worth,Texas 76137-2720
Leah Hodge, PE, CFM
(817) 764-7459
lhodge@halff.com

Phase II (Small) MS4 Annual Report Form

TPDES General Permit Number TXR040000

A. General Information

Authorization Number: TXR040573

Reporting Year (year will be either 1, 2, 3, 4, or 5): 5

Annual Reporting Year Option Selected by MS4:

Calendar Year 2018

Permit Year _____

Fiscal Year: _____ Last day of fiscal year: (_____)

Reporting period beginning date: (month/date/year) 01/01/2018

Reporting period end date (month/date/year) 12/31/2018

MS4 Operator Level: _____1_____ Name of MS4: Town of Double Oak

Contact Name: Eileen Kennedy Telephone Number: (972) 539-9464

Mailing Address: 320 Waketon Road, Double Oak, TX 75077

E-mail Address: ekennedy@double-oak.com

A copy of the annual report was submitted to the TCEQ Region YES__x_ NO___
Region the annual report was submitted. TCEQ Region 4

B. Status of Compliance with the MS4 GP and SWMP

1. Provide information on the status of complying with permit conditions: (TXR040000 Part IV Section B.2.):

	Yes	No	Explain
Permittee is currently in compliance with the SWMP as submitted to and approved by the TCEQ.	X		All BMP's for Year 5 have been completed.
Permittee is currently in compliance with recordkeeping and reporting requirements.	X		All documents are in compliance.

Permittee meets the eligibility requirements of the permit (e.g., TMDL requirements, Edwards Aquifer limitations, compliance history, etc.)	X		Community does not discharge into an impaired water body.

2. Provide a general assessment of the appropriateness of the selected BMPs. You may use the table below (**See Example 1 in instructions**):

   - The Town continues to enforce their Stormwater Ordinance that addresses the requirements for Erosion and Sediment Control, Post Construction Runoff, and Pollution Prevention.
   - There are no industrial areas in the Town, thus the possibility of discharging pollutants to the Town's stormwater systems is low.

MCM	BMP	BMP is appropriate for reducing the discharge of pollutants in stormwater? (Yes / No / Explain)
1	1.2 – Stormwater Message with Links on Town Website	Yes, the Town has more views regarding stormwater education on their website as opposed to retrieved brochures at Town Hall.
2	2.3 – Development of Storm Sewer Map Showing all Outfalls and Names of Waters of the US	Yes, the storm map is updated annually to include new storm drain culverts. Additional culverts are inspected after every rain event and regularly during the dry season.
3	3.3 – Implement Procedures for Construction Site Inspection of Runoff Controls	Yes, procedures and forms are used for Construction Site Inspection of Runoff Controls.
4	4.1 – Create and Distribute Educational Materials for Area Developers regarding Post-Construction	Yes, Town distributes education materials to contractors at pre-construction meetings.

	Stormwater Controls	

3. Describe progress towards reducing the discharge of pollutants to the maximum extent practicable. Summarize any information used (such as visual observation, amount of materials removed or prevented from entering the MS4, or if required monitoring data, etc.) to evaluate reductions in the discharge of pollutants. You may use the table (**See Example 2 in instructions**):

   - There have been no known pollutants formerly detected, therefore a demonstrated direct reduction cannot be evaluated. The following practices could result in non-tangible reductions.

MCM	BMP	Information Used	Quantity	Units	Does the BMP Demonstrate a Direct Reduction in Pollutants? (Answer Yes or No, and explain.)
1 & 2	1.2, 1.4, 2.4 Stormwater Education	Educational materials posted on website; Mayor's editorial	1 hardcopy 113 website views	Views by citizens and businesses	Yes - Access to public educational materials on the Town website and the Mayor's Editorial in the Cross Timbers Gazette could raise awareness for pollution prevention and reporting as well as result in reductions.
2	2.2 - Dry weather screening	Screening of outfalls	Multiple screenings per year	Inspections	Yes - The Mayor performs visual checks of stormwater during and post construction to check for pollutants and illicit discharges during dry season. There have been no illicit discharges observed but if

MCM	BMP	Information Used	Quantity	Units	Does the BMP Demonstrate a Direct Reduction in Pollutants? (Answer Yes or No, and explain.)
					observed they would be addressed immediately.
3	3.1 - Ordinance and Enforcement Mechanism to Require Erosion and Sediment Control at construction sites>1 Acre	Construction site observations and construction site erosion plan review	2 construction sites in 2018	Site/plan reviews	Yes – As needed, the Town continues to inspect developments with sites larger than 1 acre that have a SWPPP for their Construction Activities. Although a formal SWPPP is not mandatory for sites less than 1 acre, erosion protection is required. The Town's Erosion Control ordinance requires a construction erosion control plan that needs to be reviewed by the Town Staff or Town Engineer to assure proper BMP's are in place to reduce sediment discharge and erosion post-construction sites help to identify erosion and sediment control issues to prevent/reduce pollution.

4. Provide the measurable goals for each of the MCMs, and an evaluation of the success of the implementation of the measurable goals (**See Example 3 in instructions):**

MCM(s)	**Measurable Goal(s)**	**Explain progress toward goal or how goal was achieved** **If goal was not accomplished, please explain**
1	BMP 1.1 – Distribute Stormwater Education Material	Met Goal – The Town's website has informational links about water quality related to residential, commercial and construction activities (See attached – BMP 1.1).
1	BMP 1.2- Stormwater Message(s) with Links on Town of Double Oak Website, Maintain Website	Met goal – Links to Public Education and Outreach on Stormwater Impacts are available on the Town website. The SWMP is also available at Town Hall and on the Town website (See attached – BMP 1.2).
1	BMP 1.3- River/Stormwater System Volunteer Cleanups	Met goal – A 30-yard dumpster was provided for Christmas tree collection and recycling between Christmas and the second week of January. The waste management contract provides hazardous waste pickup for residents. The waste management contract also allows up to 15 bags of green waste are every Friday and up to 30 bags on the 3rd Friday of the month.
1	BMP 1.4- Display SWMP on Town Website for Public Review and Comments	Met goal – Links to the SWMP and 4 prior MS4 Annual Report are available on the Town website. No comments regarding SWMP were received. (See attached – BMP 1.4).
2	BMP 2.1- Implement Town Ordinance and Enforcement Procedures to Prohibit and Remove Illicit Discharges	Met goal – Reviewed Ordinances for Illegal Dumping and Illicit Discharge. Illicit Discharge Ordinance is based on NTCOG model. The existing Ordinance 13.606 was found to be sufficient to address the requirements of this BMP.

MCM(s)	Measurable Goal(s)	Explain progress toward goal or how goal was achieved If goal was not accomplished, please explain
2	BMP 2 .2- Visual Inspection of Selected Stormwater Outfalls During Dry Weather	Met goal – Dry Weather inspection procedure has been developed and implemented into the Town Maintenance schedule. A multi-use inspection form was developed and continues to be utilized. A dry weather visual inspection of selected stormwater outfalls was conducted on May 9, 2018 (See attached – BMP 2.2).
2	BMB 2.3- Development of Storm Sewer Map Showing All Outfalls and Names of Waters of the United States	Met goal - Town Map has been updated and provided with the annual report (See attached – BMP 2.3).
2	BMP 2.4 - Educate Employees, Business, and the General Public About Hazards Associated With Illegal Discharges to the System	Met goal – In April 2018, the Town Mayor included an article in the Cross Timbers Gazette titled "Spring Cleaning Tips", which included educational information about debris in flood areas, lawn waste in runoff, soil erosion, and stream and wetland buffers. The Town's website continues to display a link to the public education presentation, *Stormwater Education, Are We Keeping the Water Clean?* given at Town Council on 10/19/2015 (See attached – BMP 2.4; See also BMP 1.1).
3	BMP 3.1 - Implement/Maintain Ordinance and Enforcement Mechanism to Require Erosion and Sediment Control at site>1 Acre	Met goal – Current Erosion Control Ordinance 13.604 has been reviewed and is attached. Town continues to enforce current ordinances requiring SWPPP and Erosion Control Plans for sites larger than 1 acre. Construction permits are not issued for sites disturbing more than 1 acre without SWPPP and complying with TCEQ General Permit TXR150000.

MCM(s)	Measurable Goal(s)	Explain progress toward goal or how goal was achieved If goal was not accomplished, please explain
3	BMP 3.2 - Require Submittal of Construction Site SWPPP for Review by Town Staff	Met goal – Construction Plan Checklist has been implemented. The Town also implements a checklist for start of building construction which requires Erosion Control/SWPPP to be onsite and maintained throughout the project (See attached – BMP 3.2). Town enforces current ordinances requiring SWPPP and Erosion Control Plans for sites larger than 1 acre. Construction permits are not issued for sites disturbing more than 1 acre without SWPPP and complying with TCEQ General Permit TXR150000.
3	BMP 3.3 - Implement Procedures for Construction Site Inspection of Runoff Controls	Met goal – Ensured that goals documented in SWPPP are in-place. Enforcement of control measures follows those outlined in BMP 3.1. A Stormwater Inspection Checklist has been implemented to aid Town staff in conducting stormwater inspections. Checklist can be used for multiple types of inspection – Construction Site, Dry/Wet Weather Outfall, Illicit Discharge, and Municipal Facilities (See attached – BMP 3.3).
3	BMP 3.4 - Train Town Inspector in Conducting Proper Site Inspections	Met Goal – Town Engineer was certified by EPA's Proposed 2017 Construction General Permit on 4-27-2016
3	BMP 3.5 - Implement mechanism for contractor Comment and Procedures for Comment Consideration in regards to Runoff Controls	Met goal - Town has continued to monitor the link on the Town website during year 5 for comments from contractors and the public regarding erosion control and runoff control. Previous year's forms are still being used to record complaints (See attached – BMP 3.5). No reports or questions were received by the Town staff in 2018.

MCM(s)	Measurable Goal(s)	Explain progress toward goal or how goal was achieved If goal was not accomplished, please explain
4	BMP 4.1 - Create and Distribute Educational Materials for Area Developers regarding Post-Construction Stormwater Controls	Met goal – Town to continue to distribute checklists with Erosion Control requirements to contractors at pre-construction meetings and with building permit applications.
5	BMB 5.1- Assess Municipal Properties for Appropriate Stormwater Pollution Prevention Control	Met goal – Town facilities were inspected in on July 3, 2018. No illicit discharge or source of pollution was determined from the inspection. (See attached – BMP 5.1).

C. Stormwater Data Summary

Provide a summary of all information used including any lab results (if sampling was conducted) to assess the success of the SWMP at reducing the discharge of pollutants to the MEP. For example, did the MS4 conduct visual inspections, clean the inlets, look for illicit discharge, clean streets, look for flow during dry weather, etc.? (Refer to the MS4 General Permit TXR040000 Part IV Section B.2.(b))

- On July 3, 2018 the Public Works Director inspected Town stormwater-related facilities and operations. Inspections included review for illicit discharges, flow during dry weather, erosion and siltation issues, and other evidence of potential pollutants being discharged to the MEP. A dry weather inspection was also performed by the Town Engineer on May 9, 2018. No discharges or violations were found. These inspections are repeated annually or as-needed, and issues reported will be addressed through cleaning or other corrective action (See attached – BMP 2.2 and 5.1).

D. Impaired Waterbodies

1. If applicable, explain below any activities taken to address the discharge to impaired waterbodies, including any sampling results and a summary of the small MS4's BMPs used to address the pollutant of concern: (Refer to MS4 General Permit TXR040000 Part IV Section B.2.(c)) NOT APPLICABLE

2. Describe the implementation of targeted controls if the small MS4 discharges to an impaired water body with an approved TMDL (Refer to the MS4 General permit TXR040000; Part II Section D.4.(a)): NOT APPLICABLE

3. Report the benchmark identified by the MS4 and assessment activities (Refer to the MS4 General permit TXR040000; Part II Section D.4.(a)(6)): NOT APPLICABLE

Benchmark Parameter *(Ex: Total Suspended Solids)*	**Benchmark Value**	**Description of additional sampling or other assessment activities**	**Year(s) conducted**

4. Provide an analysis of how the selected BMPs will be effective in contributing to achieving the benchmark (Refer to the MS4 General permit TXR040000; Part II Section D.4.(a)(4)): NOT APPLICABLE

Benchmark Parameter	**Selected BMP**	**Contribution to achieving Benchmark**

5. If applicable, report on focused BMPs to address impairment for bacteria (Refer to the MS4 General Permit TXR040000; Part II Section D.4.(a)(5)): NOT APPLICABLE

Description of bacteria-focused BMP	**Comments/Discussion**

6. Assess the progress to determine BMP's effectiveness in achieving the benchmark (Refer to the MS4 General Permit TXR040000; Part II.D.4.(a)(6)): NOT APPLICABLE

For example, the MS4 may use the following benchmark indicators:

- number of sources identified or eliminated;
- decrease in number of illegal dumping;
- increase in illegal dumping reporting;
- number of educational opportunities conducted;
- reductions in sanitary sewer flows (SSOs)
- increase in illegal discharge detection through dry screening

Benchmark Indicator	Description/Comments

E. Stormwater Activities

Describe stormwater activities the MS4 operator plans to undertake during the next reporting year. You may use the table below (Refer to the MS4 General Permit TXR040000 Part IV Section B.2.(d)):

MCM(s)	BMP	Stormwater Activity	Description/Comments
1	1.1	Distribute stormwater education material	Continue to provide educational stormwater materials for citizens and businesses.
1	1.3	River/stormwater system volunteer cleanups	Continue to organize, promote, and document community cleanup events to reduce the discharge of pollutants to the MS4. Identify additional ways to engage the community in cleanup events through coordination with existing civic organizations - Boy/Girl Scouts, Rotary, Kiwanis, etc.
2	2.2	Implement dry weather inspection procedure and form.	Dry Weather inspection procedure will continue to be implemented into the Town Maintenance schedule. A multi-use inspection form has been developed and will continue to be utilized.

MCM(s)	BMP	Stormwater Activity	Description/Comments
2	2.4	Educate employees, business, and the general public	Continue to educate Town staff, community members, and local business about the hazards associated with illegal discharges to the stormwater system.
4	4.1	Create and Distribute Educational Materials for Area Developers regarding Post-Construction Stormwater Controls	Research and develop informative checklist related to erosion control requirements and post-construction stormwater controls. During pre-construction meetings (Waketon Rd. and similar developments) distribute informative checklist to contractors. Also add website links to the Illicit Discharge Ordinance and Erosion Control Ordinance, as reference for contractors and the public.
5	5.1	Assess municipal properties for appropriate stormwater pollution prevention control	Continue to conduct and document municipal property stormwater pollution prevention inspections.

F. SWMP Modifications

1. Changes have been made or are proposed to the SWMP since the NOI or the last annual report, including changes in response to TCEQ's review.
   _Yes__X__No

If 'Yes', report on changes made to measurable goals and BMPs (Refer to the MS4 General Permit TXR040000 Part IV Section B.2.(e)): NOT APPLICABLE

MCM(s)	Measurable Goal(s) or BMP(s)	Implemented or Proposed Changes (Submit NOC as needed)

Note: If changes include additions or substitutions of BMPs, include a written analysis explaining why the original BMP is ineffective or not feasible and why the replacement BMP is expected to achieve the goals of the original BMP.

2. Explain additional changes or proposed changes not previously mentioned (i.e. dates, contacts, procedures, annexation of land etc.):

G. Additional BMPs for TMDLs and I-Plans

Provide a description and schedule for implementation of additional BMPs that may be necessary, based on monitoring results, to ensure compliance with applicable TMDLs and implementation plans (Refer to the MS4 General permit TXR040000 Part IV Section B.2.(f)): NOT APPLICABLE

BMP	Description	Implementation Schedule (Start Date etc.)	Status / Completion Date (completed, in progress, not started)

H. Additional Information

1. Is the permittee relying on another entity to satisfy some of its permit obligations? (refer to the MS4 General Permit TXR040000 Part IV Section B.2.(g))

   ___ Yes _X__ No

   If 'Yes," provide the name(s) of other entities and an explanation of their responsibilities (add more spaces or pages if needed): NOT APPLICABLE

Name and Explanation:

2.a. Is the permittee part of a group sharing a SWMP with other entities?

___ Yes _X__ No

2.b. If 'yes,' is this a system-wide annual report including information for all permittees? NOT APPLICABLE

___ Yes ___ No

If 'Yes,' list all associated authorization numbers, permittee names, and SWMP responsibilities of each member. (add additional spaces or pages if needed):

Authorization Number: _____ Permittee:_____

I. Construction Activities

1. The number of construction activities that occurred in the jurisdictional area of the MS4 (Notices if intent and site notices received; Refer to the MS4 General Permit TXR040000 Part IV Section B.2.(h)) _2 sites_____

2a. Does the permittee utilize the optional 7th MCM related to construction?

___ Yes __X_ No

2b. If 'yes,' then provide the following information for this permit year (refer to the MS4 General Permit TXR040000 Part IV Section B.2.(i)):

The number of municipal construction activities authorized under this general permit	
The total number of acres disturbed for municipal construction projects	

Note: *Though the seventh MCM is optional, implementation must be requested on the NOI or on a NOC and approved by the TCEQ.*

J. Certification

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.

Name (printed): Mike Donnelly Title: Mayor

Signature: _____ Date: 3-27-19

Name of MS4 _____

Name (printed): _____ Title: _____

Signature: _____ Date: _____

Name of MS4

Name (printed): _____ Title: _____

Signature: _____ Date: _____

Name of MS4

Name (printed): _____ Title: _____

Signature: _____ Date: _____

Name of MS4

Name (printed): _____ Title: _____

Signature: _____ Date: _____

Name of MS4

Note: If this is this a system-wide annual report including information for all permittees, each permittee shall sign and certify the annual report in accordance with 30 TAC §305.128 (relating to Signatories to Reports).

A GREEN GUIDE TO YARD CARE

Your yard is the environment over which you have the most control. *YardWise* is a simple four-step program to help you maintain a healthy yard with less cost, less work, and less waste.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

GI-028 *(Rev. 2/08)*

Why YardWise?

Many common yard care practices are out of balance with nature:

> ***"These heaps of garbage … do you know what all this is? It is the flowering meadow, it is the green grass, it is perfumed hay, it is golden corn, it is bread on your table, it is warm blood in your veins, it is health, it is joy, it is life …."***
>
> ***—Victor Hugo***

- Every year more than 5 million tons of yard trimmings and other organic materials end up in Texas landfills instead of building up the soil.
- Millions of gallons of city-treated water are used to irrigate landscapes where native vegetation once grew in naturally mulched soil, sustained by rainfall.
- Much of that water runs off the land, eroding depleted and unprotected soils that are unable to absorb it. The excess sediment from your lawn and many other yards can smother aquatic life in the receiving bodies of water. Excess sediment can also increase the cost of operating water supply reservoirs.
- Costly synthetic fertilizers and pesticides are applied to compensate for the loss of nutrients and protection once provided by organic debris and rich soil life. Surprising as it may seem, residential users apply more pounds per acre of these chemicals than farmers do—often to the point of disrupting beneficial soil life.
- As your soil loses its organic matter, it allows more of these chemicals to run off and wash through it—contributing to the pollution of lakes, streams, and underground water. In excess, these pollutants can harm aquatic life or contaminate the food chain.

These practices cost Texans millions of dollars every year:

- Disposing of organic materials in Texas landfills costs more than $150 million a year and consumes more than 15 million cubic yards of space.
- The extra water and chemicals used to sustain gardens and landscapes in depleted soil costs many more millions.
- It is difficult to put a price on the loss of water quality in Texas rivers, lakes, and aquifers. However, it is almost always less expensive to prevent pollution than to clean it up.

As our population increases and home landscapes become a larger part of the Texas environment, it is more important than ever to manage them responsibly.

Contents

Glossary iii

Grasscycling: "Don't Bag It!" 1
- Basics 1
- Grasscycling Benefits 1
- Grasscycling Guidelines: Mowing 1
- Grasscycling Guidelines: Watering 2
- Grasscycling Guidelines: Fertilizing 2

Mulching 3
- Basics 3
- Mulching Benefits 3
- Mulching Guidelines: Make the Best Use of Mulch Covers 3

Composting 4
- Basics 4
- Compost Benefits 4
- Two Compost Recipes 5
  - Cool and Easy Compost 5
  - Hot and Fast Compost 6
- The Science of Composting 7
  - Basics 7
  - A Balanced Diet of Carbon and Nitrogen (C:N) 7
  - Adequate Moisture and Oxygen 8
  - The Right Particle Size 8
  - A Healthy Temperature 9
- Typical Composting Systems 12
  - Piles: Open or Covered 12
  - Homemade Bins 12
  - Manufactured Bins 13
- Harvesting and Using Compost 14
  - When is Compost Ready? 14
  - How to Harvest Compost 14
  - How to Use Compost 14
- Worm Composting 16
  - Kinds of Worms 16
  - Materials for Worm Composting 16
  - Containers for Worm Composting 16
  - Steps to Establish a Worm Composting Bin 17
  - Harvesting Worm Compost 17
  - Preventing Problems 17
- Composting in the Ground 18

Green Landscape Design and Yard Care 19
- Basics 19
- The Right Plants in the Right Places 19
- WaterWise 20
  - Basics 20
  - Watering Lawns 20
  - Watering Trees, Shrubs, and Ground Covers 20
  - Drip Irrigation 20
  - Sprinkler Irrigation 20
- Integrated Pest Management (IPM) 21
  - Basics 21
  - Identify the Problem 21
  - Know a Friend from a Foe 21
  - Use Appropriate Controls 21

Your Yard and Clean Air 25
- Small Engines—Big Problems 25
- New Regulations—Part of the Solution 25
- Pollution Prevention in Your Own Back Yard 25
  - Avoid Spilling Gasoline 25
  - Maintain Your Equipment 26
  - Consider Cleaner Options 26
  - Use Manual Tools 26
  - Reduce Mowing Time 26

For More Information 27
- General 27
- Composting 27
  - General Composting 27
  - Backyard Composting 27
  - Worm Composting (Vermicular) 27
- Xeriscaping 27
- Integrated Pest Management 27
- Small Gasoline Equipment for Lawns and Gardens 27
- Sources 27

Figures

Figure 1. Recommended Mowing Heights 1
Compost Bin Illustrations 11
Figure 2. Desirable Compost Bin Features 13
Figure 3. Trench Composting 18
Figure 4. Burying Food or Pet Wastes 18

Tables

Table 1. Mulch Application Guide 3
Table 2. Compost Pile Troubleshooting 9
Table 3. Compost Pile Ingredients 10
Table 4. Comparison of Worm Composting with Composting in Large Piles 16
Table 5. Selected Biological Control Agents 23
Table 6. Selected Botanical Pesticides: Targets and Toxicity 23

Glossary

aerobic—having sufficient free oxygen to support respiration

anaerobic—not having sufficient free oxygen to support respiration

annual—a plant with a natural life span of one year or less

botanical—derived from plant matter without chemical alteration

"brown" materials—organic materials with a high carbon-to-nitrogen ratio such as dead leaves, dry hay, dry wood chips, and paper

dripline—the ground directly below the farthest reach of a tree's branches

essential plant nutrients—elements that are necessary for the normal growth of plants

"green" materials—organic materials with a low carbon-to-nitrogen ratio such as green grass clippings, vegetable trimmings, and fresh manure

humus—the complex mixture of materials resulting from extensive decomposition of living things

macronutrients—essential plant nutrients that are used in relatively large quantities: nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur

micronutrients—essential plant nutrients that are used in very small amounts: iron, manganese, copper, zinc, boron, molybdenum, chlorine, and cobalt

microorganism—a living thing that is only visible through a microscope

organic—consisting of residues from living things, including dead leaves and branches, grass clippings, manure, and the products of the natural decomposition of these residues

organism—a living thing

peat moss—a moss harvested from peat bogs and used as a soil amendment and as a component of potting soils

perennial—a plant with a natural life span of more than two years

pH—a measurement of the acidity or alkalinity of a material, on a scale from 0 (maximum acidity) to 14 (maximum alkalinity), with 7 representing neutral.

synthetic fertilizer—a material containing manufactured essential plant nutrients

synthetic pesticide—a material containing manufactured chemicals designed to kill pests

toxicity—the ability of a substance to cause adverse effects (that is, to be *toxic*) in living organisms; a high toxicity means that very small amounts of the substance cause adverse effects

Grasscycling: "Don't Bag It!"*

Basics

Grasscycling means leaving grass clippings on the lawn to decompose into soil.

- **Mow** grass at the proper height and disperse the grass clippings down to the soil.
- **Water** grass only as needed—about 1 inch of water once a week.
- **Fertilize** grass with slow-release fertilizers as needed to correct deficiencies.

Grasscycling Benefits

- makes turf greener and tougher
- prevents common turf diseases
- reduces lawn fertilizer requirements
- does not cause thatch—in fact, helps prevent it
- reduces total time spent mowing and maintaining your lawn
- cuts down on watering needs and costs
- eliminates disposal of grass clippings (and sometimes leaves too)

** Don't Bag It is a program created by the Texas AgriLife Extension Service. Used with permission.*

Grasscycling Guidelines: Mowing

The key to grasscycling is to mow at the proper height (see Figure 1) and disperse the small grass clippings evenly so they fall down to the soil. Mowing grass too short causes stress, discourages deep root growth, and results in rapid loss of soil moisture. Letting grass grow too tall between mowings causes excess grass clippings that smother the turf and take a long time to break down.

You do not need a special mulching mower. However, grasscycling results may be improved by using a mulching mower, by replacing a standard mower blade with a mulching blade, or by covering a mower's outlet chute.

- Raise the mowing height during the hot and dry season. A higher setting reduces moisture loss and encourages deep root growth.
- Mow often enough that each mowing removes no more than one-third of the grass blade; for example, if you set your cutting height at 2 inches, then cut before the grass is more than 3 inches tall.
- Keep mower blades sharp and clean, and mow when the grass is dry.
- Mow over leaves so they will decompose along with grass clippings.
- Collect leaves and grass clippings for mulching or composting when they are too heavy or too wet for grasscycling.

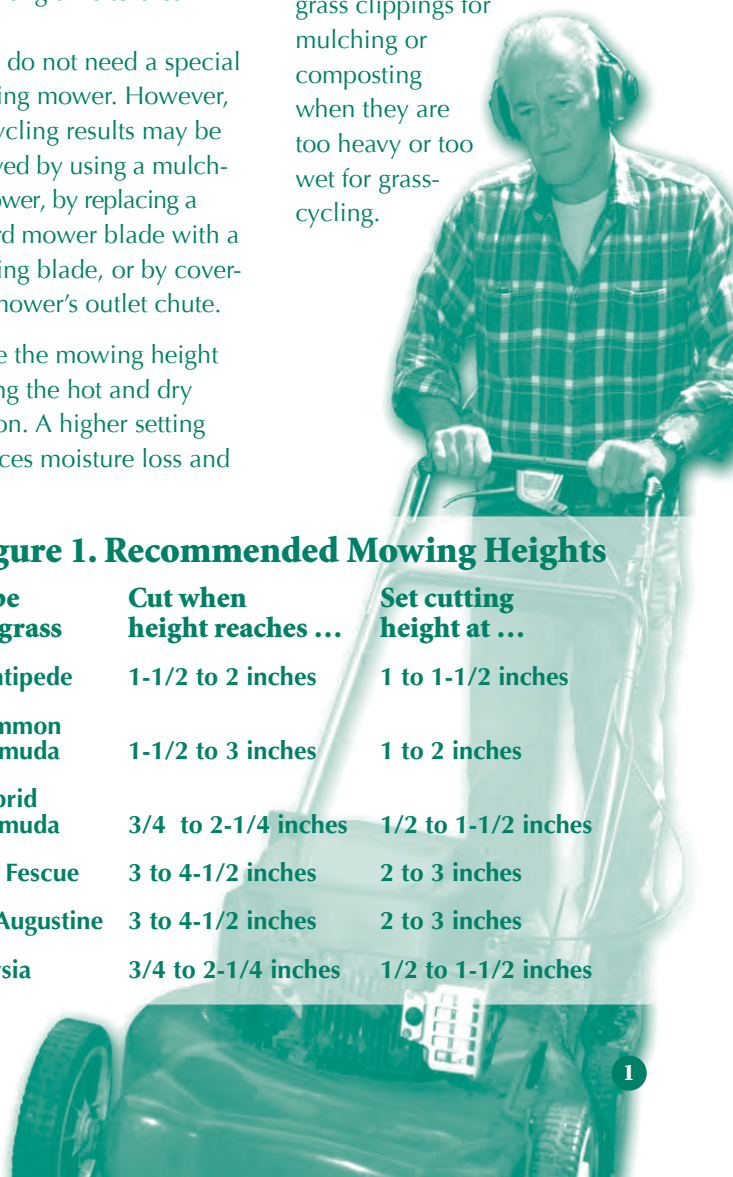


Figure 1. Recommended Mowing Heights

Type of grass	Cut when height reaches …	Set cutting height at …
Centipede	1-1/2 to 2 inches	1 to 1-1/2 inches
Common Bermuda	1-1/2 to 3 inches	1 to 2 inches
Hybrid Bermuda	3/4 to 2-1/4 inches	1/2 to 1-1/2 inches
Tall Fescue	3 to 4-1/2 inches	2 to 3 inches
St. Augustine	3 to 4-1/2 inches	2 to 3 inches
Zoysia	3/4 to 2-1/4 inches	1/2 to 1-1/2 inches

Grasscycling Guidelines: Watering

Grasscycling reduces the amount and frequency of watering. Watering too heavily or too often weakens the turf and causes erosion and runoff pollution.

- Water when footprints across the lawn remain visible or when it is difficult to push a screwdriver into the turf.
- Water deeply (6-inch penetration or deeper). Apply approximately 1 inch of water once a week. Water slowly enough to avoid runoff.
- To measure your sprinkler application, place an empty 6-ounce tuna can on your lawn. Stop watering when it is full.

Grasscycling Guidelines: Fertilizing

Excess fertilization weakens roots, increases watering needs, causes thatch and excessive growth, and pollutes waterways. Your county extension office can help you analyze your soil and recommend fertilizers and application schedules.

- Grasscycling provides about 2 pounds of nitrogen per 1,000 square feet of lawn per year. Some people find that grasscycling completely eliminates the need for synthetic lawn fertilizers.
- Slow-release nitrogen sources such as compost, blood meal, sulfur-coated urea, and urea formaldehyde help lawns grow at a moderate, even pace. Avoid using quick-release fertilizers.
- Gently water your lawn after applying fertilizers. Never wait for a rainstorm to water in your fertilizer—in most cases, the rain will fall too rapidly for the fertilizer to be absorbed, and much of it will wash into the nearest stream. *

Mulching

Basics

Mulch is a material spread on top of the ground to benefit soil and plant health, and make landscape maintenance easier. Wood chips, leaves, grass clippings, wood shavings, and compost all make good mulches.

Mulching Benefits

- ▼ prevents soil compaction and erosion
- ▼ suppresses weeds
- ▼ captures and retains soil moisture
- ▼ protects plant roots and crowns from extreme heat and cold
- ▼ protects and stimulates microbial activity in the soil
- ▼ adds nutrients to the soil as they break down

Mulching Guidelines: Make the Best Use of Mulch Covers

- ♦ Mulch all areas that are not in grass or thick ground cover.
- ♦ Trees and shrubs benefit from mulch spread at least as far as their outermost branches (the "dripline"). To prevent diseases and pest infestation, avoid piling mulch against tree trunks.
- ♦ Use a layer of coarse mulch 3 or more inches in depth for weed control.
- ♦ When converting grassy areas to mulch, smother the grass with a thick layer of cardboard or newspapers rather than kill it with chemicals. Some hardy grasses must be rooted out for successful removal.
- ♦ Blanket perennials with several inches of shredded leaves or whole pine needles to protect them from winter cold.
- ♦ Use long-lasting mulches (wood chips, shavings, evergreen needles) for trees and shrubs.
- ♦ Spread mulches under annuals after they are well established (4 to 6 inches tall).
- ♦ Water the ground thoroughly before and after applying a mulch cover.
- ♦ Never rely on a rainstorm to water in your mulches. In many cases, the rain will fall too heavily and quickly, and a fair amount of your mulch may run off into the storm drain and local creeks.
- ♦ Never mulch with diseased or insect-infested yard trimmings.

Table 1 gives further details about using mulch. ✻

Table 1. Mulch Application Guide

Mulch Use	Material	Thickness	Notes
Top Dressing for Lawns	Compost	1/4 to 1/2 inch	Sifted through 1/2-inch mesh or finer screen; apply especially after aerating or reseeding, then water in.
For Annuals and Perennials	Grass clippings	1/2 to 1 inch	Do not mulch with herbicide-treated clippings or hay that has been treated with the persistent herbicide picloram.
	Shredded leaves and stalks	1 to 1-1/2 inches	Can use unshredded leaves on perennial beds in autumn.
	Compost	1 to 2 inches	
	Old straw	1 to 2 inches	
For Shrubs and Trees	Wood or bark chips	2 to 6 inches	2 to 3 inches for fine chips; up to 6 inches for large chips (more than 1 inch in length).
	Wood shavings	1 to 2 inches	Coarse shavings only. Sawdust can bind up soil nitrogen.
	Compost	1 to 3 inches	Coarse compost is best.
For Erosion Control	Wood chips or coarse compost	2 to 4 inches	2 to 4 inches over any area without cover; 3 to 4 inches on slopes.

Composting

Basics

- "Composting" means the controlled decomposition (decay) of organic material such as yard trimmings, kitchen scraps, wood shavings, cardboard, and paper.
- "Compost" is the humus-rich material that results from composting.
- Compost contributes nutrients and beneficial life to the soil, improves soil structure, and helps prevent runoff that can pollute rivers and lakes.
- Compost helps the soil absorb and retain nutrients and moisture, and protects plants from diseases and pests. Better moisture retention means less watering, allowing you to conserve water and reduce runoff pollution.

Compost Benefits

Compost makes good mulch. It can also be mixed into garden and potting soils.

Nutrients. Compost contains the full spectrum of essential plant nutrients. However, testing the nutrient levels in your soil can be helpful in determining what supplements your landscape requires. Ask your AgriLife county extension agent for more information.

- Compost contains micronutrients such as iron and manganese that are often absent in synthetic fertilizers.
- Compost releases its nutrients slowly, over several months or years.
- Soil enriched with compost retains fertilizers better than lifeless soil does. Less fertilizer runs off to pollute waterways.
- Compost balances both acid and alkaline soils, bringing pH levels into the optimum range for nutrient availability.

Soil Structure. Compost helps bind clusters of soil particles (aggregates). Soil rich in aggregates is full of tiny air channels and pores that hold air, moisture, and nutrients like a sponge.

- Compost helps sandy soil retain water and nutrients that would normally wash right through the sand.
- Compost breaks up tightly bound particles in clay or silt soil, allowing roots to spread, water to drain, and air to penetrate.
- Compost alters the texture and structure of all soils, increasing their resistance to erosion.
- Compost particles attract and hold nutrients strongly enough to prevent them from washing out, but loosely enough so that plant roots can take them up as needed.
- Compost makes any soil easier to work and cultivate.

Beneficial Soil Life. Compost introduces and feeds diverse life in the soil, including bacteria, insects, worms, and more, which support vigorous plant growth.

- Compost bacteria break down mulch and plant debris into plant-available nutrients. Some soil bacteria also convert nitrogen from the air into a plant-available nutrient.
- Beneficial insects, worms, and other organisms are plentiful in compost-enriched soil; they burrow through the soil, keeping it loose and well aerated.
- Compost suppresses diseases and harmful pests that overrun poor, lifeless soil.

Water Quality. In the summer, as much as half of urban water usage goes for the irrigation of lawns and landscaped areas. Compost increases soil's ability to retain water and decreases runoff. Runoff pollutes water by carrying soil, fertilizers, and pesticides to nearby streams.

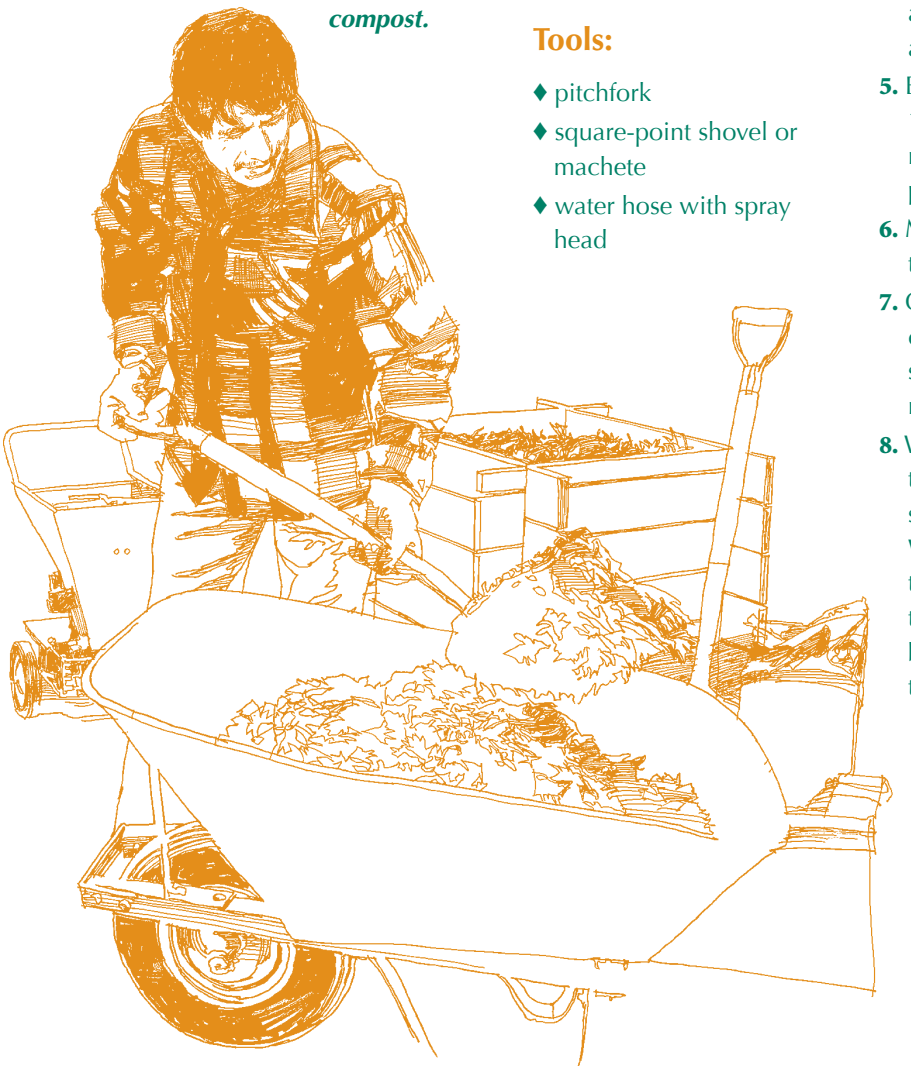
- Compost promotes healthy root growth, which decreases runoff.
- Compost can reduce or eliminate your use of synthetic fertilizers.
- Compost reduces the need for chemical pesticides because it contains beneficial microorganisms that protect your plants from diseases and pests.

Two Compost Recipes

There are two approaches to composting:

- **Cool and Easy Composting** is adding materials gradually to a bin or pile and allowing them to compost slowly with little maintenance.
- **Hot and Fast Composting** is building and actively mixing a pile to produce disease-killing temperatures and can yield finished compost in three to four months.

The following are sample "recipes." There is no need to follow them exactly. There are many different "right" ways to compost.



Cool and Easy Compost

With this low-maintenance, "continuous feed" approach, compost is ready in six months to two years. This practice does not destroy weed seeds, runners, or plant diseases.

Ingredients:

- mixed yard trimmings as available, including grass clippings, flowers and stalks, leaves, weeds without seeds or spreading roots, twigs, and small branches
- vegetable and fruit scraps, and coffee grounds
- rainwater and additional water as needed

Tools:

- pitchfork
- square-point shovel or machete
- water hose with spray head
- chipper-shredder (optional, for composting thick woody materials)
- compost bin (optional)
- tarp, burlap, or black plastic cover (optional)

Directions:

1. Set compost bin or pile where water does not puddle when it rains, preferably a shaded spot near a water source.
2. Put yard trimmings in bin or pile as they are collected.
3. Chop or shred woody trimmings.
4. When adding grass clippings and green garden wastes to the pile, mix them into the leaves and other yard materials already in the pile.
5. Bury kitchen scraps under 10 inches of yard trimmings or finished compost.
6. Moisten dry materials as they are added.
7. Optional: Cover top of compost with tarp or sheet plastic to keep it moist.
8. When material at the bottom looks like dark, rich soil, you have compost. When convenient, move the undecomposed materials into a new pile or bin, and harvest and use the compost. ✻

Hot and Fast Compost

This approach requires more maintenance but produces compost in batches that are ready in one to four months. (A minimum "batch" is enough to fill a plastic bin or to build a pile at least 3 feet high and 3 feet in diameter.) This practice destroys most plant diseases, weeds, and weed seeds.

Ingredients:

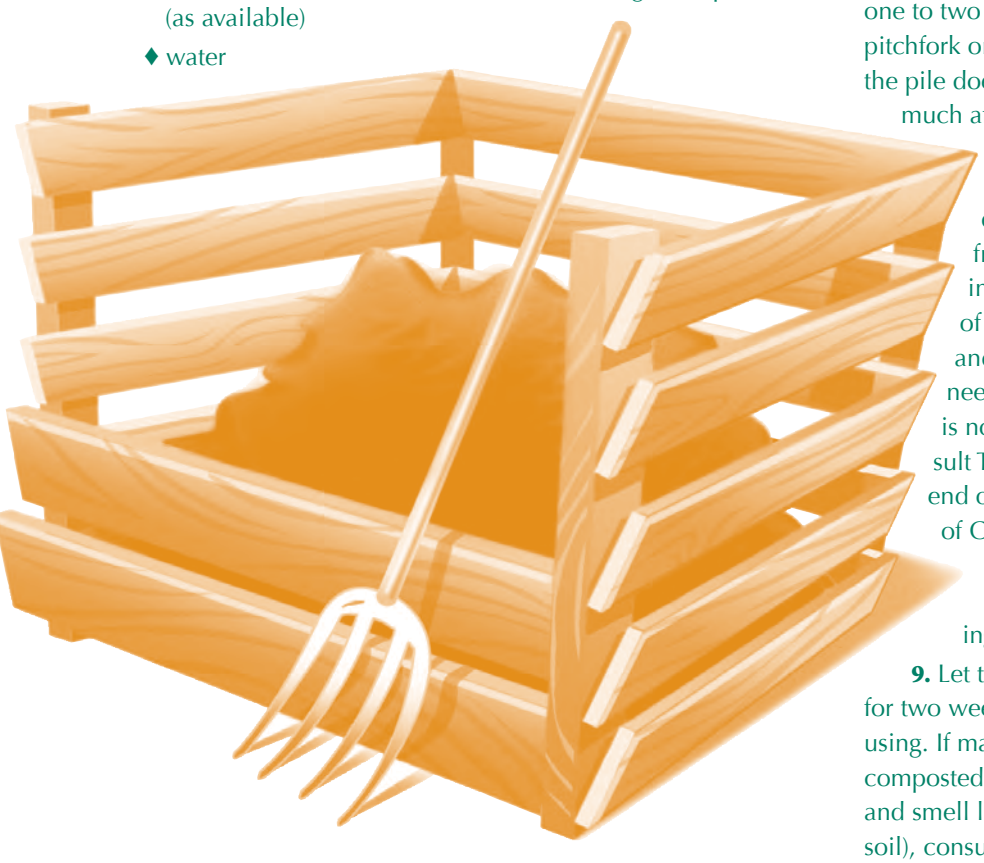
- three to four or more wheelbarrows of "green" yard materials—such as grass clippings and garden debris
- three to four or more wheelbarrows of "brown" materials—such as leaves, dry weeds, brush, and woody prunings
- vegetable and fruit scraps, and coffee grounds (as available)
- water

Tools:

- pitchfork
- square-point shovel or machete (optional)
- rotary lawnmower or chipper-shredder (when composting woody material or dry leaves)
- water hose with spray head
- compost bin (optional)
- tarp, burlap, or black plastic for covering the pile and/or mixing materials (optional)
- compost thermometer (optional)

Directions:

1. Pick a 4-foot by 8-foot area where water does not puddle when it rains, preferably a shaded spot near a water source.
2. Chop up the gathered stalks and garden plants with shovel or machete. Chip or shred woody trimmings.
3. Cover half of the 4-foot by 8-foot area with a 6-inch layer of "brown" materials.
4. Add a 3-inch layer of fresh "green" materials, and add a dash of soil or finished compost.
5. Mix this layer lightly into the layer below it with a hoe or hand cultivator.
6. Top with a 3-inch layer of "brown" materials; add water until moist.
7. Repeat steps four through six until the pile is at least 3-feet high. Note: The pile should be completely covered with 4 inches or more of brown materials. Food materials should be mixed in and buried deep in the pile.
8. Turn the pile over every one to two weeks with a pitchfork or shovel until the pile does not reheat much after turning. With each turning, move dry materials from the edges into the middle of the new pile, and add water as needed. If the pile is not heating, consult Table 2 at the end of the "Science of Composting" section for troubleshooting tips.
9. Let the pile cure for two weeks before using. If materials are not composted (do not look and smell like dark, rich soil), consult Table 2 for troubleshooting tips. ✻



Basics

Composting means creating an environment where things can decay without creating nuisance odors or attracting pests. There are two main causes of nuisance odors in composting: too much nitrogen or not enough oxygen.

- ▼ Ammonia odors are caused by too much nitrogen from fresh or "green" materials like food scraps and green grass clippings. Use "brown" materials like dry grass or dead leaves for more than half of the material in your pile. Mix your "green" materials into the "brown" materials so there are no big pockets of "green" material left.
- ▼ "Rotten" odors are caused by low oxygen levels where your material is water-soaked and compacted. Keep your pile full of air by mixing in lots of coarse materials or by remixing and turning the pile often. Your compost should stay lightly moist like a wrung-out sponge so that no water drips out when you squeeze it.

Pests are attracted to composting piles by "green" materials that are close to the surface. You can keep pests away from your pile by mixing "green" materials deep inside the pile and by keeping the top of the pile covered by a bin or a thick layer of "brown" materials. If you use "cool and easy composting," play it safe and limit the nitrogen and moisture in your pile. If you use "hot and fast composting," be sure that you keep your pile well-mixed and balanced between carbon and nitrogen.

The Science of Composting

Composting involves a complex "food chain" of bacteria, fungi, mites, worms, beetles, and other beneficial organisms that consume organic materials and produce humus. The composting process is mostly accomplished by bacteria, especially when it is proceeding rapidly at a high temperature. Bacteria quickly populate any good composting environment. Other organisms become active as conditions become favorable to them. All you have to do is maintain the conditions that allow these organisms to thrive in your pile or bin until the job is done. The proper environment for them is a mass of organic materials that contains a balanced diet of carbon and nitrogen, and adequate moisture and oxygen. For rapid composting, the materials should also have the right particle size and heat up to 120 to 150 degrees Fahrenheit.

A Balanced Diet of Carbon and Nitrogen (C:N)

Like human beings, compost organisms require a balanced diet of nutrients. You don't need to worry about proteins, vitamins, and minerals. Just balance the carbon and nitrogen in the composting materials by mixing high-nitrogen "green" materials—food scraps, green grass clippings, and manure—and high-carbon "brown" materials—dry grass, dead leaves, and wood chips and shavings. (Table 3 on pages 10-11 gives carbon-nitrogen characteristics of common compost ingredients.)

- ♦ A compost pile made up only of "brown" materials breaks down slowly because it does not contain enough nitrogen to support a large population of compost organisms.
- ♦ A compost pile with too much "green" material begins to harbor pests and to lose its nitrogen in an ammonia form, which creates odor problems.
- ♦ A good rule of thumb is to mix equal amounts of "green" and "brown" materials by weight, or about 3 parts of "brown" materials to one part of "green" materials by volume.
- ♦ Add green and brown materials in thin layers; then mix them.
- ♦ Where it is critical to prevent odor and pest problems, use more brown material.

Understanding C:N:

Living things are largely made up of nitrogen (in proteins) and carbon (in sugars, starches, and fiber). While alive, living things have a high nitrogen content—they are "green." When they die and start decomposing and drying out in the open, airborne bacteria and other decomposers consume the protein-rich tissues first and disperse the nitrogen in the form of dead bacteria, bug droppings, ammonia, and other by-products. The carbon-rich plant fibers stay intact much longer. This is

the process that turns "green" materials like green grass clippings that are left in the open into "brown" materials like dry grass. Manure is considered a "green" material because it stays rich in nitrogen for a long time.

Importance of C:N:

Part of the purpose of composting materials in piles and bins is to keep their nitrogen from dispersing. Dead bacteria and the nitrogen-rich materials that living bacteria excrete, including ammonia, diffuse and cascade slowly through the pile. New generations of bacteria and other composting organisms recycle this nitrogen as they consume the high-carbon plant fibers for energy.

Adequate Moisture and Oxygen

Just as carbon and nitrogen should be balanced, so does moisture and oxygen. Too much moisture leaves no air spaces, but too much ventilation dries out the materials.

Early in the composting process, the main difficulty is to keep all the materials in a well-mixed pile moist. Later, as they break down into a more crumbly, absorbent, compact mass, the main challenge may be to keep the material "aerated" with fresh air. Rapid composting at high temperatures can deplete oxygen in the pile quickly, even early in the composting process.

Thoroughly moisten your materials, preferably with a fine spray, as you build your pile or add to it. A pile of dry organic material can shed water like a duck. If your pile is too dry, you can

- turn it (pull it apart and restack it), wetting the materials as you restack them;
- mix in damp materials such as food scraps; or
- mix in fine-particle, absorbent materials like manure.

If your pile is too wet, turn it and mix coarse materials like dry leaves or straw into it as you restack it. If your pile keeps drying out, help it retain its moisture and nutrients by building it larger (a minimum 3-foot diameter and height), by putting it in a covered bin, or by covering it with a tarp, a plastic sheet, burlap, straw, or other mulch.

Importance of Moisture and Oxygen:

Where moisture is lacking, decay is very slow. Where oxygen is lacking (that is, in "anaerobic" conditions), materials are decomposed slowly by "anaerobic organisms" that can produce foul smells and noxious by-products. The best level of moisture for a compost pile is as much moisture as the materials can contain without filling the air space between the particles—like a completely damp, wrung-out sponge. When you squeeze the material, no water should drip out.

Most "brown" materials, including leaves and wood chips, are coarse, stiff, and "angular," creating air spaces in the pile and thus helping it stay "aerated" (oxygen-rich). "Brown" materials also tend to dry out quickly and to absorb moisture slowly. It can be difficult to keep them moist. On the other hand, "green" materials, such as fresh grass clippings and food scraps, tend to be pliable and moist and to mat together into an "anaerobic" mass.

Mixing green and brown materials together also improves the balance between moisture and oxygen in a pile, in most cases. Paper is an exception—it is very "brown," but it is easy to wet and tends to mat together, so it can help absorb excess moisture but does not help much with aeration.

The Right Particle Size

Composting happens where moist organic materials are exposed to air. When materials are broken into small particles, there is more exposed surface area for composting organisms to attack. Microscopic organisms penetrate solid objects slowly.

Break down large objects before adding them to the pile.

- Twigs and leaves can be run over with a lawn mower or run through a leaf shredder.
- Whole branches can be run through a chipper.
- Garden plants and thick prunings can be chopped with a machete or pruning shears.
- Food scraps can be cut up in the kitchen or chopped up in a bucket with a square-point shovel.

Importance of Particle Size:

Rapid, aerobic composting occurs when green and brown materials are reduced to small pieces and thoroughly mixed together. That way,

every part of the pile gives decomposing organisms access to needed carbon, nitrogen, oxygen, and water. Chunks of wood and other lumps of brown material are "nitrogen-poor zones." Whole apples or other large pieces of green material are "anaerobic zones." A pile full of large chunks of material will have too much air space, and the surfaces will dry out rapidly. A pile of very fine materials such as manure and sawdust may have too little oxygen and require frequent turning.

A Healthy Temperature

The best way to know whether your compost pile is "healthy" is to take its temperature. Composting occurs most efficiently when the pile's temperature rises to between 120 and 160 degrees Fahrenheit and stays there until most of the material has decomposed. Composting can be successful at much lower temperatures—it just takes longer.

- If your pile does not reach 120 degrees Fahrenheit, check to be sure that the particle size is right (see preceding section); that

Table 2. Compost Pile Troubleshooting

Symptom	Possible Causes	Possible Solutions
Damp and warm only in middle of pile	Pile too small, built too gradually, or cold weather	Build pile at least 3-feet high and wide. Cover with tarp. Put in a covered bin. Or allow to compost "cold."
Pile not heating up at all	1. Not enough nitrogen 2. Not enough oxygen 3. Not moist enough 4. Pile too small , built too gradually, or cold 5. Compost finished	1. Mix in fresh grass clippings, manure, or food scraps. 2. Turn or fluff the pile, especially where it is smelly or matted. 3. Turn the pile, wetting as you turn to consistency of damp sponge. 4. Build pile at least 3-feet high and wide. Cover with tarp. Put in covered bin. Or allow to compost "cold" and slow. 5. If dark and crumbly, smells earthy (not moldy or foul)—use it!
Matted, undecomposed leaves or grass clippings	Compaction, poor aeration, or lack of moisture	Avoid thick layers of leaves, grass, or paper. Break up layers with garden fork, then wet and remix the pile. Shred materials.
Odor like rancid butter, vinegar, or rotten eggs	Not enough oxygen, too wet or compacted	Turn pile, fluffing materials to aerate them. Add coarse dry materials like leaves as needed to soak up excess moisture. If odor is intense, possibly cover with a layer of newspapers and/or coarse dry materials and allow pile to mellow before turning.
Odor like ammonia	Not enough carbon	Add "brown" materials and aerate. If odor is intense, possibly cover and allow pile to mellow before turning (see preceding row).
Attracting rats, raccoons, dogs, flies, or other pests	Inappropriate materials (meat, oil, bones) or food too close to surface	Dispose of meat and oil. Use a rodent-resistant bin. Bury kitchen scraps 8 to 12 inches deep in the pile. For more details on acceptable materials, see Table 3 for a list of compost pile ingredients.
Attracting various insects, centipedes, slugs	Normal composting	If garden pests are identified in pile, use traps or barriers between pile and garden.
Infested with fire ants	Too dry, not hot enough, or food too close to surface	Drench ant mounds with compost tea sweetened with feed-grade molasses (see "How to Use Compost" on page 14). Broadcast low-toxicity fire ant bait for major infestations. Carefully rebuild pile to proper conditions, wetting thoroughly.

the pile is big enough (a minimum 3-foot diameter and height); and that it has the right balance of green and brown materials, moisture, and oxygen. Building the pile larger, covering it with a tarp or burlap, or putting it in an enclosed bin helps it build up and retain heat.

- If your pile gets too hot (hotter than 160 degrees Fahrenheit), turn it to release excess heat and restore depleted oxygen. Adding water to dry materials as you turn them will reduce overheating and restore needed moisture.
- Heat dissipates at the edges of the pile. There may be 8 inches or more at the outer edges and top of the pile that never reach 120 degrees Fahrenheit, especially in open piles or wire bins. When turning a pile, mix this outer layer into the middle of the new pile to heat the materials.
- Composting thermometers with long probes are available through garden centers.

Table 3. Compost Ingredients: Yes, No, or Use with Caution

Material	Use?	C:N*	Comments
Algae, seaweed, and lake weed	Yes	N	Good nutrient source.
Ash from coal or charcoal	No	O	May contain materials that harm plants. Best to exclude.
Ashes from clean wood (not treated or painted)	Caution	O	Small amounts are acceptable. Large quantities can elevate pH and suppress composting.
Beverages, kitchen rinse water	Yes	N	Use in place of water to moisten the inner pile. May also presoak kitchen scraps. Avoid pouring on surface or over-wetting the pile.
Bird droppings	Caution	N	May contain disease organisms and viable weed seeds.
Cardboard	Yes	C	Use it if it cannot be recycled. Best if shredded into small pieces. Glue is usually organic.
Cat droppings or litter	Caution	N	May contain disease organisms. Best to bury 5 inches deep in noncrop soils at least 100 feet from nearest lake, stream, or well.
Coffee grounds/filters	Yes	N	Worms love them.
Compost activators/ starters	OK; not required.	N	Millions of people make compost successfully without them.
Cornstalks, cobs	Yes	C	Best if chopped and mixed well with green materials.
Diseased plants	Caution	N	Piles often do not heat up enough to destroy all diseases. Compost that might contain diseased plants should be hot-composted, allowed to cure several months, and not be used around plants subject to the disease.
Dog droppings	Caution	N	See "cat droppings" above. Also, may be flushed down a toilet.
Dryer lint	Caution	C	Natural fiber materials only. Scatter thinly into the pile, not in clumps.
Eggshells	Yes	O	Crush them before adding. They break down slowly.

Importance of Temperature:

The "body heat" of teeming bacteria in a compost pile can build up temperatures of 160 degrees Fahrenheit or more when the materials are still fresh. As the material decomposes, it cannot support as many bacteria. As the number of bacteria decreases, the temperature gradually drops. Temperatures above 130 degrees Fahrenheit kill off most disease organisms within hours, and temperatures above 140 degrees Fahrenheit kill most weed seeds. However, rapid, hot composting depletes oxygen and necessitates frequent turning of the pile. Temperatures rising above 140 degrees Fahrenheit kill off organisms that help with the later stages of composting, thus delaying the curing of the pile.

Table 3. Compost Pile Ingredients: Yes, No, or Use with Caution – Continued

Material	Use?	C:N*	Comments
Fish scraps	Caution	N	Potent odor source. Magnet for rodents and other pests unless buried well in the middle of a hot compost pile.
Hair	Yes	N	Scatter thinly into the pile, not in clumps.
Lime	No	O	Add it to finished compost or soil as needed. Can kill composting organisms and can cause release of ammonia gas from compost pile.
Manure (horse, cow, pig, sheep, goat, chicken, rabbit)	Yes	N	Excellent source of nitrogen. If fresh or damp, mix with coarse brown materials.
Meat, fat, grease, oil, bones	Caution	N	Potent odor source. Health hazard to pets. Magnet for rodents and other pests unless buried well in the middle of a hot compost pile.
Milk, cheese, yogurt	Caution	N	Only in small amounts. Mix thoroughly with other materials and bury 8 inches or more deep in a hot compost pile.
Newspapers	Yes	C	Use it if it cannot be recycled. Best if shredded into small pieces. Most inks today are safe for garden use.
Oak leaves	Yes	C	Recommend shredding. Decompose slowly. Acidic.
Pine needles and cones (also cedar, other conifers)	Yes	C	Recommend shredding and using as less than half of pile mix. Decompose slowly. Acidic.
Sawdust and wood shavings	Yes	C	Very high C:N ratio. Recommend using as less than half of pile mix. May need extra nitrogen source. Avoid sawdust and shavings from pressure-treated wood. Use sawdust sparingly.
Sod	Caution	N	Avoid Bermuda sod and other hardy spreading-root sods. Compost separately, grass side down. Cover with black plastic to inhibit sod growth.
Weeds	Caution	N	Avoid roots of Bermuda and weeds that have gone to seed unless they are mixed well inside a hot compost pile. Same for morning glory, ivy, and other plants that spread by runners. It may help to dry them thoroughly on hot pavement.

* C = high carbon, N = high nitrogen, O = doesn't affect C:N balance

Typical Composting Systems

Desirable compost bin features are summarized in Figure 2. Remember that successful composting does not require a bin.

Whichever system you adopt, place the pile in an area where it is unlikely to be washed out by rainfall runoff.

Piles: Open or Covered

Approximate Cost:

$0–$10 (for optional tarp, black plastic, burlap, or other covering).

Basic Design:

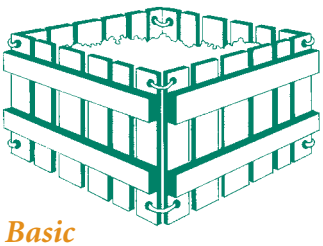
Arrange your materials in a compact mound with a minimum 3-foot height and diameter. Use a covering if desired to help contain moisture and heat.

Homemade Bins:

Pallet Bin

Approximate Cost:

$0–$10.



Basic Design:

Arrange four used pallets of uniform size and shape to form an open-top box. Avoid pallets with wide gaps between the boards. Use spare wire or coat hangers, nylon or poly rope, or strapping to lash them together near the top and bottom of each corner. Be sure that the lashing on at least one corner of the bin can easily be undone (if you use rope or strap, use a slip-loop knot, top and bottom) so you can open the bin readily by unfastening one corner and swinging one of the pallets out like a door.

Perforated Garbage Can or 55-Gallon Drum with Lid

Approximate Cost:

$0–$30.

Basic Design:

A metal or plastic trash container or drum that has not contained harmful substances, if well aerated with evenly-spaced holes in its side.

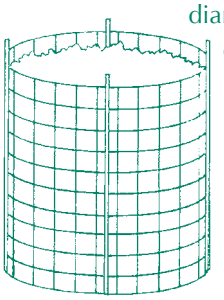
Circle Bins of Wire Fence or Hardware Cloth

Approximate Cost:

$0–$50.

Basic Design:

A 12-foot length of wire fence or hardware cloth (at least 3-feet high or higher), available at building materials and hardware stores, can be looped around with its ends overlapped about 1 foot, making a ring (cylinder) between 3 and 4 feet in diameter. Fasten ends with metal clips or wire ties. For safety and ease of opening, roll back and flatten the sharp cut ends of the fencing or hardware cloth before fastening together. Bins made with poultry wire will bulge and collapse unless supported by a sturdy frame.

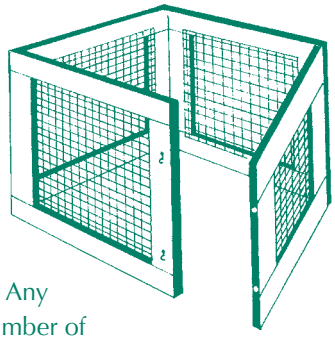


Wooden or Wood-Frame with Wire Mesh

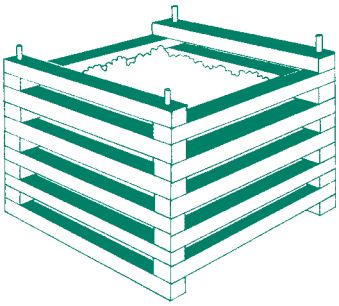
Approximate Cost:

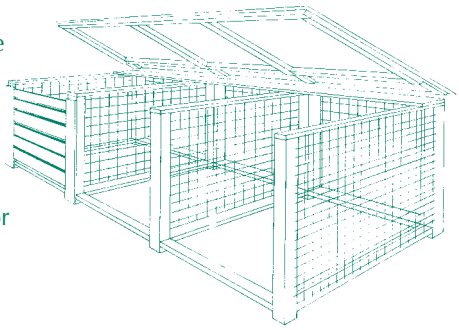
$0–$100.

Basic Design:



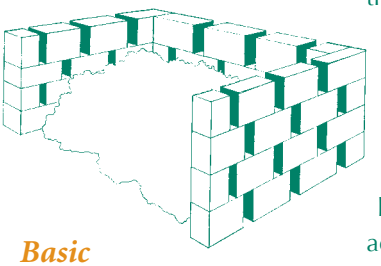
Any number of designs are possible. Several designs use wood-framed panels of wire mesh for the sides. Another design is a cube-shaped frame of two-by-fours, about 4 feet on each side, with three fixed plywood or board sides, one side a hinged door, and possibly a lid on hinges. Do not use treated or creosoted wood—it can leach toxins into your soil and compost.





Cinder Block or Brick

Approximate Cost:
$0–$100.



Basic Design:
Construct a three-sided square enclosure (at least 3 feet to a side) by laying cinder blocks or bricks in a staggered pattern without mortar. Leave gaps between the blocks for as much aeration as desired. The corners can be braced, if necessary, with fenceposts inserted through the blocks if they are lined up properly. When compost begins spilling out of the open side, it can be contained by propping up boards or laying extra blocks or bricks across that side, one row at a time as the bin fills. When it is time to harvest the compost, that wall can be taken down again.

Manufactured Bins

Approximate Cost:
$10–$150.

Basic Design:
Manufactured bins come in a wide variety of designs, including

- hook-together panels of heavy-duty plastic-coated wire fencing or wood-framed wire mesh,
- wooden slats stacked "Lincoln-Log" fashion on metal corner rods,
- flexible sheet-plastic rectangles that loop around to form cylinder-shaped bins, and
- molded plastic units with latching lids and harvesting doors.

Figure 2. Desirable Compost Bin Features

Capacity. The best composting temperature is reached in a pile or bin of at least 1 cubic yard (3-ft. length, width, and height).

Access. Select a bin design that allows easy access for adding material, for watering, and for turning.

Ease of assembly and relocation. These features allow turning by moving the bin and refilling.

Security. A well-managed compost pile should not attract harmful bugs, but pet and varmint access should be restricted.

Moisture and heat retention. Enclosed bins work better for smaller amounts of material.

Flexible size and adjustable shape. These features will accommodate changes in compost volume.

Aesthetics. This is a very personal consideration for both you and your neighbors.

Harvesting and Using Compost

When Is Compost Ready?

Using compost before it is ready can damage plants. Undecayed "brown" materials in the soil can temporarily reduce plant-available nitrogen. Undecayed "green" materials can harbor pests and diseases. Immature compost can also introduce weed seeds and root-damaging organic acids. Compost is ready when

- it smells earthy—not sour, putrid, or like ammonia;
- it no longer heats up after it is turned or wetted; and
- it has a crumbly texture and it looks like dark soil.

How to Harvest Compost

Compost can be shoveled out of a pile or bin and used just as it is, especially for mulch. Remove undecayed objects by sifting them through a screen. If you are using compost in preparing soil for planting or sodding, sift it through a 1-inch mesh screen. Compost used in potting mixes or as top-dressing on lawns is commonly sifted through a 3/8-inch or 1/2-inch mesh screen. Make a simple screen by mounting hardware cloth or other durable wire mesh in a sturdy wooden frame that will fit neatly onto the wheelbarrow or other container into which you will screen the compost. Spread compost onto the screen in a thin layer and shake it. You can work the finer material through the screen with a paddle if it is clumpy. Add the "oversized" material that remains on top of the screen to a new pile to help it start composting faster.

How to Use Compost

Information on using compost as a topdressing or mulch can be found in Table 1, "Mulch Application Guide," on page 3.

The following are rules of thumb. Obtain procedures for using commercial compost from the store where you purchased it or from the manufacturer.

Soil Builder:

Plants benefit most from compost when it is mixed thoroughly with the soil 6 to 12 inches deep. Plants growing in a layer of pure compost have difficulty sending roots down below the compost into the soil. Compost used as a soil preparation should be sifted through a 1/2-inch or finer mesh screen.

- **Flower and vegetable beds and ground covers.**
  - New areas: dig or till soil to an 8- to 10-inch depth, add a 1- to 4-inch layer of compost, and mix it thoroughly into the tilled soil.
  - Established areas: mix 1 to 3 inches of compost into the top 6 to 10 inches of soil before each planting. (It takes one-half cubic yard or 6 bushels to cover 100 square feet to a 1-inch depth.)
- **New Lawns.** Till soil 6 to 12 inches deep and then thoroughly mix in a 1- to 2-inch layer of fine compost (sifted through a 1/2-inch or finer mesh screen) before sodding or seeding.
- **Trees and shrubs.** Before planting, dig or till 8 to 12 inches deep over the entire planting area—or at least two to five times the area covered by the root ball. Add and thoroughly mix in a 1- to 4-inch layer of compost.

Potting Mix:

Mix compost into potting soil; compost can be one-fourth to one-third of a potting soil mix in planters or seed-starting flats or pots. Unlike sand, bark, peat, vermiculite, or pumice, compost supplies nutrients and suppresses harmful fungi. Use only mature compost. Sift it through a 1/2-inch or finer mesh screen.

This simple potting soil recipe is acceptable for general use;

- 1/3 compost
- 1/3 sand
- 1/3 healthy top soil

Potting soil recipes for specific types of plants are available from local nurseries and natural gardening manuals.

Compost Tea:

Soak finished compost in water to produce a nutrient-rich liquid for foliar feeding (spraying on plants) or for watering gardens, landscapes, or potted plants. The following are two methods of making compost tea. The "dregs" can be returned to your compost pile.

- Fill an old cloth bag or pillow case with mature compost and tie it off. Soak it in a tub or barrel for one day. Remove and squeeze out the bag. Dilute the compost solution to the color of iced tea.
- Fill a clean 5- to 15-gallon bucket at least half full of manure-based compost, and finish filling with water. Let the mix sit for 3 to 14 days, then strain and dilute to color of iced tea. Compost tea (especially from manure-based compost) is effective against many insect and fungal pests when applied as a foliar spray. Compost tea made with feed-grade molasses is an effective drench for fire ant mounds.

Worm Composting

Worm composting means decomposing materials in a controlled environment where earthworms rather than bacteria do most of the work. Table 4 compares its advantages and drawbacks.

Kinds of Worms

Large soil-burrowing worms such as "night crawlers" can thrive in open outdoor beds, but they do not do well in enclosed containers. Instead, select "red worms," "red wigglers," "manure worms," or "brown-nose worms." The most widely used species is *Eisenia foetida*. For a list of mail-order sources of composting worms and related supplies, call the Small Business and Environmental Assistance division of the Texas Commission on Environmental Quality (TCEQ) at 512-239-3100.

Materials for Worm Composting

Bedding:

Torn-up paper, including newspapers, junk mail, and cardboard, is an excellent bedding material for worms to live in. Other "brown" materials can serve as bedding, particularly if they are partially decomposed, such as leaf mold. Worms eventually consume their bedding.

Food Scraps:

Almost any material derived from grain, fruit, or vegetable—other than oil—is suitable for worm composting. Egg shells, coffee grounds and filters, and tea bags are also fine. Worms can eat food scraps more quickly when they have been mashed or cut up or presoaked in leftover beverages. However, avoid saturating the bedding with *excess* liquid. Worm compost should not be damper than a wrung-out sponge.

Other Materials:

A little soil or fine sand may be needed to provide grit. Livestock manure is excellent food for worms in outdoor containers. Grass clippings can be added in small amounts.

Materials to Avoid or Use with Caution:

The same as those noted in Table 3 on pages 10 and 11, a list of compost-pile ingredients.

Containers for Worm Composting

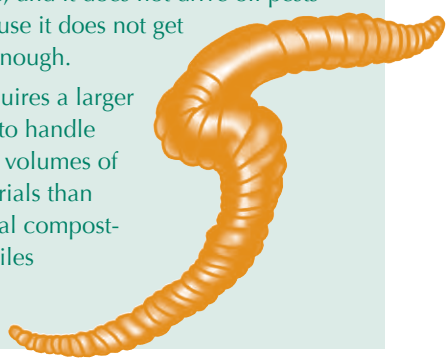
You need enough capacity to contain your food scraps and an equal amount of bedding until some of the compost is ready to harvest (about four months). A wooden box approximately 1 ft. by 2 ft. by 3-1/2 ft., or four 10-gallon plastic containers, may be about right for a medium-sized family. Because materials will be added in thin layers and worked in from above, it helps to use broad, shallow containers.

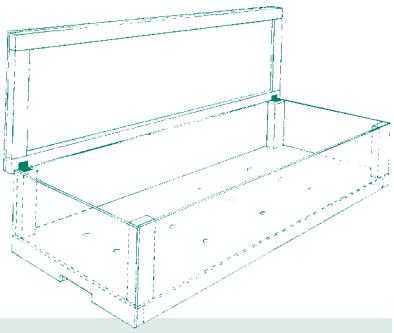
A 3- to 4-inch "mulch" layer of clean bedding on top is usually effective in keeping small pests out of the food.

A tight-fitting lid that fastens may be needed for

Table 4. Comparison of Worm Composting with Composting in Large Piles

Advantages of Worm Composting	Drawbacks to Worm Composting
▼ It does a faster and more thorough job of composting paper than large compost piles. ▼ It takes less work, particularly if paper and food are the main materials to be composted. No heavy lifting or shoveling is involved. ▼ It can be done in small containers, even indoors. ▼ It creates a product richer in plant-available nutrients than other composts.	▼ It does not destroy diseases and weed seeds, and it does not drive off pests because it does not get hot enough. ▼ It requires a larger area to handle large volumes of materials than typical composting piles do.





Steps to Establish a Worm Composting Bin

1. Soak bedding in water and let it drain.
2. Add drained bedding to a bin until it is one-third full.
3. Mix in a little soil or fine sand.
4. Add a pound of worms for each pound of food scraps you compost each week.
5. Add a 1/2 inch or thinner layer of food scraps on top, mix it lightly into the top 3 inches of bedding, and cover everything with 2 inches or more of clean bedding (at least 3 inches if the bin has no lid).
6. Wait two days or longer, and then repeat step 5 as food scraps become available.

Always maintain at least 1 inch of clean bedding covering all food materials.

outdoor containers visited by large pests like raccoons. However, worm composting containers need to be ventilated to allow oxygen in and excess moisture out. Several 1/8-inch holes drilled in the sides of a wooden box provide enough ventilation. Plastic containers with sealed lids need more ventilation than wooden boxes. Cut two holes 2 inches wide by 4 inches long in the lid or upper part of the sides of a plastic bin. Cover these holes with fine-mesh screen such as "tree wrap" or stocking fabric, using a hot glue gun or duct tape to attach it. Do not put holes in the lid if the bin will be exposed to rain.

Use soil-burrowing worms for composting in shallow beds in the ground, but fire ant infestations are likely in soil beds unless food scraps are well buried in moist bedding.

Harvesting Worm Compost

When a worm bin is full, scoop out undigested food scraps and the material that contains the most worms—usually the top 6 to 8 inches of the material. Put this worm-rich material in another bin and mix it with an equal amount of fresh bedding; cover the mixture with 2 to 3 inches of clean bedding. Use what is left in the first bin as compost. If you are not sure it is fully composted, let it sit for a few weeks without adding any more food before using it.

There are several ways to recover worms from finished compost.

- Sift the compost over a 3/8-inch or finer mesh screen; save the worms that don't go through.
- Set the compost out in mounds and scrape off the top layer as it dries; the worms will mass at the bottom of each mound.
- In the compost, bury an onion sack or other mesh bag containing a favorite worm food such as rotten apple or banana for a day or two as a "worm trap," and pull it out before harvesting the compost.
- In a large bin, move older material to one side and add fresh material to the other side; most of the worms will migrate out of the older material before it must be harvested.
- Lay compost on an old window screen above an empty garden space and wash the compost through with a spray nozzle, leaving clean worms on top.

Composting worms that are not removed from compost can thrive in the moist bottom layer of a mulch cover in your yard or garden.

Preventing Problems

- Worms can double in population every 90 days. You should never need to add more worms unless you suddenly increase the amount of food you compost.
- Immediately store food scraps that are awaiting composting in a sealed container or refrigerate them to keep them free of pests.
- Add food scraps to the bin in small amounts, especially at first. Otherwise your bin may get smelly or moldy, or it may start hot composting and drive out your worms.
- Keep your bin in a shaded or sheltered location where the bedding can stay below 90 degrees Fahrenheit. If the compost must be in an area that gets hot, a large wooden box with a good amount of compost and bedding in it will resist heating better than a small plastic bin.
- Don't let the bedding become soaking wet. Add dry paper as needed to soak up excess water in the bin.
- Keep the bedding damp like a wrung-out sponge. Old, dry bedding harbors roaches and other pests, and is difficult to re-wet.
- Handle the worms and their bedding gently—with gloved hands or a weeding fork, not a shovel.
- Wash your hands after you handle worm compost.

Composting in the Ground

Putting materials on or into the ground without composting them saves you time and effort, and burying the materials stops odor problems fast.

Walkway Composting

Spread a thick layer of leaves, chipped branches, and grass clippings into shallow ditches or rows between garden beds to form walkways. Add more material later as it compacts. In a few months, most of this material will decompose enough to incorporate it into the garden soil when it is reworked for planting.

Sheet Composting

A few inches of leaves can be tilled into fallow garden space in the fall to enrich the soil for spring planting. Avoid sheet composting just before planting. Much of the soil's plant-available nitrogen will become temporarily unavailable as composting microbes consume it along with the brown leaves. A few months after sheet composting, there will be more plant-available nitrogen in the soil than before.

Burying Food Scraps

This practice is a useful way to compost food or other high-nitrogen materials that have become smelly. The material should compost within a year without releasing odors or harboring pests. Material buried too deep, however, decomposes more slowly and benefits plants less. There are several variations; here are two:

- In "trench composting," put food scraps in trenches 12 to 18 inches deep, mix into the soil, then bury under 8 inches of soil (see Figure 3). After one year, planting rows or beds are created above these trenches. Some gardeners lay out garden rows or beds in groups of three, so that each row or bed spends one year as a trench for food scraps, the next as a planted row or bed, and the next as a mulched walkway.
- In "compostholing," place kitchen scraps mixed with soil in postholes or other narrow holes 12 to 18 inches deep and bury under 8 inches of soil (see Figure 4). These "compostholes" can be placed in any fallow landscaping or garden space. Some people prefer to place them around the driplines of trees and shrubs.

Burying Pet Droppings

Most manures (horse, cow, pig, sheep, goat, poultry, rabbit) are safe to compost in piles or worm bins. Cat, dog, and bird droppings, however, can contain disease organisms that infect humans. Bury them at a depth of 5 to 8 inches. Avoid burying them where food crops grow or where they are likely to be washed out by rain water. ✻

Figure 3. Trench Composting

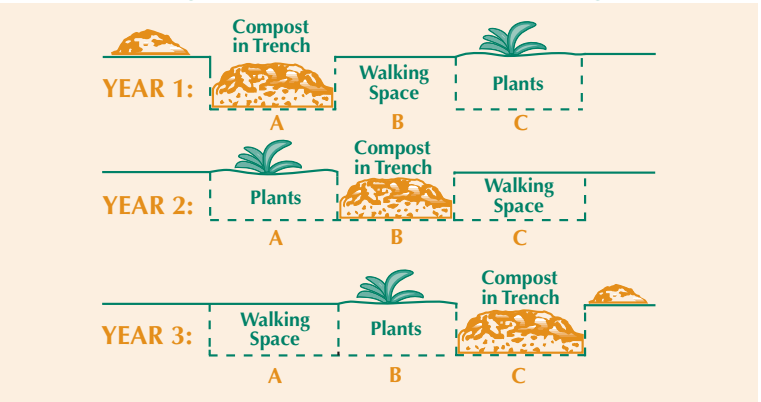
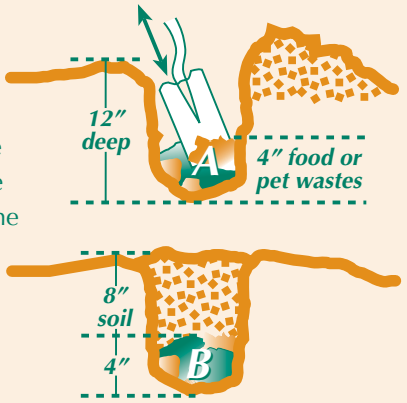


Figure 4. Burying Food or Pet Wastes

To bury food or pet wastes, first dig a hole about 1 foot deep. Put 3 – 4″ of the material at the bottom of the hole, and use a shovel to chop and mix the wastes into the soil (A):

Then cover the material to keep rodents and pets from digging them up (B):



Basics

Now you're ready to build on your foundation of healthy soil restored by grasscycling, mulching, and composting. The following strategies will boost the health of your yard and garden, and they will minimize pests, water and chemical usage, soil erosion, runoff, and pollution.

- ▼ Put the right plants in the right places—using native and adapted plants and grasses.
- ▼ Be water wise—avoid watering wastefully, too rapidly, or too often.
- ▼ Use "integrated pest management" to control pests with a minimum of chemical pesticides.

Green Landscape Design and Yard Care

(For additional information on the care of lawns, gardens, and landscapes, consult your county extension office, city environmental office, local garden center, and various gardening publications. These sources can help you select and perfect "green" yard care practices that are appropriate to your climate, soil, and other local features.)

The Right Plants in the Right Places

Start with a Plan

Begin with a well-planned design. Sketch your yard showing the location of existing structures, trees, shrubs, and grass. As you plan, consider budget, appearance, function, maintenance, and water requirements.

Grow Native Landscape Plants

Native plants are the best choice for trouble-free gardening. They need less water and fertilizer, and have fewer pest problems than plants imported from other areas.

Select Appropriate Grasses

Carefully select grasses according to their intended uses, planting location, and maintenance requirements (see the sidebar "Selected Lawn Grasses"). Grasses require more frequent watering and maintenance than most other landscape plants.

Reduce Thirsty Turf Grass Area

In most landscaped areas, turf grasses have the highest water demand and the highest maintenance requirements of all plants.

Selected Lawn Grasses

Buffalo Grass. This is the only native Texas lawn grass and is the best choice for full sun. It requires little water and fertilizer. Left to grow uncut, this prairie grass reaches a maximum height of 6 to 12 inches. Buffalo grass needs at least six hours of sun per day. It takes one to two years to establish it from seed.

Bermuda Grass. This popular grass is easy to maintain and inexpensive to install. It only grows in full sun. It can be a problem because it spreads into planting beds. Common Bermuda grass is less susceptible to diseases and insects than other Bermuda varieties.

Zoysia Grass. A slow-growing grass for full sun to partial shade, zoysia grass is exotic looking with dark green, thick, and succulent foliage. Zoysia grasses are less drought tolerant than buffalo and Bermuda grasses.

St. Augustine Grass. A wider blade than Bermuda grass, it can tolerate more shade, but it will not do well in heavy shade. St. Augustine requires more water and care than other grasses and is susceptible to freeze and disease.

Alternative plant areas and other forms of ground cover can reduce your ongoing expenditures of time, energy, and money. Group plants that have similar watering needs to prevent overwatering and excessive plant growth.

Practice Garden Diversity

Incorporate a variety of plants. Diverse plantings provide food and cover for a variety of living things. Diversity minimizes damage from pests because many attack only one plant species.

Install Low-Maintenance Design Features

Lawn edging and hard surfaces between turf and other landscape features reduce weeds, trimming, and use of herbicides. Dense plantings provide shade that keeps out invading weeds. Avoid narrow strips or odd shapes of turf grass that will be difficult to irrigate without wasting water.

Minimize Soil Disturbance

Avoid frequent, deep cultivation, which can damage plant roots, dry out the soil, disturb healthy soil organisms, and bring weed seeds to the surface where they will germinate.

Design Your Landscape to Minimize Runoff Pollution

Take note of slopes, and consider including buffer zones of turf grass or other thick vegetation to absorb runoff from buildings and patios, and to reduce runoff into driveways and streets.

WaterWise

Much of the water applied to lawns and gardens is never absorbed by plants. The greatest waste of water results from applying it too rapidly or too often. Water applied too rapidly is lost as runoff, which may carry polluting fertilizers and pesticides to streams and lakes. Some water evaporates when applied to bare, unmulched soil, or in the hot afternoon.

Watering Lawns

The key to watering lawns is to apply the water infrequently, yet thoroughly. This creates a deep, well-rooted lawn that efficiently uses water stored in the soil. See the "Grasscycling" section on page 1 for more details.

Watering Trees, Shrubs, and Ground Covers

As with lawns, apply water infrequently yet thoroughly. In the absence of rain, most trees, shrubs, and ground covers benefit from a thorough monthly watering during the growing season. Move a slow-running hose from point to point along the dripline of each plant until each area becomes saturated to a depth of 8 to 10 inches.

Drip Irrigation

Drip irrigation is more efficient than using a sprinkler. Drip irrigation slowly applies water to the soil. The water flows under low pressure through emitters, bubblers, or spray heads placed at each plant. Water applied by drip irrigation has little chance of waste through evaporation or runoff.

Basics

- Water thoroughly, but only as needed—monthly for trees, shrubs, and ground covers, every week or so for lawns.
- Water early in the morning to prevent diseases and to minimize evaporation.
- Use drip irrigation where possible to minimize evaporation.
- Avoid wasting water on sidewalks and other paved areas. Also, try to keep water from running off your yard.
- Set sprinkler head to spray large droplets, not fine mist.

Sprinkler Irrigation

Make sure that sprinkler heads are properly adjusted to avoid watering sidewalks and driveways. A sprinkler head should spray large droplets of water instead of a fog of fine mist, which wastes water by evaporation and wind drift. Water early in the morning when possible. Avoid watering from mid-morning to late afternoon—you can lose one-third of your water to evaporation. Avoid watering in the evening because lawns and plants left wet overnight are more prone to disease.

Integrated Pest Management (IPM)

Practicing "green landscaping," including efficient watering, planting, soil building, will significantly reduce your pest problems. When, despite your best efforts, unwanted pests sometimes take hold, the steps outlined in this section provide a strategy to control pests with a minimum of harm to your health, your pocketbook, and the environment.

Identify the Problem

Before considering what control measure to use, identify what is harming your plants. Keep in mind that insect infestations and diseases are often not the main problem, but rather a symptom of stress caused by poor growing conditions such as sterile or compacted soils, nutrient deficiencies, too much or too little moisture, or a poorly adapted plant for the climate or the particular landscape conditions. Simply correcting the stressful condition may control the pest and prevent further infestations. Your county extension office, local nurseries, and gardening books can help you diagnose your landscape problems.

Know a Friend from a Foe

Nature has a system of checks and balances that limits pest activity. Of the millions of kinds of insects in the world, less than 2 percent are harmful. Beneficial insects such as ground beetles, ladybugs, fireflies, green lacewings, praying mantids, spiders, and wasps keep harmful insects from devouring your plants. They also pollinate your plants and decompose organic matter. Chemicals may harm beneficial insects more than unwanted pests. Organic gardening books identify beneficial insects and provide tips on how to avoid interfering with them.

Use Appropriate Controls

The control depends on the problem. Options include removal by hand, barriers, repellants, traps, biological controls, and least-polluting chemical controls.

Removal

The only 100-percent effective, species-specific pesticide is removal by hand. Watch plants carefully for signs of damage. You can catch invading pests before they do much harm. Don't run for a can of pesticide when you could pick off and mash a few harmful insects. A blast of water can strip aphids from your plants. Use pruning shears to remove tent caterpillars. Pruning and removing diseased leaves, branches, or whole plants can stop the spread of diseases. Uproot weeds that have spreading roots; chop the others with a hoe or pop them with a mechanical weed-puller.

Basics

- Identify the problem before taking action. Pests are often a symptom of plant stress caused by conditions such as poor soils, too much or too little moisture, or the wrong plant for the location. If so, the first step is to address the cause of plant stress.
- There are landscaping features that attract and support natural predators to keep pests under control, particularly a water source and a variety of perennial plants.
- Use the least-disruptive and least-polluting protections against a pest before resorting to more polluting methods. In general, try the following methods as applicable: first, physical removal, barriers, and traps; next, biological controls; then, appropriate botanical and mineral pesticides; and finally, the least toxic chemical pesticides.
- Carefully follow safe use and disposal instructions for all pesticides. Always store pesticides in original containers away from food and out of reach of children.

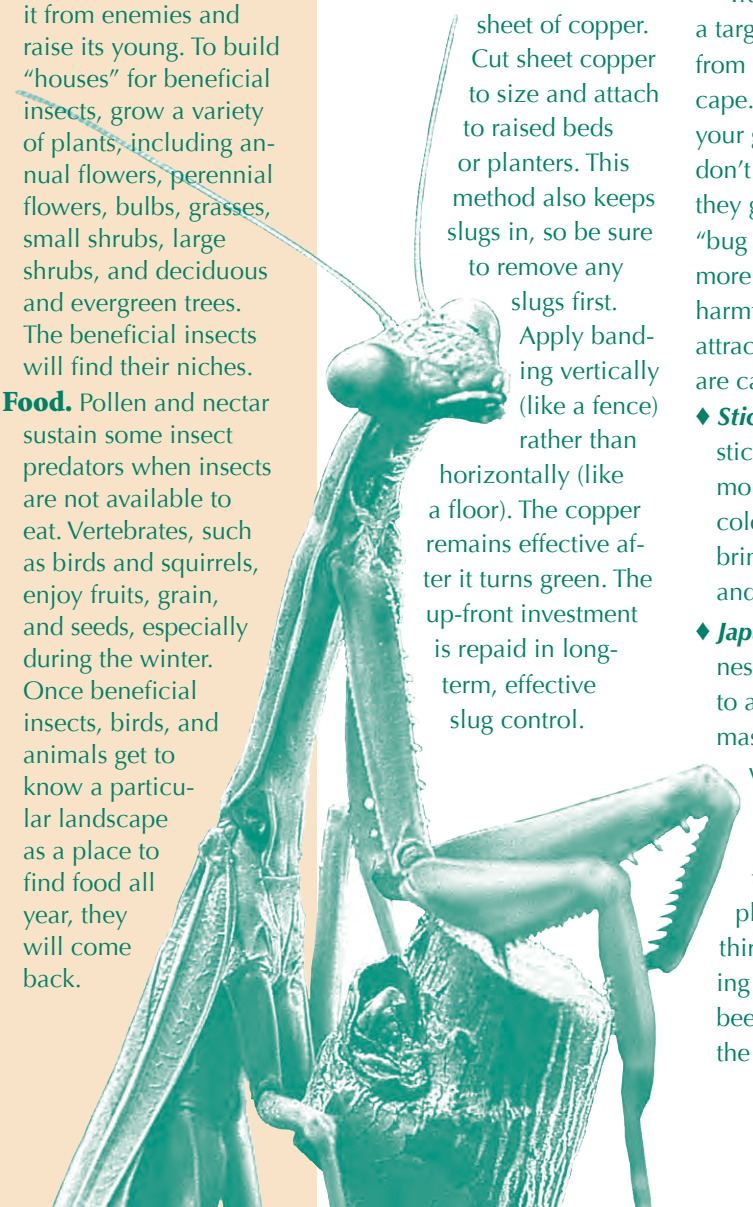
Creating a Haven for Beneficial Insects

Beneficial insects will come to the landscape if they are provided the following.

Water. This could be as small as a bowl or bird bath or as large as a pond, just as long as it is available and filled with fresh water all year. Be sure to keep the water fresh; stagnant water attracts mosquitoes and other insect pests.

Shelter. Every animal needs shelter to protect it from enemies and raise its young. To build "houses" for beneficial insects, grow a variety of plants, including annual flowers, perennial flowers, bulbs, grasses, small shrubs, large shrubs, and deciduous and evergreen trees. The beneficial insects will find their niches.

Food. Pollen and nectar sustain some insect predators when insects are not available to eat. Vertebrates, such as birds and squirrels, enjoy fruits, grain, and seeds, especially during the winter. Once beneficial insects, birds, and animals get to know a particular landscape as a place to find food all year, they will come back.



Barriers

Barriers, like a screen door on a kitchen, don't kill pests but keep them out.

- ***Floating row covers.*** These are thin, lightweight pieces of fabric or plastic that are placed over growing plants. They allow light, air, and water to reach plants, but keep insects off. Drape them over plants, and secure the covers on the sides with stones or soil. As plants grow, they push the fabric up.
- ***Netting.*** Netting is good for keeping birds off plants, especially as they come into fruit.
- ***Copper slug barrier.*** Slugs cannot cross a 3-inch wide sheet of copper. Cut sheet copper to size and attach to raised beds or planters. This method also keeps slugs in, so be sure to remove any slugs first. Apply banding vertically (like a fence) rather than horizontally (like a floor). The copper remains effective after it turns green. The up-front investment is repaid in long-term, effective slug control.
- ***Protective collars.*** Protect individual seedlings from cutworms with a 3-inch collar made from stiff paper or plastic pressed 1 inch into the ground. (Toilet paper tubes work well.)

Repellants

Herbal pest repellants include garlic and hot-pepper sprays, which can be made by processing these herbs with water in a blender and straining out the pulp. You can add a few drops of soap, which is toxic to soft-bodied insects.

Traps

Traps work by attracting a target pest into a container from which it cannot escape. Place traps away from your garden so that pests don't eat your plants before they get to the trap. Electric "bug zappers" destroy many more beneficial insects than harmful ones. Use traps that attract only the insects that are causing you problems.

- ***Sticky traps.*** These use a sticky surface with one or more attractants such as color, smell, or shape to bring the target pests in and keep them there.
- ***Japanese beetle trap.*** Japanese beetles are attracted to a fermenting mush of mashed fruit and sugar water or wine, with some yeast to spur fermentation. Cut off the necks of 1-gallon plastic jugs and fill one-third full with the fermenting mixture. Strain out the beetles regularly and reuse the mixture.

Table 5. Selected Biological Control Agents

Control Agent	Target Pests
Ladybird Beetles (Ladybugs)	Aphids, small worms, and other soft-bodied insects
Lacewings	Aphids, scales, spider mites, and other soft-bodied insects and eggs
Predatory Mites	Spider mites and other pest mites
Trichogramma Wasps	Moth and butterfly eggs
Bacillus thuringiensis (Bt)	Larvae of moths, butterflies, mosquitos, and other pests

♦ ***Slug and snail trap.*** Set out a bait of stale beer, spoiled yogurt, or a mixture of yeast and water in saucers or tuna cans. Bury with the lip of the container level with the soil surface, so the pests fall in and drown. Put a raised cover over the trap to keep rain from diluting the beer and to keep large animals from drinking it.

Biological Controls

Using living organisms (for example, beneficial insects and animals, parasitic nematodes, and microorganisms) to control pests is called biological control. It is the essence of a balanced ecosystem, whether in the forest or in the backyard. A good integrated pest management (IPM) plan takes the fullest advantage of the beneficial species that are naturally present.

Table 5 shows some of the biological control agents that you can buy. Their effectiveness depends on the time, location, and manner in which they are released. Obtain detailed instructions before releasing these agents.

Least-Polluting Chemical Controls

Using IPM practices can eliminate the need for pesticides. But you may at times choose to use them as a last resort. All pesticides are toxic to some living things and often indirectly affect other living things.

♦ Botanical pesticides (see Table 6), almost all of which are insecticides, are derived directly from plants. Some are more toxic than others, and a few are even more toxic than some synthetics. However, many synthetic pesticides are persistent in the environment—that is, they take a long time to break down into harmless substances—but all botanicals break down rapidly, usually in a matter of hours or days. Also, some synthetic pesticides accumulate in the food chain—that is, they concentrate in the tissues of predators that eat

Table 6. Selected Botanical Pesticides: Targets and Toxicity

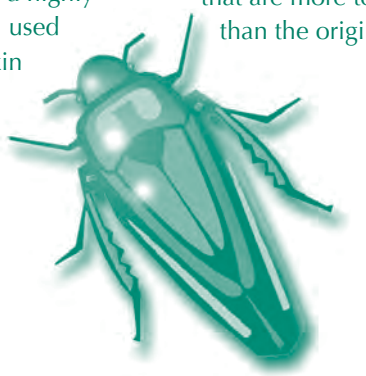
Botanical	Targets	Human Toxicity
Insecticidal Soaps	Soft-bodied insects like aphids, scales, and mites	Very low
Pyrethrum/ Pyrethroids	Most insects	Moderate
Rotenone	Most insects; best used against leaf-eating caterpillars and beetles	Low; very toxic to fish
Ryania	Most insects; best used in hot weather	Low; moderately toxic to some animals
Sabadilla Dust	Most insects; works for adult insects not controlled by other botanicals	Very low; but lethal to honey bees
Nicotine Sulfate	Most insects	Extremely toxic; use only as last resort

When Using Pesticides

1. **Read** and follow all label directions. Never use more than is recommended.
2. **Protect** yourself. Wear a long-sleeved shirt, long pants, boots, rubber gloves, goggles, a hat, and a respirator when mixing and applying pesticides.
3. **Never** apply on a windy day or when rain is forecast.
4. **Only** mix as much as you will use in one day.
5. **Dispose** of unwanted pesticides safely. If possible use up all of the pesticides, or give them to someone who can use them. If you still cannot get rid of the pesticides, take them to a household hazardous waste collection facility or event. ***Never*** pour pesticides down the drain, into a storm drain, or directly on the ground. For more information about household hazardous waste collection and disposal, contact the TCEQ's Small Business and Environmental Assistance division at 512-239-3100.
6. **Dispose** of empty containers properly. When a product label says to "triple rinse the container," rinse it three times, pour the rinse water into the sprayer, and apply it to the target area according to the label instructions. Do not pour the rinse water down the drain or onto paved surfaces. Wrap empty and rinsed containers in newspaper and dispose of them in your trash can. Home-use pesticide containers are not acceptable in most community recycling programs. For information on recycling programs for empty pesticide containers, call the TCEQ's Agricultural Waste program at 512-239-3100, or your county extension agent.

the poisoned pests—but botanicals are not known to do so.

- Mineral pesticides. Dormant and horticultural oils are low-toxicity mineral products used to suffocate insects and their eggs on plants. Powdered diatomaceous earth is a highly abrasive material used to damage the skin and body joints of insects and to create slug barriers.
- Synthetic pesticides are chemical compounds invented in a laboratory. Some are more toxic than others, some are longer-lasting than others, and some release compounds that are more toxic than the original pesticides when they break down in the environment. Some accumulate in the environment and cause harm far removed from the original site or purpose of application. Others, called persistent materials, do not break down for long periods of time and remain in the soil or water. ✻



Your Yard and Clean Air

Small Engines—Big Problems

Most people do not associate air pollution with mowing the lawn. Yet emissions from lawn mowers, chain saws, leaf blowers, and similar outdoor power equipment can be a significant source of pollution. Today's small engines emit high levels of carbon monoxide—a colorless, odorless and poisonous gas that results from incomplete fuel combustion. Infants and people with heart disease or respiratory problems are especially sensitive to carbon monoxide poisoning.

Small engines also emit hydrocarbons and nitrogen oxides, which are pollutants that contribute to the formation of ozone and acid rain. While ozone occurs naturally in the upper atmosphere and shields the earth from harmful radiation, ozone at ground level is a noxious pollutant. Ground-level ozone impairs lung function, inhibits plant growth, and is a key ingredient of smog.

New Regulations—Part of the Solution

The U.S. Environmental Protection Agency (EPA) and the power equipment industry are working to implement new provisions of the federal Clean Air Act that place increasingly strict emission requirements on small nonroad engines. Before a regulated engine can be sold in the U.S., the manufacturer must provide test data and other information demonstrating that the engine model meets the applicable emission standards, and must receive a certificate of conformity from the EPA.

The EPA requires that the engine manufacturer label each certified engine to indicate compliance with the rule for small spark-ignition engines. Emission labels on the engine or elsewhere may read "This engine conforms to Phase 1 (or Phase 2) U.S. EPA regulations for small nonroad engines." Some engine labels will indicate compliance with both EPA and California (stricter) regulations.

Pollution Prevention in Your Own Back Yard

Many people who use power equipment unintentionally contribute to air pollution by carelessly handling fuel and by improperly maintaining their equipment. By adopting simple,

common-sense practices, consumers can help protect the environment now and in the future.

Avoid Spilling Gasoline

Preventing spills and overfills is an easy and effective way for power equipment owners to prevent pollution. Even small gasoline spills evaporate and pollute the air. Here are some tips:

- Use a gasoline container you can handle easily and hold securely. Pour slowly and smoothly.
- Use a funnel, or a spout with an automatic stop device to prevent overfilling the gas tank. Keep the cap or spout and the vent hole on gasoline containers closed tightly.
- Transport and store gasoline and power equipment out of direct sunlight in a cool, dry place.
- Use caution when pumping gasoline into a container at the gas station.

Maintain Your Equipment

Follow the manufacturer's guidelines for maintenance, including the following practices:

- Change oil and clean or replace air filters regularly. Be sure to recycle your used oil at a collection center. To locate a used-oil recycling center near you, call 1-800-CLEANUP, or go to <**www.cleanup.org**>.
- Use the proper fuel/oil mixture in equipment with two-stroke engines.
- Get periodic tune-ups, maintain sharp mower blades, and keep the underside of the deck clean.
- Make sure your equipment is protected from the elements when not in use.

Consider Cleaner Options

Ask your dealer about the new, cleaner-operating gasoline equipment entering the marketplace. Electric equipment is cleaner than equipment powered by gasoline engines. Electrically powered lawn and garden tools produce essentially no pollution from exhaust emissions or through fuel evaporation. However, generating the power to run electric equipment does produce pollution.

Use Manual Tools

Tools without electric or gasoline engines are especially handy for small yards or small jobs. Hand tools—like shears, edgers, and reel push mowers—are lightweight, quiet, easy to use, and generate no emissions.

Reduce Mowing Time

- Use low-maintenance turf grasses or grass-and-flower seed mixtures that grow slowly and require less mowing. See the "Selected Lawn Grasses" section of this guide, or check with your local Texas AgriLife Extension office or lawn and garden center about what is appropriate for your region.
- Replace turf grass areas with native and adapted trees, shrubs, and flowers. Doing so reduces the energy needed to heat and cool your house, and it provides landscaping for wildlife. Native wildflowers and plants require little or no maintenance after planting.

For more information on small gasoline equipment for lawns and gardens, go to this EPA Web site: **www.epa.gov/otaq/equip-ld.htm**.

For More Information

General Information

YardWise – Texas Information & Resources
www.yardwise.org
www.tceq.state.tx.us

Texas AgriLife Extension, EarthKind Information
http://earthkind.tamu.edu

U.S. Environmental Protection Agency, Greenscapes for Homeowners
www.epa.gov/epaoswer/non-hw/green/owners.htm

Composting

Environmental Protection Agency,
www.epa.gov/epaoswer/non-hw/composting/index.htm

Texas A & M University
Composting guide index:
http://aggie-horticulture.tamu.edu/extension/compost/compost.html

Worm Composting (Vermiculture)

Worm Digest
www.wormdigest.org

Flowerfield Enterprises
www.wormwoman.com

Xeriscaping

Texas A & M University
http://floriculture.tamu.edu:7998/urbanlandscapeguide/zipcode.html

EPA's Green Landscaping with Native Plants
www.epa.gov/greenacres

Integrated Pest Management

City of Austin – Grow Green
www.ci.austin.tx.us/growgreen/
Click on "Landscape Problems."

Sources

- U.S. Environmental Protection Agency, Office of Transportation and Air Quality
- Composting Council
- Texas AgriLife Extension Service
- Integrated Pest Management Practitioners Association
- *The Secret Life of Compost* by Malcolm Beck
- *The Rodale Guide to Composting* by Jerry Minnich et al.
- *Don't Waste Your Wastes—Compost 'Em* by Bert Whitehead
- *The Dirt Doctor's Guide to Organic Gardening* by Howard Garrett
- *Worms Eat My Garbage* by Mary Appelhof
- *A Guide to Alternatives to Pesticides* by Environmental Services, City of Portland, Oregon
- *Rodale's Encyclopedia of Organic Gardening*
- *The Nature and Properties of Soils, 8th Edition* by Nyle C. Brady

For more information, contact:

Small Business and Environmental Assistance Division, MC 113
Texas Commission on Environmental Quality
PO Box 13087
Austin TX 78711-3087
512-239-3100
www.tceq.state.tx.us

Texas Commission on Environmental Quality

Take Care of Texas

Visit us on the Web!
www.takecareoftexas.org

For more information, contact:

Small Business and Environmental Assistance Division, MC 113
Texas Commission on Environmental Quality
PO Box 13087
Austin, TX 78711-3087
512-239-3100
www.tceq.state.tx.us

The TCEQ is a partner with the private sector, the U.S. Environmental Protection Agency, and other states to provide citizens with environmental information about their communities. An automated system provides a single source of environmental and recycling information over the Internet and through a state-of-the-art, computerized, interactive phone system. People can call 1-800-CLEAN-UP then enter their five-digit ZIP code to get information on topics such as these:

- local recycling information
- environmental events
- household hazardous waste collections

This information is available 24 hours a day using the interactive phone system or the Internet. If a community or county is not listed, citizens can add it to the system. For more information on the system, contact:

1-800-CLEAN-UP
www.cleanup.org

Disclaimer

Neither TCEQ nor any TCEQ employee makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the products or processes cited in this publication. Reference herein to any specific product, process, organization, or publication does not constitute or imply an endorsement or recommendation by TCEQ. The information herein is only intended to further the public interest by facilitating awareness of composting and green yard care practices, including awareness of sources of information and products related to these practices.

The TCEQ is an equal opportunity employer. The agency does not allow discrimination on the basis of race, color, religion, national origin, sex, disability, age, sexual orientation or veteran status. In compliance with the Americans with Disabilities Act, this document may be requested in alternate formats by contacting the TCEQ at 512-239-0028, Fax 239-4488, or 1-800-RELAY-TX (TDD), or by writing P.O. Box 13087, Austin, TX 78711-3087.

printed on recycled paper using soy-based ink

Developing Your Stormwater Pollution Prevention Plan

A Guide for Construction Sites

EPA-833-R-06-004
May 2007

Developing Your Stormwater Pollution Prevention Plan

A Guide for Construction Sites

Who?

Construction site operators (generally, the person who has operational control over construction plans and/or the person who has day-to-day supervision and control of activities occurring at the construction site)

Where?

Construction sites required to comply with stormwater discharge requirements

What?

A guide to help you develop a good Stormwater Pollution Prevention Plan (SWPPP)

Why?

Stormwater runoff from construction sites can cause significant harm to our rivers, lakes, and coastal waters

A SWPPP is required (by your construction general permit) and will help you prevent stormwater pollution

A SWPPP is more than just a sediment and erosion control plan.
It describes all the construction site operator's activities to prevent stormwater contamination, control sedimentation and erosion, and comply with the requirements of the Clean Water Act

---

Purpose of this Guidance Document

This document provides guidance to construction site operators that need to prepare a SWPPP in order to receive NPDES permit coverage for their stormwater discharges. The Clean Water Act provisions, EPA regulations and EPA's Construction General Permit described in this document contain legally binding requirements. This document does not substitute for those provisions, regulations or permit, nor is it a regulation or permit itself. It also does not substitute for requirements under State law or construction general permits issued by States. It does not impose legally-binding requirements on EPA, States, or the regulated community, and may not apply to a particular situation based upon the circumstances. EPA and State decisionmakers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance where appropriate. Any decisions regarding a particular construction site will be made based on the applicable statutes, regulations and/or permit terms. Therefore, interested parties are free to raise questions and objections about the appropriateness of the application of this guidance to a particular situation, and EPA—or the applicable NPDES permitting authority—will consider whether or not the recommendations or interpretations in the guidance are appropriate in that situation based on the law and regulations.

This guidance document occasionally uses language describing mandatory requirements for construction site operators and those covered by a general permit for stormwater discharges from such sites. This language is generally intended to reflect requirements applicable where EPA is the NPDES permitting authority. Although requirements in jurisdictions where EPA is not the permitting authority may resemble these requirements, the reader should not assume that this guidance accurately describes those requirements. Rather, the reader should consult the applicable regulations and any applicable NPDES permit.

Contents

Chapter 1: Introduction . . . 1
- A. Why Should You Use this Guide? . . . 1
- B. What Is Stormwater Runoff and What Are Its Impacts? . . . 2
- C. How Can Construction Site Operators Prevent Stormwater Pollution? . . . 3

Chapter 2: Getting Started . . . 4
- A. What Are the Federal Requirements for Stormwater Runoff from Construction Sites? . . . 4
- B. Who Is Required to Get NPDES Permit Coverage? . . . 6
- C. What Elements Are Required in a SWPPP? . . . 8
- D. SWPPP Roles and Responsibilities . . . 8
- E. Common SWPPP Objectives . . . 9

Chapter 3: SWPPP Development—Site Assessment and Planning . . . 10
- A. Assess Your Site and Proposed Project . . . 10
- B. Identify Approaches to Protect Natural Resources . . . 14
- C. Develop Site Maps . . . 15

Chapter 4: SWPPP Development—Selecting Erosion and Sediment Control BMPs . . . 17

Chapter 5: SWPPP Development—Selecting Good Housekeeping BMPs . . . 24

Chapter 6: SWPPP Development—Inspections, Maintenance, and Recordkeeping . . . 28
- A. Describe Your Plans and Procedures for Inspecting BMPs . . . 28
- B. BMP Maintenance . . . 30
- C. Recordkeeping . . . 30

Chapter 7: Certification and Notification . . . 31
- A. Certification . . . 31
- B. Notification . . . 32

Chapter 8: SWPPP Implementation . . . 33
- A. Train Your Staff and Subcontractors . . . 33
- B. Ensure Responsibility—Subcontractor Agreements . . . 34
- C. Implement Your SWPPP Before Construction Starts . . . 34
- D. Conduct Inspections and Maintain BMPs . . . 34
- E. Update and Evaluate Your SWPPP . . . 36

Chapter 9: Final Stabilization and Permit Termination . . . 37
- A. Final Stabilization . . . 37
- B. Permit Termination . . . 38
- C. Record Retention . . . 39

References . . . 40

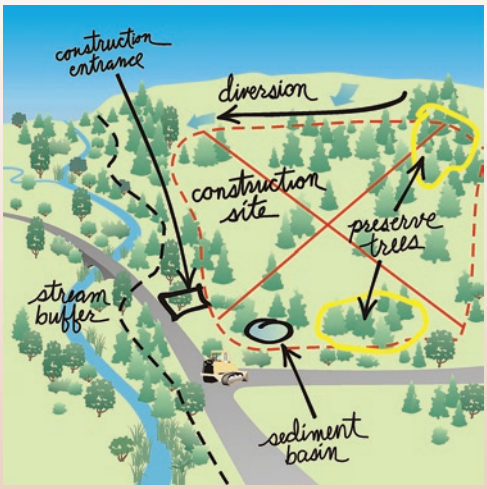
Appendices
- Appendix A – SWPPP Template (available at **www.epa.gov/npdes/swpppguide**) . . . 41
- Appendix B – Inspection Report (available at **www.epa.gov/npdes/swpppguide**) . . . 42
- Appendix C – Calculating the Runoff Coefficient . . . 43
- Appendix D – Resources List . . . 45

What is a Stormwater Pollution Prevention Plan (SWPPP)?

A SWPPP may be called many things. Your state may use terms like:

- **Construction Best Practices Plan**
- **Sediment and Stormwater Plan**
- **Erosion, Sediment, and Pollution Prevention Plan**
- **Construction Site Best Management Practices Plan**
- **Erosion Control Plan and Best Management Practices**
- **Best Management Practices Plan**
- **Erosion and Sediment Control Plan**

Regardless of the title used in your state, these documents—and the stormwater permits that require them—tend to have many common elements. This guide is intended to help you develop a better SWPPP for your construction site.



Example sketch identifying various points to address in the SWPPP.

How to Use This Guide

- This guide was developed as a helpful reference guide for construction site operators across the country. We have tried to accommodate the wide range of knowledge and experience about stormwater pollution prevention that currently exists among operators—from novice to expert.
  - If you are relatively new to managing stormwater at a construction site, you will probably want to read this entire guide.
  - If you are very experienced and familiar with the requirements in your state, this guide may help you brush up on certain requirements or provide you with ideas to improve your SWPPP. You might want to review the table of contents and skip around. Be sure to take a look at the SWPPP template (Appendix A) to see if you can make improvements in the way you develop and maintain your SWPPP.

- This guide is written in a general format and can be used at most construction sites in any state, territory, or in Indian country. The document assumes that you will obtain discharge authorization under an appropriate National Pollutant Discharge Elimination System (NPDES) construction general permit and use both the permit and this guidance to assist in developing your SWPPP. In this guide, we make some references to the U.S. Environmental Protection Agency's Construction General Permit for illustrative purposes. **You should always consult your applicable NPDES permit for the exact requirements that apply to you**.

- Remember that you are developing your SWPPP for both your use and for review by the regulatory agencies responsible for overseeing your stormwater controls. As such, one of your goals in developing your SWPPP should be to present the information in a way that clearly demonstrates that it meets all the requirements of your NPDES permit.

- You can obtain an electronic copy of this guide (PDF format), the SWPPP template, and inspection form (in Microsoft Word) at **www.epa.gov/npdes/swpppguide**

Chapter 1: **Introduction**

▶ This chapter provides an orientation to this guide and its contents and describes why stormwater controls at construction sites are necessary.

A. Why Should You Use this Guide?

If you are responsible for erosion and sediment control and stormwater management at a permitted construction site, then this guide may be useful to you. This guide is designed to walk you through the steps for developing and implementing an effective stormwater pollution prevention plan (SWPPP). The basic outline of the guide is presented below:

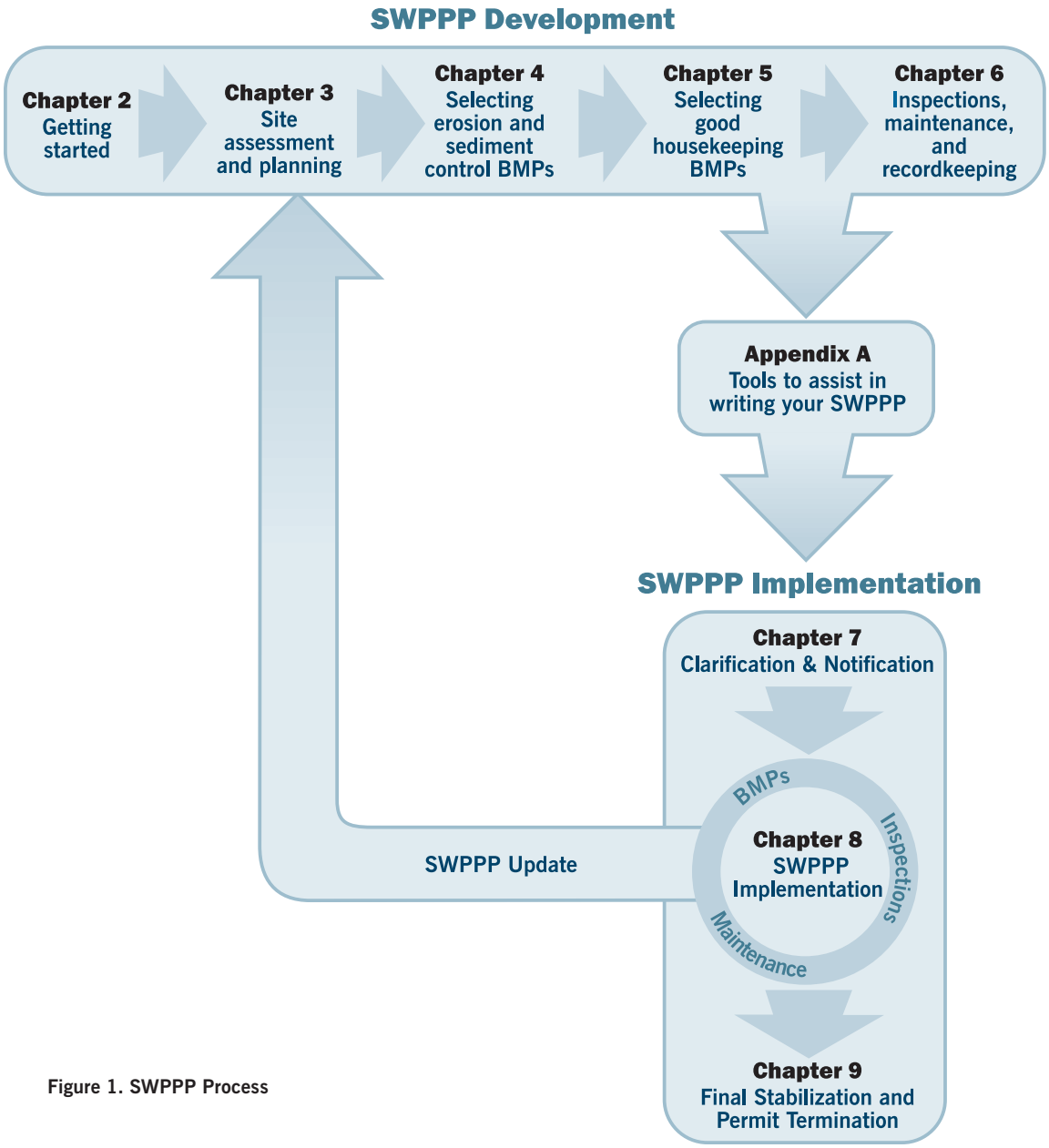


Figure 1. SWPPP Process

Take a Closer Look…

What is a SWPPP?

A SWPPP is 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. Reduction of pollutants is often achieved by controlling the volume of stormwater runoff (e.g., taking steps to allow stormwater to infiltrate into the soil).
- Identifies procedures the operator will implement to comply with the terms and conditions of a construction general permit

What does this mean to me?

Failure to implement your SWPPP could result in significant fines from EPA or a state environmental agency. Therefore, it is important that you develop your SWPPP to address the specific conditions at your site, fully implement it, and keep it up-to-date to reflect changes at your site.

B. What Is Stormwater Runoff and What Are Its Impacts?

Stormwater runoff is rain or snowmelt that flows over land and does not percolate into the soil. Stormwater runoff occurs naturally, in small amounts, from almost any type of land surface, especially during larger storm events. Impervious surfaces, such as buildings, homes, roads, sidewalks, and parking lots, can significantly alter the natural hydrology of the land by increasing the volume, velocity, and temperature of runoff and by decreasing its infiltration capacity. Increasing the volume and velocity of stormwater runoff can cause severe stream bank erosion, flooding, and degrade the biological habitat of these streams. Reducing infiltration can lower ground water levels and affect drinking water supplies.

SWPPP Tip!

A SWPPP can have different names

A SWPPP may also be called a *"construction best practices plan," "sediment and stormwater plan," "erosion, sedimentation, and pollution prevention plan,"* or similar term. The SWPPP (or similarly named plan) is generally required to comply with EPA's or the state's stormwater construction general permit.

In addition, as stormwater runoff moves across surfaces, it picks up trash, debris, and pollutants such as sediment, oil and grease, pesticides and other toxics. Changes in ambient water temperature, sediment, and pollutants from stormwater runoff can be detrimental to aquatic life, wildlife, habitat, and human health. Soil exposed by construction activities is especially vulnerable to erosion. Runoff from an unstabilized construction site can result in the loss of approximately 35–45 tons of sediment per acre each year (ASCE and WFF, 1992). Even during a short period of time, construction sites can contribute more sediment to streams than would be deposited naturally over several decades. Excess sediment can cloud the water reducing the amount of sunlight reaching aquatic plants, clog fish gills, smother aquatic habitat and spawning areas, and impede navigation in our waterways.

The primary stormwater pollutant at a construction site is sediment. To control erosion at a construction site, it is important to understand the different types of erosion that can occur. Erosion begins when raindrops break down the soil structure and dislodge soil particles. Runoff carrying the soil particles becomes sheet erosion which eventually forms smaller rills and larger gullies. The best way to stop erosion is to keep the soil in place through vegetation, erosion control blankets, or other methods that prevent the soil from becoming dislodged during rain events.

The erosion process is typically influenced by climate, topography, soils, and vegetative cover. Understanding how these factors influence erosion will help you select and design appropriate controls to minimize erosion from your construction site.

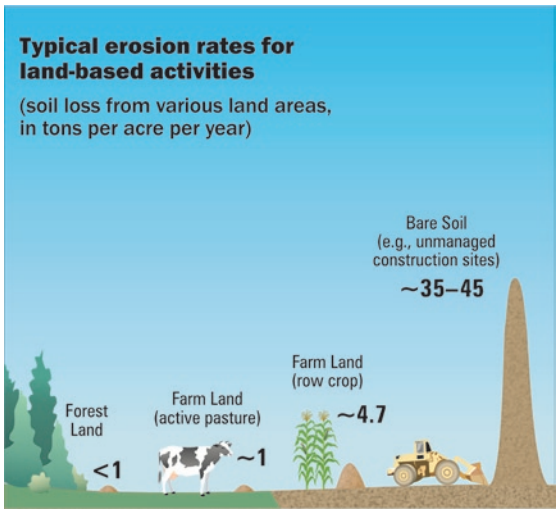


Figure 2. Typical erosion rates from land-based activities. (Dunne, T. and L. Leopold, 1978; NRCS, 2000; NRCS, 2006; ASCE and WEF, 1992)

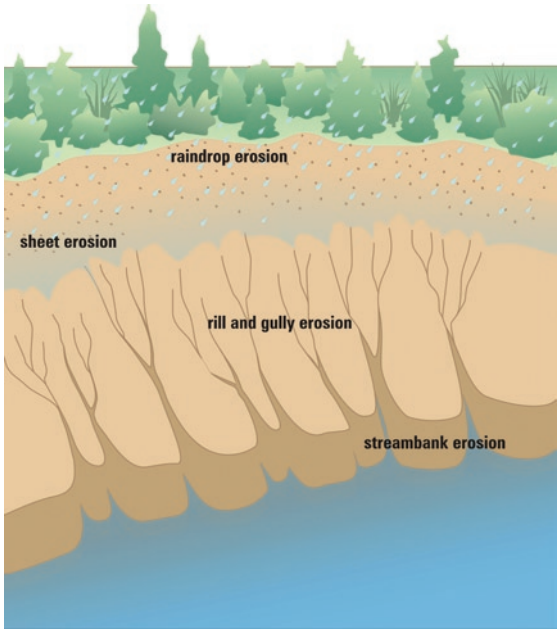


Figure 3. Types of erosion.

Raindrop erosion
Dislodging of soil particles by raindrops

Sheet erosion
The uniform removal of soil without the development of visible water channels

Rill erosion
Soil removal through the formation of concentrated runoff that creates many small channels

Gully erosion
The result of highly concentrated runoff that cuts down into the soil along the line of flow

Streambank erosion
Flowing water that erodes unstable streambanks

Climate. The frequency, intensity, and duration of rainfall are the principal factors influencing erosion from a construction site. Know the weather patterns in your area and, if possible, plan your soil disturbance activities for periods of historically lower rainfall.

Topography. The longer and steeper a slope, the greater the potential there is for erosion from that slope. Use practices such as diversions or fiber rolls to break up long slopes. Consider minimizing soil disturbance activities on steeper slopes.

Soils. Soil type can also impact erosion. Soil texture, structure, organic matter content, compaction, and permeability can all influence erosion rates.

Vegetative cover. Vegetative cover provides a number of critical benefits in preventing erosion—it absorbs the energy of raindrops, slows velocity of runoff, increases infiltration, and helps bind the soil. Soil erosion can be greatly reduced by maximizing vegetative cover at a construction site.

C. How Can Construction Site Operators Prevent Stormwater Pollution?

An effective SWPPP is the key! If sediment and erosion controls and good housekeeping practices are not followed, construction activity can result in the discharge of significant amounts of sediment and other pollutants. The term *Best Management Practices* or BMPs is often used to describe the controls and activities used to prevent stormwater pollution.

SWPPP Tip!

Erosion versus Sedimentation

Erosion is the process by which the land surface is worn away by the action of water or wind. Sedimentation is the movement and settling out of suspension of soil particles. It is usually easier and less expensive to prevent erosion than it is to control sediment from leaving a construction site.

BMPs can be divided into two categories—structural and non-structural BMPs. Structural BMPs include silt fences, sedimentation ponds, erosion control blankets, and temporary or permanent seeding, while non-structural BMPs include picking up trash and debris, sweeping up nearby sidewalks and streets, maintaining equipment, and training site staff on erosion and sediment control practices. In this document, the term "BMPs" is used broadly and includes both structural and non-structural controls and practices.

A SWPPP is more than just a sediment and erosion control plan. Most SWPPPs are written documents that describe the pollution prevention practices and activities that will be implemented on the site. It includes descriptions of the site and of each major phase of the planned activity, the roles and responsibilities of contractors and subcontractors, and the inspection schedules and logs. It is also a place to document changes and modifications to the construction plans and associated stormwater pollution prevention activities.

Chapter 2: **Getting Started**

▶ This chapter describes some of the basic things you'll want to determine (Do you need permit coverage? What permit applies to you?), as well as some of the materials and information you may need to develop your SWPPP. Collecting this information before you start will help you develop your SWPPP more efficiently. Keep in mind that you may also need to gather this information and develop your SWPPP before you complete your Notice of Intent (NOI) and file for permit coverage (note that filing an NOI is not discussed until Chapter 7).

A. What Are the Federal Requirements for Stormwater Runoff from Construction Sites?

The Clean Water Act and associated federal regulations (Title 40 of the *Code of Federal Regulations* [CFR] 123.25(a)(9), 122.26(a), 122.26(b)(14)(x) and 122.26(b)(15)) require nearly all construction site operators engaged in clearing, grading, and excavating activities that **disturb one acre or more, including smaller sites in a larger common plan of development or sale**, to obtain coverage under a National Pollutant Discharge Elimination System (NPDES) permit for their stormwater discharges. Under the NPDES program, the U.S. Environmental Protection Agency (EPA) can authorize states to implement the federal requirements and issue stormwater permits. Today, most states are authorized to implement the NPDES program and issue their own permits for stormwater discharges associated with construction activities.

SWPPP Tip!

Don't forget about "common plans of development or sale"

A *common plan of development or sale* includes larger-scale plans for land development to be carried out by one or more entities. Examples include housing developments and subdivisions, industrial parks, and commercial developments.

EPA has described this term in the fact sheet accompanying its Construction General Permit as including: any announcement or piece of documentation (including a sign, public notice or hearing, sales pitch, advertisement, drawing, permit application, zoning request, computer design, etc.), or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating construction activities may occur on a specific plot. Each permitting authority may review documentation to determine if common plan requirements apply.

Each state (or EPA, in the case of states that are not authorized) issues one or more NPDES construction general permits. These permits, generally, can be thought of as umbrella permits that cover all stormwater discharges associated with construction activity in a given state for a designated time period, usually 5 years. Operators of individual constructions sites then apply for coverage under this permit. *Before applying for permit coverage, you should read and understand all the provisions of the appropriate construction general permit and develop a SWPPP.* **Because authorized states develop their own NPDES requirements, you should carefully read your state's construction general permit and follow the specific instructions it contains.**

Take a Closer Look…

EPA Permits vs. State-Issued Permits

At the time of publication, EPA was the NPDES permitting authority in Massachusetts, New Hampshire, New Mexico, Idaho, Alaska, the District of Columbia, Puerto Rico, the U.S. territories (except the Virgin Islands), most Indian country lands, and for federal facilities in four states. For an up-to-date list of NPDES permitting authorities, visit **www.epa.gov/npdes/stormwater/construction** or **www.cicacenter.org/swrl.html**

What does this mean to me?

Because EPA and state-issued permits can be different, you should make sure you read and apply for the correct permit. Use the links on either of the web sites listed to the left to determine which agency issues NPDES permits where your construction activity will occur.

Most construction general permits contain similar elements:

- Applicability—describes the geographic area covered and who is eligible to apply
- Authorization—describes the types of stormwater (and non-stormwater) discharges that are covered
- SWPPP requirements—outlines the elements that should to be addressed to prevent the contamination of stormwater runoff leaving the construction site
- Application—includes instructions for obtaining permit coverage, usually by filing an application or Notice of Intent (NOI) form
- Implementation—BMP installation, inspection, and maintenance requirements
- Other requirements—may include additional requirements such as spill prevention
- Standard conditions—list of conditions that are applicable to most NPDES permits
- Termination—lists conditions for terminating permit coverage after construction is complete

What Construction Activities Require NPDES Permit Coverage?

In this document, "*construction*" refers to actions that result in a disturbance of the land, including clearing, grading, excavating, and other similar activities. It also includes "*construction-related activities,*" areas that support the construction project such as stockpiles, borrow areas, concrete truck washouts, fueling areas, material storage areas and equipment storage areas.

Construction activities that do not disturb land, such as interior remodeling, generally do not require NPDES permit coverage.

Are There Situations Where a Permit Is Not Needed?

Generally, permit coverage is not required for activities that are considered routine maintenance, such as landscaping, road maintenance, and maintaining stormwater BMPs. Some states and EPA offer the option of a waiver for small sites (disturbing less than 5 acres) in areas and times of the year with low predicted rainfall. To be eligible for the waiver, you would have to meet the requirements specified in the regulations.

Local Requirements

Operators of construction sites should keep in mind that local governments (cities, towns, counties) often have their own requirements for construction sites (e.g., local permits for grading, sediment and erosion, utilities). **Compliance with local requirements does not mean compliance with federal NPDES requirements or vice versa, unless the authorized state agency or EPA has specifically designated the local program a *qualifying local program*.**

Qualifying Local Programs

In some states, the NPDES permitting agency has identified certain local construction stormwater control programs that have requirements that are equivalent or more protective than the state's requirements. If one of these local stormwater programs has been designated by the permitting agency as a *qualifying local program*, the construction site operator may simply read and follow the local requirements. The permitting agency (state or EPA) might choose to waive the requirement to file a Notice of Intent (NOI) or similar application form for small construction sites operating within the jurisdiction of a qualifying local program. If waived, these sites would be covered under the appropriate construction general permit automatically. Check your construction general permit carefully.

The NPDES permitting authority must identify any qualifying local programs in the construction general permit. Violations of the local requirements are also considered violations of the NPDES requirements and may be enforced accordingly.

SWPPP Tip!

Read Your General Permit!

You should thoroughly read and understand the requirements in your general permit. This includes requirements on eligibility (whether your site qualifies for the general permit), application (how to notify EPA or the state that you'd like to be covered by the general permit), SWPPPs, and termination (stabilizing your site and notifying EPA or the state that your project is complete). By applying for coverage under the general permit, you are telling EPA or your state that you will comply with the permit's requirements, so read your permit carefully!

B. Who Is Required to Get NPDES Permit Coverage?

Construction site *operators* are responsible for obtaining NPDES permit coverage for their stormwater discharges. Each state has its own definition of the term *operator*. Operators may include owners (e.g., developers), general contractors, independent subcontractors, government officials, companies, or corporations. This section reflects EPA's understanding of most NPDES permit requirements for stormwater discharges throughout the country. You should, of course, consult your construction general permit for the requirements that apply to you. In some cases, states have defined the operator as a single entity, usually the land owner or easement holder. In other states, several entities may meet the definition of operator. For instance, the owner may control the project's plans and specifications, and the general contractor may control the site's day-to-day operations. In such cases, both may be defined as operators. If a site has multiple operators, they may cooperate on the development and implementation of a single SWPPP. Operators generally obtain coverage under an NPDES permit, often by filing a form called a Notice of Intent (NOI).

Figure 4. Use signage to help educate construction staff.

EPA's Construction General Permit (which applies only where EPA is the permitting authority—see Chapter 2 Section A) defines operator as any party that:

- Has control over the construction plans and specifications

  and/or

- Has day-to-day operational control of the site, including activities necessary to implement the SWPPP

Regardless of whether or not the operator is a corporation or governmental entity, someone must direct the SWPPP's preparation and implementation and apply for NPDES permit coverage for the stormwater discharges. In most cases, this will be a high-level official, such as a corporate officer, manager or elected official, or a principal executive officer. For specific instructions, refer to the appropriate NPDES stormwater permit.

Multiple Operators

In many instances, there may be more than one party at a site performing tasks related to *operational control* and more than one operator may need to submit an NOI. Depending on the site and the relationship between the parties (e.g., owner, developer, general contractor), there can either be a single party acting as site operator and consequently responsible for obtaining permit coverage, or there can be two or more operators all needing permit coverage. Exactly who is considered an operator is largely controlled by how the *owner* of the project chooses to structure the contracts with the *contractors* hired to design and/or build the project. The following are three general operator scenarios (variations on any of these three are possible, especially as the number of owners and contractors increases):

- *Owner as sole permittee*. The property owner designs the structures for the site, develops and implements the SWPPP, and serves as general contractor (or has an on-site representative with full authority to direct day-to-day operations). The owner may be the only party that needs permit coverage under these circumstances. Everyone else on the site may be considered subcontractors and might not need permit coverage.

- *Contractor as sole permittee*. The property owner hires one company (i.e., a contractor) to design the project and oversee all aspects of the construction project, including preparation and implementation of the SWPPP and compliance with the permit (e.g., a *turnkey* project). Here, the contractor would likely be the only party needing a permit. It is under this scenario that an individual having a personal residence built for his own use (e.g., not those to be sold for profit or used as rental property) would not be considered an operator. However, individual property owners would meet the definition of *operator* and may require permit coverage if they perform general contracting duties for construction of their personal residences.
- *Owner and contractor as co-permittees*. The owner retains control over any changes to site plans, SWPPPs, or stormwater conveyance or control designs; but the contractor is responsible for overseeing actual earth disturbing activities and daily implementation of SWPPP and other permit conditions. In this case, which is the most common scenario, both parties may need to apply for permit coverage.

However, you are probably not an operator and subsequently would not need permit coverage if one of the following is true:

- You are a subcontractor hired by, and under the supervision of, the owner or a general contractor (i.e., if the contractor directs your activities on-site, you probably are not an operator)
- The operator of the site has indicated in the SWPPP that someone other than you (or your subcontractor) is reponsible for your activities as they relate to stormwater quality (i.e., another operator has assumed responsibility for the impacts of your construction activities). This is typically the case for many, if not most, utility service line installations.

In addition, *owner* typically refers to the party that owns the structure being built. Ownership of the land where construction is occurring does not necessarily imply the property owner is an operator (e.g., a landowner whose property is being disturbed by construction of a gas pipeline). Likewise, if the erection of a structure has been contracted for, but possession of the title or lease to the land or structure does not to occur until after construction, the would-be owner may not be considered an operator (e.g., having a house built by a residential homebuilder).

Transferring Ownership

In many residential developments, an overall developer applies for the stormwater permit coverage, conducts grading activities, and installs the basic infrastructure (e.g., utilities, roads). Individual lots are then sold to builders who then construct the houses. Unless the developer is still responsible for stormwater on these individual lots (which is typically not the case), it is likely that the builder will need to apply for NPDES permit coverage for stormwater discharges during home construction.

Subcontractors

It is typically a good idea to include specific contract language requiring subcontractors to implement appropriate stormwater controls. Subcontractors should be trained on appropriate BMPs and requirements in the SWPPP and should not disturb or remove BMPs. Some contractors will include specific penalties in subcontractor agreements to ensure subcontractors do not damage or remove BMPs.

Take a Closer Look…

Erosion Control vs. Sediment Control

When developing a SWPPP, it is important to understand the difference between erosion control and sediment control. Erosion control measures (e.g., mulch, blankets, mats, vegetative cover) protect the soil surface and prevent soil particles from being dislodged and carried away by wind or water. Sediment control measures remove soil particles after they have been dislodged (typically through settling or filtration). It is usually easier and less expensive to prevent erosion than it is to control sedimentation.

What does this mean to me?

You should try to use erosion control BMPs as the primary means of preventing stormwater contamination, and sediment control techniques to capture any soil that does get eroded. Because no one technique is 100 percent effective, a good SWPPP will use both kinds of BMPs in combination for the best results.

C. What Elements Are Required in a SWPPP?

The SWPPP lays out the steps and techniques you will use to reduce pollutants in stormwater runoff leaving your construction site. Therefore, proper development and implementation of your SWPPP is crucial. First and foremost, your SWPPP must be developed and implemented consistent with the requirements of the applicable NPDES stormwater construction permit. The following discussion describes requirements that are contained in most of these permits.

Your SWPPP is used to identify all potential pollution sources that could come into contact with stormwater leaving your site. It describes the BMPs you will use to reduce pollutants in your construction site's stormwater discharges, and it includes written records of your site inspections and the follow-up maintenance that is performed.

Your SWPPP should contain the following elements:

- Cover/title page
- Project and SWPPP contact information
- Site and activity description, including a site map
- Identification of potential pollutant sources
- Description of controls to reduce pollutants
- Maintenance/inspection procedures
- Records of inspections and follow-up maintenance of BMPs
- SWPPP amendments
- SWPPP certification

Chapters 3–6 of this guide describe how to develop a SWPPP—from site evaluation and data collection to selecting appropriate BMPs and assigning maintenance and inspection responsibilities.

D. SWPPP Roles and Responsibilities

The operator has the lead for developing and implementing the SWPPP and commiting resources to implement the BMPs. Stormwater pollution control is typically the job of more than a single person; the SWPPP development process provides a good opportunity to define roles and responsibilities of everyone involved. Roles and responsibilities are to be documented clearly in the SWPPP and subcontractor agreements as necessary. Your SWPPP should describe:

- Who is on the stormwater pollution prevention team?
- Who will install structural stormwater controls?
- Who will supervise and implement good housekeeping programs, such as site cleanup and disposal of trash and debris, hazardous material management and disposal, vehicle and equipment maintenance, and so on?
- Who will conduct routine inspections of the site to ensure all BMPs are being implemented and maintained?
- Who will maintain the BMPs?
- Who is responsible for documenting changes to the SWPPP?
- Who is responsible for communicating changes in the SWPPP to people working on the site?

When you apply for your stormwater permit, the application may ask for a SWPPP contact. This could be the construction site operator, but in many cases it's a staff person (e.g., project superintendent, field manager, construction manager, stormwater compliance officer) at the construction site who is responsible for conducting inspections, ensuring BMPs are installed and maintained, and updating the SWPPP when necessary.

SWPPP Tip!

Erosion Control Certification

Several programs promote the training and certification of individuals in erosion and sediment control. Some states have developed certification programs and require construction sites to have a certified individual on-site at all times. The Soil and Water Conservation Society and the International Erosion Control Association sponsor a national certification program, the Certified Professional in Erosion and Sediment Control (**www.cpesc.org**)

E. Common SWPPP Objectives

The SWPPP outlines the steps you will take to comply with the terms and conditions of your construction general permit. Keeping the following objectives in mind as you develop your SWPPP will help guide you in addressing your permit requirements and in protecting water quality.

- *Stabilize the site as soon as possible.* Get your site to final grade and either permanently or temporarily stabilize all bare soil areas as soon as possible. Take into consideration germination times for the grasses or other vegetation selected, and provide additional stabilization (mulches, matrices, blankets, soil binders) on erosion-prone areas such as slopes and drainage ways. Also consider seasonal limitations to plant establishment and growth, such as drought or cold temperatures, and make an effort to ensure that areas that are not showing adequate vegetation establishment are reseeded or mulched immediately. Areas needed for future roads, construction, or other purposes should be temporarily stabilized (see your permit for requirements related to areas of the site not currently under active construction). Establishing a vegetated cover on as much of the site as possible will help to minimize erosion and sediment problems. Perimeter controls should remain in place until final stabilization has been achieved.
- *Protect slopes and channels.* Convey concentrated stormwater runoff around the top of slopes and stabilize slopes as soon as possible. This can be accomplished using pipe slope drains or earthen berms that will convey runoff around the exposed slope. Avoid disturbing natural channels and the vegetation along natural channels, if possible.
- *Reduce impervious surfaces and promote infiltration.* Reducing impervious surfaces will ultimately reduce the amount of runoff leaving your site. Also, divert runoff from rooftops and other impervious surfaces to vegetated areas when possible to promote infiltration.
- *Control the perimeter of your site.* Divert stormwater coming on to your site by conveying it safely around, through, or under your site. Avoid allowing run-on to contact disturbed areas of the construction site. For the runoff from the disturbed areas of the site, install BMPs such as silt fences to capture sediment before it leaves your site. Remember—"Divert the clean water, trap the dirty water."
- *Protect receiving waters adjacent to your site.* Erosion and sediment controls are used around the entire site, but operators should consider additional controls on areas that are adjacent to receiving waters or other environmentally sensitive areas. **Remember, the primary purpose of erosion and sediment controls is to protect surface waters.**
- *Follow pollution prevention measures.* Provide proper containers for waste and garbage at your site. Store hazardous materials and chemicals so that they are not exposed to stormwater.
- *Minimize the area and duration of exposed soils.* Clearing only land that will be under construction in the near future, a practice known as construction phasing, can reduce off-site sediment loads by 36 percent for a typical subdivision (Claytor 2000). Additionally, minimizing the duration of soil exposure by stabilizing soils quickly can reduce erosion dramatically.

Take a Closer Look…

Incentives to preserve open space

It should be the goal of every construction project to, where possible, preserve open space and minimize impervious surfaces through practices such as clustering houses. Open space preservation can provide significant water quality and economic benefits to property owners.

What does this mean to me?

From a marketing perspective, studies have shown that lots abutting forested or other open space are initially valued higher than lots with no adjacent open space, and over time their value appreciates more than lots in conventional subdivisions (Arendt 1996). For example, lots in an open space subdivision in Amherst, Massachusetts, experienced a 13 percent greater appreciation in value over a comparable conventional development after 20 years even though the lots in the conventional development were twice as large (Arendt 1996).

Chapter 3: **SWPPP Development—Site Assessment and Planning**

▶ **The first step in developing a SWPPP is assessing the site and identifying measures to protect natural features.**

This chapter describes a number of steps that will help provide a good foundation for your SWPPP, including:

- Assessing current conditions at the site
- Establishing pollution prevention and water quality protection goals for your project
- Developing a framework to help you meet those goals

A. Assess Your Site and Proposed Project

The first step in developing your SWPPP is to evaluate your proposed construction site. Your SWPPP should describe the undeveloped site and identify features of the land that can be incorporated into the final plan and natural resources that should be protected. Understanding the hydrologic and other natural features of your site will help you develop a better SWPPP and, ultimately, to more effectively prevent stormwater pollution.

SWPPP Tip!

A SWPPP is a detailed plan that:

- Identifies potential sources of stormwater pollution
- Describes the practices that will be used to prevent stormwater pollution. These should include: erosion and sediment control practices, good housekeeping practices, conservation techniques, and infiltration practices (where appropriate), and
- Identifies procedures the operator will implement to comply with all requirements in the construction general permit

Visit the Site

The people responsible for site design and drafting the SWPPP should conduct a thorough walk-through of the entire construction site to assess site-specific conditions such as soil types, drainage patterns, existing vegetation, and topography. Avoid copying SWPPPs from other projects to save time or money. Each construction project and SWPPP is unique, and visiting the site is the only way to create a SWPPP that addresses the unique conditions at that site.

Assess Existing Construction Site Conditions

Assess the existing conditions at the construction site, including topography, drainage, and soil type. This assessment, sometimes called *fingerprinting* (see text box on page 11) is the foundation for building your SWPPP and for developing your final site plan. In this assessment, use or create a topographic drawing that:

- Indicates how stormwater currently drains from the site, and identify the location of discharge points or areas
- Identifies slopes and slope lengths. The topographic features of the site are a major factor affecting erosion from the site
- Identifies soil type(s) and any highly erodible soils and the soil's infiltration capacity
- Identifies any past soil contamination at the site
- Identifies natural features, including trees, streams, wetlands, slopes and other features to be protected

Take a Closer Look…

Fingerprinting Your Site

When you evaluate your construction site, you should clearly identify vegetation, trees, and sensitive areas, such as stream buffers, wetlands, highly erodible soils, and steep slopes at your site. You should protect these areas from disturbance. Inventorying a site's natural features is a technique called fingerprinting. Fingerprinting identifies natural features that you can protect from clearing and heavy equipment by signage or physical barriers.

What does this mean to me?

Fingerprinting your site will help ensure that you don't damage natural features such as waterways or wetlands. Conducting construction activity in a waterway or wetland without the proper permits can result in significant penalties.

In most cases, the site designer can compile all this information on a digitized drawing that can then be adapted to show the planned construction activity, the phases of construction, and the final site plan.

Topographic maps are readily available on the Internet (e.g., **www.terraserver.com** or **www.mapquest.com**) or by contacting the U.S. Geological Survey store (**http://store.usgs.gov**). If you need help determining your soil type, contact your local Natural Resource Conservation Service (NRCS) office or extension service office. To find the NRCS office nearest to your site, visit the U.S. Department of Agriculture's Service Center Locator website (**http://offices.sc.egov.usda.gov/locator/app**). Soil information is also available online from NRCS (**http://soils.usda.gov**).

Identify Receiving Waters, Storm Drains, and Other Stormwater Conveyance Systems

Your SWPPP should clearly identify the receiving waters and stormwater systems through which stormwater from your site could flow. Many states require planning for a specific storm event or storm events. These storm events are referred to by their recurrence interval and duration such as 1-year, 6-hour storm or a 100-year, 24-hour storm. These events then translate into a specific rainfall amount depending on average conditions in your area.

If your site's stormwater flows into a municipal storm drain system, you should determine the ultimate destination of that system's discharge. This may be obvious and easy to document. However, in some systems, you may have to consult with the local agency responsible for the storm drain system to determine the waterbody to which you are discharging.

If your site's stormwater runs off to areas not connected to the storm drain system, you should consider your land's topography and then identify the waterbodies that it could reach. Many sites will discharge some stormwater to a storm drain system and some to other areas not connected to the system. If your site's stormwater could potentially reach two or more waterbodies, note that in your SWPPP. Remember, stormwater can travel long distances over roads, parking lots, down slopes, across fields, and through storm sewers and drainage ditches.

Describe Your Construction Project

Your SWPPP should contain a brief description of the construction activity, including:

- Project type or function (for example, low-density residential, shopping mall, highway)
- Project location, including latitude and longitude
- Estimated project start and end dates
- Sequence and timing of activities that will disturb soils at the site
- Size of the project
- Estimated total area expected to be disturbed by excavation, grading, or other construction activities, including dedicated off-site borrow and fill areas
- Percentage of impervious area before and after construction

Construction Site Pollutants									
	Primary Pollutant	Other Pollutants							
Areas of Consideration	Sediment	Nutrients	Heavy metals	pH (acids & bases)	Pesticides & herbicides	Oil & grease	Bacteria & viruses	Trash, debris, solids	Other toxic chemicals
Clearing, grading, excavating, and unstabilized areas	✓							✓	
Paving operations	✓							✓	
Concrete washout and waste			✓	✓				✓	
Structure construction/ painting/cleaning		✓		✓				✓	✓
Demolition and debris disposal	✓							✓	
Dewatering operations	✓	✓							
Drilling and blasting operations	✓			✓				✓	
Material delivery and storage	✓	✓	✓	✓	✓	✓		✓	✓
Material use during building process		✓	✓	✓	✓	✓		✓	✓
Solid waste (trash and debris)								✓	✓
Hazardous waste			✓	✓	✓	✓			✓
Contaminated spills		✓	✓	✓	✓	✓			✓
Sanitary/septic waste		✓		✓			✓		✓
Vehicle/equipment fueling and maintenance						✓			✓
Vehicle/equipment use and storage						✓			✓
Landscaping operations	✓	✓						✓	

- Runoff coefficient[1] before and after construction
- Soil types
- Construction site location and any nearby waters or wetlands
- Describe and identify the location of other potential sources of stormwater contamination, such as asphalt and concrete plants, stucco operations, paint and concrete washout, and such

Identify Pollutants and Pollution Sources

Identify the pollutants and sources that are likely to be found on the site. The principle pollutant of concern, of course, is sediment. There are, however, other pollutants that may be found, usually in substantially smaller amounts, in stormwater runoff from construction sites. These can include nutrients, heavy metals, organic compounds, pesticides, oil and grease, bacteria and viruses, trash and debris, and other chemicals. After identifying the pollutants and sources, be as specific as possible in your SWPPP about the BMPs you will use to address them. The table at the left lists the sources of pollutants at construction sites, including sediment, the primary pollutant and other pollutants that may be present at construction sites.

Figure 5. Make sure storm drain inlets are protected.

[1] The runoff coefficient is the partial amount of the total rainfall which will become runoff. Runoff coefficients generally range from 0.95 (highly impervious) to 0.05 (vegetated surface that generates little runoff). For more information on calculating the runoff coefficient for your site, see Appendix C.

Non-Stormwater Discharges

Most permits will require you to identify any non-stormwater discharges in your SWPPP. Certain non-stormwater discharges may be allowed under the terms and conditions of your permit, however, you should make every effort to eliminate these discharges where possible. You should identify these sources in your SWPPP and identify pollution prevention measures to ensure that pollutants are not introduced to these discharges and carried to nearby waterbodies.

EPA's CGP identifies these allowable non-stormwater discharges: discharges from fire-fighting activities, fire hydrant flushings, waters used to wash vehicles, buildings, and pavements where detergents are not used, water used to control dust, potable water (including uncontaminated water line flushings), uncontaminated air conditioning condensate, uncontaminated ground water or spring water, among others. The permit goes on to say that non-stormwater discharges should be eliminated or reduced to the extent feasible and that the SWPPP should identify and ensure the implementation of appropriate pollution prevention measures for these discharges. More discussion of pollution prevention measures for some of these non-stormwater sources can be found in Chapter 5.

Permanent Stormwater Controls (Post-Construction)

The topic of designing, installing, and maintaining permanent or post-construction stormwater controls, although a requirement, is beyond the scope of this SWPPP guide. A SWPPP compiled in support of coverage under EPA's Construction General Permit, however, needs to include a description of all permanent stormwater controls that will be constructed along with the buildings, roads, parking lots, and other structures. You should incorporate sediment and erosion controls into your SWPPP for areas where permanent stormwater controls, such as wet ponds, swales, and bioretention cells are to be constructed.

Effectively managing stormwater over the long-term—long after the actual construction process is over—is a significant challenge. Many communities (and a few states) have or are developing comprehensive requirements to better manage permanent (or post-construction) stormwater runoff. To be most effective, you should consider integrating your design process for your permanent stormwater controls into your overall design for your site. Planning for your permanent stormwater controls could affect your decisions about site design, location of buildings and other structures, grading, and preserving natural features. By preserving natural drainage patterns, trees, native vegetation, riparian buffers, and wetlands, you might need to construct fewer or smaller structural storm-water controls to cope with runoff from your site. Permanent stormwater controls should be designed with two important goals in mind: (1) reduction of the volume and velocity of runoff, and (2) reduction of the pollutants in the stormwater that does leave your site.

Techniques, such as *Low Impact Development*, Better Site Design, or *Conservation Development*, which emphasize addressing stormwater where it falls, infiltrating it, preserving natural drainage patterns, and

Take a Closer Look…

Specimen Trees and Natural Vegetation

Before a site plan is prepared, identify and clearly mark existing trees and vegetation you want to preserve. Some communities have tree preservation ordinances, and local extension service offices and foresters will often provide free advice on tree and plant preservation. Remember to notify all employees and subcontractors about trees and areas you intend to preserve and mark them clearly.

What does this mean to me?

Large trees and other native vegetation can represent significant value in the long term to property owners and the community at large. Many studies document that the presence of trees on residential and commercial sites provide many benefits including improved aesthetics, habitat for birds and other wildlife, and energy savings (shade) that ultimately enhance the economic value of the site. Trees also provide shade and act as windbreaks, which can reduce energy costs over the long term. By protecting existing trees, you can reduce landscaping costs and improve the appearance of a newly developed property. According to the National Arbor Day Foundation, trees around a home can increase its value by 15 percent or more.

preserving natural vegetation offer the best opportunity to protect nearby rivers, lakes, wetlands, and coastal waters. **Incorporating these ideas and concepts into the design for your project before it is built also offers the opportunity to reduce capital infrastructure and long-term maintenance costs**.

At the neighborhood or even at the watershed scale, *Smart Growth* techniques can help us design neighborhoods that minimize impacts on water quality, reduce air pollution, and improve the general quality of life for residents. **In the *Resources* list in Appendix D, you will find a list of suggestions on this topic, including how to incorporate Smart Growth and Low Impact Development techniques into the design of your site.**

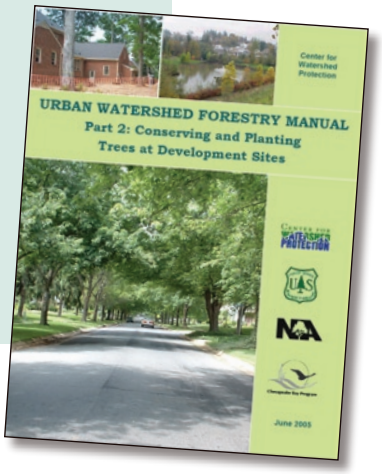
B. Identify Approaches to Protect Natural Resources

Preservation of natural areas, waterbodies, and open space has numerous economic, aesthetic, community, and environmental benefits. Preservation efforts also often increase the value of lots and homes and help to reduce overall expenditures on infrastructure. Specifically, these kinds of conservation efforts can help to significantly reduce the volume and velocity of stormwater runoff and the pollutants that may be carried with it.

SWPPP Tip!

Tree Preservation Resources

For more on tree preservation, contact your local extension service office or forester. Also, American Forests has useful information and tools at their website, **www.americanforests.org/resources/urbanforests**. The Center for Watershed Protection in cooperation with the U.S. Forest Service has developed a series of manuals on urban forestry. Part two, titled Conserving and Planting Trees at Development Sites will be of particular interest. You can find these manuals at **www.cwp.org**



Protect Nearby Waters

Your SWPPP should describe how you will protect and preserve any streams, wetlands, ponds or other waterbodies that are on your property or immediately adjoining it. Riparian areas around headwater streams are especially important to the overall health of the entire river system. Many states and communities have buffer or shoreline protection requirements to preserve sensitive areas around waterbodies.

Many states apply special designations to high-value or high-quality waters. Check with your state water pollution control agency to determine if your project could discharge to *outstanding* or special protection waters (such as wetlands, or salmon and trout streams). You might be subject to additional requirements to protect these waterbodies.

Wetland areas, including bogs, marshes, swamps, and prairie potholes may be found in areas adjacent to rivers, lakes, and coastal waters but may also be found in isolated places far from other surface waters. Many types of wetlands are protected under the Clean Water Act and construction activities in and around these areas may require an additional permit from the Army Corps of Engineers. Construction site operators should make every effort to preserve wetlands and must follow applicable local, state, and federal requirements before disturbing them or the areas around them.

To ensure the protection of natural areas during the construction period, you should use a combination of techniques, including temporary fencing, signage, and educating staff and subcontractors.

Assess Whether Your Project Impacts an Impaired Waterbody

Under the Clean Water Act, states are required to determine if rivers, lakes, and other waters are meeting water quality standards. When a waterbody does not meet water quality standards because of one or more sources of pollution, the state lists the water as impaired. When a water is determined to be impaired, the state or EPA develops a plan for correcting the situation. This plan is called a Total Maximum Daily Load (TMDL). If stormwater from your project could reach an impaired water with or without an approved TMDL (either directly or indirectly through a municipal storm drain system), your permit

may include additional requirements to ensure that your stormwater discharges do not contribute to that impairment and your stormwater controls are consistent with plans to restore that waterbody. Your SWPPP should describe the specific actions you will take to comply with these permit requirements for impaired waters.

You should determine, before you file for permit coverage, if the receiving waters for your project are impaired and if so, whether a TMDL has been developed for this waterbody. Visit EPA's Enviromapper website (**www.epa.gov/waters/enviromapper**) or contact your state environmental agency for more information.

Assess Whether You Have Endangered Plant or Animal Species in Your Area

The federal Endangered Species Act protects endangered and threatened species and their critical habitat areas. (States and tribes may have their own endangered species laws.) In developing the assessment of your site, you should determine whether listed endangered species are on or near your property. Critical habitat areas are often designated to support the continued existence of listed species. You should also determine whether critical habitat areas have been designated in the vicinity of your project. Contact your local offices of the U.S. Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), or your state or tribal heritage centers. These organizations often maintain lists of federal and state listed endangered and threatened species on their Internet sites. For more information and to locate lists for your state, visit **www.epa.gov/npdes/endangeredspecies**

Additionally, your state's NPDES stormwater permit may specifically require that you address whether the activities and the stormwater discharged by your construction site have the potential to adversely affect threatened or endangered species or the critical habitat areas. You might need to conduct a biological investigation or assessment and document the results of the assessment in your SWPPP. The state may reference federal, state, or tribal endangered species protection laws or regulations.

EPA's Construction General Permit contains detailed procedures to assist construction site operators in determining the likely impact of their projects on any endangered species or critical habitat. Construction site operators in areas covered by EPA's Construction General Permit are required to assess the impact of their activities and associated stormwater discharges on species and habitat in the "project area" which may extend beyond the site's immediate footprint.

Assess Whether You Have Historic Sites that Require Protection

The National Historic Preservation Act, and any state, local and tribal historic preservation laws, apply to construction activities. As with endangered species, some permits may specifically require you to assess the potential impact of your stormwater discharges on historic properties. However, whether or not this is stated as a condition for permit coverage, the National Historic Preservation Act and any applicable state or tribal laws apply to you. Contact your State Historic Preservation Officer (**www.ncshpo.org/stateinfolist/fulllist.htm**) or your Tribal Historic Preservation Officer (**grants.cr.nps.gov/thpo/tribaloffices.cfm**).

C. Develop Site Maps

The final step in the site evaluation process is to document the results of your site assessment and your planned phases of construction activity on a detailed site map or maps. This includes developing site maps showing planned construction activities and stormwater practices for the various major stages of construction, protected areas, natural features, slopes, erodible soils, nearby waterbodies, permanent stormwater controls, and so on. You must keep your SWPPP and your site maps up-to-date to reflect changes at your site during the construction process.

Location Maps

A general location map is helpful to identify nearby, but not adjacent, waterbodies in proximity to other properties. You can use any easily available maps or mapping software to create a location map.

Site Maps

The detailed construction site maps should show the entire site and identify a number of features at the site related to construction activities and stormwater management practices.

Figure 6. Example site map.

Map of undeveloped or existing site. For many sites, a map of the undeveloped or existing site, noting the features that you identified in Section A of this Chapter, will help you develop your SWPPP and identify current site features that you want to preserve. On this map note current drainage patterns, storm drains, slopes, soil types, waters and other natural features. Also note any existing structures, roads, utilities, and other features.

Map or series of maps for construction plans. Site maps should show the construction activities and stormwater management practices for each major phase of construction (e.g., initial grading, infrastructure, construction, and stabilization). The site maps should legibly identify the following features:

- Stormwater flow and discharges. Indicate flow direction(s) and approximate slopes after grading activities, as well as locations of discharges to surface waters or municipal storm drain systems.
- Areas and features to be protected. Include wetlands, nearby streams, rivers, lakes, and coastal waters, mature trees and natural vegetation, steep slopes, highly erodible soils, etc.
- Disturbed areas. Indicate locations and timing of soil disturbing activities (e.g. grading). Mark clearing limits.
- BMPs. Identify locations of structural and non-structural BMPs identified in the SWPPP, as well as post-construction stormwater BMPs.
- Areas of stabilization. Identify locations where stabilization practices are expected to occur. Mark areas where final stabilization has been accomplished.
- Other areas and roads. Indicate locations of material, waste, borrow, or equipment storage.

You should complete your site maps after reviewing Chapters 4 and 5 and any applicable BMP design manual to select appropriate BMPs for your site.

Use Site Maps to Track Progress

Develop and keep up-to-date site maps showing non-structural BMPs that change frequently in location as the work on a construction site progresses. Your permit requires that you keep your SWPPP up-to-date, so mark up the site map with the location of these BMPs. Indicate the current location of the following:

- Portable toilets
- Material storage areas
- Vehicle and equipment fueling and maintenance areas
- Concrete washouts
- Paint and stucco washouts
- Dumpsters or other trash and debris containers
- Spill kits
- Stockpiles
- Any other non-structural non-stormwater management BMPs
- Any temporarily removed structural BMPs
- Any changes to the structural BMPs

If a marked-up site map is too full to be easily read, you should date and fold it, put it in the SWPPP for documentation, and start a new one. That way, there is a good hard copy record of what has occurred on-site.

Construction sites are dynamic. As conditions change at the construction site, such as the locations of BMPs, your SWPPP must reflect those changes.

Chapter 4: **SWPPP Development—Selecting Erosion and Sediment Control BMPs**

▶ **This chapter presents a brief discussion of erosion and sediment control principles and a discussion of some commonly used BMPs.**

This document is not intended as an engineering or design manual on BMPs. The engineer or other qualified person that develops the details of your sediment and erosion control plan should be using the appropriate state or local specifications. The descriptions below provide a kind of checklist of the things to look for and some helpful installation and maintenance hints.

Erosion and sediment controls are the structural and non-structural practices used during the construction process to keep sediment in place (erosion control) and to capture any sediment that is moved by stormwater before it leaves the site (sediment control). Erosion controls—keeping soil where it is—are the heart of any effective SWPPP. Your SWPPP should rely on erosion controls as the primary means of preventing stormwater pollution. Sediment controls provide a necessary second line of defense to properly designed and installed erosion controls.

The suite of BMPs that you include in your SWPPP should reflect the specific conditions at the site. The information that you collected in the previous steps should help you select the appropriate BMPs for your site. An effective SWPPP includes a combination or suite of BMPs that are designed to work together.

Ten Keys to Effective Erosion and Sediment Control (ESC)

The ultimate goal of any SWPPP is to protect rivers, lakes, wetlands, and coastal waters that could be affected by your construction project. The following principles and tips should help you build an effective SWPPP. **Keep in mind that there are many BMP options available to you. We have selected a few common BMPs to help illustrate the principles discussed in this chapter.**

Erosion Control (keeping the dirt in place) and Minimizing the Impact of Construction

1. **Minimize disturbed area and protect natural features and soil**
2. **Phase construction activity**
3. **Control stormwater flowing onto and through the project**
4. **Stabilize soils promptly**
5. **Protect slopes**

Sediment Controls (the second line of defense)

6. **Protect storm drain inlets**
7. **Establish perimeter controls**
8. **Retain sediment on-site and control dewatering practices**
9. **Establish stabilized construction exits**
10. **Inspect and maintain controls**

Take a Closer Look…

BMPs in Combination

BMPs work much better when they are used in combination. For instance, a silt fence should not be used alone to address a bare slope. An erosion control BMP should be used to stabilize the slope, and the silt fence should serve as the backup BMP.

What does this mean to me?

Wherever possible, rely on erosion controls to keep sediment in place. Back up those erosion controls with sediment controls to ensure that sediment doesn't leave your site. Continually evaluate your BMPs. Are they performing well? Could the addition of a supplemental BMP improve performance? Should you replace a BMP with another one that might work better? Using BMPs in series also gives you some protection in case one BMP should fail.

Erosion Control and Minimizing the Impact of Construction

ESC Principle 1: Minimize disturbed area and protect natural features and soil. As you put together your SWPPP, carefully consider the natural features of the site that you assessed in Chapter 3. By carefully delineating and controlling the area that will be disturbed by grading or construction activities, you can greatly reduce the potential for soil erosion and stormwater pollution problems. Limit disturbed areas to only those necessary for the construction of your project. Natural vegetation is your best and cheapest erosion control BMP.

Figure 7. Protect vegetated buffers by using silt fence or other sediment controls.

Protecting and preserving topsoil is also a good BMP. Removing topsoil exposes underlying layers that are often more prone to erosion and have less infiltration capacity. Keeping topsoil in place preserves the natural structure of the soils and aids the infiltration of stormwater.

ESC Principle 2: Phase construction activity. Another technique for minimizing the duration of exposed soil is phasing. By scheduling or sequencing your construction work and concentrating it in certain areas, you can minimize the amount of soil that is exposed to the elements at any given time. Limiting the area of disturbance to places where construction activities are underway and stabilizing them as quickly as possible can be one of your most effective BMPs.

ESC Principle 3: Control stormwater flowing onto and through your project. Plan for any potential stormwater flows coming onto the project area from upstream locations, and divert (and slow) flows to prevent erosion. Likewise, the volume and velocity of on-site stormwater runoff should be controlled to minimize soil erosion.

Example BMP: Diversion Ditches or Berms

Description: Diversion ditches or berms direct runoff away from unprotected slopes and may also direct sediment-laden runoff to a sediment-trapping structure. A diversion ditch can be located at the upslope side of a construction site to prevent surface runoff from entering the disturbed area. Ditches or berms on slopes need to be designed for erosive velocities. Also, ensure that the diverted water is released through a stable outlet and does not cause downslope or downstream erosion or flooding.

Installation Tips:

- Divert run-on and runoff away from disturbed areas
- Ensure that the diversion is protected from erosion, using vegetation, geotextiles, or other appropriate BMPs
- Divert sediment-laden water to a sediment-trapping structure
- Use practices that encourage infiltration of stormwater runoff wherever possible

Maintenance:

- Inspect diversions and berms, including any outlets, regularly and after each rainfall
- Remove any accumulated sediment

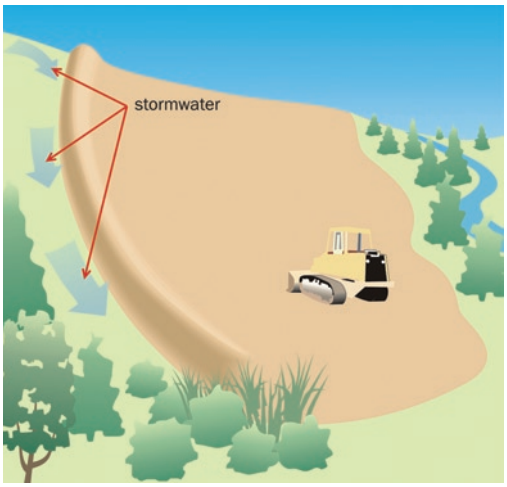


Figure 8. Illustration of a construction berm to divert stormwater away from the disturbed construction area.

ESC Principle 4: Stabilize soils promptly. Where construction activities have temporarily or permanently ceased, you should stabilize exposed soils to minimize erosion. You should have stabilization measures in place after grading activities have ceased (many permits require stabilization within a specified time frame). You can provide either temporary or permanent cover to protect exposed soils. Temporary measures are necessary when an area of a site is disturbed but where activities in that area are not completed or until permanent BMPs are established. Topsoil stockpiles should also be protected to minimize any erosion from these areas. Temporary-cover BMPs include temporary seeding, mulches, matrices, blankets and mats, and the use of soil binders (there may be additional state and local requirements for the use of chemical-based soil binders). Permanent-cover BMPs include permanent seeding and planting, sodding, channel stabilization, and vegetative buffer strips. Silt fence and other sediment control measures are not stabilization measures.

SWPPP Tip!

Final Stabilization

Once construction activity in an area is completed and the area is stabilized (typically by achieving 70 percent permanent vegetative cover), you can mark this area on your SWPPP and discontinue inspections in that area. By bringing areas of your site to final stabilization, you can reduce your workload associated with maintaining and inspecting BMPs. For more information on final stabilization, see Chapter 9.

Example BMP: Temporary Seeding

Description: Temporarily seeding an area to establish vegetative cover is one of the most effective, and least expensive, methods of reducing erosion. This approach, as a single BMP, might not be appropriate on steep slopes, when vegetation cannot be established quickly enough to control erosion during a storm event, or when additional activities might occur soon in the area.

Installation Tips:

- Seed and mulch area (the mulch provides temporary erosion protection by protecting the soil surface, moderating temperature, and retaining moisture while seeds germinate and grow)
- Water regularly, if needed, to ensure quick growth
- Maintain backup BMPs, such as silt fence or settling ponds

SWPPP Tip!

Wind Control BMPs

In areas where dust control is an issue, your SWPPP should include BMPs for wind-erosion control. These consist of mulching, wet suppression (watering), and other practices.

ESC Principle 5: Protect slopes. Protect all slopes with appropriate erosion controls. Steeper slopes, slopes with highly erodible soils, or long slopes require a more complex combination of controls. Erosion control blankets, bonded fiber matrices, or turf reinforcement mats are very effective options. Silt fence or fiber rolls may also be used to help control erosion on moderate slopes and should be installed on level contours spaced at 10- to 20-foot intervals. You can also use diversion channels and berms to keep stormwater off slopes.

Example BMP: Rolled erosion control products

Description: Erosion control products include mats, geotextiles, and erosion control blankets and products that provide temporary stabilization and help to establish vegetation on disturbed soils. Such products help control erosion and help establish vegetation and are often used on slopes, channels, or stream banks.

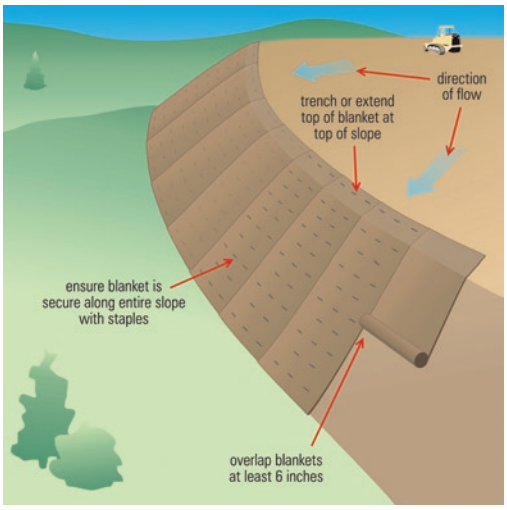


Figure 9. Illustration of erosion control blankets installed on slope.

Installation Tips:

- Use rolled erosion-control products on slopes steeper than 3 to 1 (horizontal to vertical) and in swales or long channels

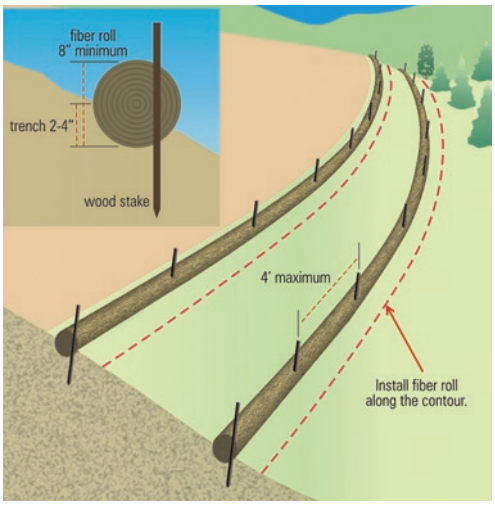


Figure 10. Illustration of a fiber roll installation along a slope.

- Trench the top of the blanket into the ground to prevent runoff from flowing under the blanket
- Overlap the lower end of the top mat over the top of the downslope mat to ensure that runoff stays on top of the blankets and mats
- Staple blankets and mats according to specifications

Maintenance:

- Periodically inspect for signs of erosion or failure
- Repair the blanket or mat if necessary
- Continue inspections until vegetation is established at the level required to qualify as final *stabilization*

ESC Principle 6: Protect storm drain inlets. Protect all inlets that could receive stormwater from the project until final stabilization of the site has been achieved. Install inlet protection before soil-disturbing activities begin. Maintenance throughout the construction process is important. Upon completion of the project, storm drain inlet protection is one of the temporary BMPs that should be removed. Storm drain inlet protection should be used not only for storm drains within the active construction project, but also for storm drains outside the project area that might receive stormwater discharges from the project. If there are storm drains on private property that could receive stormwater runoff from your project, coordinate with the owners of that property to ensure proper inlet protection.

Example BMP: Storm Drain Inlet Protection

Description: Storm drain inlet protection prevents sediment from entering a storm drain by surrounding or covering the inlet with a filtering material. Several types of filters are commonly used for inlet protection: silt fence, rock-filled bags, or block and gravel. The type of filter used depends on the inlet type (for example, curb inlet, drop inlet), slope, and volume of flow. Many different commercial inlet filters are also available. Some commercial inlet filters are placed in front of or on top of an inlet, while others are placed inside the inlet under the grate.

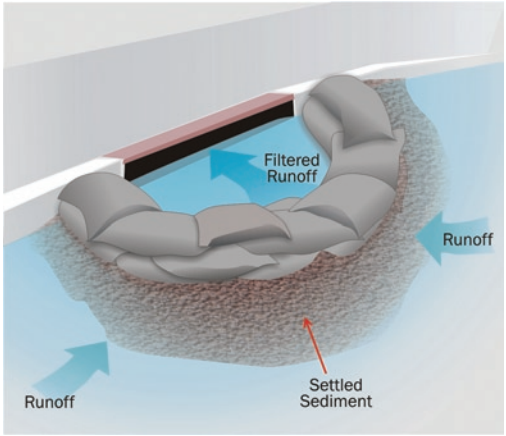


Figure 11. Illustration of a storm drain inlet with rock-filled bags filtering stormwater.

Installation Tips:

- Install inlet protection as soon as storm drain inlets are installed and before land-disturbance activities begin in areas with existing storm drain systems
- Protect all inlets that could receive stormwater from your construction project
- Use in conjunction with other erosion prevention and sediment control BMPs—remember, inlet protection is a secondary BMP!
- Design your inlet protection to handle the volume of water from the area being drained. Ensure that the design is sized appropriately.

Maintenance:

- Inspect inlets frequently and after each rainfall

- Remove accumulated sediment from around the device and check and remove any sediment that might have entered the inlet
- Replace or repair the inlet protection if it becomes damaged
- Sweep streets, sidewalks, and other paved areas regularly

SWPPP Tip!

Storm drain inlet protection should never be used as a primary BMP! Use erosion control techniques such as hydromulching or erosion-control blankets to prevent erosion. Use inlet protection and other sediment control BMPs as a *backup* or last line of defense.

ESC Principle 7: Establish perimeter controls. Maintain natural areas and supplement them with silt fence and fiber rolls around the perimeter of your site to help prevent soil erosion and stop sediment from leaving the site. Install controls on the downslope perimeter of your project (it is often unnecessary to surround the entire site with silt fence). Sediment barriers can be used to protect stream buffers, riparian areas, wetlands, or other waterways. They are effective only in small areas and should not be used in areas of concentrated flow.

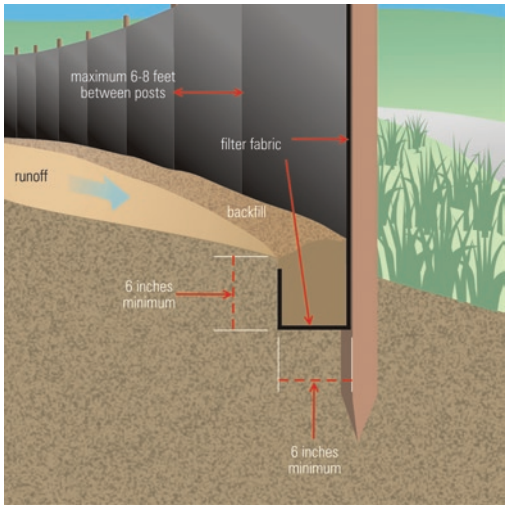


Figure 12. Illustration of proper techniques to use in installing silt fence.

Example BMP: Silt Fence and Fiber Rolls

Description: A silt fence is a temporary sediment barrier consisting of a geotextile attached to supporting posts and trenched into the ground. Silt fencing is intended to retain sediment that has been dislodged by stormwater. It is designed only for runoff from small areas and is not intended to handle flows from large slopes or in areas of concentrated flow. Fiber rolls serve the same purpose and consist of an open mesh tubular sleeve filled with a fibrous material which traps sediment. Fiber rolls are generally staked to the ground.

Installation Tips:

DO:

- Use silt fence or fiber rolls as perimeter controls, particularly at the lower or down slope edge of a disturbed area
- Leave space for maintenance between toe of slope and silt fence or roll
- Trench in the silt fence on the uphill side (6 inches deep by 6 inches wide)
- Install stakes on the downhill side of the fence or roll
- Curve the end of the silt fence or fiber roll up-gradient to help it contain runoff

DON'T:

- Install a silt fence or fiber rolls in ditches, channels, or areas of concentrated flow
- Install it running up and down a slope or hill
- Use silt fencing or fiber rolls alone in areas that drain more than a quarter-acre per 100 feet of fence

Maintenance:

- Remove sediment when it reaches one-third of the height of the fence or one-half the height of the fiber roll
- Replace the silt fence or roll where it is worn, torn, or otherwise damaged
- Retrench or replace any silt fence or roll that is not properly anchored to the ground

ESC Principle 8: Retain sediment on-site and control dewatering practices. Sediment barriers described in ESC Principle 7 can trap sediment from small areas, but when sediment retention from a larger area is required, consider using a temporary sediment trap or sediment basin. These practices detain sediment-laden runoff for a period of time, allowing sediment to settle before the runoff is discharged. Proper design and maintenance are essential to ensure that these practices are effective.

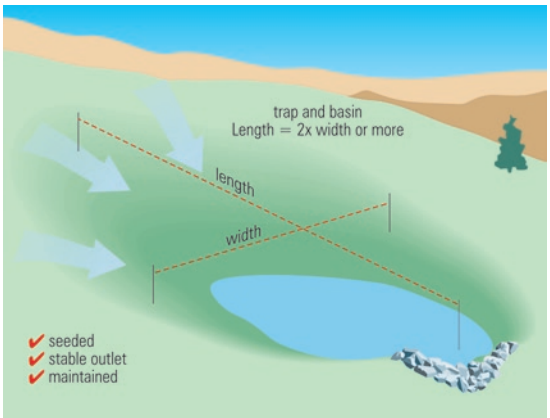


Figure 13. Illustration of a sediment basin.

You should use a sediment basin for common drainage locations that serve an area with 10 or more acres disturbed at any one time. The basin should be designed to provide storage for the volume of runoff from the drainage area for at least a 2-year, 24-hour storm (or 3,600 cubic feet of storage per acre drained, which is enough to contain 1 inch of runoff, if the 2-year, 24-hour calculation has not been performed). Check your permit for exact basin sizing requirements. Sediment basins should be located at low-lying areas of the site and on the down-gradient side of bare soil areas where flows converge. Do not put sediment traps or basins in or immediately adjacent to flowing streams or other waterways.

Where a large sediment basin is not practical, use smaller sediment basins or sediment traps (or both) where feasible. At a minimum, use silt fences, vegetative buffer strips, or equivalent sediment controls for all down-gradient boundaries (and for those side-slope boundaries deemed appropriate for individual site conditions).

Dewatering practices are used to remove ground water or accumulated rain water from excavated areas. Pump muddy water from these areas to a temporary or permanent sedimentation basin or to an area completely enclosed by silt fence in a flat vegetated area where discharges can infiltrate into the ground. Never discharge muddy water into storm drains, streams, lakes, or wetlands unless the sediment has been removed before discharge.

Keep in mind that some states and local jurisdictions require a separate permit for dewatering activities at a site.

ESC Principle 9: Establish stabilized construction exits. Vehicles entering and leaving the site have the potential to track significant amounts of sediment onto streets. Identify and clearly mark one or two locations where vehicles will enter and exit the site and focus stabilizing measures at those locations. Construction entrances are commonly made from large crushed rock. They can be further stabilized using stone pads or concrete. Also, steel wash racks and a hose-down system will remove even more mud and debris from vehicle tires. Divert runoff from wash areas to a sediment trap or basin. No system is perfect, so sweeping the street regularly completes this BMP.

Example BMP: Stabilized Construction Exit

Description: A rock construction exit can reduce the amount of mud transported onto paved roads by vehicles. The construction exit does this by removing mud from vehicle tires before the vehicle enters a public road.

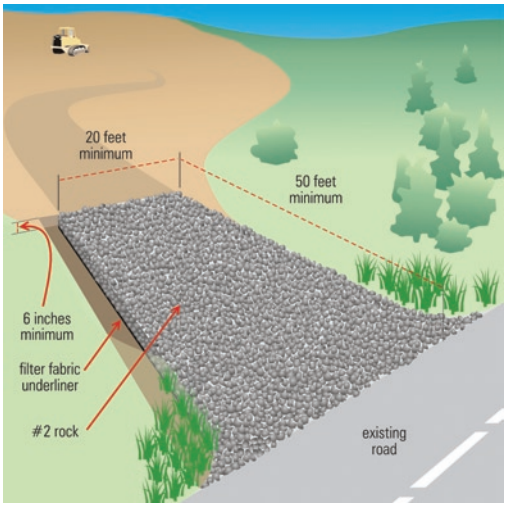


Figure 14. Illustration of a stabilized construction exit.

You might also want to install a wheel wash when mud is especially difficult to remove or space doesn't allow sufficient tire revolutions (four or five are needed) before exiting the site. Direct wash water to a suitable settling area—do not discharge wash water to a stream or storm drain!

Installation tips:

- Ensure that the exit is at least 50 feet long (generally, the length of two dump trucks) and graded so runoff does not enter the adjacent street
- Place a geotextile fabric under a layer of aggregate at least 6–12 inches thick. The stones or aggregate should be 3–6 inches in diameter
- Train employees and subcontractors to use the designated construction exits. Empower your employees to provide directions to subcontractors and others that are not on the site every day

Maintenance:

- Replenish or replace aggregate if it becomes clogged with sediment
- Sweep the street regularly

ESC Principle 10: Inspect and maintain controls. Inspection and maintenance is just as important as proper planning, design, and installation of controls. Without adequate maintenance, erosion and sediment controls will quickly fail, sometimes after just one rainfall, and cause significant water quality problems and potential violations of the NPDES construction general permit. Your permit likely requires you to maintain your BMPs at all times. To do this effectively, you should establish an inspection and maintenance approach or strategy that includes both regular and spot inspections. Inspecting both prior to predicted storm events and after will help ensure that controls are working effectively. Perform maintenance or corrective action as soon as problems are noted. **Inspection and maintenance of BMPs are addressed in more detail in Chapter 6.**

Other Sediment and Erosion Control Techniques

As mentioned at the beginning of this chapter, there are many other erosion and sediment control techniques that can be used effectively. The BMPs highlighted in this chapter are among those more commonly used and highlight many general erosion and sediment control principles for which other BMPs may be used effectively. Check to see if your state or local government has developed a BMP design manual for detailed information on any BMP you are considering. Appendix D lists several good BMP design manuals. You can also find out more about various BMPs by visiting EPA's Menu of BMPs at **www.epa.gov/npdes/menuofbmps**

The following BMPs are also commonly used at construction sites.

Erosion control measures:

- Surface roughening, trackwalking, scarifying, sheepsfoot rolling, imprinting
- Soil bioengineering techniques (e.g., live staking, fascines, brush wattles)
- Composting
- Sodding

Sediment control and runoff management measures:

- Gravel bag barrier
- Compost berm
- Rock or brush filters
- Baffles or skimmers in sediment basins to increase effectiveness
- Lowering soil levels near streets and sidewalks to prevent runoff
- Level spreaders
- Energy dissipaters
- Check dams

Chapter 5: **SWPPP Development—Selecting Good Housekeeping BMPs**

▶ **This chapter presents a brief discussion of good housekeeping principles to consider to ensure your construction site does not contaminate stormwater runoff.**

As noted in Chapter 3, sediment is the principal pollutant of concern in stormwater discharges from construction sites. But, EPA's CGP and many state construction general permits require that the SWPPP describe good housekeeping measures for other pollutants that might be found on construction sites. This chapter discusses these measures.

Six Key Pollution Prevention Principles for Good Housekeeping

Construction projects generate large amounts of building-related waste, which can end up polluting stormwater runoff if not properly managed. The suite of BMPs that are described in your SWPPP must include pollution prevention (P2) or good housekeeping practices that are designed to prevent contamination of stormwater from a wide range of materials and wastes at your site. The six principles described below are designed to help you identify the pollution prevention practices that should be described in your SWPPP and implemented at your site.

1. Provide for waste management
2. Establish proper building material staging areas
3. Designate paint and concrete washout areas
4. Establish proper equipment/vehicle fueling and maintenance practices
5. Control equipment/vehicle washing and allowable non-stormwater discharges
6. Develop a spill prevention and response plan

P2 Principle 1: Provide for waste management. Design proper management procedures and practices to prevent or reduce the discharge of pollutants to stormwater from solid or liquid wastes that will be generated at your site. Practices such as trash disposal, recycling, proper material handling, and cleanup measures can reduce the potential for stormwater runoff to pick up construction site wastes and discharge them to surface waters.

Figure 15. Illustration showing construction materials with secondary containment and overhead cover to prevent stormwater contamination.

Provide convenient, well-maintained, and properly located toilet facilities. Provide for regular inspections, service, and disposal. Locate toilet facilities away from storm drain inlets and waterways to prevent accidental spills and contamination of stormwater. Treat or dispose of sanitary and septic waste in accordance with state or local regulations.

Proper material use, storage, waste disposal, and training of employees and subcontractors can prevent or reduce the discharge of hazardous and toxic wastes to stormwater. Implement a comprehensive set of waste-management practices for hazardous or toxic materials, such as paints, solvents, petroleum products, pesticides, wood preservatives, acids, roofing tar, and other materials. Practices should include storage, handling, inventory, and cleanup procedures, in case of spills (see the following P2 principles).

Waste Management Checklist

Solid or Construction Waste

- ✓ Designate trash and bulk waste-collection areas on-site
- ✓ Recycle materials whenever possible (e.g., paper, wood, concrete, oil)
- ✓ Segregate and provide proper disposal options for hazardous material wastes
- ✓ Clean up litter and debris from the construction site daily
- ✓ Locate waste-collection areas away from streets, gutters, watercourses, and storm drains. Waste-collection areas (dumpsters, and such) are often best located near construction site entrances to minimize traffic on disturbed soils. Consider secondary containment around waste collection areas to further minimize the likelihood of contaminated discharges.

Sanitary and Septic Waste

- ✓ Provide restroom facilities on-site
- ✓ Maintain clean restroom facilities and empty porta-johns regularly
- ✓ Provide secondary containment pans under porta-johns, where possible
- ✓ Provide tie-downs or stake downs for porta-johns in areas of high winds
- ✓ Educate employees, subcontractors, and suppliers on locations of facilities
- ✓ Do not discharge or bury wastewater at the construction site
- ✓ Inspect facilities for leaks, repair or replace immediately

Hazardous Materials and Wastes

- ✓ Develop and implement employee and subcontractor education, as needed, on hazardous and toxic waste handling, storage, disposal, and cleanup
- ✓ Designate hazardous waste-collection areas on-site
- ✓ Place all hazardous and toxic material wastes in secondary containment
- ✓ Hazardous waste containers should be inspected to ensure that all containers are labeled properly and that no leaks are present

P2 Principle 2: Establish proper building material handling and staging areas.
Your SWPPP should include comprehensive handling and management procedures for building materials, especially those that are hazardous or toxic. Paints, solvents, pesticides, fuels and oils, other hazardous materials or any building materials that have the potential to contaminate stormwater should be stored indoors or under cover whenever possible or in areas with secondary containment. Secondary containment prevents a spill from spreading across the site and include dikes, berms, curbing, or other containment methods. Secondary containment techniques should also ensure the protection of ground water. Designate staging areas for activities such as fueling vehicles, mixing paints, plaster, mortar, and so on. Designated staging areas will help you to monitor the use of materials and to clean up any spills. Training employees and subcontractors is essential to the success of this pollution prevention principle.

SWPPP Tip!

Material Staging Area Measures

Your SWPPP should include procedures for storing materials that can contribute pollutants to stormwater. Consider the following:

- Train employees and subcontractors in proper handling and storage practices
- Designate site areas for storage. Provide storage in accordance with secondary containment regulations and provide cover for hazardous materials when necessary. Ensure that storage containers are regularly inspected for leaks, corrosion, support or foundation failure, or any other signs of deterioration and tested for soundness
- Reuse and recycle construction materials when possible

P2 Principle 3: Designate washout areas.
Concrete contractors should be encouraged, where possible, to use the washout facilities at their own plants or dispatch facilities. If it is necessary to provide for concrete washout areas on-site, designate specific washout areas and design facilities to handle anticipated washout water. Washout areas should also be provided for paint and stucco operations. Because washout areas can be a source of pollutants from leaks or spills,

EPA recommends that you locate them at least 50 yards away from storm drains and watercourses whenever possible.

Several companies rent or sell prefabricated washout containers, and some provide disposal of waste solids and liquids along with the containers. These prefabricated containers are sturdy and provide a more reliable option for preventing leaks and spills of wash water than self-constructed washouts. Alternatively, you can construct your own washout area, either by digging a pit and lining it with 10 mil plastic sheeting or creating an aboveground structure from straw bales or sandbags with a plastic liner. If you create your own structure, you should inspect it daily for leaks or tears in the plastic because these structures are prone to failure.

Regular inspection and maintenance are important for the success of this BMP. Both self-constructed and prefabricated washout containers can fill up quickly when concrete, paint, and stucco work are occurring on large portions of the site. You should also inspect for evidence that contractors are using the washout areas and not dumping materials onto the ground or into drainage facilities. If the washout areas are not being used regularly, consider posting additional signage, relocating the facilities to more convenient locations, or providing training to workers and contractors.

SWPPP Tip!

Washout Area Measures

When concrete, paint, or stucco is part of the construction process, consider these practices which will help prevent contamination of stormwater. Include the locations of these areas and your maintenance and inspection procedures in your SWPPP.

- Do not washout concrete trucks or equipment into storm drains, streets, gutters, uncontained areas, or streams
- Establish washout areas and advertise their locations with signs
- Provide adequate containment for the amount of wash water that will be used
- Inspect washout structures daily to detect leaks or tears and to identify when materials need to be removed
- Dispose of materials properly. The preferred method is to allow the water to evaporate and to recycle the hardened concrete. Full service companies may provide dewatering services and should dispose of wastewater properly. Concrete wash water can be highly polluted. It should not be discharged to any surface water, storm sewer system, or allowed to infiltrate into the ground. It should not be discharged to a sanitary sewer system without first receiving written permission from the system operator

P2 Principle 4: Establish proper equipment/vehicle fueling and maintenance practices. Performing equipment/vehicle fueling and maintenance at an off-site facility is preferred over performing these activities on the site, particularly for road vehicles (e.g., trucks, vans). For grading and excavating equipment, this is usually not possible or desirable. Create an on-site fueling and maintenance area that is clean and dry. The on-site fueling area should have a spill kit, and staff should know how to use it. If possible, conduct vehicle fueling and maintenance activities in a covered area; outdoor vehicle fueling and maintenance is a potentially significant source of stormwater pollution. Significant maintenance on vehicles and equipment should be conducted off-site.

SWPPP Tip!

Equipment/Vehicle Fueling and Maintenance Measures

Consider the following practices to help prevent the discharge of pollutants to stormwater from equipment/vehicle fueling and maintenance. Include the locations of these areas and your inspection and maintenance procedures in your SWPPP.

- Train employees and subcontractors in proper fueling procedures (stay with vehicles during fueling, proper use of pumps, emergency shut-off valves, and such)
- Inspect on-site vehicles and equipment daily for leaks, equipment damage, and other service problems
- Clearly designate vehicle/equipment service areas away from drainage facilities and water-courses to prevent stormwater run-on and runoff
- Use drip pans, drip cloths, or absorbent pads when replacing spent fluids
- Collect all spent fluids, store in appropriate labeled containers in the proper storage areas, and recycle fluids whenever possible

P2 Principle 5: Control equipment/vehicle washing and allowable non-stormwater discharges. Environmentally friendly washing practices can be practiced at every construction site to prevent contamination of surface and ground water from wash water. Procedures and practices include using off-site facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water or routing to the sanitary sewer; and training employees and subcontractors in proper cleaning procedures.

Take a Closer Look…

Non-Stormwater Runoff

A construction site might have sources of runoff that are not generated by stormwater. These non-stormwater discharges include fire hydrant flushing, vehicle or equipment wash water (no detergents!), water used to control dust, and landscape irrigation.

What does this mean to me?

Take steps to infiltrate these sources of uncontaminated water into the ground. You can also route these sources of water to sediment ponds or detention basins or otherwise treat them with appropriate BMPs.

SWPPP Tip!

Equipment/Vehicle Washing Measures

The following equipment/vehicle washing measures will help prevent stormwater pollution. Include the location of your washing facilities and your inspection and maintenance procedures in your SWPPP.

- Educate employees and subcontractors on proper washing procedures
- Clearly mark the washing areas and inform workers that all washing must occur in this area
- Contain wash water and treat and infiltrate it whenever possible
- Use high-pressure water spray at vehicle washing facilities without any detergents because water can remove most dirt adequately
- Do not conduct any other activities, such as vehicle repairs, in the wash area

P2 Principle 6: Develop a spill prevention and response plan. Most state and EPA construction general permits require the preparation of spill prevention and response plans. Generally, these plans can be included or incorporated into your SWPPP. The plan should clearly identify ways to reduce the chance of spills, stop the source of spills, contain and clean up spills, dispose of materials contaminated by spills, and train personnel responsible for spill prevention and response. The plan should also specify material handling procedures and storage requirements and ensure that clear and concise spill cleanup procedures are provided and posted for areas in which spills may potentially occur. When developing a spill prevention plan, include, at a minimum, the following:

- Note the locations of chemical storage areas, storm drains, tributary drainage areas, surface waterbodies on or near the site, and measures to stop spills from leaving the site
- Specify how to notify appropriate authorities, such as police and fire departments, hospitals, or municipal sewage treatment facilities to request assistance
- Describe the procedures for immediate cleanup of spills and proper disposal
- Identify personnel responsible for implementing the plan in the event of a spill

SWPPP Tip!

Spill Prevention Measures

Additional spill prevention measures that will help prevent spills and leaks include the following:

- Describe and list all types of equipment to be used to adequately clean up the spill
- Provide proper handling and safety procedures for each type of waste
- Establish an education program for employees and subcontractors on the potential hazards to humans and the environment from spills and leaks
- Update the spill prevention plan and clean up materials as changes occur to the types of chemicals stored and used at the facility

Take a Closer Look…

Spill Prevention, Control and Countermeasure (SPCC) Plan

Construction sites may be subject to 40 CFR Part 112 regulations that require the preparation and implementation of a SPCC Plan to prevent oil spills from aboveground and underground storage tanks. Your facility is subject to this rule if you are a nontransportation-related facility that:

- Has a total storage capacity greater than 1,320 gallons or a completely buried storage capacity greater than 42,000 gallons and
- Could reasonably be expected to discharge oil in quantities that may be harmful to navigable waters of the United States and adjoining shorelines

Furthermore, if your facility is subject to 40 CFR Part 112, your SWPPP should reference the SPCC Plan. To find out more about SPCC Plans, see EPA's website on SPPC at **www.epa.gov/oilspill/spcc.htm**

What does this mean to me?

Reporting Oil Spills

In the event of an oil spill, you should contact the National Response Center toll free at 1-800-424-8802 for assistance, or for more details, visit their website: ***www.nrc.uscg.mil/nrchp.html***

Chapter 6: **SWPPP Development—Inspections, Maintenance, and Recordkeeping**

▶ **This chapter describes the inspection and maintenance procedures your SWPPP should include, as well as recordkeeping requirements.**

A. Describe Your Plans and Procedures for Inspecting BMPs

Earlier discussions in this manual pointed out that the effectiveness of erosion and sediment control BMPs and good housekeeping and pollution prevention measures depend on consistent and continual inspection and maintenance. This step focuses on developing a plan for BMP inspection and maintenance to ensure that a schedule and procedures are in place.

Inspections

Your responsibility does not stop after BMPs are installed. Your BMPs must be maintained in good working order at all times. Further, your permit requires that you conduct regular inspections and document the findings of those inspections in your SWPPP.

Your construction general permit describes the ***minimum*** frequency of inspections, which is typically weekly or bi-weekly and after each rainfall event exceeding one-half inch. To meet the requirement to maintain all BMPs in good working order, EPA recommends that you develop an inspection schedule that goes beyond these minimums and is customized for your site and the conditions affecting it.

In developing your inspection schedule consider the following:

- Consider using *spot* inspections. You may want to inspect certain parts of your site more frequently or even daily. Target places that need extra attention, such as areas around construction site entrances, check nearby streets for dirt, check inlet protection, and so on.
- Consider using informal inspections. Your permit outlines the minimum requirements for formal inspections that must be documented and included in your SWPPP. You can also add informal inspections that wouldn't require documentation, unless of course, a problem is identified. Always document any problems you find and those that are identified by staff.
- Consider adding inspections *before or even during* rain events. Many permits require inspections of BMPs after rain events. You should consider adding inspections ***before or during*** predicted rain events. Consult a local weather source and initiate inspections before predicted storm events as a way to ensure that controls are operational.
- Train staff and subcontractors. Use your staff and subcontractors to help identify any potential problems with your BMPs. Again, document any issues that are confirmed problems.

SWPPP Tip!

Inspection Guide

The State of Minnesota has developed a *Stormwater Construction Inspection Guide* to assist municipal site inspectors in procedures for conducting a compliance inspection at construction sites. This guide can also be useful for construction operators conducting self-inspections. Available at **www.pca.state.mn.us/water/stormwater/stormwatr-c.html**

EPA recommends that you develop an inspection schedule that meets the needs of your site. You'll probably also want to update and refine this schedule based on your experiences, the findings of your inspections, and the changing conditions at your site.

SWPPP Tip!

Selecting BMP Inspectors

A BMP inspection is only as good as the inspector. Therefore, it is important to select qualified personnel to conduct BMP inspections. The SWPPP should identify who has the responsibility for conducting inspections. Personnel selected to conduct inspections should be knowledgeable in the principles and practices of erosion and sediment controls, possess the technical skills to assess conditions at the construction site that could impact stormwater quality, and assess the effectiveness of any sediment and erosion control measures selected.

Several states and other organizations offer training that will help prepare inspectors to accurately evaluate BMPs, decide when maintenance is appropriate, or when a different BMP should be substituted. (Several states require that sites be inspected by someone that the state certifies as a qualified inspector.) One national organization offers two certification programs that would be useful for personnel who are developing and implementing SWPPPs and conducting inspections. These certification programs are called: "*Certified Professional in Erosion and Sediment Control (CPESC)*" and "*Certified Professional in Stormwater Quality (CPSWQ)*." You can find more information on these programs at **www.cpesc.org**

Inspection Reports

Complete an inspection report after each inspection. You should retain copies of all inspection reports and keep them with or in your SWPPP. Generally, the following information is required to be included in your inspection report:

- Inspection date
- Inspector information, including the names, titles, and qualifications of personnel conducting the inspection
- Weather information for the period since the last inspection (or for the first inspection since commencement of construction activity) including a best estimate of the beginning of each storm, its duration, approximate amount of rainfall for each storm (in inches), and whether any discharges occurred. You may create a log to record the basic weather information or you may keep copies of weather information from a reliable local source, such as the internet sites of local newspapers, TV stations, local universities, etc.
- Current weather information and a description of any discharges occurring at the time of the inspection
- Descriptions of evidence of previous or ongoing discharges of sediment or other pollutants from the site
- Location(s) of BMPs that need to be maintained
- Location(s) of BMPs that failed to operate as designed or proved inadequate for a location
- Location(s) where additional BMPs are needed but did not exist at the time of inspection
- Corrective action required, including any necessary changes to the SWPPP and implementation dates
- Reference to past corrective actions documenting follow-up actions taken

Consider taking digital photographs during inspections to document BMPs, problems identified, and progress in implementing the SWPPP.

Appendix B includes an example stormwater inspection report. You should use this report, or a similar report, to document your stormwater construction site inspections. Check to see if your state or local authority has developed an inspection checklist for your use. The inspection report is broken up into two main sections—site-specific BMPs and overall site issues. For the site-specific BMPs, you should number the structural and non-structural BMPs in your SWPPP on a copy of your site map (preferably in the order in which you would inspect them on the site). Then as you conduct your inspections, you can verify whether each BMP has been installed and maintained. If a BMP has not been installed or needs maintenance, describe this in the corrective action section and list a date for when the corrective action will be completed and who will be responsible for completing the action. The overall site issues section describes 11 common issues at construction sites you should inspect for. You can customize this form to meet the needs of your particular situation.

Make sure each inspection report is signed and certified consistent with your permit's requirements.

Chapter 8, Section D contains more information on implementing an inspection program. Also, see the suggested inspection report form in Appendix B.

SWPPP Tip!

Consider More Effective BMPs

During inspections, consider whether the installed BMPs are working effectively. If you find a BMP that is failing or overwhelmed by sediment, you should consider whether it needs to be replaced with a more effective BMP or enhanced by the addition of another, complimentary BMP. Ensure that you record such changes in your SWPPP and on your site map.

B. BMP Maintenance

Implementing a good BMP maintenance program is essential to the success of your SWPPP and to your efforts to protect nearby waterways. You should conduct maintenance of BMPs regularly and whenever an inspection (formal or informal) identifies a problem or potential issue. For instance, trash and debris should be cleaned up, dumpsters should be checked and covered, nearby streets and sidewalks should be swept daily, and so on. Maintenance on erosion and sediment controls should be performed as soon as site conditions allow. Consider the following points when conducting maintenance:

- Follow the designers or manufacturer's recommended maintenance procedures for all BMPs
- Maintenance of BMPs will vary according to the specific area and site conditions
- Remove sediment from BMPs as appropriate and properly dispose of sediment into controlled areas to prevent soil from returning to the BMP during subsequent rain events
- Remove sediment from paved roadways and from around BMPs protecting storm drain inlets
- Ensure that construction support activities, including borrow areas, waste areas, contractor work areas, and material storage areas and dedicated concrete and asphalt batch plants are cleaned and maintained
- Replace damaged BMPs, such as silt fences, that no longer operate effectively

You should keep a record of all maintenance activities, including the date, BMP, location, and maintenance performed in your SWPPP.

C. Recordkeeping

You must keep copies of the SWPPP, inspection records, copies of all reports required by the permit, and records of all data used to complete the NOI to be covered by the permit for a period of at least 3 years from the date that permit coverage expires or is terminated.

Records should include:

- A copy of the SWPPP, with any modifications
- A copy of the NOI and Notice of Termination (NOT) and any stormwater-related correspondence with federal, state, and local regulatory authorities
- Inspection forms, including the date, place, and time of BMP inspections
- Names of inspector(s)
- The date, time, exact location, and a characterization of significant observations, including spills and leaks
- Records of any non-stormwater discharges
- BMP maintenance and corrective actions taken at the site (Corrective Action Log)
- Any documentation and correspondence related to endangered species and historic preservation requirements
- Weather conditions (e.g., temperature, precipitation)
- Date(s) when major land disturbing (e.g. clearing, grading, and excavating) activities occur in an area
- Date(s) when construction activities are either temporarily or permanently ceased in an area
- Date(s) when an area is either temporarily or permanently stabilized

Chapter 7: **Certification and Notification**

▶ **This chapter describes how, after developing your SWPPP, you can obtain permit coverage for your stormwater discharges.**

A. Certification

Signature and Certification

The construction site operator must sign the permit application form, which is often called a *Notice of Intent* or *NOI*. (In some instances, the construction general permit may not require the submission of an NOI or application. Construction activities may be covered automatically.)

All reports, including SWPPPs and inspection reports, generally must be signed by the construction site operator or a duly authorized representative of that person. The authorized representative is typically someone who has direct responsibility for implementing the SWPPP. If the operator chooses to designate an authorized representative, a signed letter or statement to that effect must be included in the SWPPP. Check your permit for exact requirements.

Your SWPPP must include the signature of the construction site operator or authorized representative and the certification statement provided in the general permit. An example of the certification language from EPA's Construction General Permit follows:

> "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."

This ensures that the SWPPP was developed and reviewed by a responsible party with the ability to implement the BMPs and other commitments described in the SWPPP.

SWPPP Tip!

Posting a sign at the construction entrance

EPA and many state general permits require that you post a sign or other notice conspicuously near the main entrance of the construction site. EPA's permit requires that the sign contain a copy of the NOI, the location of the SWPPP, and a contact person for viewing the SWPPP.

Copy of Permit Requirements

Most general permits require you to keep a copy of the permit and your NOI with your SWPPP. This allows you to quickly check the permit if a question arises about a permit requirement.

Other State, Tribal, and Local Programs

Include in your SWPPP a description of any other federal, state, tribal, or local requirements for erosion and sediment control and stormwater management that apply to your site. Many local governments also impose erosion and sediment control requirements; your SWPPP should comply with both the general permit and any applicable local requirements.

SWPPP Tip!

Making your SWPPP available

While EPA and most states do not require you to submit a copy of your SWPPP for review, your SWPPP must be available to these and other government agencies for inspection. Your permit may also require you to make your SWPPP available to the public, if requested. If you have the ability, you should consider posting your SWPPP on the Internet and publicizing the URL. Check your permit for exact requirements.

B. Notification

Now that you have developed your SWPPP and before you begin construction, you must begin the process of obtaining permit coverage from your authorized state or EPA. Authorized states and EPA use *general* permits to cover all construction sites. These broadly written general or *umbrella* permits apply to all construction activities in a given state.

Obtaining Coverage Under a General Permit

Important! Before obtaining permit coverage, you should read a copy of the appropriate construction general permit *and* develop your SWPPP.

To obtain coverage under a state or EPA construction general permit, you will typically need to fill out and submit an application form, often called a Notice of Intent or NOI. Submitting this form to the permitting authority indicates your *intent* to be authorized to discharge stormwater under the appropriate general permit for construction activities. Depending on the permit, you may be authorized to discharge immediately or at some later time. In some cases, you are not authorized to discharge until the state has notified you accordingly. EPA's Construction General Permit requires a 7-day waiting period after a complete NOI is received and posted on EPA's website (**www.epa.gov/npdes/noisearch**). The waiting period expires when the permit's status changes from *waiting* to *active*.

Take a Closer Look…

Information on the Application or Notice of Intent (NOI)

The NOI provides the permitting authority with pertinent information about your construction site, such as owner/operator information, site location, estimated project start and completion dates, approximate area to be disturbed, information about your SWPPP, receiving waters, and endangered species review certification. An appropriate person who is authorized to represent your organization must sign and verify that the facts contained in the NOI are true and accurate. For businesses, a certifying official is typically a corporate officer, such as a president, vice president, or manager of operations. For municipalities, it's typically a principal executive officer or ranking elected official. Check your permit for exact signature requirements.

In general, the only information you need to submit to the permitting authority is the NOI. EPA and most authorized state agencies do not require you to submit your SWPPP for approval. However, many local governments review and approve at least the erosion and sediment control component of your SWPPP.

What does this mean to me?

There are significant penalties for failing to obtain authorization to discharge or for submitting inaccurate information. If you are the certifying official, make sure you are authorized to discharge before construction activities begin.

SWPPP Tip!

Deadline for submitting NOIs under EPA's Construction General Permit

For EPA's construction general permit, the fastest and easiest way to obtain permit coverage is to use EPA's electronic permit application system, called "eNOI" at **www.epa.gov/npdes/stormwater/enoi**. Using this approach, you may be authorized to discharge in as little as 7 days after submission of your electronic NOI. If you choose to submit your NOI by mail, EPA recommends that you send it at least one month before you need permit coverage.

Chapter 8: **SWPPP Implementation**

▶ **Your SWPPP is your guide to preventing stormwater pollution. However, it is just a plan. Implementing your SWPPP, maintaining your BMPs, and then constantly reevaluating and revising your BMPs and your SWPPP are the keys to protecting your local waterways.**

A. Train Your Staff and Subcontractors

Your site's construction workers and subcontractors might not be familiar with stormwater BMPs, and they might not understand their role in protecting local rivers, lakes and coastal waters. Training your staff and subcontractors in the basics of erosion control, good housekeeping, and pollution prevention is one of the most effective BMPs you can institute at your site.

Basic training should include

- Spill prevention and cleanup measures, including the prohibition of dumping any material into storm drains or waterways
- An understanding of the basic purpose of stormwater BMPs, including what common BMPs are on-site, what they should look like, and how to avoid damaging them
- Potential penalties associated with stormwater noncompliance

Staff directly responsible for implementing the SWPPP should receive comprehensive stormwater training, including

- The location and type of BMPs being implemented
- The installation requirements and water quality purpose for each BMP
- Maintenance procedures for each of the BMPs being implemented
- Spill prevention and cleanup measures
- Inspection and maintenance recordkeeping requirements

You can train staff and subcontractors in several ways: short training sessions (food and refreshments will help increase attendance), posters and displays explaining your site's various BMPs, written agreements with subcontractors to educate their staff members, signs pointing out BMPs and reminders to keep clear of them. Every construction site operator should try to train staff and subcontractors to avoid damaging BMPs. By doing so, operators can avoid the added expense of repairs.

SWPPP Tip!

Train your staff and subcontractors!

Here are a few key things you will want to cover with each person working on your site:

- Use only designated construction site entrances
- Keep equipment away from silt fences, fiber rolls, and other sediment barriers
- Know the locations of disposal areas, and know the proper practices for trash, concrete and paint washout, hazardous chemicals, and so on
- Keep soil, materials, and liquids away from paved areas and storm drain inlets. Never sweep or wash anything into a storm drain
- Know the location and understand the proper use of spill kits
- Know the locations of your site's designated protection areas. Keep equipment away from stream banks, valuable trees and shrubs, and steep slopes. Clearly mark these areas with signs
- Keep equipment off mulched, seeded, or stabilized areas. Post signs on these areas, too
- Know who to contact when problems are identified!

B. Ensure Responsibility—Subcontractor Agreements

At any given site, there might be multiple parties (developer, general contractor, builders, subcontractors) that have roles and responsibilities for carrying out or maintaining stormwater BMPs at a given site. These roles and responsibilities should be documented clearly in the SWPPP (see Chapter 2, Section D). In some cases (state requirements vary), there may be one entity that has developed the SWPPP and filed for permit coverage and, therefore, is designated as the *operator*. When other parties at a site are not officially designated as operators, many operators are incorporating the roles and responsibilities of these *non-operators* in the agreements and contracts they have with these companies and individuals. This contract language should spell out responsibilities implementing and maintaining stormwater BMPs, for training staff, and for correcting damage to stormwater BMPs on the site. Several states have stormwater regulations that hold other parties liable even if they are not identified as the *operator*.

C. Implement Your SWPPP Before Construction Starts

Once you have obtained permit coverage and you are ready to begin construction, it is time to implement your SWPPP. You must implement appropriate parts of your SWPPP before construction activity begins. This generally involves installing storm drain inlet protection, construction entrances, sediment basins, and perimeter silt fences before clearing, grading, and excavating activities begin.

After construction activities begin, your SWPPP should describe when additional erosion and sediment controls will be installed (generally after initial clearing and grading activities are complete). You should also begin BMP inspections once clearing and grading activities begin.

SWPPP Tip!

Take Photographs During Inspections

Taking photographs can help you document areas that need maintenance and can help identify areas where subcontractors might need to conduct maintenance. Photographs can also help provide documentation to EPA or state inspectors that maintenance is being performed.

SWPPP Tip!

Prepare for the rain and snowmelt!

In some areas of the country, construction site operators are required to develop *weather triggered* action plans that describe additional activities the operator will conduct 48 hours before a predicted storm (at least a 50 percent forecasted chance of rain). It is also a good idea to stockpile additional erosion and sediment control BMPs (such as silt fencing, and fiber rolls) at the site for use when necessary.

D. Conduct Inspections and Maintain BMPs

As mentioned earlier (Chapter 6), EPA recommends that you develop an inspection schedule for your site that considers the size, complexity, and other conditions at your site. This should include regularly scheduled inspections and less formal inspections. EPA recommends that you develop a plan that includes inspections before and after anticipated rain events. You might also want to inspect some BMPs during rain events to see if they are actually keeping sediment on site! Conducting inspections during rain events also allows a construction site operator to address minor problems before they turn into major problems.

Temporarily Removed BMPs

BMPs sometimes need to be temporarily removed to conduct work in an area of the site. These temporarily removed BMPs should be noted on the site plan and replaced as soon as possible after the completion of the activity requiring their removal. If a rain is forecast, the BMPs should be replaced as soon as possible before the rain event.

Recommended Inspection Sequence

You should conduct thorough inspections of your site, making sure to inspect all areas and BMPs. The seven activities listed below are a recommended inspection sequence that will help you conduct a thorough inspection (adapted from MPCA 2004).

1. Plan your inspection

- ☑ Create a checklist to use during the inspection (see Appendix B)
- ☑ Obtain a copy of the site map with BMP locations marked
- ☑ Plan to walk the entire site, including discharge points from the site and any off-site support activities such as concrete batch plants should also be inspected
- ☑ Follow a consistent pattern each time to ensure you inspect all areas (for example, starting at the lowest point and working uphill)

2. Inspect discharge points and downstream, off-site areas

- ☑ Inspect discharge locations to determine whether erosion and sediment control measures are effective
- ☑ Inspect nearby downstream locations, if feasible
- ☑ Walk *down the street* to inspect off-site areas for signs of discharge. This is important in areas with existing curbs and gutters
- ☑ Inspect downslope municipal catch basin inlets to ensure that they are adequately protected

3. Inspect perimeter controls and slopes

- ☑ Inspect perimeter controls such as silt fences to determine if sediment should be removed
- ☑ Check the structural integrity of the BMP to determine if portions of the BMP need to be replaced
- ☑ Inspect slopes and temporary stockpiles to determine if erosion controls are effective

4. Compare BMPs in the site plan with the construction site conditions

- ☑ Determine whether BMPs are in place as required by the site plan
- ☑ Evaluate whether BMPs have been adequately installed and maintained
- ☑ Look for areas where BMPs are needed but are missing and are not in the SWPPP

5. Inspect construction site entrances

- ☑ Inspect the construction exits to determine if there is tracking of sediment from the site onto the street
- ☑ Refresh or replace the rock in designated entrances
- ☑ Look for evidence of additional construction exits being used that are not in the SWPPP or are not stabilized
- ☑ Sweep the street if there is evidence of sediment accumulation

6. Inspect sediment controls

- ☑ Inspect any sediment basins for sediment accumulation
- ☑ Remove sediment when it reduces the capacity of the basin by the specified amount (many permits have specific requirements for sediment basin maintenance. Check the appropriate permit for requirements and include those in your SWPPP)

7. Inspect pollution prevention and good housekeeping practices

- ☑ Inspect trash areas to ensure that waste is properly contained
- ☑ Inspect material storage and staging areas to verify that potential pollutant sources are not exposed to stormwater runoff
- ☑ Verify that concrete, paint, and stucco washouts are being used properly and are correctly sized for the volume of wash water
- ☑ Inspect vehicle/equipment fueling and maintenance areas for signs of stormwater pollutant exposure

Common Compliance Problems During Inspections

The following are problems commonly found at construction sites. As you conduct your inspections, look for these problems on your site (adapted from MPCA 2004).

Problem #1—Not using phased grading or providing temporary or permanent cover (i.e., soil stabilization)

In general, construction sites should phase their grading activities so that only a portion of the site is exposed at any one time. Also, disturbed areas that are not being actively worked should have temporary cover. Areas that are at final grade should receive permanent cover as soon as possible.

Problem #2—No sediment controls on-site

Sediment controls such as silt fences, sediment barriers, sediment traps and basins must be in place before soil-disturbance activities begin. Don't proceed with grading work out-of-phase.

Problem #3—No sediment control for temporary stockpiles

Temporary stockpiles must be seeded, covered, or surrounded by properly installed silt fence. Stockpiles should never be placed on paved surfaces.

Problem #4—No inlet protection

All storm drain inlets that could receive a discharge from the construction site must be protected before construction begins and must be maintained until the site is finally stabilized.

Problem #5—No BMPs to minimize vehicle tracking onto the road

Vehicle exits must use BMPs such as stone pads, concrete or steel wash racks, or equivalent systems to prevent vehicle tracking of sediment.

Problem #6—Improper solid waste or hazardous waste management

Solid waste (including trash and debris) must be disposed of properly, and hazardous materials (including oil, gasoline, and paint) must be properly stored (which includes secondary containment). Properly manage portable sanitary facilities.

Problem #7—Dewatering and other pollutant discharges at the construction site

Construction site dewatering from building footings or other sources should not be discharged without treatment. Turbid water should be filtered or allowed to settle.

Problem #8—Poorly managed washouts (concrete, paint, stucco)

Water from washouts must not enter the storm drain system or a nearby receiving water. Make sure washouts are clearly marked, sized adequately, and frequently maintained.

Problem #9—Inadequate BMP maintenance

BMPs must be frequently inspected and maintained if necessary. Maintenance should occur for BMPs that have reduced capacity to treat stormwater (construction general permits or state design manuals often contain information on when BMPs should be maintained), or BMPs that have been damaged and need to be repaired or replaced (such as storm drain inlet protection that has been damaged by trucks).

Problem #10—Inadequate documentation or training

Failing to develop a SWPPP, keep it up-to-date, or keep it on-site, are permit violations. You should also ensure that SWPPP documentation such as a copy of the NOI, inspection reports and updates to the SWPPP are also kept on-site. Likewise, personnel working on-site must be trained on the basics of stormwater pollution prevention and BMP installation/maintenance.

E. Update and Evaluate Your SWPPP

Like your construction site, your SWPPP is dynamic. It is a document that must be amended to reflect changes occurring at the site. As plans and specifications change, those changes should be reflected in your SWPPP. If you find that a BMP is not working and you decide to replace it with another, you must reflect that change in your SWPPP. Document in your SWPPP transitions from one phase of construction to the next, and make sure you implement new BMPs required for that next phase.

Are Your BMPs Working?

You should evaluate the effectiveness of your BMPs as part of your routine inspection process. An informal analysis of both your inspection's findings and your list of BMP repairs will often reveal an inadequately performing BMP. An inspection immediately after a rain event can indicate whether another approach is needed.

You may decide to remove an existing BMP and replace it with another, or you may add another BMP in that area to lessen the impact of stormwater on the original installation.

When you update your SWPPP, you can simply mark it up, particularly for relatively simple changes and alterations. More significant changes might require a rewriting of portions of the SWPPP. The site map should also be updated as necessary.

Chapter 9: **Final Stabilization and Permit Termination**

▶ **This chapter describes what you must do to stabilize your construction site and end permit coverage.**

Stabilize Disturbed Areas

As your construction project progresses, you must stabilize areas not under construction. EPA and most states have specific requirements and time frames that must be followed. Generally, it is a wise management practice to stabilize areas as quickly as possible to avoid erosion problems that could overwhelm silt fences, sediment basins, and other sediment control devices.

SWPPP Tip!

Stabilize as soon as practicable

EPA's Construction General Permit states that, "stabilization measures must be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased."

Temporary stabilization can be achieved through a variety of BMPs, including mulching, seeding, erosion control blankets, hydroseeding, and other measures.

Permanent or final stabilization of areas on your site is generally accomplished by installing the final landscape requirements (e.g., trees, grass, gardens, or permanent stormwater controls). Once the site has been stabilized, you can terminate your permit coverage.

Sediment controls, such as silt fence, berms, sediment ponds or traps, alone, are not stabilization measures. You should continue to use these kinds of measures (e.g., silt fence around an area that has been seeded) until full stabilization is achieved.

A. Final Stabilization

When you have completed your construction project or an area within the overall project, you must take steps to permanently and finally stabilize it. Check your permit for the specific requirements you must meet. After a project or an area in the project has been fully stabilized, you should remove temporary sediment and erosion control devices (such as silt fences). You might also be able to stop routine inspections in these stabilized areas. However, in some states such as Colorado, inspections are required every 30 days (after the construction has been completed and the site is stabilized) until permit coverage has been terminated. In general, you should be aware that

Figure 16. Seeding is an effective BMP that can be used to temporarily or permanently stabilize disturbed areas.

final stabilization often takes time (weeks or even months), especially during times of low rainfall or during the colder months of the year. You should not discontinue routine inspections until you have met the final stabilization requirements in your permit.

EPA and many states define final stabilization as occurring when a uniform, evenly distributed perennial vegetative cover with a density of 70 percent of the native background cover has been established on all unpaved areas and areas not covered by permanent structures. Some states have a higher percentage of vegetative cover required (e.g., New York requires 80 percent). Please review your state's construction general permit for specific requirements.

Native vegetation must be established uniformly over each disturbed area on the site. Stabilizing seven of ten slopes, or leaving an area equivalent to 30 percent of the disturbed area completely unstabilized will not satisfy the *uniform vegetative cover* standard.

The contractor must establish vegetation over the entire disturbed soil area at a minimum density of 70 percent of the native vegetative coverage. For example, if native vegetation covers 50 percent of the undisturbed ground surface (e.g., in an arid or semi-arid area), the contractor must establish 35 percent vegetative coverage uniformly over the entire disturbed soil area ($0.70 \times 0.50 = 0.35$ or 35 percent). Several states require perennial native vegetative cover that is *self-sustaining* and capable of providing *erosion control equivalent to preexisting conditions* to satisfy the 70 percent coverage requirement.

In lieu of vegetative cover, you can apply alternate measures that provide equivalent soil stabilization to the disturbed soil area. Such equivalent measures include blankets, reinforced channel liners, soil cement, fiber matrices, geotextiles, or other erosion-resistant soil covering or treatments. Your construction general permit might allow all or some of these alternate measures for equivalent soil stabilization for final stabilization; check your general permit.

B. Permit Termination

Once construction activity has been completed and disturbed areas are finally stabilized, review your general permit for specific steps to end your coverage under that permit. EPA and many states require you to submit a form, often called a notice of termination (NOT), to end your coverage under that construction general permit. Before terminating permit coverage, make sure you have accomplished the following:

- Remove any construction debris and trash
- Remove temporary BMPs (such as silt fence). Remove any residual sediment as needed. Seed and mulch any small bare spots. BMPs that will decompose, including some fiber rolls and blankets, may be left in place
- Check areas where erosion-control blankets or matting were installed. Cut away and remove all loose, exposed material, especially in areas where walking or mowing will occur. Reseed all bare soil areas
- Ensure that 70 percent of background native vegetation coverage or equivalent stabilization measures have been applied for final soil stabilization of disturbed areas
- Repair any remaining signs of erosion
- Ensure that post-construction BMPs are in place and operational. Provide written maintenance requirements for all post-construction BMPs to the appropriate party
- Check all drainage conveyances and outlets to ensure they were installed correctly and are operational. Inspect inlet areas to ensure complete stabilization and remove any brush or debris that could clog inlets. Ensure banks and ditch bottoms are well vegetated. Reseed bare areas and replace rock that has become dislodged
- Seed and mulch or otherwise stabilize any areas where runoff flows might converge or high velocity flows are expected
- Remove temporary stream crossings. Grade, seed, or re-plant vegetation damaged or removed
- Ensure subcontractors have repaired their work areas before final closeout

You might also be required to file an NOT if you transfer operational control to another

Take a Closer Look…

Is there a deadline to submit an NOT?

Many states require a Notice of Termination (NOT) or similar form to indicate that the construction phase of a project is completed and that all the terms and conditions have been met. This notification informs the permitting authority that coverage under the construction general permit is no longer needed. If your permitting authority requires such a notification, check to see what conditions must be met in order to submit it and check to see if there is a deadline for submission. EPA's Construction General Permit requires that you submit an NOT when you have met all your permit requirements. The NOT is due no later than 30 days after meeting these requirements.

What does this mean to me?

Check your permit carefully for details and conditions relating to terminating your permit coverage.

party before the project is complete. The new operator would be required to develop and implement a SWPPP and to obtain permit coverage as described above.

EPA and most states allow homebuilders to terminate permit coverage when the property has been transferred to the homeowner with temporary or final stabilization measures in place. If the transfer is made with temporary stabilization measures in place, EPA expects the homeowner to complete the final landscaping. Under these circumstances, EPA and most states do not require homeowners to develop SWPPPs and apply for permit coverage.

C. Record Retention

EPA's regulations specifies that you must retain records and reports required in the permit, including SWPPPs and information used to complete the NOI, for at least 3 years from the termination of coverage or expiration of the permit. You should also keep maintenance and inspection records related to the SWPPP for this same time frame. General permits issued by states may have a longer period for retention.

Figure 17. Make sure inlets, outlets, and slopes are well stabilized before leaving the site and filing your "Notice of Termination" for ending permit coverage.

References

American Society of Civil Engineers (ASCE) and Water Environment Federation (WEF). 1992. *Design and Construction of Urban Stormwater Management Systems*

Arendt, R. 1996. *Conservation Design for Subdivisons: A Practical Guide to Creating Open Space Networks*. American Planning Association Planners Book Service. Chicago, IL.

Claytor, R. 2000. Practical tips for construction site phasing. Article 54 in *The Practice of Watershed Protection*. Center for Watershed Protection, Ellicott City, MD, pp. 317–322.

Dunne, T. and L. Leopold. 1978. *Water and Environmental Planning.*

Environmental Protection Agency (EPA). 1993. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. 840-B-92-002. Office of Water. Washington, DC.

Maryland Department of the Environment (MDE). 2000. *Maryland Stormwater Design Manual: Volumes 1 and 2*. Maryland Department of the Environment, Baltimore, MD. <**www.mde.state.md.us/environment/wma/stormwatermanual**>

Minnesota Pollution Control Agency (MPCA). 2004. *Stormwater Construction Inspection Guide*. <**www.pca.state.mn.us/publications/wq-strm2-10.pdf**>

National Arbor Day Foundation. No date. *The Value of Trees to a Community.* <**www.arborday.org/trees/Benefits.cfm**>

Natural Resources Conservation Service (NRCS). 2000. *1997 National Resources Inventory Summary Report.* <**http://www.nrcs.usda.gov/TECHNICAL/NRI/1997/summary_report/**>

Natural Resources Conservation Service (NRCS). 2006. *National Resources Inventory 2003 Annual NRI - Soil Erosion.* <**http://www.nrcs.usda.gov/Technical/land/nri03/SoilErosion-mrb.pdf**>

Robertson, B., R. Pitt, A. Ayyoubi, and R. Field. 1995. A Multi-Chambered Stormwater Treatment Train. In *Proceedings of the Engineering Foundation Conference:*

Stormwater NPDES-Related Monitoring Needs, Mt. Crested Butte, Colorado, August 7–12, 1994, American Society of Civil Engineers, New York, NY.

Terrene Institute. 2001. Landscaped rain gardens offer stormwater control. *Nonpoint Source News-Notes* 66:18–20.

Acknowledgements

The graphics used in this guide were developed by Tetra Tech, Inc. for the Kentucky Divison of Water's Erosion and Sediment Control Field Guide.

Appendix A: **SWPPP Template**

An electronic copy of the SWPPP template is available on EPA's web site at:
http://www.epa.gov/npdes/swpppguide

Appendix B: **Sample Inspection Report**

An electronic copy of the sample inspection report is available on EPA's web site at:
http://www.epa.gov/npdes/swpppguide

Appendix C: **Calculating the Runoff Coefficient**

The following information is largely taken from EPA's 1992 guidance *Stormwater Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices* (EPA 832-R-92-005).

It is important to estimate your development's impact on runoff after construction is complete. This can be done by estimating the runoff coefficient for pre- and post-construction conditions. The runoff coefficient ("C" value) is the partial amount of the total rainfall which will be come runoff. The runoff coefficient is used in the "rational method" which is:

$$Q = CiA,$$

Where Q = the rate of runoff from an area,
i = rainfall intensity, and
A = the area of the drainage basin.

There are many methods which can be used to estimate the amount of runoff from a construction site. You are not required to use the rationale method to design stormwater conveyances or BMPs. Consult your State/local design guides to determine what methods to use for estimating design flow rates from your development.

The less rainfall that is absorbed (infiltrates) into the ground, evaporates, or is otherwise absorbed on site, the higher the "C" value. For example, the "C" value of a lawn area is 0.2, which means that only 20 percent of the rainfall landing on that area will run off, the rest will be absorbed or evaporate. A paved parking area would have a "C" value of 0.9, which means that 90 percent of the rainfall landing on that area will become runoff. You should calculate the runoff coefficient for conditions before construction and after construction is complete. It is suggested that a runoff coefficient be calculated for each drainage basin on the site. The following is an example of how to calculate the "C" value.

The runoff coefficient or "C" value for a variety of land uses may be found in Table C-1 (NOTE: Consult your State/local design guide, if available, to determine if specific "C" values are specified for your area). The "C" values provide an estimate of anticipated runoff for particular land uses. Most sites have more than one type of land use and therefore more than one "C" value will apply. To have a "C" value that represents your site you will need to calculate a "weighted C value."

Calculating a "Weighted C value"

When a drainage area contains more than one type of surface material with more than one runoff coefficient a "weighted C" must be calculated. This "weighted C" will take into account the amount of runoff from all the various parts of the site. A formula used to determine the "weighted C" is as follows:

$$C = \frac{A_1C_1 + A_2C_2 + \ldots + A_xC_x}{(A_1 + A_2 + \ldots + A_x)}$$

Where A = acres and C = coefficient.

Therefore, if a drainage area has 15 acres (ac.) with 5 paved acres ($C = 0.9$), 5 grassed acres ($C = 0.2$), and 5 acres in natural vegetation ($C = 0.1$), a "weighted C" would be calculated as follows:

$$C = \frac{(5\text{ ac} \times 0.9) + (5\text{ ac} \times 0.2) + (5\text{ ac} \times 0.1)}{(5\text{ ac} + 5\text{ ac} + 5\text{ ac})} = 0.4$$

Table C-1. Typical "C" Values

Description of Area	Runoff Coefficients
Business	
Downtown Areas	0.70 – 0.95
Neighborhood Areas	0.50 – 0.70
Residential	
Single-family areas	0.30 – 0.50
Multi-units, detached	0.40 – 0.60
Multi-units, attached	0.60 – 0.75
Residential (suburban)	0.25 – 0.40
Apartment dwelling areas	0.50 – 0.70
Industrial	
Light Areas	0.50 – 0.80
Heavy Areas	0.60 – 0.90
Parks, cemeteries	0.10 – 0.25
Playgrounds	0.20 – 0.35
Railroad yard areas	0.20 – 0.40
Unimproved areas	0.10 – 0.30
Streets	
Asphalt	0.70 – 0.95
Concrete	0.80 – 0.95
Brick	0.70 – 0.85
Drives and Walks	0.75 – 0.85
Roofs	0.75 – 0.95
Lawns – course textured soil (greater than 85% sand)	
Slope: Flat, 2%	0.05 – 0.10
Average, 2-7%	0.10 – 0.15
Steep, 7%	0.15 – 0.20
Lawns – fine textured soil (greater than 40% clay)	
Slope: Flat, 2%	0.13 – 0.17
Average, 2-7%	0.18 – 0.22
Steep, 7%	0.25 – 0.35

Appendix D: **Resources List**

The following are just a few of the many resources available to assist you in developing your SWPPP. The inclusion of these resources does not constitute an endorsement by EPA.

EPA Resources

EPA Stormwater Construction Website
http://www.epa.gov/npdes/stormwater/construction

- EPA's Construction General Permit (**http://www.epa.gov/npdes/stormwater/cgp**)
  EPA's general permit that applies to all construction activity disturbing greater than one acre in the states and territories where EPA is the permitting authority.
- Construction SWPPP Guide, SWPPP Template and inspection form (**www.epa.gov/npdes/swpppguide**)
  A downloadable copy of this guide, the SWPPP template and inspection form.
- Menu of BMPs (**http://www.epa.gov/npdes/stormwater/menuofbmps**)
  Site containing over 40 construction BMP fact sheets. Also contains fact sheets on other stormwater program areas, and case studies organized by program area.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas
http://www.epa.gov/owow/nps/urbanmm/index.html

Managing Your Environmental Responsibilities: A Planning Guide for Construction and Development
http://www.epa.gov/compliance/resources/publications/assistance/sectors/constructmyer/index.html

Expedited Settlement Offer Program for Stormwater (Construction)
http://www.epa.gov/Compliance/resources/policies/civil/cwa/esoprogstormwater.pdf
A supplemental program to ensure consistent EPA enforcement of stormwater requirements at construction sites for relatively minor violations.

Construction Industry Compliance Assistance
http://www.cicacenter.org
Plain language explanations of environmental rules for the construction industry. Links to stormwater permits and technical manuals for all 50 states.

Smart Growth and Low Impact Development Resources

Using Smart Growth Techniques as Stormwater Best Management Practices
http://www.epa.gov/livablecommunities/pdf/sg_stormwater_BMP.pdf

Stormwater Guidelines for Green, Dense Development
http://www.epa.gov/smartgrowth/pdf/Stormwater_Guidelines.pdf

Protecting Water Resources with Smart Growth
http://www.epa.gov/smartgrowth/pdf/waterresources_with_sg.pdf

Parking Spaces / Community Places: Finding the Balance Through Smart Growth Solutions
http://www.epa.gov/smartgrowth/parking.htm

EPA Nonpoint Source Low Impact Development site
http://www.epa.gov/owow/nps/lid/

Better Site Design: A Handbook for Changing Development Rules in Your Community
Available from **http://www.cwp.org**

State BMP/Guidance Manuals

Kentucky Erosion Prevention and Sediment Control Field Guide
http://www.water.ky.gov/permitting/wastewaterpermitting/KPDES/storm/
Easy to read field guide describing erosion and sediment control BMP selection, installation and maintenance.

Minnesota Stormwater Construction Inspection Guide
http://www.pca.state.mn.us/publications/wq-strm2-10.pdf
A manual designed to assist municipal construction inspectors in the procedures for conducting a compliance inspection at construction sites.

California Stormwater Quality Association's Construction Handbook
http://www.cabmphandbooks.org/Construction.asp

Delaware Erosion and Sediment Control Handbook
http://www.dnrec.state.de.us/dnrec2000/Divisions/Soil/Stormwater/StormWater.htm

Western Washington Stormwater Management Manual – Volume II – Construction Stormwater Pollution Prevention
http://www.ecy.wa.gov/programs/wq/stormwater/manual.html

Eastern Washington Stormwater Management Manual
http://www.ecy.wa.gov/biblio/0410076.html
A guidance document addressing stormwater design and management in more arid climates.

Certification Programs

Certified Professional in Erosion and Sediment Control
http://www.cpesc.org

Virginia Erosion and Sediment Control Certification Program
http://www.dcr.virginia.gov/sw/estr&crt2.htm

Florida Stormwater, Erosion and Sedimentation Control Inspector Certification
http://www.dep.state.fl.us/water/nonpoint/erosion.htm

Other Resources

International Erosion Control Association
http://www.ieca.org
A non-profit organization helping members solve the problems caused by erosion and its byproduct—sediment.

Erosion Control Magazine
http://www.erosioncontrol.com
A journal for erosion and sediment control professionals.

Designing for Effective Sediment & Erosion Control on Construction Sites by Jerald S. Fifield, PH.D., CPESC. Available from Forester Press
http://www.foresterpress.com
Book describing proven and practical methods for minimizing erosion and sedimentation on construction sites.

Stormwater Permitting: A Guide for Builders and Developers by National Association of Home Builders (NAHB). Available from NAHB **http://www.nahb.org**

Stormwater and the Construction Industry

Protect Natural Features

Bad

Good

- Minimize clearing.
- Minimize the amount of exposed soil.
- Identify and protect areas where existing vegetation, such as trees, will not be disturbed by construction activity.
- Protect streams, stream buffers, wild woodlands, wetlands, or other sensitive areas from any disturbance or construction activity by fencing or otherwise clearly marking these areas.

Construction Phasing

Bad

Good

- Sequence construction activities so that the soil is not exposed for long periods of time.
- Schedule or limit grading to small areas.
- Install key sediment control practices before site grading begins.
- Schedule site stabilization activities, such as landscaping, to be completed immediately after the land has been graded to its final contour.

Vegetative Buffers

Bad

Good

- Protect and install vegetative buffers along waterbodies to slow and filter stormwater runoff.
- Maintain buffers by mowing or replanting periodically to ensure their effectiveness.

Silt Fencing

Bad

Good

- Inspect and maintain silt fences after each rainstorm.
- Make sure the bottom of the silt fence is buried in the ground.
- Securely attach the material to the stakes.
- Don't place silt fences in the middle of a waterway or use them as a check dam.
- Make sure stormwater is not flowing around the silt fence.

Maintain your BMPs!

www.epa.gov/npdes/menuofbmps

Site Stabilization

Bad

Good

- Vegetate, mulch, or otherwise stabilize all exposed areas as soon as land alterations have been completed.

Construction Entrances

Bad

Good

- Remove mud and dirt from the tires of construction vehicles before they enter a paved roadway.
- Properly size entrance BMPs for all anticipated vehicles.
- Make sure that the construction entrance does not become buried in soil.

Slopes

Bad

Good

- Rough grade or terrace slopes.
- Break up long slopes with sediment barriers, or under drain, or divert stormwater away from slopes.

Dirt Stockpiles

Bad

Good

- Cover or seed all dirt stockpiles.

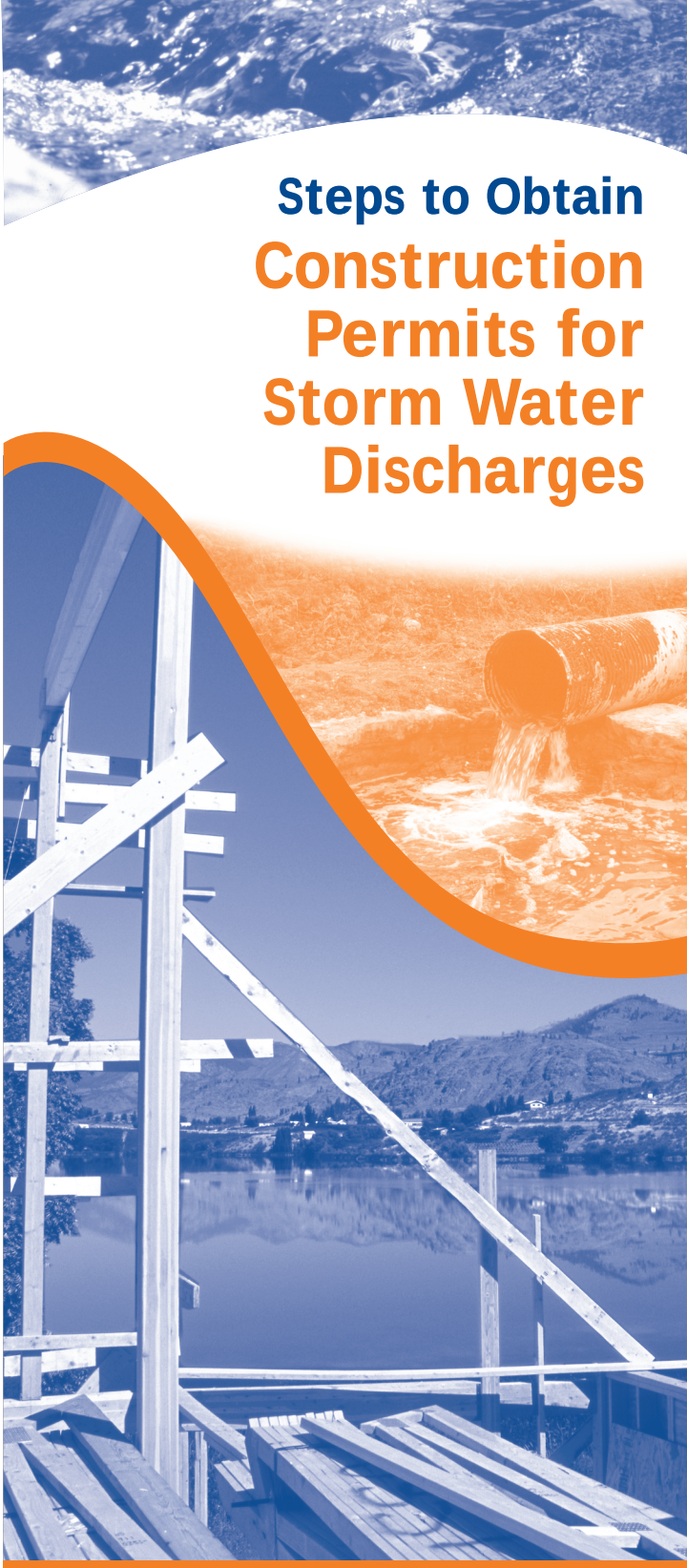
Storm Drain Inlet Protection

Bad

Good

- Use rock or other appropriate material to cover the storm drain inlet to filter out trash and debris.
- Make sure the rock size is appropriate (usually 1 to 2 inches in diameter).
- If you use inlet filters, maintain them regularly.

Steps to Obtain Construction Permits for Storm Water Discharges



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

RG-436 rev. 7/08

Many local governments in Texas require building permits before construction begins. Additionally, the state government, through the Texas Commission on Environmental Quality, requires specific permits designed to protect water quality. This brochure details which projects require permits and outlines the steps needed to obtain permit coverage.

What is storm water?

Storm water is water runoff resulting from a storm (rain) or snowmelt, which can enter surface waters in Texas. Surface water in this state includes lakes, ponds, bays, reservoirs, streams, creeks, rivers, estuaries, canals, and other waters. Runoff, or water draining from properties, can flow into surface waters.

Why are storm water discharges regulated?

Storm water discharges often contain pollutants in amounts that could reduce water quality. The primary pollutants of concern from construction activities are silt and sediment, but other pollutants such as oils and greases, vehicle fluids, and debris are present as well.

Who needs a permit to discharge storm water?

The Storm Water Permitting Program requires operators of construction sites disturbing land of one acre or greater, or less than one acre but part of a larger common plan of development, to obtain this permit.

Small construction projects are those covering more than one acre, but less than five acres, of disturbed land, that are **not** part of a larger common plan of development. Small-construction-site operators may be eligible for a waiver if they are located in portions of the state that are more arid. Small construction sites are not required to submit a Notice of Intent (NOI), but do need to develop and implement a Storm Water Pollution Prevention Plan (SWP3).

Large construction projects are those involving five acres or more of disturbed land, or less than five acres, but part of a larger common plan of development. Large-construction-site operators must submit an NOI, and develop and implement an SWP3.

In areas with a larger common plan of development, such as new subdivisions, each operator within the development may need to apply for storm water permit coverage.

Construction sites over the recharge, contributing, or transition zones of the Edwards Aquifer have additional requirements that can be found at <www.tceq.state.tx.us/goto/eapp/>.

What is an SWP3?

An SWP3 (Storm Water Pollution Prevention Plan) documents the measures you take to minimize the discharge of pollutants from your site. This is a living document, developed by you, and you should update it frequently during the life of your project. The plan requires several parts, including:

- a site or project description (including maps)
- a description of best management practices, structural controls, and permanent storm water controls
- inspection findings
- maintenance schedules
- a description of discharges that do not involve storm water

How do I apply for a permit?

Small Sites

1. Determine if you are able to claim the Rainfall Erosivity Waiver.
   If not,
2. Determine if you are able to obtain a permit under the Low Potential for Erosion Option.
   If not,
3. Develop and implement your Storm Water Pollution Prevention Plan (SWP3).
4. Post the Construction Site Notice.
5. Submit a copy of the site notice to your local Municipal Separate Storm Sewer System (MS4) operator.

Large Sites

1. Develop and implement an SWP3.
2. Submit a Notice of Intent (NOI). Electronic submissions are granted immediate coverage and receive a discounted fee. Paper submissions will get permit coverage seven days from the date of postmark.
3. Post a copy of your NOI and the Large Construction Site Notice at your site.
4. Submit copies of your NOI and site notice to your local MS4 operator.

Are there penalties for not complying with regulations on storm water?

If during an investigation officials discover that you do not have permit coverage or you do not comply with the elements of the Construction General Permit, the TCEQ can begin enforcement action, which may include fines.

Where can I get help?

For more information on storm water permitting for construction sites and to download the necessary forms, please visit <www.tceq.state.tx.us/goto/wq_construction/>.

Electronic submittals:

www.tceq.state.tx.us/permitting/steers/steers.html

Or contact one of these:

- TCEQ regional offices: www.tceq.state.tx.us/goto/region/index.html
- TCEQ Storm Water and Pretreatment team, 512-239-4671
- TCEQ Small Business and Local Government Assistance Program, 1-800-447-2827

Other helpful Web sites:

The EPA's Web page on Construction Storm Water: http://cfpub1.epa.gov/npdes/stormwater/const.cfm

Construction Industry Compliance Assistance: www.cicacenter.org

The International Stormwater Best Management Practices Database: www.bmpdatabase.org

Tools to help small businesses: www.sblga.info

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

The TCEQ is an equal opportunity employer. The agency does not allow discrimination on the basis of race, color, religion, national origin, sex, disability, age, sexual orientation, or veteran status.

printed on recycled paper using soy-based ink

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

The Used Oil Recycling Handbook

GUIDANCE FOR USED OIL HANDLERS

RG-325 (Rev. 11/05)

Kathleen Hartnett White, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
Larry R. Soward, *Commissioner*
Glenn Shankle, *Executive Director*

Published and distributed by
Texas Commission on Environmental Quality
PO Box 13087
Austin TX 78711-3087

Authorization for use or reproduction of any original material contained in this publication—that is, not obtained from other sources—is freely granted. The commission would appreciate acknowledgment.

Copies of this publication are available for public use through the Texas State Library, other state depository libraries, and the TCEQ Library, in compliance with state depository law. For more information on TCEQ publications call 512/239-0028 or visit our Web site at:

www.tceq.state.tx.us/publications

This is a guidance document and should not be interpreted as a replacement to the rules. The rules for used oil recycling are found in 30 Texas Administrative Code (TAC) Chapter 324.

The Used Oil Recycling Handbook

GUIDANCE FOR USED OIL HANDLERS

RG-325 (Rev. 11/05)

Prepared by:
Pemitting and Remediation Support Division, MC-129
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Contents

3 General Introduction

4 Glossary

11 Chapter 1—Basics of Used Oil Recycling

23 Chapter 2—Collection and Management of Used Oil

31 Chapter 3—Technical Aspects of Used Oil Recycling

47 Index

List of Figures

Figure 1-1. Used Oil or Hazardous Waste? 15

List of Tables

Table 1-1. Which Requirements of the Used Oil Management Standards Apply to You? 14

Table 1-2. Which Chapter Applies—324 or 335? 17

Table 2-1. Types of Used Oil Handlers 25

Table 2-2. Examples of Facilities Eligible for an Exemption from the Automotive Oil Fee 27

Table 3-1: Managing Mixtures of Used Oil and Hazardous Waste 34

Table 3-2: Analytical Methods for Organic Halogens Determination 36

Table 3-3: Specifications for Used Oil Burned for Energy Recovery 38

Table 3-4: Total Halogen Content for Used Oil as a Fuel 39

Table 3-5: Some Analytical Methods for Used Oil Fuel Specifications 40

General Introduction

This handbook has been created to help used oil handlers follow state and federal regulations on recycling used oil and notifying the Texas Commission on Environmental Quality (TCEQ) about their activities. This handbook should not be interpreted as a replacement for the rules, but should be read in conjunction with them. Specifically, this handbook gives guidance on regulations in Title 30 of the Texas Administrative Code (TAC), Chapter 324 (Used Oil Recycling). The rules apply to recycled used oil that is generated, transported, stored, marketed, processed or re-refined, and burned in Texas. Correct and timely compliance with the regulations helps to protect the states's environment and safeguard the health of Texas citizens.

A glossary is included that first lists definitions of acronyms, followed by definitions of terms and phrases that occur frequently in association with used oil. Definitions found in this glossary are intended to help the reader understand how the words are being used in this handbook.

Glossary

For readers' convenience, this glossary briefly describes acronyms and terms as they are used in the *Used Oil Recycling Handbook*. These descriptions do not replace any definitions in laws or regulations. And these lists do not include all the acronyms and terms found in reading about used oil recycling.

Acronyms

AST – Aboveground storage tank
CERLCA – Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (known as Superfund)
CESQG – Conditionally Exempt Small-Quantity Generator
CFCs – Chlorofluorocarbons
CFR – Code of Federal Regulations
DIY – Do-it-yourselfer
EPA – Environmental Protection Agency
FR – Federal Register
HW – Hazardous waste
MSWLF – Municipal solid waste landfill
NFPA – National Fire Protection Association
NOR – Notice of Registration
PCBs – Polychlorinated biphenyls
ppm – Parts per million
PST – Petroleum storage tank
RCRA – Resource Conservation and Recovery Act
RRC – Railroad Commission of Texas
SB – Senate Bill
SPCC – Spill Prevention, Control, and Countermeasures Plan
SSD – Service station dealer
TAC – Texas Administrative Code
TCEQ – Texas Commission on Environmental Quality
TCLP – Toxicity characteristic leaching procedure
THSC – Texas Health and Safety Code
TOX – Total organic halogens
TPH – Total petroleum hydrocarbons
TSCA – Toxic Substances Control Act
TxDOT – Texas Department of Transportation
UST – Underground storage tank

Terms and Phrases

Aboveground storage tank (AST) — a stationary device made of non-earthen materials (such as steel or plastic) that is designed to hold an accumulation of petroleum products and that is located on or above the surface of the ground.

Base stock — used oil after it has been treated and impurities extracted.

Bill of lading — a document evidencing the receipt of goods for shipment issued by a person engaged in the business of transporting or forwarding goods.

Biodegradable — capable of being broken down by the actions of living things.

Bioremediation — the application of organisms to a waste (in this case, used oil and/or absorbents) to reduce or eliminate its levels of contaminants (for example, total petroleum hydrocarbons [TPH], benzene, toluene, ethylbenzene, xylene, and others).

Characteristically hazardous used oil — used oil that exhibits one or more of these characteristics:

- Ignitability (flash point of less than 140 degrees Fahrenheit)
- Corrosivity (pH of 2 or less or 12.5 or more)
- Reactivity (capable of violent reaction or explosion)
- Toxicity (leaches more than the maximum contaminant levels in 40 CFR 261.24, Table 1)

Chlorinated paraffin — a paraffin oil or wax in which some of the hydrogen atoms have been replaced by chlorine or a chlorine compound. Chlorinated paraffin is nonflammable, has low toxicity, and is used in high-pressure lubricants. Paraffin is a substance that is made of carbons and varies with increasing molecular weight from a gas to a waxy solid.

Chlorofluorocarbons — simple gaseous compounds containing carbon, chlorine, fluorine, and sometimes hydrogen, that are used in refrigerants, cleaning solvents, and aerosol propellants.

Combustion engine — a machine for converting energy through a chemical process into mechanical force and motion.

Conditionally Exempt Small-Quantity Generator (CESQG) — a facility or person that generates less than 100 kilograms (220 lbs.) of hazardous waste and less than 1 kilogram (2.2 lbs.) of acutely hazardous waste per month (see 40 CFR 261.5).

Container — any portable device in which a material is stored, transported, treated, disposed of, or otherwise handled (an example of a container is a 55-gallon drum).

Crude oil — oil in the natural or virgin state as it comes out of the ground, before any processing has occurred.

De minimis — small spills, leaks, or drippings from pumps, machinery, pipes, and other similar equipment during normal operations; or small amounts of oil lost to the wastewater treatment system during washing or draining operations.

Distributor — in general, a person who markets a product; and, for used oil purposes, one who annually sells more than 25,000 gallons of automotive oil.

Do-it-yourselfer used oil collection center — any site or facility that accepts or aggregates and stores used oil collected only from household do-it-yourselfers.

First sale — the first actual sale of automotive oil delivered to a location in Texas and sold to a purchaser who is not an automotive oil manufacturer or distributor.

Flashpoint — the lowest temperature at which a liquid generates enough vapors to ignite.

Free-flowing oil — a visible sign of exiting oil.

Generator — any person whose activity or process produces used oil or whose activity first causes the used oil to become subject to regulation (for example, automotive service center that performs oil changes for the public).

Halogen — any of the following five elements: fluorine, chlorine, bromine, iodine, and astatine.

Household do-it-yourselfer used oil — used oil from individuals who generated it from the maintenance of a personal vehicle, household appliances, or garden equipment; and—in amounts of 25 gallons or less— from farming equipment or heavy equipment.

Hydrocarbon — an organic compound (such as acetylene or benzene) containing only carbon and hydrogen and often occurring in petroleum, natural gas, or coal.

Importer — any person who imports automotive oil (or causes it to be imported) for sale, use, or consumption in Texas.

Listed hazardous waste — EPA's listing of hazardous wastes, which consists of the following classes: "F" listed wastes from nonspecific sources; "K" listed wastes from

specific sources; and "P" and "U" listed wastes from commercial chemical products.

Lubricant — a substance, such as grease or oil, that reduces friction between surfaces.

Manifest — a form that goes with a shipment of used oil that is being disposed of as hazardous waste.

Off-specification used oil — see used oil burner.

Oil manufacturer — any person or organization that formulates automotive oil and packages, distributes, or sells it. The term includes any person packaging or repackaging automotive oil.

Processing — chemical or physical operations to make used oil more suitable for production of fuel oils, lubricants, or other products derived from used oil.

Process knowledge — this term refers to the used oil handler's understanding of the operations and activities that created the used oil at his facility and possible contaminants in the used oil.

Rebuttable presumption — used oil containing more than 1,000 ppm of total halogens is *presumed* to have been mixed with a halogenated listed hazardous waste. A used oil handler can *rebut* this presumption by proving, through documented process knowledge or analytical testing, that the used oil has not been mixed with a halogenated listed hazardous waste.

Reclaiming — processing material to recover a usable product or the regenerated material.

Recycling — reusing or re-refining used oil as a petroleum product, or burning used oil for energy recovery.

Re-refining — applying a process to material composed primarily of used oil to produce high-quality base stock for lubricants or other petroleum products.

Responsible person — in this handbook, the owner or operator of a facility or vehicle that has caused a spill of used oil; or any other person who causes or allows such a spill.

Secondary containment system — structures (dike, berms, and/or retaining walls) that are made of material capable of containing all potential spills and releases of used oil from tanks or containers.

Service station dealer (SSD) — a service station, filling station, garage, or similar retail facility that earns significant revenues from fueling, repairing, or servicing motor vehicles and that collects used oil for recycling; includes DIY used oil collection facilities run by government agencies and quick-lube shops.

Special waste — a state-regulated category of waste that includes petroleum-contaminated materials disposed of in municipal solid waste landfills.

Spent material — a material that has been used and, as a result of contamination, can no longer be used for its originally intended purpose.

Sufficiently impervious — prevents any used oil released into the containment system from migrating out of the system to the soil, groundwater, or surface water.

Synthetic oils — oils not derived from crude oil, including those derived from shale, coal, or a polymer-based starting material; and nonpolymeric synthetic fluids that are used as hydraulic fluids and heat transfer fluids, such as those based on phosphate esters, diphenyl oxide, or alkylated benzenes. Synthetic oils are generally used for the same purpose as oils derived from crude oil, and usually are mixed and managed in the same manner. Synthetic oils present relatively the same level of hazards after use.

Underground storage tank — a stationary device made of non-earthen materials (such as steel or plastic) that is designed to hold an accumulation of liquid and that has 10 percent or more of its volume beneath the surface of the ground.

Used oil — any oil originally refined from crude or synthetic oil, that as a result of use, is contaminated by physical or chemical impurities and cannot be used for its intended purpose.

Used oil aggregation point — any facility that accepts and/or stores used oil generated at other sites that belong to the same owner or operator.

Used oil burner — a facility where used oil is burned for energy recovery. Used oil that does not meet the specification in 40 CFR 279.11 is referred to as off-specification used oil, and must be burned in devices identified in 40 CFR 279.61(a).

Used oil collection center — any registered facility that accepts, stores, and manages used oil collected from used oil generators who bring used oil in shipments less than

55 gallons, such as service stations, governments, and businesses. Collection centers also may accept used oil from household do-it-yourselfers.

Used oil handlers — term used to refer collectively to used oil transporters and transfer facilities, processors/re-refiners, and burners of off-specification used oil.

Used oil management standards — the federal and state laws and regulations that apply to all used oil handlers. In this handbook, these laws and regulations are referred to collectively as the used oil management standards. This term includes the following laws and regulations:

- 40 CFR Part 279, federal regulations on management of used oil;
- 30 TAC Chapter 324, state regulations on used oil recycling (adoption of 40 CFR Part 279);
- THSC Chapter 371, state law on collection, management, and recycling of used oil.

Used oil marketer — anyone who sends a shipment of off-specification used oil from his facility to a used oil burner or first claims that used oil that is to be burned for energy recovery meets the used oil fuel specification set forth in 40 CFR 279.11.

Used oil processor or re-refiner — any person or facility that makes used oil more amenable for production of fuel oils, lubricants, or other products derived from used oil.

Used oil transfer facility — any transportation-related facility (including loading docks and parking and storage areas) where shipments of used oil are held for more than 24 hours and not longer than 35 days during the normal course of transportation.

Used oil transporter — any person who transports more than 55 gallons of used oil off site or collects used oil from generators to transport it.

Viscosity — a fluid's or semifluid's resistance to flow.

Basics of Used Oil Recycling

Chapter 1

Chapter Contents

12 Introduction
15 What Is Used Oil?
16 What Is Not Used Oil?
17 Used Oil or Hazardous Waste?
18 Some Do's, Don'ts, and Facts about Used Oil
19 Used Oil as a Resource
21 Highlights of Chapter 1

List of Figures

15 Figure 1-1. Used Oil or Hazardous Waste?

List of Tables

14 Table 1-1. Which Requirements of the Used Oil Management Standards Apply to You?
17 Table 1-2. Which Chapter Applies—324 or 335?

Introduction

This chapter

- defines what constitutes used oil, gives examples, and helps you determine whether you are handling used oil or hazardous waste; and
- gives a brief description of applicable state and federal laws and regulations.

In addition, Chapter 1 gives some general information about used oil, how to handle it, and ways the material can be reused.

Used Oil Regulations

With increased knowledge of the environmental hazards associated with waste disposal, methods that were once acceptable have become unacceptable and illegal. To reduce oil-related environmental pollution, the 74th Texas Legislature amended the state's used oil program (Texas Health and Safety Code Chapter 371) by passing the Used Oil Collection, Management, and Recycling Act, Senate Bill (SB) 1683.

This law became effective on September 1, 1995, and it banned the landfilling and dumping of used motor oil and created the recycling program. The purposes of SB 1683 were:

- to ensure that the state's used oil program would be consistent with and not more stringent than the federal program for the management of used oil under 40 CFR Part 279, unless otherwise required by state or federal law; and
- to establish a program for collection centers that accept used oil in small amounts (up to 55 gallons).

In March 1996, the TCEQ implemented SB 1683 by adopting a new chapter in the Texas Administrative Code (TAC). The new chapter (30 TAC Chapter 324) adopts, by reference, the Environmental Protection Agency's (EPA) used oil management standards found in 40 Code of Federal Regulations (CFR) Part 279.

Used Oil Management Standards. This handbook on Used Oil Recycling is intended to clearly explain the main points in federal and state laws and regulations that apply to used oil handlers. In this handbook, these laws and regulations are referred to collectively as the used oil management standards. This term includes the following laws and regulations briefly referred to in the preceding paragraphs:

- 40 CFR Part 279, federal regulations on management of used oil;

- 30 TAC Chapter 324, state regulations on used oil recycling (adoption of 40 CFR Part 279);
- THSC Chapter 371, state law on collection, management, and recycling of used oil.

Changes in Used Oil Regulations

Legislative Changes

During the regular session of the 79th Legislature, SB 1299 was passed, relating to an exception to the prohibition against commingling used oil with solid waste if the commingling is incident to the dismantling of scrap, used, or obsolete metals.

Chapter 7 Section 7.176, Subsections (a) and (c) of the Texas Water Code were amended to read as follows:

(a) A person commits an offense if the person:

(2) Knowingly mixes or commingles used oil with solid waste that is to be disposed of in landfills or directly disposes of used oil on land or in landfills, unless the mixing or commingling of used oil with solid waste that is to be disposed of in landfills is incident to and the unavoidable result of the dismantling or mechanical shredding of motor vehicles, appliances, or other items of scrap, used, or obsolete metals;

(c) It is an exception to the application of Subsection (a)(2) that the mixing or commingling of used oil with solid waste that is to be disposed of in landfills is incident to and the unavoidable result of the dismantling or mechanical shredding of motor vehicles, appliances, or other items of scrap, used, or obsolete metals.

Which Used Oil Requirements Apply to You?

The first column of Table 1-1 lists the major state and federal requirements for the management of used oil. To see which of these major requirements apply to you, find your activity or activities in the top row, and then read down that column for a quick answer. For more details, see the applicable state rules (30 TAC Chapter 324) and federal regulations (40 CFR Part 279).

Where to Obtain State Rules and Federal Regulations. To obtain copies of either state or federal rules,

- TCEQ's Web site at www.tceq.state.tx.us/rules; or
- TCEQ's Publications unit at 512/239-0028.

If you have any questions regarding registration and reporting, call the Used Oil Program at 512/239-6832 (select Option 2). For answers to questions on waste classification, call the Waste Permits Division at 512/239-2334.

Table 1-1. Which Requirements of the Used Oil Management Standards Apply to You?

Requirements	Generator	Collection Center	Transporter/ Transfer Facility	Processor/ Re-refiner	Marketer	Off-Spec. Burner
Storage Management	Yes	Yes	Yes	Yes	Yes	Yes
Release Response	Yes	Yes	Yes	Yes	Yes	Yes
Secondary Containment	Recommended	Recommended	Yes	Yes	Yes[1]	Yes
Notification to EPA	No	No	Yes	Yes	Yes	Yes
Tracking	No	No	Yes	Yes	Yes	Yes
Financial Assurance	No	No	Yes	Yes	Yes[1]	Yes
Rebuttable Presumption	Yes, if mixed with hazardous waste (HW)	Yes, if mixed with HW	Yes	Yes	Yes[1]	Yes
Register with [2] the TCEQ	No	Every two years	One-time	One-time	One-time	One-time
Report to the TCEQ[2]	No	Annually	No	Every Two Years	No	No

Note: This table serves only as a guideline. For more detailed information on regulations that may apply to you, please refer to state and federal used oil regulations.

[1] *This requirement does not apply to a marketer that is also a generator or collection center. Generators must still meet the requirements listed for them in the table's second column above.*

[2] *Registration and reports must be submitted to the TCEQ Used Oil Program.*

What Is Used Oil?

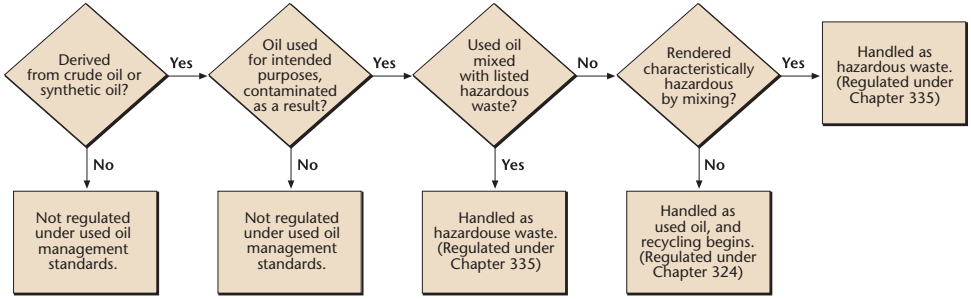
Used oil includes any of the materials listed below.

- Any oil, either synthetic or refined from crude oil, that
  - ▼ has been used for its designed and intended purposes; and
  - ▼ as a result of use, is contaminated by physical or chemical impurities; and
  - ▼ as a result, has become a spent material (that is, it can no longer be used for its originally intended purpose without processing).
- Any other material that has physical and chemical properties similar to used oil, is used in normally accepted functions of oil, and has been designated as used oil by the TCEQ.
- Used oil that is characteristically hazardous from use (as opposed to oil rendered characteristically hazardous by mixing).
- Used oil collected from household DIYs.
- Hazardous used oil or used oil mixtures from Conditionally Exempt Small-Quantity Generators (CESQGs).
- Used oil to be burned for energy recovery.

For help in determining whether you are handling used oil or hazardous waste, see Figure 1-1 below. (If you find that your waste is hazardous, see the section on "Mixtures of Used Oil and Hazardous Waste" in Chapter 3.)

Figure 1-1. Used Oil or Hazardous Waste?

Is your used oil ...



This chart gives general information to help you determine whether your oil is recyclable. For detailed information on how to handle a mixture of used oil and hazardous waste, please refer to Chapter 3 of this handbook.

Examples of Used Oil

A key part of the definition of used oil given above is the term, "spent material." The following lists give some examples of oils that have become spent materials through use.

Spent Engine Oil and Vehicle Lubricants. Used oils include, but are not limited to, the following spent engine lubricating oils and vehicle fluids:

- automotive crankcase oil, including car, truck, marine, and aircraft engine oils not used for engine fuel;
- diesel engine crankcase oil, including car, truck, bus, marine, heavy equipment, and railroad engine oils not used for fuel;
- natural-gas-fired engine oils;
- alternative fuel engine oils;
- transmission fluids;
- brake fluids; and
- power steering fluids.

Spent Industrial Oils. *Used* oils also include, but are not limited to, the following spent industrial oils:

- compressor, turbine, and bearing oils;
- hydraulic oils or fluids;
- metalworking oils or oil emulsions, including cutting, grinding, machining, rolling, stamping, quenching, and coating oils;
- electrical insulating oils;
- refrigerator/air conditioning unit oils;
- rubber-making oils;
- cable oils;
- greases; and
- oil-like heat transfer fluids.

What Is Not Used Oil?

The materials listed below are ***not*** used oil.

- Used animal or vegetable oils (they are considered food wastes rather than used oil, because they are not synthetic and not derived from crude oil).
- Unused contaminated or uncontaminated oils going for reclamation.
- Solid wastes contaminated with used oil (such as absorbents and scrap metal) that are not burned for energy recovery and that do not have free-flowing oil.
- Solvents (such as petroleum spirits, mineral spirits, petroleum ether, acetone, fuel additives, alcohols, paint thinners, brush cleaners, and other cleaners).
- Substances that cannot readily be recycled in the same processes as used oil.
- Used antifreeze.

Figure 1-1 on page 15 is designed to help you determine whether you are dealing with

- *used oil* that is regulated under the used oil recycling rules in 30 TAC *Chapter 324;* or
- *hazardous waste* that must be managed according to regulations in 30 TAC *Chapter 335*.

Used Oil or Hazardous Waste?

Under the used oil management standards, used oil is recyclable if it is

- not mixed with a listed hazardous waste, and
- not rendered hazardous by mixing with characteristically hazardous waste.

Table 1-2. Which Chapter Applies —— 324 or 335?

Chapter 324 regulates recycled used oil that is …	Chapter 335 regulates industrial and hazardous waste, including …
■ nonhazardous, ■ characteristically hazardous through use as opposed to mixing, ■ mixed with CESQG or household hazardous waste, ■ mixed with characteristically hazardous waste but does not result in a characteristically hazardous mixture, ■ contained in materials that are to be burned for energy recovery, or ■ removed or drained from materials. ***NOTE:*** Table 3-1 in Chapter 3 of this handbook explains rules on managing mixtures of used oil and certain hazardous wastes.	■ used oil that is disposed of rather than recycled, ■ mixtures of characteristically hazardous waste and used oil that exhibit hazardous characteristic(s), or ■ mixtures of listed hazardous waste and used oil. ***NOTE:*** If a used oil handler recycles its own used oil, then the handler does not have to include the used oil as a waste in the Notice of Registration to the TCEQ required under Chapter 335. For more information, refer to TCEQ Publication RG-22, *Guidelines for the Classification and Coding of Industrial and Hazardous Wastes.*

(For an explanation of how to handle used oil that is mixed with hazardous waste, please refer to the section on "Mixtures of Used Oil and Hazardous Waste" in Chapter 3.)

In addition, used oil containing more than 1,000 ppm of total halogens can be considered recyclable if the used oil handler can prove that the used oil was not mixed with halogenated listed hazardous waste (see the section on "Mixtures of Used Oil and Halogens" in Chapter 3).

Used oil that does not meet the standards for recycling is regulated as hazardous waste under 30 TAC Chapter 335.

Table 1-2 on page 17 gives more details on materials regulated as used oil under Chapter 324 compared to those regulated as industrial and hazardous waste under Chapter 335.

For more information:

- on used oil regulated in 30 TAC Chapter 324, contact the TCEQ Used Oil Program at 512/239-6832 (select Option 2);
- on waste regulated under 30 TAC Chapter 335, contact the Industrial and Hazardous Waste Program at 512/239-6413.

Some Do's, Don'ts, and Facts about Used Oil

Fact.

Oil does not wear out, but it does get dirty. Through re-refining or processing, used oil can be used over and over without losing its lubricating ability.

Fact.

Re-refining used oil takes 70 percent less energy than refining crude oil.

Fact.

Just one quart of oil can contaminate approximately 250,000 gallons of water.

Used Oil Do's

- Determine whether your used oil is recyclable (see Figure 1-1 on page 15).
- Store used oil in containers or tanks that are in good condition, not leaking or rusting, and clearly labeled with the words "Used Oil."
- Keep used oil storage containers covered and out of the weather.
- Be ready to contain and clean up spills of used oil onto land or surface water (see Chapter 3 of this handbook for information about spills).
- Reuse your used oil containers, if possible.
- Obtain all necessary federal, state, and local approvals and registrations.
- Keep complete records on all used oil recycling activities.
- To find a used oil recycler who serves your area, look in the Yellow Pages under "Oils—Waste & Used" or go online to **www.renewtx.org**
- When sending used oil for recycling, ask transporters, marketers, processors/re-refiners, and burners to provide proof of insurance, EPA identification number, and TCEQ used oil registration number.

Used Oil Don'ts

- Don't dump your used oil in the trash, on the ground, or down a drain; and don't pour it onto roads or driveways to control dust. Why not? For one thing, it's illegal—you could get fined. More important, used oil may contain heavy metals and additives. If dumped on the ground, it can contaminate the soil and water and have harmful effects on ***your own*** health and local environment.
- Don't mix used oil with any other liquids such as antifreeze, brake cleaner, carburetor cleaner, gasoline, paint thinner, pesticides, chemicals, or solvents. Mixing used oil with any of these liquids may make the used oil unfit for recycling.
- When recycling used oil, don't use containers that held hazardous chemicals that could contaminate the used oil (for example, bleach or a hazardous solvent used as a cleanser).

Used Oil as a Resource

When properly managed and recycled, used oil is a valuable energy resource. Used oil can be recycled into a

number of different products. The American Petroleum Institute estimated in 1996 that the amount of used lube oil released onto the land each year in the United States equals 25 times the amount of oil spilled by the Exxon Valdez tanker in Alaska. Recovering used oil is desirable for protection of human health and the environment.

Re-refining Used Oil

Re-refining used oil produces high-quality base stock, which is used for lubricants or other petroleum products. It takes ***42 gallons*** of crude oil to produce 2.5 quarts of lubricating oil; the same amount of lubricating oil can be produced from only ***1 gallon*** of used oil.

Re-refining versus Processing

Re-refining is not the same as processing. The major difference is that re-refined used oil has sufficient quality to be used again as a lubricating oil. By contrast, processing produces a used oil of lower quality, which can be used as a fuel for producing electricity or other purposes. Processed used oil can also be blended for marine fuel or other use. It can even be mixed with asphalts.

What Can Be Made from Re-refined Used Oil?

Once used oil has been re-refined into base stock, it is sent to packagers for mixing with additives. Several hundred products—such as automotive oil, industrial oil, lubricants, and industrial fuels—are produced from base stock. The waste byproducts and residual oil from the re-refining process can be used as asphalt extender. Another product that can be made from such used oil is called "chain oil," a low-grade oil for lubrication.

Burning Used Oil for Energy Recovery

Some used oil is recycled for use as a fuel oil rather than for re-refining. Several types of fuel oils are produced from used oil, including bunker fuel (used in ships) and supplementary fuel in cement kilns. Used oil is also burned for its heating value in asphalt plants to dry the sand in the aggregate.

When used oil is received at a processing plant, water and solids are extracted as much as possible. In some cases, used oil is blended with a residual oil (for example, number 6 fuel oil) to give it the viscosity and flash point to be utilized for its heating value. The ratio for blending is approximately 75 percent used oil and 25 percent residual oil. However, this ratio depends on the type of fuel that the customer is requesting.

Highlights of Chapter 1

- One-time registration applies to transporters, transfer facilities, processors, re-refiners, marketers, and off-specification used oil burners, but only processors and re-refiners are required to submit a report to the TCEQ. This report is due January 25 of every even-numbered year and covers the preceding (odd-numbered) year.
- A used oil handler is required to provide proof of financial responsibility upon registration.
- The financial responsibility requirement applies to used oil transporters, transfer facilities, processors, re-refiners, and off-specification used oil burners.
- Used animal oil or vegetable oils are considered food wastes rather than used oil, because they are not synthetic and not derived from crude oil.
- Under used oil management standards, used oil is recyclable if it is
  - not mixed with a listed hazardous waste, and
  - not rendered hazardous by mixing with characteristically hazardous waste.
- Chapter 324 regulates recyclable used oil, as noted in Table 1-2.
- Chapter 335 regulates industrial and hazardous waste, as noted in Table 1-2.
- Mixing used oil with liquids such as antifreeze, carburetor cleaner, gasoline, paint thinner, pesticides, brake cleaner, chemicals, or solvents may make your used oil unfit for recycling.
- Oil does not wear out, but it does get dirty. Through re-refining, the used oil can be used over and over again without losing its lubricating ability.

Collection and Management of Used Oil

Chapter 2

Chapter Contents

24 Introduction
24 Types of Used Oil Handlers
24 Shipments of Used Oil
26 Used Oil Collection Centers
28 Highlights of Chapter 2

List of Tables

25 Table 2-1. Types of Used Oil Handlers
27 Table 2-2. Examples of Facilities Eligible for an Exemption from the Automotive Oil Fee

Introduction

Used oil generators, collection centers, and handlers are required to follow state and federal regulations contained in Title 30 of the Texas Administrative Code (TAC), Chapter 324; and Title 40 of the Code of Federal Regulations (CFR), Part 279. Chapter 2 of the *Used Oil Recycling Handbook* gives some general guidelines to help you comply with those requirements. Please note that this chapter is only a general guideline and does not replace the complete rules and regulations. You can obtain copies of applicable state or federal rules from the sources listed in Chapter 1 under the heading "Where to Obtain State Rules and Federal Regulations" on page 13.

Types of Used Oil Handlers

To find out what type of used oil handler you are, see Table 2-1; the determination is based on the activities you conduct. Please notice that you may need to register as more than one type. For example, transporters of used oil who burn off-specification used oil for energy recovery must comply with regulations for off-specification used oil burners as well as applicable regulations for transporters.

Shipments of Used Oil

All shipments of used oil must be delivered only to facilities registered with the Environmental Protection Agency (EPA) and the TCEQ. Used oil handlers are required to keep all records on used oil shipments (for example, shipping documents, bills of lading, or invoices) for a minimum of three years. Used oil shipments must comply with all requirements under the U.S. Department of Transportation regulations in 49 CFR parts 171 through 180.

Exemptions on Shipments

If you are a generator and you transport 55 gallons or less of used oil in your own or an employee's vehicle to a used oil collection center or to your own used oil aggregation point, you are not required to register as a used oil transporter.

Spills Reporting

Spills of used oil must be reported to the TCEQ. For more about spills of used oil into water or onto the land, please refer to Chapter 3 of this handbook.

Table 2-1. Types of Used Oil Handlers

If you …	Then you should register with the TCEQ as a …
transport used oil[1]	used oil transporter
collect used oil from other generators and transport it	used oil transporter
own or operate a facility where shipments of used oil are held for more than 24 hours and less than 35 days	used oil transfer facility
are involved in chemical or physical operations designed to (1) produce fuel oils, lubricants, or other products derived from used oil; or (2) make used oil more suitable for production of these products.	used oil processor/re-refiner
store used oil for more than 35 days	used oil processor/re-refiner
direct a shipment of off-specification used oil to a used oil burner or first claim that used oil to be burned for energy recovery meets the used oil specifications	used oil marketer
have used oil that does not meet the used oil fuel specification requirement and must be burned in an industrial furnace, a boiler, or a hazardous waste incinerator	burner of off-specification used oil

[1] *If you are a generator and you transport 55 gallons or less of used oil in your own or an employee's vehicle to a used oil collection center or to your own used oil aggregation point, you are not required to register as a transporter.*

Used Oil Collection Centers

A collection center is a facility that accepts, aggregates, or stores used oil received from generators such as service stations, governments, or businesses (in shipments of not more than 55 gallons of used oil at a time). A center may accept used oil from household do-it-yourselfers (DIYs). Facilities accepting household DIY used oil must post and maintain a durable and readable sign showing that the facility is a public or household DIY used oil collection center and showing the hours used oil is collected.

Registration and Reporting. Used oil collection centers must register with the TCEQ's Used Oil Program within 30 days of starting operation. Collection centers must re-register no later than January 25 of *odd-numbered years*. Also, no later than January 25 of *every year*, used oil collection centers must report to TCEQ the amounts of used oil collected during the previous year. The TCEQ will send a reporting form to registered collection centers by December 1 of each year.

Updating Registration. Used oil collection centers are requested to notify the TCEQ in writing within 30 days whenever:

- the office address has changed,
- the registered facility name has changed,
- additional vehicles are acquired to transport used oil or used oil filters,
- there is a change in ownership, or
- the operations or management methods are no longer adequately described in the existing registration.

Send notifications to the TCEQ Used Oil Program, MC-129, P.O. Box 13087, Austin, TX 78711-3087.

CERCLA Liability Exemption for Service Station Dealers

What Is CERCLA Liability?

The Comprehensive Environmental Response, Compensation, and Liability Act addresses who is responsible when used oil is released into the environment. A qualified service station dealer (SSD) can be exempted from certain liability provisions of CERCLA—namely, response costs, damage, and injunctive relief. This exemption applies only to releases that occur after used oil has left the SSD—for example, when the used oil is with a transporter or at a recycling facility.

What Is an SSD?

An SSD is a retail facility—such as a service station, filling station, quick-lube center, or garage—that receives most of its business from fueling and servicing motor vehicles.

How Does an SSD Qualify for the Exemption?

To qualify for the exemption, a retail facility must fulfill all of the following conditions:

- the facility meets the definition of an SSD according to CERCLA, and accepts used oil from household DIYs;
- the used oil has not been mixed with any hazardous substance; and
- the SSD's used oil activities are managed according to used oil management standards.

When Does the Exemption Not Apply?

The exemption does not apply to

- any used oil mixed with a hazardous waste; or
- any used oil spilled at the SSD's own facility.

Automotive Oil Fee Exemption

Automotive oil is any lubricating oil intended for use in an internal combustion engine, crankcase, transmission, gearbox, or differential for an automobile, bus, or truck. The term includes oil that

- is not labeled for this specific use but
- is suitable and has been accepted for this use by industry specifications.

The first sale of new automotive oil is subject to a fee collected by the Texas Comptroller of Public Accounts. The fee is one cent per quart, or four cents per gallon.

Table 2-2. Examples of Facilities Eligible for an Exemption from the Automotive Oil Fee

Type of Facility	Example	Activities
Retailers	Discount retailers, grocery stores	Accept used oil from household do-it-yourselfers and involved in activities where automotive oil is changed, used, consumed, or sold to individuals
Commercial	Lube centers	Same as above
Other	Distributors	Collect used oil from household do-it-yourselfers and sell oil to individuals.

An exemption from the automotive oil fee can be obtained by used oil collection centers that

- are registered with the TCEQ,
- accept used oil from household DIYs during business hours, and
- provide automotive oil sales and service to the public.

Table 2-2 on page 27 shows some examples of facilities eligible for exemption from the automotive oil fee. This fee exemption is an incentive to encourage creation of DIY used oil collection centers around the state.

Highlights of Chapter 2

- You may need to register as more than one type of used oil handler. See Table 2-1 for more information.
- Shipments of used oil must be delivered only to facilities registered with the Environmental Protection Agency (EPA) and the TCEQ.
- Used oil handlers are required to keep all records on used oil (for example, shipping documents, bills of lading, or invoices) for a minimum of three years.
- Used oil collection centers must register with the TCEQ's Used Oil Program, Permitting and Remediation Support Division, within 30 days of starting operation. Collection centers must re-register no later than January 25 of odd-numbered years. Also, no later than January 25 of *every year,* used oil collection centers must report to TCEQ the amounts of used oil collected during the previous year.
- A qualified service station dealer (SSD) can be exempted from certain liability provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)—namely, response costs, damage, and injunctive relief. This exemption applies only to *releases that occur after used oil has left the SSD*—for example, when the used oil is with a transporter or at a recycling facility.

- An SSD is a retail facility—such as a service station, filling station, quick-lube center, or garage—that receives most of its business from fueling and servicing motor vehicles.
- The first sale of new automotive oil is subject to a fee collected by the Texas Comptroller of Public Accounts.
- The fee is one cent per quart, or four cents per gallon.
- An exemption from this fee can be obtained by used oil collection centers that are registered with the TCEQ, accept used oil from household do-it-yourselfers (DIY), and provide automotive oil sales and service to the public.

Technical Aspects of Used Oil Recycling

Chapter 3

Chapter Contents

32 Introduction
32 What is Hazardous Waste?
33 Mixtures of Used Oil and Hazardous Waste
35 Mixtures of Used Oil with Halogens
37 Used Oil Containing PCBs
38 Wastewater Containing Used Oil
39 Used Oil Fuel Specifications
41 Spills of Used Oil
42 Used Oil Absorbents
45 Highlights of Chapter 3

List of Tables

34 Table 3-1: Managing Mixtures of Used Oil and Hazardous Waste
36 Table 3-2: Analytical Methods for Organic Halogens Determination
38 Table 3-3: Specifications for Used Oil Burned for Energy Recovery
39 Table 3-4: Total Halogen Content for Used Oil as a Fuel
40 Table 3-5: Some Analytical Methods for Used Oil Fuel Specifications

Introduction

This chapter addresses technical aspects of used oil recycling activities for generators, collection centers, transporters, processors and re-refiners, marketers, and off-specification used oil burners. Important technical aspects of used oil recycling include determining

- whether a *characteristically hazardous waste* has become mixed with used oil and rendered the mixture characteristically hazardous; or
- whether used oil may be contaminated with *listed hazardous wastes* or with PCBs. (The terms in italics are explained in this chapter's next section.)

Also, this chapter discusses various used oil absorbents, mixtures of used oil and wastewater, total halogen content in used oil, and the specifications that used oil must meet to be burned for fuel.

What Is Hazardous Waste?

A generator of solid waste is required to determine whether that waste is hazardous, as defined in Title 40 Code of Federal Regulations Part 261 (40 CFR 261). The regulatory definition can be found in 40 CFR Part 261, Subpart C (characteristic hazardous waste) and Subpart D (listed hazardous waste).

Listed Hazardous Wastes

The first step in making a hazardous waste determination is to decide whether a waste is a listed hazardous waste. There are three categories.

Nonspecific-Source "F" Listed Wastes. The "F" listed wastes come from *nonspecific* sources. Examples are degreasing agents and spent solvents such as toluene and carbon tetrachloride.

Specific-Source "K" Listed Wastes. The "K" listed wastes come from *specific* industrial processes. Examples are bottom sediment sludges from wood preservation operations using creosote and/or pentachlorophenol.

Commercial Chemical Product "P" and "U" Listed Wastes. "P" and "U" listed wastes are commercial chemical products discarded, or to be discarded, or spilled. They include off-specification products, container residues, and spill residues of commercial chemical products. "P" listed wastes are *acutely hazardous* because of their toxicity.

For more information please refer to 40 CFR Part 261, Subpart D; or to TCEQ Publication RG-22, *Guidelines for the Classification and Coding of Industrial and Hazardous Wastes*.

Characteristic Hazardous Wastes

If a waste is not one of those listed as hazardous, the second step is to decide whether it has hazardous characteristics. Waste with any of four characteristics can be hazardous.

Ignitable Wastes. Liquids that have a flash point of less than 140° Fahrenheit (F), solids that have a tendency to ignite and burn.

Corrosive Wastes. Generally, water-containing liquids with a pH of 2.0 or less or 12.5 or more.

Reactive Wastes. Explosive wastes or wastes that are normally unstable and react vigorously.

Toxic Wastes. Wastes that leach more than the maximum allowable concentrations listed in 40 CFR Part 261 Subpart C, Table 1. This determination is made by a testing method called the toxicity characteristic leaching procedure (TCLP).

For more information, please refer to 40 CFR Part 261 Subpart C or to TCEQ Publication RG-22, *Guidelines for the Classification and Coding of Industrial and Hazardous Wastes*.

Mixtures of Used Oil and Hazardous Waste

Used oil generators and handlers are responsible for ensuring that used oil is not intentionally mixed with a hazardous waste. If listed hazardous waste or characteristically hazardous waste does become mixed with used oil, the resulting mixture may have to be managed as hazardous waste. If the resulting mixture is not hazardous, it is managed as a used oil.

- Mixtures of used oil and listed hazardous waste are managed as listed hazardous waste.
- Mixtures of used oil and ignitable-only characteristically hazardous waste are managed as used oil, *unless the resulting mixture exhibits the characteristic of ignitability*.
- Mixtures of used oil and characteristically hazardous waste are managed as used oil, *unless the resulting mixture exhibits any hazardous characteristic*.
- Mixtures of used oil and nonregulated hazardous waste are managed as used oil.
- Mixtures of used oil and fuel products are managed as used oil.

- Mixtures of used oil with hazardous waste from a CESQG or household are managed as used oil.

Table 3-1 presents the same mixtures in an "if-then" format. In the first two columns find the mixture that occurred in your situation; in the third column find how the mixture must be managed.

Exemption. Used oil is exempt from hazardous waste regulations if the used oil:

- is destined to be recycled;
- is not rendered hazardous by mixing with characteristically hazardous waste; and
- is not mixed with a listed hazardous waste.

Table 3-1: Managing Mixtures of Used Oil and Hazardous Waste

If used oil becomes mixed with…	And the resulting mixture shows…	Then the mixture must be managed as…
Listed hazardous waste	(No specific condition required)	Listed hazardous waste[1]
Ignitable-only waste (e.g., mineral spirits)	No characteristics of ignitability	Used oil
Ignitable-only waste	Characteristics of ignitability	Hazardous waste[1]
Any characteristically hazardous waste	Any hazardous characteristic [2]	Hazardous waste
Any characteristically hazardous waste	No hazardous characteristics	Used oil
Nonregulated hazardous waste [3]	(No specific condition required)	Used oil
Fuel product	(No specific condition required)	Used oil

Note: *This table applies to all used oil handlers, including generators.*

[1] *For information on hazardous waste, contact the TCEQ's Industrial and Hazardous Waste Permits Section at 512/239-6412.*

[2] *Even if the resulting characteristic is from the used oil itself.*

[3] *Nonregulated hazardous waste is hazardous waste from a household or from a Conditionally Exempt Small-Quantity Generator (CESQG).*

Used oil containing more than 1,000 ppm of total halogens is presumed hazardous unless the used oil generator or handler can demonstrate that the used oil was not mixed with listed hazardous waste. (See the following subsection, "Mixtures of Used Oil with Halogens").

Any mixing or blending of used oil with hazardous waste to bring down the level of a hazardous concentration is considered a hazardous waste treatment activity and may require a hazardous waste permit.

Mixtures of Used Oil with Halogens

A generator must evaluate used oil at the time it is generated. Each used oil handler—transporter, processor/refiner, marketer, and burner—must prove that used oil was not mixed with a listed waste; the proof can be made either by adequate documentation or by testing the used oil. This requirement does not apply to used oil generated by a household do-it-yourselfer or by a CESQG. It also does not apply to a collection center that only accepts household used oil.

The Rebuttable Presumption

Used oil containing more than 1,000 parts per million (ppm) of total halogens is presumed to be mixed with a halogenated listed hazardous waste. This presumption is known as the "rebuttable presumption." To rebut it, a used oil handler must prove that the used oil containing more than 1,000 ppm total halogens does not contain halogenated listed hazardous waste. This proof must be supported either by analytical data or by process knowledge. (The most common halogens are fluorine, chlorine, and bromine.)

***Caution*:** Mixing or blending used oils, or diluting such mixtures to bring the level of halogens down to less than 1,000 ppm, is considered a processing activity and requires a hazardous waste treatment permit.

Process Knowledge versus Analytical Data

There are two general approaches to proving that used oil destined for recycling is not mixed with hazardous waste: analytical testing (described in the subsection titled "Analytical Data") or documented process knowledge.

Documented Process Knowledge

The term "process knowledge" refers to a used oil handler's understanding of the operations and activities that created the used oil at his facility and possible contaminants in the used oil. The word "documented" refers to records of the used oil's origin, use, processes it has

Table 3-2: Analytical Methods for Organic Halogens Determination (EPA SW 846 Methods)

Determination	Sample Preparation Method	Sample Analysis Method
Total halogens	N/A	9075, 9076, 9077
Total halogens	5050	9056, 9253
Individual halogens	3585 (liquid organic matrix)	8260 or 8021
Halogenated Pesticides	3580	8081A

Source: EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW 846), *3rd ed.*

undergone, identification of possible contaminants, and other information on used oil activities. If enough documented process knowledge is available to show that mixing did not occur, then the used oil handler may eliminate the cost of analytical testing.

Analytical Data

The Environmental Protection Agency (EPA) recommended test methods for the rebuttable presumption are listed in Table 3-2. Methods listed in the table are used to determine total halogen content and specific halogens, to demonstrate that used oil has not been mixed with a listed hazardous waste. However, other EPA-approved test methods may be used to demonstrate the analytical results.

- *Total halogen* content can be determined by EPA methods (nonspecific determination) listed in Table 3-2. If the total halogen content is more than 1,000 ppm, then a more specific test method should be used to determine the level of individual halogenated compounds.
- *Specific halogen* content can be determined using one of the methods also listed in Table 3-2. For example, to determine halogen-containing volatile compounds in used oil, EPA Method 3585 is used for sample preparation, and Method 8260 or 8021 may be used for sample analysis. For analysis of halogenated pesticides, Method 8081A is recommended.

Exemptions

The following used oils are exempt from the rebuttable presumption. In other words, you don't have to prove that they have not been mixed with halogenated listed waste.

- Metal-working oils contaminated with chlorinated paraffins are not subject to the rebuttable presumption, if the used oils are reclaimed through a tolling arrangement. A tolling arrangement is a contract between a processor/re-refiner and a generator stating that the used oil reclaimed is to be returned to the generator. The generator uses the reclaimed oil as a lubricant, cutting oil, or coolant.
- If the used oil is not included in a metal-working tolling arrangement, the presumption may be rebutted if the generator can prove that the source of the total halogen content is chlorinated paraffins and the used oil was not mixed with a chlorinated hazardous waste.
- Used oil from households or a CESQG facility is not subject to the rebuttable presumption.
- Used oil contaminated with chlorofluorocarbons (CFCs) removed from refrigeration units is exempt from the rebuttable presumption when the CFCs are destined for reclamation. However, CFC-contaminated used oils that have been mixed with used oil from sources other than refrigeration units are not exempt from the rebuttable presumption.

Used Oil Containing PCBs

PCBs (polychlorinated biphenyls) are man-made organic chemicals that range in consistency from heavy, oily liquids to waxy solids. They are used for their cooling properties because they only boil at high temperature and do not readily react with other chemicals.

Used oil containing PCBs can be burned for energy recovery, but only in combustion units that thermally degrade the PCBs; for example, rotary kilns, cement kilns, liquid injection incinerators, and high-temperature boilers.

The regulations you have to follow depend on the concentration of PCBs in the used oil.

From 2 ppm to Less Than 50 ppm

Used oil that is to be burned for energy recovery is presumed to contain 2 ppm or more PCBs unless the person

generating the used oil can document, by testing or process knowledge, that the oil contains no detectable PCBs.

Used oil containing between 2 ppm and less than 50 ppm of PCBs that is to be burned for energy recovery is subject to the following regulations:

- the used oil management standards (as defined in this handbook's glossary); and
- 40 CFR 761.20(e)—federal regulations implementing the Toxic Substances Control Act (TSCA); includes requirements on marketing, burning, testing, and record keeping.

Table 3-3: Specifications for Used Oil Burned for Energy Recovery

Constituent	Allowable Level
Arsenic	5 ppm maximum
Cadmium	2 ppm maximum
Chromium	10 ppm maximum
Lead	100 ppm maximum
Total halogens	4,000 ppm maximum
Flash point	100°F minimum

Less Than 2 ppm

Used oil that is to be burned for energy recovery and contains less than 2 ppm PCBs is not regulated under TSCA but under 40 CFR Part 279.

For more information on PCBs, contact EPA Region 6 at 214-665-7224, or call the TSCA Assistance Information Line at 202-554-1404.

Wastewater Containing Used Oil

Discharge of wastewater contaminated with *de minimis* (small) quantities of used oil is subject to the Clean Water Act, and is not regulated as used oil. *De minimis* quantities of used oil are small spills, leaks, or drips from pumps, machinery, and pipes during normal operations; or small amounts of oil lost to the wastewater treatment system during washing or draining operations.

This exception does not apply to the following situations:

- Used oil discarded as a result of abnormal manufacturing operations resulting in substantial leaks, spills, or other releases.
- Used oil recovered from wastewater—such oil is subject to the used oil management standards.

When a generator separates used oil from wastewater generated on-site, in order to make the water acceptable for discharge or reuse, this activity is not considered processing of used oil.

Used Oil Fuel Specifications

Used oil to be burned for energy recovery is divided into two classes: (1) on-specification used oil, which contains no more than the allowable levels of contaminants shown in Table 3-3; and (2) off-specification used oil, which exceeds the allowable levels.

- On-specification used oil burned for energy recovery is not subject to the used oil management standards so long as (1) the used oil is not mixed with or contaminated by hazardous waste; and (2) it meets the marketer requirements in 40 CFR 279.72–73 and 279.74 (b).
- A used oil burner may mix off-specification used oil with virgin oil or with on-specification oil. But if the used oil is mixed to produce on-specification used oil fuel, the burner becomes subject to the standards for a used oil processor and possibly to the marketer requirements.

Table 3-4: Total Halogen Content for Used Oil as a Fuel

Total halogens	Hazardous waste or used oil?	May be burned in an …
Less than 1,000 ppm	used oil	on-specification unit[1]
From 1,000 to less than 4,000 ppm	used oil (if hazardous waste presumption successfully rebutted)	on-specification unit[1]
More than 4,000 ppm	used oil (if hazardous waste presumption successfully rebutted)	off-specification unit or undergo further processing to be burned in an on-specification unit

[1] *If all other requirements shown in Table 3-3 have been met.*

Total Halogen Content for Used Oil as a Fuel

Used oil burned for energy recovery is subject to the used oil management standards. One requirement concerns total halogen content. If the total halogen content is 1,000 ppm or more, but less than 4,000 ppm, and the used oil handler can successfully prove the used oil was not mixed with listed halogenated hazardous waste, the used oil can be burned as an on-specification fuel for energy recovery, provided all other requirements listed in Table 3-3 are met. Table 3-4 on page 39 shows how total halogen content affects burning used oil as a fuel.

Approved Test Methods for Used Oil Fuel Specifications

Table 3-5 below includes some of the EPA-recommended SW 846 test methods to determine used oil specification levels. However, other EPA-approved test methods may be used to demonstrate the analytical results.

Table 3-5: Some Analytical Methods for Used Oil Fuel Specifications

DETERMINATION	METHODS	
	Sample Preparation	Sample Analysis
Multi-element analysis including arsenic, cadmium, chromium, and lead	3051	6010A, 6020
Arsenic	3051	7060A, 7061A, 7062
Cadmium	3051	7130, 7131A
Chromium	3051	7190, 7191
Lead	3051	7420, 7421

SOURCE: *EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW 846)*, 3rd ed.

Spills of Used Oil

Persons who store used oil near either navigable waters or storm drains leading to such waters are subject to applicable spill prevention, control, and countermeasures in 40 CFR Part 112. Whenever a release or discharge of used oil reaches the environment, the "responsible person" (see glossary for definition) must immediately take corrective action to protect human health and the environment.

What Spills Must Be Reported?

The answer depends on the type of facility at which the spill occurs. The following list covers some of the more common situations.

- ***Any facility*** must report a spill of used oil that is large enough to cause a sheen on water.
- A ***do-it-yourselfer used oil collection center*** must report a spill of
  - ▼ automotive engine used oil, or
  - ▼ a mixture of automotive used oil and other used oil,

  in the amount of 25 gallons or more that goes into the environment (outside of secondary containment).
- A spill or overfill of used oil at ***an underground storage tank*** must be reported when it results in a release to the environment that exceeds 25 gallons or that causes a sheen on nearby surface water.
- For ***facilities exempted from certain requirements of the petroleum storage tank (PST) program***, the reportable threshold is 210 gallons or more for spills or discharges of used oil onto land. Some of these exempted facilities are electric generating facilities; petrochemical plants; petroleum refineries; bulk loading facilities; and pipeline facilities exempted from the PST program. Also included are farms or residences that have tanks with capacity of 1,100 gallon or less used for storing motor fuel for noncommercial use. For information on petroleum storage tanks, refer to 30 TAC 334 (Underground and Aboveground Storage Tanks).

When Must a Spill Be Reported?

A spill must be reported to the regional TCEQ office as soon as possible and not later than 24 hours after it is discovered.

How Should a Spill Be Reported?

- During normal business hours, the responsible person may notify the TCEQ office for the region where the discharge or spill occurred; or
- the responsible person may call the 24-hour number of TCEQ's Emergency Response Team at 512/239-2507 or the state toll-free, 24-hour Spill Reporting Hot Line at 800-832-8224.

Who Reports a Spill during Transportation?

If used oil is spilled during transportation, the transporter must take immediate action to protect human health and the environment. If the spill creates an imminent health threat, the responsible person must immediately notify and cooperate with the local emergency authorities. The responsible person must take immediate action to prevent any environmental impact (dike the discharge area) and clean up any environmental contamination. Additional notification may be required by other local, state, or federal law.

What Information Should a Spill Report Contain?

- The initial notification should include information such as the name, address, and telephone number of the person making the report; the date, time, and location of the spill; a description or identification of the used oil spilled; and an estimate of the quantity spilled.
- As soon as possible, but no later than two weeks after the spill, the responsible person must attempt to notify the owner and any residents of the property where the spill occurred and residents of any other property that the spill may adversely affect.
- Within 30 days of the spill, the responsible person must send the TCEQ regional office a detailed written description of the spill and actions taken in response.

Used Oil Absorbents

Used oil contains many toxic metals and additives that may pollute the environment if not managed correctly. Absorbents, when properly selected and used, can soak up and slow the movement of used oil. Many factors affect the performance and cost of using absorbents for cleaning up used oil spills, including safety, capacity, characteristics, applicability, reuse, and disposal.

General Classes of Absorbents

The three general classes of absorbents are synthetic pads, clay (commonly called "Kitty Litter"), and cellulose materials.

Synthetic pads, made of polypropylene, are water repellant so that moisture will not affect their usefulness. Such pads are not biodegradable. However, they can be disposed of by incineration, and the pads have low ash content. Synthetic pads can also be burned for energy recovery, which is preferable to incineration or land disposal. Some absorbent pads are made to be reusable, which makes them more desirable for recycling and saves on disposal costs when the used oil has been properly removed.

Clay, commonly called Kitty Litter, is more like an adsorbent (where the oil sticks to the surface) rather than an absorbent material (where the oil soaks into the material). Clay is heavy, highly abrasive, and not biodegradable. It also has a high ash content and low heating value—qualities that make it the least desirable of the three classes to incinerate or use in fuel blending.

Cellulose materials are biodegradable organic absorbents, such as peat moss, corn cobs, or recycled paper products. Cellulose materials can be burned for energy recovery.

Federal Regulations on Absorbents

Absorbent materials with signs of free-flowing oil are managed as used oil. If there are no visible signs of free-flowing oil, these materials are not regulated as used oil—unless they are burned for energy recovery. If they are to be disposed of in a landfill, absorbent materials are solid waste and subject to a hazardous waste determination (see "What Is Hazardous Waste?" in this chapter.)

State Regulations on Absorbents

The TCEQ categorizes petroleum-contaminated materials as "special waste" when disposed of in municipal solid waste landfills (MSWLFs). Regulations covering the management of special waste are found in 30 TAC 330.136.

Please contact the TCEQ Municipal Solid Waste Permits Section at 512/239-2334 for regulations and authorization to dispose of absorbent materials in MSWLFs.

Proper Management of Used Oil Absorbents

The best approach, of course, is to prevent spills and thereby minimize the need for used oil absorbents. However,

once this waste is generated, there are several options for proper management. Recycling such absorbents by reuse or by burning for energy recovery is the next most desirable option, followed by bioremediation and incineration. TCEQ considers disposing of used oil absorbents in landfills the least environmentally responsible option. Please call the TCEQ Used Oil Program at 512/239-6832 (select Option 2) for a list of used oil handlers.

Recycling

There are several options for recycling used oil absorbents. One is to wring the oil out of the absorbent pad, reclaim the used oil, and reuse the pads. Another option is to send the used oil absorbent material to a facility that burns it for energy recovery.

Absorbent materials recycled by burning for energy recovery are regulated as used oil and must meet the used oil specifications requirements in Table 3-3 of this chapter.

To find other options for recycling used absorbents, go online to **www.renewtx.org** or call 512/239-3100 and ask for information about the RENEW program.

Incineration

Incineration offers the greatest control of toxic organic contamination, combined with very low human health risks. Hydrocarbons, in particular, incinerate well because of their organic content and energy value. Hazardous waste incinerators are regulated under Title 40 CFR Parts 264 or 265.

Bioremediation

This method involves applying organisms or oxygen and mineral nutrients, such as phosphate and nitrogen, to the contaminated used oil absorbent material. Under a controlled environment, bioremediation can be a cost-effective alternative to landfill disposal. This method can:

- reduce liability and expenses associated with using landfills; and
- reduce or eliminate levels of contaminants such as TPH (total petroleum hydrocarbons) and BTEX (benzene, toluene, ethylbenzene, and xylenes).

Bioremediation of absorbents that do not contain free-flowing oil is not subject to the used oil management standards. For more information, call the Texas Bioremediation Council at 800-626-6598.

Landfill Disposal

Disposal in municipal solid waste landfills (MSWLFs) requires the absorbent materials to be sampled, tested, and

certified as nonhazardous waste before disposal. Because the TPH of absorbent materials contaminated with used oil is usually high, it is generally preferable to have those materials burned for energy recovery. For more information on current state regulations for disposal of absorbent materials in an MSWLF, please contact the TCEQ Municipal Solid Waste Permits Section at 512/239-2334.

Analytical Testing of Absorbents before Landfill Disposal

A generator may use process knowledge to eliminate unnecessary testing. If there is insufficient documentation to support using process knowledge, then analytical data must be used to classify the waste for landfill disposal. The kind of analytical testing done depends on the source of contamination. Generally, analytical tests for used oil absorbents are:

- total petroleum hydrocarbons (TPH)
- toxicity characteristic leaching procedure (TCLP)
- total organic halogens (TOX)

Before landfill disposal, the generator is required to:

- determine the amount of waste to be disposed of,
- explore reuse/recycling options,
- contact the landfill about its restrictions, and
- obtain prior approval from the TCEQ Municipal Solid Waste Permits Section on a case-by-case basis.

Railroad Commission of Texas Permit

If the generator of used oil absorbents is under the jurisdiction of the Railroad Commission of Texas (RRC), contact that agency (at 512/463-6887) for additional requirements.

Highlights of Chapter 3

- Used oil handlers are responsible for ensuring that used oil is not intentionally mixed with a hazardous waste.
- Used oil is exempt from hazardous waste regulations if the used oil:
  - ▼ is destined to be recycled;

- is not rendered hazardous by mixing with characteristically hazardous waste; and
- is not mixed with a listed hazardous waste.

- If used oil containing more than 1,000 ppm of total halogens can be proven not to have been mixed with listed halogenated hazardous waste, then it is regulated as used oil (not hazardous waste).
- There are two general approaches to proving that used oil destined for recycling is not mixed with hazardous waste: analytical testing or documented process knowledge.
- Used oil containing between 2 and less than 50 ppm of PCBs that is to be burned for energy recovery is subject to the used oil management standards, in addition to requirements in 40 CFR 761.20(e) implementing the Toxic Substances Control Act (TSCA).
- Used oil that is to be burned for energy recovery is presumed to contain 2 ppm or more PCBs, unless this presumption is rebutted by testing or process knowledge.
- Used oil that is burned for energy recovery is not subject to the used oil management standards under the following conditions: (1) it meets the fuel specification; (2) the used oil is not hazardous waste; and (3) it meets the marketing requirements in 40 CFR 279.72–73 and 279.74(b).
- The used oil fuel specification applies only to used oil that is to be burned for energy recovery.
- Absorbent materials are managed as follows:
  - If they show signs of free-flowing oil, they are managed as used oil.
  - If they show no visible signs of free-flowing oil, they are solid waste. (If they are to be disposed of in a landfill, you must perform a hazardous waste determination.)
  - If they are to be burned for energy recovery, they are subject to used oil management standards.

Index

1-800 numbers outside back cover

A
aboveground storage tank (AST) 4
absorbents. *See* used oil absorbents
aggregation point 8, 25
analytical data 35-36, 45. *See also* rebuttable presumption
automotive oil fee exemption 27

B
bill of lading 5

C
CERCLA liability exemption 26
CFCs (chlorofluorocarbons) 4-5, 37
Chapter 324. *See* TCEQ rules
Chapter 335. *See* TCEQ rules
Chapter 371 9, 12-13
characteristically hazardous used oil 5
characteristic hazardous waste 32-33
collection centers. *See* used oil
Conditionally Exempt Small-Quantity Generator (CESQG) 5

D
de minimis. *See* spills of used oil
documented process knowledge 7, 35-36. *See also* rebuttable presumption

E
Emergency Response Team. *See* TCEQ exemptions 37

F
financial responsibility, state-required 21

H
halogens. *See* total halogens
hazardous waste
  characteristic. *See* characteristic hazardous waste
  listed. *See* listed hazardous waste

L
listed hazardous waste 6, 32

M
manifest 7

O
off-specification used oil 7-8, 21, 24-25, 32, 39
on-specification used oil 39

P
petroleum storage tank (PST) 41
process knowledge. *See* documented process knowledge

R
Railroad Commission of Texas Permit 45
rebuttable presumption 7, 35
registration
  biannual 14
  one-time 14
reporting spills of used oil. *See* spills of used oil
re-refining used oil. *See* used oil
rules, state and federal, obtaining copies 13

S
Senate Bill (SB) 1299 (2005 amendment
to the Texas Water Code, Chapter 7ss 7.176(a)(a)
Violations Relating To Handling of Used Oil) 13
Senate Bill (SB) 1683 (1995 amendments to the Used Oil
Collection, Management, and Recycling Act) 12
Service Station Dealer (SSD) 8, 26-27
shipping document 24
special waste 8, 43
spent material 8, 16
spills of used oil
in *de minimis* quantities 6, 38
general reporting instructions 41-42
reporting for DIY collection centers 41
reporting for PST-exempted facilities 41
SSD. *See* Service Station Dealer

T
TAC (Texas Administrative Code) Title 30, Chapter 324. *See*
TCEQ rules
TAC Title 30, Chapter 335. *See* TCEQ rules
TCEQ
Emergency Response Team 42
Municipal Solid Waste Permit Section outside back cover
Used Oil Program 14, 26, 28, 44
Web pages outside back cover
TCEQ rules
Chapter 324 3, 9, 12, 18
Chapter 335 17-18
obtaining copies 13
test methods
for total halogens 36
for used oil fuel specifications 39-40
TH&SC (Texas Health & Safety Code) Chapter 371 9, 12-13
toll-free telephone numbers outside back cover
total halogens 4, 7, 18, 36-38, 46. *See also* rebuttable
presumption
TSCA (Toxic Substances Control Act) 38

U
underground storage tank (UST) 41
used oil absorbents
analytical tests before disposal 47
federal and state regulations 45
management options 13
types of 44-45
used oil
aggregation point 8, 25
as energy resource 19-20
collection center 8, 12, 26, 28, 29, 41
containing PCBs 37-38
exempted 37
fuel specifications 38-40
handlers, types of 24-25
management standards 9, 12, 17, 21, 27, 38-40, 44, 46
regulations, changes in 12-13
re-refining 20

W
wastewater 38

How to Contact Sources Mentioned in This Booklet

TCEQ Used Oil Program—
512/239-6832 (select Option 2)

TCEQ Municipal Solid Waste Permits Section—
512/239-2334

TCEQ Industrial and Hazardous Waste Permits Section—
512/239-6412

TCEQ Industrial and Hazardous Waste Program—
512/239-6413

TCEQ Emergency Response Team (24-hour number)—
512/239-2507

Railroad Commission of Texas—
512/463-6887

EPA Region 6 Office—
214/665-7224

TSCA Assistance Information Line—
202/554-1404

Toll-Free Numbers

Spill Reporting Hot Line—
800-832-8224 (24-hour number)

TCEQ Used Oil Collection Center Information Line—
800-CLEAN-UP (prerecorded, menu-driven system that lets you to listen to selected information)

TCEQ Small Business Assistance Hotline—
800-447-2827

Texas Bioremediation Council—
800-626-6598

TCEQ Publications

Internet
for rules: www.tceq.state.tx.us/rules
for publications: www.tceq.state.tx.us/publications
Fax: 512/239-4488
Voice: 512/239-0028

The TCEQ is an equal opportunity/affirmative action employer. The agency does not allow discrimination on the basis of race, color, religion, national origin, sex, disability, age, sexual orientation or veteran status. In compliance with the Americans with Disabilities Act, this document may be requested in alternate formats by contacting the TCEQ at 512/239-0028, Fax 512/239-4488 or 1-800-RELAY-TX (TDD), or by writing P.O. Box 13087, Austin, TX 78711-3087.

Analytics Town of Double Oak
All Web Site Data

Go to report

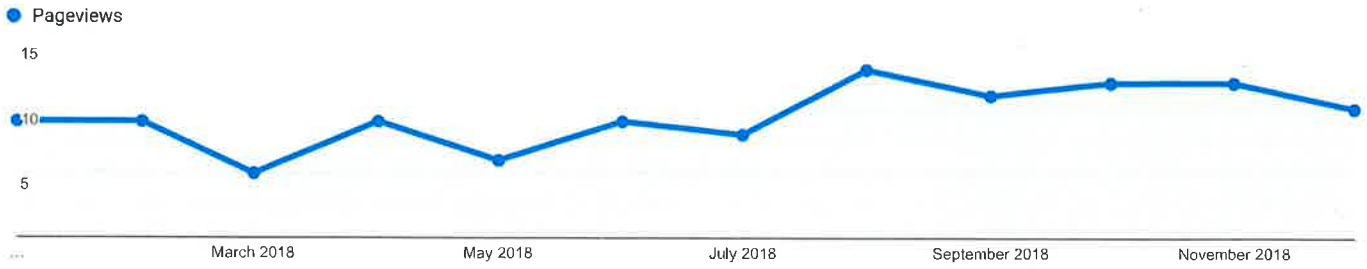
Content Drilldown

ALL » PAGE PATH LEVEL 1: /category/ » PAGE PATH LEVEL 2: /town/ » PAGE PATH LEVEL 3: /public-works/

Jan 1, 2018 - Dec 31, 2018

All Users
0.17% Pageviews

Explorer



Page path level 4	Pageviews	Unique Pageviews	Avg. Time on Page	Bounce Rate	% Exit
	113 % of Total: 0.17% (67,622)	89 % of Total: 0.20% (44,273)	00:00:15 Avg for View: 00:00:54 (-71.57%)	0.00% Avg for View: 38.52% (-100.00%)	4.42% Avg for View: 34.06% (-87.01%)
1. /	113 (100.00%)	89 (100.00%)	00:00:15	0.00%	4.42%

Rows 1 - 1 of 1

© 2019 Google

Double Oak

The best little town in North Texas!

- Home
- Town News & Events »
- Life in Double Oak »
- Government »
- Departments »
- Forms & Links

Stormwater

The Texas Commission on Environmental Quality "TCEQ" issued TPDES General Permit Number TXR040000, requiring small Municipal Separate Storm Sewer System "MS4s" to apply for authorization to discharge stormwater to surface waters in the State of Texas, defined as Waters of the United States. This new General Permit is issued pursuant to Section 26.040 of the Texas Water Code and Section 402 of the Clean Water Act.

Double Oak meets the definition of a small MS4, as defined in the permit document and must therefore make application to the TCEQ for authorization to discharge stormwater to surface waters in the state. Application for coverage under this permit includes the submittal of a Notice of Intent (NOI) form and preparation of a Storm Water Management Program (SWMP). The permit provides coverage for a five-year period, and requires an annual update and status report submittal to TCEQ. A copy of Double Oak's SWMP is available to view online or you may request at copy from the Town offices.

The SWMP provides a listing and description of Best Management Practices (BMPs) developed to prevent pollution in the stormwater to the Maximum Extent Practicable (MEP). BMPs have been developed for the following six Minimum Control Measures (MCMs):

• Public Education and Outreach on Stormwater Impacts
• Public Involvement/Participation
• Illicit Discharge Detection and Elimination
• Construction Site Stormwater Runoff Control
• Post-Construction Stormwater Management in New Development and Redevelopment
• Pollution Prevention/Good Housekeeping for Municipal Operations

Each MCM contains an appropriate number and type of BMP to satisfy the permit requirements to the MEP. The permit regulations state that existing programs or BMPs may be used to satisfy the requirements of this SWMP. BMPs must include a schedule of implementation during the five-year permit period and a determination of measurable goals to evaluate the effectiveness of the BMP. A description of how each measurable goal will be evaluated must also be provided.

It was the intent of TCEQ to provide a General Permit for small MS4s with enough flexibility to create a stormwater program to meet the unique individual needs of smaller systems. The program is to be developed by Double Oak such that it effectively reduces pollutants to the receiving waters of the United States.

Double Oak welcomes input and/or comments relative to this SWMP.

Useful Information

- TCEQ Oil-Recycling
- TCEQ WaterQuality Brochure
- TCEQ_GreenGuideYardCare
- TCEQ_HowtoPrepareSWPPP
- PosterforConstructionBMP

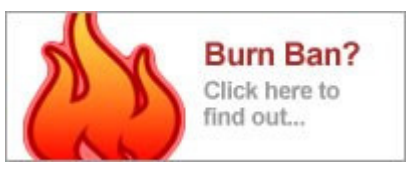
Below is a link to the Stormwater Management Program and year 1 Annual Report

- Storm Water Management Program
- Double Oak_MS4 Annual Report Year 3
- DoubleOak_MS4 Annual Report_Year2
- Double Oak_MS4 Annual Report_Year1

Below are public education materials for Stormwater Quality
• Storm Water Public Education Presentation-2015

Water Use

Burn Ban



West Nile Virus (WNV)

Event Calendar

Like us? Follow us online!

CompliAssure™ Secured
CLICK TO VERIFY >
powered by Aperia Solutions

DOUBLE OAK

59°

few clouds
humidity: 71%
wind: 10mph NNE
H 65 • L 60

72°	73°	74°
TUE	WED	THU

Weather from OpenWeatherMap

©2019 Town of Double Oak. All Rights Reserved | Website by The Image Doctor

Sec. 13.606 Illicit Connections Prohibited

No person shall make an illicit connection to the MS4, or allow such a connection to continue.

DOUBLE OAK

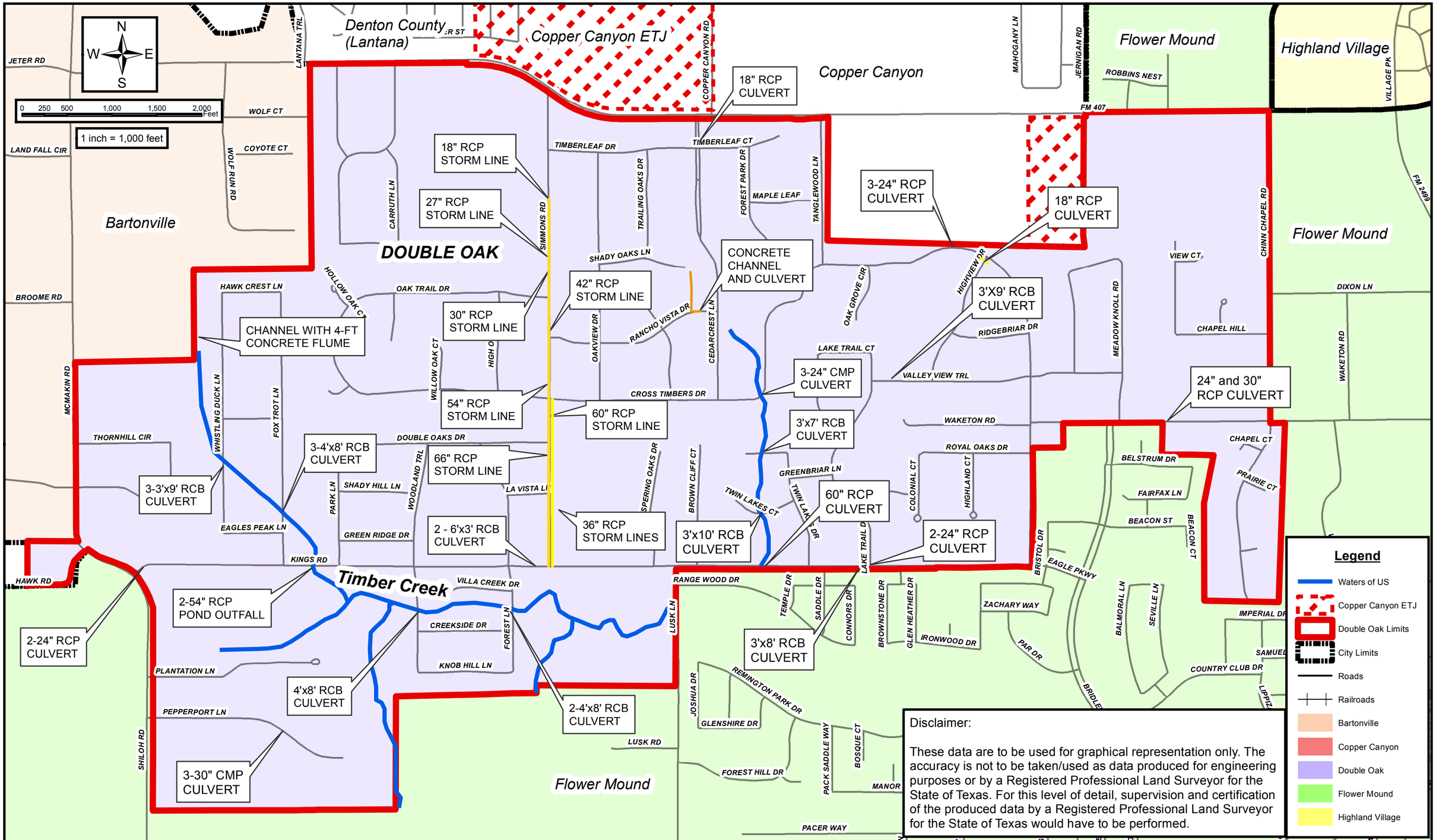
Stormwater Inspection Form

Type of Inspection:

☐ Illicit Discharge ☐ Construction Site ☒ Stormwater Outfalls/Dry Weather

☐ Stormwater Outfalls/Post Storm ☐ Municipal Operation

Report ID (Yr-ID#):	5-9-2018		
Property Owner's Name:	N/A		
Address			
City:			
Phone:			
Community:			
Subwatershed:			
Inspector's Name:	Brian Haynes (Halff)		
Discharge Description:	Dry Weather inspection of the Town		
Corrective Actions:			
Conversation:			
Investigator 1:			
Investigator 2: (if applicable)			
Warning Citation Issued			
Citation Issued			
Citation Number: (if applicable)			
Signature(s):			
Additional Notes:			
Performed dry weather inspection and did not see any unusual water flowing in ditches, drainage channels, or culverts.			
Resolve Date:	N/A		
Files:			
Photo Locations:			



Disclaimer:

These data are to be used for graphical representation only. The accuracy is not to be taken/used as data produced for engineering purposes or by a Registered Professional Land Surveyor for the State of Texas. For this level of detail, supervision and certification of the produced data by a Registered Professional Land Surveyor for the State of Texas would have to be performed.

HALFF
4000 Fossil Creek Blvd.
Fort Worth, Texas 76137
Main: 817-847-1422

TOWN OF DOUBLE OAK WATERS OF US

DECEMBER 2018

DOUBLE OAK
320 Waketon Road
Double Oak, TX 75077
Phone:(972) 539-9464

Double Oak

The best little town in North Texas!

News from Town Hall – April 2018

Mar 29, 2018 by Eileen

News from Town Hall

April 2018

Hello and greetings from Town Hall,

United States Air Force Captain Mark Weber of Bartonville, Texas

USAF Captain Mark Weber gave his life serving and protecting the United States of America. The Town of Double Oak extends condolences to the Weber family of Bartonville, Texas. God Bless and remember Captain Weber for his service and sacrifice.

Double Oak Police Lieutenant Ruben Rivas graduates from the FBI National Academy

On March 16, 2018 Police Chief Derrick Watson and I had the honor and privilege to fly to Washington D.C. to attend Double Oak Police Lt. Ruben Rivas graduation from the FBI National Academy at Quantico, Virginia. Lt. Rivas went through 10-weeks of intense class work, special studies and physical training. The presentation of diplomas was conducted by FBI Director Christopher A. Wray. The town is very proud of the dedication, effort and work of Lt. Ruben Rivas who joins Chief Watson (Class of 2006) as graduates of the prestigious FBI National Academy at Quantico.

May Town Council Elections

Due to unopposed candidates, the May Town Council elections are canceled.

Congratulations to Anita Nelson, Andrew Wills, Joe Dent and Ginger Brittain on their election to office.

The swearing-in and Oaths of Office will be held on Monday, May 7, 2018 at 7:00pm.

The town sincerely thanks Mayor Pro-Tem Ted Gruenloh and Council Member Stacie Stoehner for their dedicated service.

May School District Elections

Both public school districts that serve our town will be holding elections.

The Denton ISD will be holding a Board of Trustees election and a bond election.

The Lewisville ISD will be holding a Board of Trustees election.

May Primary Run-Off Elections

A friendly reminder that some March Primary Elections are headed to May 22 Run-Off Elections including the races for Commissioner Precinct 4 and Justice of the Peace Precinct 4.

Cross Timbers Water Supply Corporation Annual Meeting and Board of Directors election

Members of the CTWSC should receive information in the mail regarding the April 23, 2018 annual meeting and a ballot with instructions to elect board members.

The candidates are: Karla Hohenberger, Patrick McDonald(I), Andre Nicholas, Sherry Price and Robert Stegmaier(I). The membership will elect 3 of the 5 candidates. Ballots must be received at the PO Box no later than April 19, 2018.

Town reviewing Accessory Building Ordinance

Town Council has asked the Planning and Zoning Commission and staff to hold meetings and hear from residents regarding accessory building ordinance and regulations. Please contact town hall staff and check the town website for future posted meetings.

TCEQ – Double Oak Required Spring Newsletter – Spring Cleaning Tips

Spring weather can make a mess of your yard and our local waterways. Here are a few tips for getting your landscape back in shape and keeping local lakes, streams and rivers clean:

Avoid putting any permanent structures in flood prone areas of your yard and try to keep those areas clear during the spring. Spring storms can create standing water and voluntary streams that wash loose dirt and debris out of your yard and into creeks and roadside ditches where

they are carried downstream to local waterways.

Keep grass clippings, leaves and debris out of local streams and wetlands. Compost your yard waste or dispose of it in your street-side pick-up. Yard waste that ends up in wetlands or streams contributes to algae growth in the summer, making the water green and smelly.

Stabilize your soil and increase infiltration by planting deep-rooted native plants or trees. The roots of turf grass extend only two to three inches into the soil, giving it little ability to hang on when the water flows. Native flowers and grasses, on the other hand, can have root systems four to twelve feet deep! These deep roots anchor the plants and keep soil from washing away. They also increase the amount of water the soil can absorb, meaning that more water sinks in to recharge groundwater aquifers and less ends up in the storm drain.

If you live along a stream or wetland, it is important to maintain a healthy un-mowed buffer along your shoreline. A shoreline or stream bank planted in trees and native plants will hold the soil steady when it rains. Buffers also catch and filter many of the pollutants found in storm water runoff.

Double Oak Women's Club News

Please check the DOWC website for membership and event information at www.doubleoakwomensclub.com.

Double Oak and our DOVFD and DOPD public safety departments appreciate the support of the Double Oak Women's Club.

Happy Easter

Edit this page

Related Posts

Tags

Share This

Water Use

Burn Ban

Sec. 13.604 Discharge Prohibitions

(a) No person shall introduce or cause to be introduced, into the MS4, any discharge that is not composed entirely of stormwater, except those discharges listed in allowable nonstormwater discharges below.

(b) No person shall discharge or cause to be discharged, into the MS4, any harmful quantity of any substance, as determined by the control authority.

(c) No person shall introduce or cause to be introduced, into the MS4, any harmful quantity of sediment, silt, earth, soil or other material associated with clearing, grading, excavation, or any other construction activities, in excess of what could be retained on-site or captured by employing erosion and sediment control measures to the maximum extent practicable.

(d) No person shall use, store, or dispose of any harmful quantity of any substance in any manner that introduces that substance into the MS4 or the environment.

(e) No person shall discharge waste concrete into or adjacent to the MS4 or water in the state.

(f) No person shall intentionally dispose of yard wastes, such as grass clippings, leaves and tree branches into the MS4 or water in the state.

(g) No person shall introduce or cause to be introduced, into the MS4, any discharge that causes the town to violate its TPDES permit for stormwater discharges associated with small MS4s or any other discharge permit for discharges from its MS4.

(h) No person shall release or cause, allow, or permit to be introduced any of the following substances into the MS4 nor onto or into the ground or air such that the substance may enter the air or groundwater:

(1) Any used motor oil, antifreeze, or any other motor vehicle fluid;

(2) Any industrial waste;

(3) Any hazardous waste, including hazardous household waste;

(4) Any domestic sewage or septic tank waste, grease trap waste, or grit trap waste;

(5) Any wastewater from a commercial carwash facility; from any commercial vehicle washing, cleaning, or maintenance at any new or used automobile or other vehicle dealership, rental agency, body shop, repair shop, or maintenance facility;

(6) Any wastewater from a commercial mobile power washer or from the washing or other cleaning of a building exterior where the wastewater contains any harmful cleaning substance;

(7) Any wastewater from commercial floor, rug, or carpet cleaning;

(8) Any wastewater from the wash down or other cleaning of pavement that contains any harmful quantity of any cleaning substance; or any wastewater from the wash down or other cleaning of any

pavement where any spill, leak, or other release of oil, motor fuel, or other petroleum or hazardous substance has occurred, unless all harmful quantities of such released material have been previously removed;

(9) Any effluent from a cooling tower, condenser, compressor, emissions scrubber, emissions filter, or the blow down from a boiler;

(10) Any ready-mixed concrete, mortar, ceramic, or asphalt base material or hydromulch material, or from the cleaning of commercial vehicles or equipment containing, or used in transporting or applying, such material;

(11) Any filter backwash from a swimming pool, fountain, or spa;

(12) Any swimming pool or spa water;

(13) Any discharge from water line disinfection by super-chlorination or other means if it contains any harmful quantity of chlorine or any other chemical used in line disinfection;

(14) Any water from a water curtain in a spray room used for painting vehicles or equipment;

(15) Any contaminated runoff from a vehicle wrecking or storage yard;

(16) Any substance or material that will damage, block, or clog the MS4;

(17) Any release from a petroleum storage tank (PST), or any leachate or runoff from soil contaminated by a leaking PST, or any discharge of pumped, confined, or treated wastewater from the remediation of any such PST release, unless the discharge complies with all state and federal standards and requirements.

CHECKLIST FOR BUILDING

___Building permit is posted on the jobsite so that it is visible from the street before any work is done on the structure. Erosion control/SWPPP must be onsite and maintained throughout the project until completion. Both are required before construction begins.

___All structures must be built in accordance with the APPROVED plans attached to the original application on file in Town Hall, any changes to the structure will need to be approved by the building inspector.

___Temporary utility service cannot be granted until are permits are obtained.

___Permanent utility service cannot be granted until all fixtures are in place or safety cover plates are installed to protect anyone that may come in contact with wires.

___Sanitary facilities must be provided for workmen during construction and must be in place before a permit can be issued.

___No plumbing or electrical work shall be covered until required inspections have been made and approved.

___Building area must be kept free of trash and litter during the building process by means of containers. It is unlawful to allow trash, building materials, and/or litter to be thrown, blown or accumulated on any town street, easement or property. Trash must be removed from site as needed but no longer than on a weekly basis.

___Swimming pools must be fenced prior to filling and have self closing and latching gates with a fence 4 feet high and openings no larger that 4 inches.

___$55 fee will be paid for each red tag or re-inspection made. The fee shall be paid in advance of the inspection.

___Grass and weeds must be kept lower than 10 inches in height.

The following inspections will be necessary during construction:

___1. Temporary Pole (T-Pole)
___2. Pier Hole (if applicable)
___3. Plumbing Rough (Water Test) & Form Board Survey
___4. Foundation
___5. Seconds:
    ___a. Framing
    ___b. Fireplace
    ___c. Electrical Rough-In
    ___d. Mechanical Rough-In
    ___e. Plumbing Top-Out (2-story Water Test)
    ___f. Gas (Air-Test)
    ___g. Brick Ties (As high as the installers can reach)
___6. Flat Work (approach & culvert) inspections can be made at any time during construction.
___7. Meter Releases
    ___a. Final Electrical (temp release 30 days only)
    ___b. Gas

SWIMMING POOLS

___Ground Electrical / Belly Steel
___ Deck Steel
___Fence inspection prior to plaster and filling of pool
___Pool Final (electrical and plumbing)

ENGINEERING DESIGN MANUAL

CHECKLISTS

Please make sure the plans you are submitting are in accordance with this checklist. The following checklist will be used during the Plan Review.

Plat Application: ____**Preliminary Plat** ____ **Preliminary Replat**
____**Final Plat** ____ **Final Replat**

Engineering Plan: ____**Preliminary** ___ **Final**

Site Construction Plan: _____**Preliminary** ___ **Final** ____**Post Construction**

Storm Water Management: ____**Conceptual** ___ **Preliminary** ____ **Final**

Project Information

A. Name of Development:_____ B. Date: _____

C. Location of Development: _____

D. Type of Development: _____

E. Total area (acres):_____

F. Proposed Land Uses (zoning designations):_____

G. Anticipated project schedule: _____

H. Name of Owner: _____

I. Owner Telephone No.: _____ J. FAX No.:_____

K. Owner Contact Name:_____

L. Owner Address:_____

M. Owner Email Address:_____

N. Engineer/Surveyor's Name: _____

O. Engineer/Surveyor's Email Address:_____

P. Engineer/Surveyor Firm: _____

Q. Telephone No.: _____

FORM CT-2

PRELIMINARY PLAT CHECKLIST:

1.	Ten (10) Sets of Final Plats submitted to the Town	Yes ____ No ____ N/A ____
2.	Preliminary plats shall be placed on maximum 24" x 36" sheets and drawn to a scale of 1” = 100’ or 1” = 50' unless approved in advance by the Town.	Yes ____ No ____ N/A ____
3.	Title or name of the subdivision preceded by the words: "Preliminary Plat"	Yes ____ No ____ N/A ____
4.	Name, address and telephone number of the owner, applicant, survey, and/or engineer.	Yes ____ No ____ N/A ____
5.	Volume and page, or deed record number of the ownership deed from Denton County Deed Records.	Yes ____ No ____ N/A ____
6.	Vicinity map and key map, if multiple sheets are needed.	Yes ____ No ____ N/A ____
7.	Date of preparation, written and graphic scale, and north arrow.	Yes ____ No ____ N/A ____
8.	Boundary line of the proposed subdivision drawn with a heavy line.	Yes ____ No ____ N/A ____
9.	Computed gross acreage of the subdivision	Yes ____ No ____ N/A ____
10.	Metes and bounds description of the proposed subdivision.	Yes ____ No ____ N/A ____
11.	Location of the subdivision with respect to a corner of the survey or tract or an original corner of the survey of which it is a part.	Yes ____ No ____ N/A ____
12.	Names of adjoining subdivisions with lots and blocks shown with dashed lines and/or property owners of record for all contiguous unplatted properties.	Yes ____ No ____ N/A ____
13.	Town limits (if applicable).	Yes ____ No ____ N/A ____
14.	Location, dimension, and description and recording information for all existing rights-of-way, railroad rights-of-way, easements or other public ways on or adjacent to the property being developed.	Yes ____ No ____ N/A ____
15.	Show permanent structures or uses that will remain.	Yes ____ No ____ N/A ____
16.	Sizes and flowlines of existing drainage structures, 100-year floodplain and floodway as defined by FEMA.	Yes ____ No ____ N/A ____
17.	Location, size and type of all existing utilities within or adjacent lot the site.	Yes ____ No ____ N/A ____

18. Number each proposed lot and block. Provide the proposed number of lots. Yes ____ No ____ N/A ____

19. Existing two (2) foot interval contours referenced to NAD. Yes ____ No ____ N/A ____

20. Proposed streets, alleys, drainage ways, parks, open spaces, easements, other public areas and other rights-of-way within the subdivision. Dimensions of all easements and rights-of-way. Yes ____ No ____ N/A ____

21. Dimensions for all lots. Gross acreage for all non-residential lots. Approximate acreage for areas in residential use. Approximate acreage of streets, parks, and other non-residential uses. Yes ____ No ____ N/A ____

22. Front building setback lines, side and rear building setback lines. Yes ____ No ____ N/A ____

23. Preliminary Storm Water Management Plan meeting the requirements of the Engineering Design Manual shall be submitted with the Preliminary Plat. (Checklist in App. C) Yes ____ No ____ N/A ____

24. Preliminary Plat approval block as described by the Subdivision Regulation Ordinance. Yes ____ No ____ N/A ____

25. Where the Preliminary Plat is part of a larger area owned by the Applicant that will be subsequently subdivided, provide a layout of the larger area showing the tentative layout of streets, blocks, drainage, water, sewerage, and other improvements for the larger area. Yes ____ No ____ N/A ____

FINAL PLAT CHECKLIST

1. Ten (10) Sets of Final Plats submitted to the Town Yes ____ No ____ N/A ____

2. Final plats shall be placed on maximum 24" x 36" sheets and drawn to a scale of 1” = 100’ or 1” = 50' unless approved in advance by the Town. Yes ____ No ____ N/A ____

3. Title or name of the subdivision preceded by the words "Final Plat" Yes ____ No ____ N/A ____

4. Name address and telephone number of the owner, applicant, survey, and/or engineer. Yes ____ No ____ N/A ____

5. Vicinity map and key map if multiple sheets are needed. Yes ____ No ____ N/A ____

6. Date, written and graphic scale, and north arrow. Yes ____ No ____ N/A ____

7. Boundary line of subdivision drawn with a heavy line and with bearings, dimensions and curve data. Yes ____ No ____ N/A ____

8. Names of adjoining subdivisions with lots and blocks shown with dashed lines and/or property owners of record for all contiguous unplatted properties. Yes ____ No ____ N/A ____

9. Town limits, if applicable. Yes ____ No ____ N/A ____

10. Proposed streets, alleys, drainageways, parks, open spaces, easements, other public areas and other rights-of-way within the subdivision including dimensions, bearings and curve data. Yes ____ No ____ N/A ____

11. Location, dimension, description and recording information for all existing rights-of-way, railroad rights-of-way, easements or other public ways on or adjacent to the property being platted. Yes ____ No ____ N/A ____

12. Location and description of all permanent monuments and control points Yes ____ No ____ N/A ____

13. Final Storm Water Management Plan meeting the requirements of the Engineering Design Manual shall be submitted with the Preliminary Plat. (Checklist in App. C) Yes ____ No ____ N/A ____

14. Floodways / Floodplains (FEMA):

    a. Show the ultimate 100-year water surface elevation. Yes ____ No ____ N/A ____

    b. Show floodplain and floodway boundaries. Yes ____ No ____ N/A ____

    c. Drainage Floodway easement limits Yes ____ No ____ N/A ____

    d. Minimum fill and floor elevations specified. Yes ____ No ____ N/A ____

15. Minimum building setback lines. Yes ____ No ____ N/A ____

16. Lot and block numbers. Yes ____ No ____ N/A ____

17. Approval block in the form prescribed by the Subdivision Regulations Ordinance. Yes ____ No ____ N/A ____

18. Abutting property owner names and recording information. Yes ____ No ____ N/A ____

19. Gross acreage of the land being subdivided Yes ____ No ____ N/A ____

26. Added the note for buildings within 1,000 feet from existing oil or gas well as described by the Subdivision Regulation Ordinance. Yes ____ No ____ N/A ____

20. Owner's certificate of deed or dedication with the following: Yes ____ No ____ N/A ____

    a. Metes and bounds description. Yes ____ No ____ N/A ____

    b. Representation that dedicators own the property. Yes ____ No ____ N/A ____

    c. Dedication statement. Yes ____ No ____ N/A ____

    d. Reference and identification or name of final plat. Yes ____ No ____ N/A ____

e. Surveyor certification in the form prescribed by the Subdivision Regulation Ordinance. Yes ____ No ____ N/A ____

21. Certificate showing all taxes have been paid. Yes ____ No ____ N/A ____

22. A letter fully outlining and alterations from the approved Preliminary Plat. Yes ____ No ____ N/A ____

ENGINEERING SITE PLAN – Each Engineering Site Plan shall include:

1. Engineering Site plans shall be placed on maximum 22" x 34" sheets and drawn to a scale of 1" = 100' or 1" = 50' unless approved in advance by the Town. Yes ____ No ____ N/A ____

2. Title block in lower right hand corner including:

   a. Subdivision name with lot and block number. Yes ____ No ____ N/A ____

   b. Area in acres. Yes ____ No ____ N/A ____

   c. Metes and bounds description including survey name and abstract number. Yes ____ No ____ N/A ____

   d. Town and County. Yes ____ No ____ N/A ____

   e. Preparation Date. Yes ____ No ____ N/A ____

3. Name, address and telephone number of the owner, applicant, and surveyor/engineer. Yes ____ No ____ N/A ____

4. Vicinity map and key map, if multiple sheets are needed. Yes ____ No ____ N/A ____

5. Written scale, graphic scale and north arrow. Yes ____ No ____ N/A ____

6. Approximate distance to the nearest street. Yes ____ No ____ N/A ____

7. Site boundaries, dimensions, lot lines and lot areas. Yes ____ No ____ N/A ____

8. Legend. Yes ____ No ____ N/A ____

9. Site data summary table including:

   a. Zoning. Yes ____ No ____ N/A ____

   b. Proposed use. Yes ____ No ____ N/A ____

   c. Building area (gross square footage). Yes ____ No ____ N/A ____

   d. Building height (feet and inches). Yes ____ No ____ N/A ____

   e. Area of impervious surface. Yes ____ No ____ N/A ____

   f. Total Parking: Required and provided. Yes ____ No ____ N/A ____

   g. Number of handicap parking spaces. Yes ____ No ____ N/A ____

h. Number of dwelling units and number of bedrooms (multifamily). Yes ____ No ____ N/A ____

10. Existing improvements within 75' of the subject property. Yes ____ No ____ N/A ____

11. Land use, zoning, subdivision name, recording information and adjacent owners. Yes ____ No ____ N/A ____

12. Building locations, sizes, and dimensions. Yes ____ No ____ N/A ____

13. Distance between buildings on the same lot. Yes ____ No ____ N/A ____

14. Building lines and setbacks. Yes ____ No ____ N/A ____

15. Dimensions of all drive lanes and traffic flow arrows. Yes ____ No ____ N/A ____

16. FEMA floodplains with elevations, and minimum finished floor elevations (include the floodplain note shown on the final plat). Yes ____ No ____ N/A ____

17. Public streets, private drives, and fire lanes with pavement widths and including rights-of-way, median openings, turn lanes, existing driveways, adjacent existing driveways with dimensions, radii, and surface. Yes ____ No ____ N/A ____

18. Distances between existing and proposed driveways. Yes ____ No ____ N/A ____

19. Loading and unloading areas. Yes ____ No ____ N/A ____

20. Ramps, crosswalks, sidewalks and barrier-free ramps with dimensions. Yes ____ No ____ N/A ____

21. Locations of dumpsters and trash compactors with height and material of screening. Yes ____ No ____ N/A ____

22. Size, location, dimensions and details of all signs and exterior lighting of signs, including type of standards, locations and radius of light and intensity of foot-candles. All signage are subject to approval by the Building Inspections Department. Yes ____ No ____ N/A ____

23. Location and sizes of existing and proposed water and sewer mains. Yes ____ No ____ N/A ____

24. Location of fire hydrants. Yes ____ No ____ N/A ____

25. Location and sizes of storm drains, culverts, inlets and other drainage features on or adjacent to the site. Yes ____ No ____ N/A ____

26. Locations, widths, and types of existing and proposed easements. Yes ____ No ____ N/A ____

27. Provide an elevation of all four sides of the building including materials, colors and dimensions at an architectural scale of 1”=20’. Yes ____ No ____ N/A ____

28. Landscape plan provided on separate sheet to show the following: Yes ____ No ____ N/A ____

a. Natural features including tree masses and anticipated tree loss. Yes ____ No ____ N/A ____

b. Floodplains, drainageways and creeks. Yes ____ No ____ N/A ____

c. Screening walls and fences, retaining walls, headlight screens, and service area screens including height and type of Yes ____ No ____ N/A ____

construction.

d. Existing and preserved trees including location, size, and species. Yes ____ No ____ N/A ____

e. Landscaping materials including location and size. Yes ____ No ____ N/A ____

f. Proposed plant materials. Yes ____ No ____ N/A ____

g. Note to indicate type and placement of irrigation system. Yes ____ No ____ N/A ____

29. 2" x 3" blank box in lower right corner for Town use. Yes ____ No ____ N/A ____

30. Additional information as requested to clarify the proposed development. Yes ____ No ____ N/A ____

SITE CONSTRUCTION PLAN – Site Construction Plan shall include:

COVER SHEET * - The cover sheet shall include:

1. Project title and type of project. Yes ____ No ____ N/A ____
2. Location map. Yes ____ No ____ N/A ____
3. Disposal site for excess excavation. Yes ____ No ____ N/A ____
4. Index of Sheets (if not included on its own sheet). Yes ____ No ____ N/A ____
5. Approval blocks for Town including Town Engineer and Director of Public Works. Yes ____ No ____ N/A ____
6. Professional Engineer's seal, signature and date. Yes ____ No ____ N/A ____
7. "Release for Construction" note. Yes ____ No ____ N/A ____

* NOTE: If the Cover Sheet is not furnished, information should appear on other sheets.

GENERAL

1. North arrow clearly shown on each plan sheet. Yes ____ No ____ N/A ____
2. Bench marks shown on each sheet; located on permanent structure outside of construction limits and conveniently spaced (500' +). Yes ____ No ____ N/A ____
3. Title blocks, title, sheet number and scales shown. Yes ____ No ____ N/A ____
4. Each sheet must bear the seal of a Licensed Professional Engineer, signature, and date. Yes ____ No ____ N/A ____
5. Street names on each sheet. Yes ____ No ____ N/A ____
6. Property owners and property lines shown. Yes ____ No ____ N/A ____
7. Submit four (4) sets of plans for review on 22" x 34" sheets. Yes ____ No ____ N/A ____
8. Prepare plans on 22" x 34" sheets allowing for half size reduction to 11" x 17". Yes ____ No ____ N/A ____

9. Text shall be legible on the half size 11” x17” plans. Yes ____ No ____ N/A ____

10. Place standard general notes on plans. Yes ____ No ____ N/A ____

11. Existing, proposed and future facilities must clearly be defined. Yes ____ No ____ N/A ____

12. Project name on right end of plan sheets. Yes ____ No ____ N/A ____

GRADING * – Each grading plan shall include:

1. Horizontal scale for grading plans shall be at 1” = 20’ on full size drawings. Yes ____ No ____ N/A ____

2. Existing one-foot contours based on an on-the-ground survey or controlled aerial topographic map (dashed lines and labeled) to extend 20 feet from property line onto adjacent property. Yes ____ No ____ N/A ____

3. Proposed one-foot contours – solid lines and labeled. Yes ____ No ____ N/A ____

4. Show top of curb elevation every 50 feet on streets, alleys, existing and proposed parking lots. Yes ____ No ____ N/A ____

5. Slope:

   a. Back of street curb to property line: ¼” per foot. Yes ____ No ____ N/A ____

   b. Parking lot top of curb to property line: Maximum 4 (horizontal) to 1 (vertical). Yes ____ No ____ N/A ____

   c. Any unpaved area to property line: Maximum slope of 4:1. Yes ____ No ____ N/A ____

   d. Show driveways with ¼” per foot + 6” from street gutter up to property line. Yes ____ No ____ N/A ____

6. Letter of approval if grading is proposed on adjacent property. Yes ____ No ____ N/A ____

7. Utility easement from abutting property owners. Yes ____ No ____ N/A ____

8. Proposed inlets, label and size. Yes ____ No ____ N/A ____

9. Proposed pipes, label and size. Yes ____ No ____ N/A ____

10. Existing inlets and pipes. Yes ____ No ____ N/A ____

    * NOTE: Add statement that grading <u>only</u> is being submitted with these plans.

PAVING PLAN – Each Paving Plan shall include:

1. Horizontal scale for paving plans shall be at 1” = 20’ on full size drawings. Yes ____ No ____ N/A ____

2. Right-of-way, street, alley, drives and sidewalks dimensioned. Yes ____ No ____ N/A ____

3. Centerline stations shown. Yes ____ No ____ N/A ____

4. Limits of work defined. Yes ____ No ____ N/A ____

5. Barrier free ramps at all intersections. Yes ____ No ____ N/A ____

6. Pavement transitions. Yes ____ No ____ N/A ____

7. Traffic control items; striping, traffic buttons, sign. Yes ____ No ____ N/A ____

8. Street lighting. Yes ____ No ____ N/A ____

9. Concrete pavement thickness. Yes ____ No ____ N/A ____

10. Minimum 3,600 psi in 28 days concrete compressive strength. Yes ____ No ____ N/A ____

11. 6” curbs. Yes ____ No ____ N/A ____

12. Minimum reinforcement with No. 4 bars 24” o.c. both ways. Yes ____ No ____ N/A ____

13. Sidewalks to be 4” thick, 3,600 psi in 28 days, reinforced with No. 3 bars 14” O.C.E.W. Yes ____ No ____ N/A ____

14. Expansion joints at intersection and at minimum 600 foot intervals for pavement. Yes ____ No ____ N/A ____

15. Saw cut at 15-, 17.5- and 20-foot intervals for 6-inch, 7-inch and 8-inch pavements respectively. Yes ____ No ____ N/A ____

16. Radius at corners conform to Table II-2. Yes ____ No ____ N/A ____

17. Gutter flow arrows. Yes ____ No ____ N/A ____

18. Roadways comply with thoroughfare plan. Yes ____ No ____ N/A ____

19. Geometrics meet design speed criteria. Yes ____ No ____ N/A ____

20. Is Superelevation required? Yes ____ No ____ N/A ____

21. Retaining Walls:

    a. Type, beginning and ending locations and wall elevations. Yes ____ No ____ N/A ____

    b. Provide design if non-standard or modified. Yes ____ No ____ N/A ____

    c. Drainage behind walls shown. Yes ____ No ____ N/A ____

22. Driveway grades shown. Yes ____ No ____ N/A ____

23. Prepare plans and necessary forms for TDLR plans review and field inspection. Yes ____ No ____ N/A ____

24. Developer to pay for all review and inspection fees. Yes ____ No ____ N/A ____

PAVING PROFILES AND GRADES – Plans shall include:

1. Vertical scale for paving profiles shall be at 1” = 4’ on full size drawings. Yes ____ No ____ N/A ____

2. Profiles plotted showing ground at proposed property line. Yes ____ No ____ N/A ____

3. Top of curb profiles must meet minimum and maximum grade requirements. Yes ____ No ____ N/A ____

4. Driveway profile grades. Yes ____ No ____ N/A ____

5. Vertical curves must be designed in accordance with Table II-5. Yes ____ No ____ N/A ____

6. Contour grading plans for major intersections. Yes ____ No ____ N/A ____

7. Spot top of curb elevations in plan view on proposed left turn lanes. Yes ____ No ____ N/A ____

8. Check carefully for any place water might pond. Are inlets located at sag points or vertical curves? Yes ____ No ____ N/A ____

9. Are grades, crossfall, slopes, etc., consistent with information shown on typical section? Yes ____ No ____ N/A ____

10. Check ends of project for drainage. If gutters drain to ditches or field type inlets, are grades and profiles shown? Yes ____ No ____ N/A ____

11. Minimum grades maintained to assure complete drainage. Yes ____ No ____ N/A ____

WATER – All water distribution and transmission facilities shall include:

1. Approval letter to connect to the waste line from Bartonville Water Supply Corporation Yes ____ No ____ N/A ____

2. Horizontal scale for plan views shall be at 1” = 20’ on full size drawings. Yes ____ No ____ N/A ____

3. Vertical scale for profile views shall be at 1” = 4’ on full size drawings. Yes ____ No ____ N/A ____

4. Loop water mains. Yes ____ No ____ N/A ____

5. Valves on fire hydrant leads. Yes ____ No ____ N/A ____

6. Valves on main lines between each fire hydrant. Yes ____ No ____ N/A ____

7. Maximum distance between each fire hydrant.

   a. Residential – 500’ c-c on street. Yes ____ No ____ N/A ____

   b. Multifamily – 400’ c-c on street. Yes ____ No ____ N/A ____

   c. Office, retail, commercial, industrial 300’ c-c on street. Yes ____ No ____ N/A ____

8. All portions of building within 300’ radius of a fire hydrant in commercial. Yes ____ No ____ N/A ____

9. All portions of building within 400’ radius of a fire hydrant in multifamily. Yes ____ No ____ N/A ____

10. All portions of buildings within 500’ radius of a fire hydrant in single family and duplex residential. Yes ____ No ____ N/A ____

11. Maximum length non-looped line serving a fire hydrant is 150 feet. Yes ____ No ____ N/A ____

12. Lateral service (min. 1” copper) from main line to two feet from ROW. Yes ____ No ____ N/A ____

13. Water main extended to opposite property line or tied to existing main. Yes ____ No ____ N/A ____

14. Profile mains 12” and larger. Yes ____ No ____ N/A ____

15. Show other utility lines crossing wastewater lines. Yes ____ No ____ N/A ____

16. Show location of water meters:

    a. Domestic. Yes ____ No ____ N/A ____

    b. Irrigation. Yes ____ No ____ N/A ____

    c. Fire line. Yes ____ No ____ N/A ____

17. Show size of water meters. Yes ____ No ____ N/A ____

18. Note minimum pipe covers (attach water and standard details and general notes). Yes ____ No ____ N/A ____

19. Dedicate water line easements up to and including fire hydrants and water meters for lines off ROW. Yes ____ No ____ N/A ____

WASTEWATER – All wastewater plans shall include:

1. Approval letter to connect to the wastewater collection agency (i.e. Flower Mound, Highland Village, Upper Trinity, Private) Yes ____ No ____ N/A ____

2. Horizontal scale for plan views shall be at 1” = 20’ on full size drawings. Yes ____ No ____ N/A ____

3. Vertical scale for profile views shall be at 1” = 4’ on full size drawings. Yes ____ No ____ N/A ____

4. 8” minimum, PVC SDR-35 (unless 6-inch approved by Town). Yes ____ No ____ N/A ____

5. Manhole at end of all lines. Yes ____ No ____ N/A ____

6. Manholes at change of pipe size, tees and bends. Yes ____ No ____ N/A ____

7. 500’ maximum distance between manholes on lines 21” and smaller. 800’ maximum distance between manholes on lines 24” and larger. Yes ____ No ____ N/A ____

8. Minimum slopes:

    a. 6” – 0.50% (Pipe size as approved by Town). Yes ____ No ____ N/A ____

    b. 8” – 0.33%. Yes ____ No ____ N/A ____

    c. 10” – 0.25%. Yes ____ No ____ N/A ____

    d. 12” – 0.20%. Yes ____ No ____ N/A ____

    e. 15” – 0.14%. Yes ____ No ____ N/A ____

    f. 18” – 0.12%. Yes ____ No ____ N/A ____

9. Maximum slope such that velocity is less than 10 fps. Yes ____ No ____ N/A ____

10. Sewer laterals 10' downstream from water service or to center of lot. Yes ____ No ____ N/A ____

11. Minimum lateral size:

    a. Residential, 4". Yes ____ No ____ N/A ____

    b. Apartment, retail or commercial – 6". Yes ____ No ____ N/A ____

    c. Manufacturing or industrial – 8". Yes ____ No ____ N/A ____

12. Profile all sewer lines except laterals. Yes ____ No ____ N/A ____

13. Show other utility lines crossing wastewater lines. Yes ____ No ____ N/A ____

14. Label lines to correspond to profile. Yes ____ No ____ N/A ____

15. Concrete encasement at creek crossing. Yes ____ No ____ N/A ____

16. Provide stub outs to adjacent property. Add services for Planned Development Communities. Yes ____ No ____ N/A ____

17. Note benchmark on all sheets. Yes ____ No ____ N/A ____

18. 10' utility easement provided for lines not in ROW. Yes ____ No ____ N/A ____

UTILITIES – All plans shall show the following:

1. Existing and proposed facilities shown in plan and profiles views. Yes ____ No ____ N/A ____

2. Underground facilities close to or in conflict with proposed construction located by actual ties and elevations. Yes ____ No ____ N/A ____

3. Caution notes shown when construction operations come close to existing utilities. Telephone number of utility contact shall be shown. Yes ____ No ____ N/A ____

EROSION CONTROL – All plans shall show the following:

1. The scale for Erosion Control Plans may vary however shall be prepared on sheets no smaller than 1" = 100' on full size drawings. Yes ____ No ____ N/A ____

2. Existing and Proposed Grading. Yes ____ No ____ N/A ____

3. Existing and Proposed Drainage Features. Yes ____ No ____ N/A ____

4. Erosion features including temporary construction entrance, silt fence, inlet protection, rock berms, seeding, etc. Yes ____ No ____ N/A ____

5. Erosion control standard details. Yes ____ No ____ N/A ____

PAVEMENT MARKINGS AND SIGNAGE

1. The scale for Pavement Marking Plans may vary however shall be prepared on sheets no smaller than 1” = 100’ on full size drawings. Yes ____ No ____ N/A ____
2. Pavement Markings and Signage Plan in accordance with MUTCD. Yes ____ No ____ N/A ____
3. Pavement Markings Standard Details. Yes ____ No ____ N/A ____

TRAFFIC CONTROL PLAN

1. The scale for Traffic Control Plans may vary however shall be prepared on sheets no smaller than 1” = 200’ on full size drawings. Yes ____ No ____ N/A ____
2. Traffic Control Plan in accordance with MUTCD. Yes ____ No ____ N/A ____
3. Traffic Control Standard Details. Yes ____ No ____ N/A ____
4. Traffic Control Phasing as necessary. Yes ____ No ____ N/A ____

LANDSCAPE AND IRRIGATION PLANS

1. The scale for Landscape and Irrigation Plans may vary however shall be prepared on sheets no smaller than 1” = 100’ on full size drawings. Yes ____ No ____ N/A ____
2. Landscape Plan showing rights-of-way and proposed back of curbs, sidewalk, existing; and proposed utilities and other features pertinent to the plan. Yes ____ No ____ N/A ____
3. Planting details. Yes ____ No ____ N/A ____
4. Irrigation Plans including metering, back flow prevention, and provision for electrical service and controllers. Yes ____ No ____ N/A ____
5. Irrigation details. Yes ____ No ____ N/A ____

STREET LIGHTING

1. The scale for Street Lighting Plans may vary however shall be prepared on sheets no smaller than 1” = 100’ on full size drawings. Yes ____ No ____ N/A ____

1. Lighting and Conduit Layout Plan. Yes ____ No ____ N/A ____
2. Lighting Standard Details. Yes ____ No ____ N/A ____

POST CONSTRUCTION

1. Temporary Erosion Control Devices removed. Yes ____ No ____ N/A ____

2. Contractor completed Punchlist items Yes ____ No ____ N/A ____

3. Notice of Termination (NOT) submitted to TCEQ and copy of executed NOT submitted to Town. Yes ____ No ____ N/A ____

4. Texas Accessibility Standards (TAS) Inspection approved by TDLR and copy of approved inspection submitted to Town. Yes ____ No ____ N/A ____

5. Contractor submitted As-Built drawings to the Town (Public Projects). Yes ____ No ____ N/A ____

6. Engineer submitted Record Drawings to the Town. Yes ____ No ____ N/A ____
   (Both Public and Private Projects)
   a. One (1) Full Size Bond Record Drawing Set
   b. Two (2) Half Size Bond Record Drawing Set
   c. Two (2) Compact Disk with the Digital Record Drawing Set
      - One (1) Digital CAD files with reference files merged
      - One (1) PDF Set (300 dpi)

7. Contractor submitted Affidavit of payment to sub-contractor, vendors, and suppliers. Yes ____ No ____ N/A ____

8. Contractor submitted Surety consent for final payment to town. Yes ____ No ____ N/A ____

9. Contractor submitted an acceptance letter from water and sewer provider to the Town. Yes ____ No ____ N/A ____

10. Certificate of Completion signed by Contractor and Town. Yes ____ No ____ N/A ____

ENGINEER'S CHECKLIST FOR CONCEPTUAL STORM WATER MANAGEMENT PLAN

Please attach additional sheets as necessary for comments and descriptions.

1. Planning Concerns

A.	Have any previous drainage or watershed plans been completed in the watershed? (If yes, describe)	Yes ____ No ____ N/A ____
B.	Is there any known history of flooding downstream? (If yes, describe conditions and locations)	Yes ____ No ____ N/A ____
C.	Is there any known history of excessive erosion downstream? (If yes, describe conditions and locations)	Yes ____ No ____ N/A ____
D.	Are there any known downstream drainage constrictions such as undersized culverts or channels? Size?	Yes ____ No ____ N/A ____
E.	Are there any FEMA 100-year floodplains which will need flood studies, CLOMRs, LOMRs, etc., for this project?	Yes ____ No ____ N/A ____
F.	Are there any known or suspected wetlands areas, mitigation areas, 404 permit areas, or other natural habitat features which require special consideration?	Yes ____ No ____ N/A ____
G.	Are there any existing dams over six feet in height which are or will be subject to TCEQ regulations?	Yes ____ No ____ N/A ____
H.	Are there any existing impoundments subject to TCEQ water rights permitting? (Livestock ponds are not exempt when converted to other uses.)	Yes ____ No ____ N/A ____
I.	Are there any existing environmental concerns on the site requiring special treatment or design consideration (i.e. fuel stations, vehicle maintenance, auto recycling, illegal dump sites, outdoor material storage, loading and transfer areas, landfills, industrial facilities, etc.)?	Yes ____ No ____ N/A ____

2. Existing Conditions Map(s) showing the following information on or adjacent to the development site:

A.	Digital ortho-photography showing project boundaries	Yes ____ No ____ N/A ____
B.	Existing topography (normally 2-foot contours)	Yes ____ No ____ N/A ____
C.	Soil types from USDA soil surveys and/or soil borings	Yes ____ No ____ N/A ____
D.	Perennial or intermittent streams	Yes ____ No ____ N/A ____
E.	Boundaries of existing predominant vegetation	Yes ____ No ____ N/A ____
F.	Delineation of current FEMA floodplains and floodways	Yes ____ No ____ N/A ____
G.	Locations of steep slopes (>15%)	Yes ____ No ____ N/A ____
H.	Locations of wetlands and natural habitat areas if known.	Yes ____ No ____ N/A ____
I.	Locations of all dams and impoundments	Yes ____ No ____ N/A ____
J.	Existing paved roads, buildings, and other impervious areas	Yes ____ No ____ N/A ____
K.	Environmental concerns identified in (2.H) above	Yes ____ No ____ N/A ____
L.	Existing major utilities, pipelines, and easements	Yes ____ No ____ N/A ____

3. Does this development provide opportunities for Low-Impact Design?

A.	Preserve floodplains and natural valley storage?	Yes ____	No ____	N/A ____
B.	Preserve natural streams and drainage patterns?	Yes ____	No ____	N/A ____
C.	Preserve steep slopes?	Yes ____	No ____	N/A ____
D.	Preserve trees and undisturbed natural vegetation?	Yes ____	No ____	N/A ____
E.	Preserve wetlands and other natural features?	Yes ____	No ____	N/A ____
F.	Drain runoff to pervious areas?	Yes ____	No ____	N/A ____
G.	Utilize natural drainage vs. storm drain systems?	Yes ____	No ____	N/A ____
H.	Reduce pavement and other impervious covers?	Yes ____	No ____	N/A ____

4. Conceptual analysis of hydrologic and hydraulic impacts of the proposed development:

A.	Hydrologic analysis to determine conceptual rates of runoff, volumes, and velocities to support decisions related to flood control and erosion protection downstream.	Yes ____	No ____	N/A ____
B.	Conceptual estimates of the three (3) storm design approach requirements.	Yes ____	No ____	N/A ____
C.	Conceptual selection, location, and size of proposed storm water structural controls.	Yes ____	No ____	N/A ____
D.	Conceptual limits of proposed clearing and grading.	Yes ____	No ____	N/A ____

5. Conceptual Drainage Area Map(s) showing the following information for the development site:

A.	Conceptual street layout (scale 1”=200’)	Yes ____	No ____	N/A ____
B.	All off-site drainage areas with topography (reduced scale)	Yes ____	No ____	N/A ____
C.	Delineation of watershed boundaries with flow arrows	Yes ____	No ____	N/A ____
D.	Reference info (file number, etc.) for previous drainage studies or existing developments & drainage facilities	Yes ____	No ____	N/A ____
E.	Approximate zone of influence for all outfalls	Yes ____	No ____	N/A ____
F.	Downstream constrictions, flooding, or erosion locations	Yes ____	No ____	N/A ____
G.	Location of proposed structural storm water controls, if any	Yes ____	No ____	N/A ____

(seal)	I certify that this Conceptual Storm Water Management Plan, including this checklist, required attachments, and additional comments, was prepared under my responsible supervision and that the information presented on this checklist and attachments is correct to the best of my knowledge. I also understand that an acceptance of this plan by the Town does not waive any Town standards or requirements unless a specific waiver request has been submitted and approved. Signed _____ Date _____ Print Name:_____ PE No _____

Form CT-2

ENGINEER'S CHECKLIST FOR PRELIMINARY STORM WATER MANAGEMENT PLAN

Please attach additional sheets as necessary for comments and descriptions.

1. **Changes or Modifications to Conceptual Site Plan** (May be reprinted with changes tracked or highlighted)

_____

_____

_____

_____

_____

_____

2. **Preliminary Project Layout Map(s) shows the following information on or adjacent to the development site:**

A.	Digital ortho-photography showing project boundaries	Yes ____	No ____	N/A ____
B.	Existing topography (normally 2-foot contours)	Yes ____	No ____	N/A ____
C.	Preliminary street and lot layout	Yes ____	No ____	N/A ____
D.	Benchmarks used for site control	Yes ____	No ____	N/A ____
E.	Construction phasing plan, if applicable	Yes ____	No ____	N/A ____
F.	Limits of proposed clearing and grading	Yes ____	No ____	N/A ____
G.	Proposed dams > 6' high (attach Dam Safety Checklist)	Yes ____	No ____	N/A ____
H.	Proposed FEMA floodplains with flood study reference info	Yes ____	No ____	N/A ____
I.	Proposed ponds subject to TCEQ water rights permits	Yes ____	No ____	N/A ____
J.	If yes, has water rights permit been applied for?	Yes ____	No ____	N/A ____

3. **Preliminary Drainage Area Map(s) shows the following information for the development site:**

A.	Preliminary street and lot layout (scale 1"=200')	Yes ____	No ____	N/A ____
B.	All off-site drainage areas with topography (reduced scale)	Yes ____	No ____	N/A ____
C.	Delineation of watershed boundaries with flow arrows	Yes ____	No ____	N/A ____
D.	Proposed modifications to watershed boundaries	Yes ____	No ____	N/A ____
E.	File numbers for existing developments & drainage facilities	Yes ____	No ____	N/A ____
F.	Zoning or Comp Plan info to document off-site land use	Yes ____	No ____	N/A ____
G.	Preliminary hydrology with supporting data & calculations for on-site existing & proposed, & off-site ultimate conditions	Yes ____	No ____	N/A ____
H.	Proposed detention ponds or other storm water controls, with summary hydrology for all applicable design storms	Yes ____	No ____	N/A ____
I.	Delineate entire zone of influence for all outfalls	Yes ____	No ____	N/A ____
J.	Downstream constrictions, flooding, or erosion locations	Yes ____	No ____	N/A ____

K. Proposed facilities with private maintenance (Maintenance Agreement and Maintenance Plan required for final) Yes ____ No ____ N/A ____

4. **Determination of Adequate Outfalls and Zones of Influence:** Describe these and provide supporting methodology:

_____

_____

_____

_____

_____

_____

_____

5. **Description of Any Proposed Waiver Requests:** (for informational purposes only; all Waiver Requests must follow published procedures)

_____

_____

_____

_____

6. **Other Comments:**

_____

_____

_____

_____

(seal)	I certify that this Preliminary Storm Water Management Plan, including this checklist, required attachments, and additional comments, was prepared under my responsible supervision and that the information presented on this checklist and attachments is correct to the best of my knowledge. I also understand that an acceptance of this plan by the Town does not waive any Town standards or requirements unless a specific waiver request has been submitted and approved. Signed _____ Date _____ Print Name:_____ PE No _____

ENGINEER'S CHECKLIST FOR
FINAL STORM WATER MANAGEMENT PLAN

Please attach additional sheets as necessary for comments and descriptions.

1. **Changes or Modifications to Preliminary Storm Water Management Plan** (May be reprinted with changes tracked or highlighted)

_____

_____

_____

_____

_____

_____

2. **Additional Study Attachments (include if applicable)**

A.	Dam Safety Checklist	Yes ____	No ____	N/A ____
B.	Storm Water Pollution Prevention Plan (SWPPP)	Yes ____	No ____	N/A ____
C.	Executed Maintenance Agreement (with Maintenance Plan)	Yes ____	No ____	N/A ____
D.	Landscaping Plan (for Storm Water controls)	Yes ____	No ____	N/A ____
E.	Copy of approved Waiver Request	Yes ____	No ____	N/A ____

3. **Applicable Local, State and Federal Permits** (Indicate acquired or application pending)

A.	CLOMR, LOMR or LOMA	Yes ____	No ____	N/A ____
B.	TCEQ water rights permit	Yes ____	No ____	N/A ____
C.	404 permit	Yes ____	No ____	N/A ____
D.	Other: _____	Yes ____	No ____	N/A ____
E.	Other: _____	Yes ____	No ____	N/A ____

4. **Hydrologic Analysis and Storm Water Management Design Plan** (separate Attachment, either A or B and C)

A.	Approved Infrastructure Plans. Attach a copy of the signed cover sheet.	Yes ____	No ____	N/A ____
		Plan File No.:		
B.	Site SWM Plan showing final hydrology, Identification of all storm water controls with summary calculations, delineation of adequate outfalls, zones of influence, required mitigation, and structural details and specifications as required	Yes ____	No ____	N/A ____
C.	Digital Copy of final hydrologic and hydraulic models	Yes ____	No ____	N/A ____

(seal)	I certify that this Final Storm Water Management Plan, including this checklist, required attachments, and additional comments, was prepared under my responsible supervision and that the information presented on this checklist and attachments is correct to the best of my knowledge. I also understand that an acceptance of this plan by the Town does not waive any Town standards or requirements unless a specific waiver request has been submitted and approved. Signed _____ Date _____ Print Name:_____ PE No _____

Variance Procedure –Storm Water Management Design Manual

Good engineering practice and practical considerations are necessary when developing storm water management plans and preparing construction drawings for specific projects. The criteria in this manual cannot cover every possibility.

The closer the criteria are followed, the more likely the plan or drawing will be approved and the construction accepted. For those situations where varying from the criteria is warranted, a variance process is described below.

Submit variance request in writing on the Request for Variance from the Town/City – Storm Water Form (CT-7) as early as possible. The variance request must include the following:

- The specific criteria that you want to vary.
- Why the criteria needs to be varied.
- How the basis for the criteria will still be satisfied or why the criteria is not applicable.
- Indicate if there are no criteria for the proposed analysis, design, or feature in this manual.
- Appropriate technical information supporting the variance request, such as calculations, excerpts from the drainage or design plan, and/or construction drawings.

Note: Submittals with insufficient technical information to support the variance request will be returned without review.

The town will either approve or reject the variance in writing on the variance request form. If it is rejected, a written explanation will be provided.

REQUEST FOR VARIANCE – STORM WATER – FORM CT-7

Submitted by:_____ Phone:_____ Email:_____

Company:_____Date:_____

Proposed Project Description

Name:_____

Type:_____

Location:_____(include map)

Existing Condition (show information on map or drawing)

Existing Site: _____

Existing Right-of-Way:_____

Topography:_____

Other Pertinent Data Related to Variance Request:

_____

_____

Variance Request

Specific criteria you want to vary:_____

_____

Explain why the criteria needs to be varied or is not applicable:_____

_____

Explain how the basis for the criteria will be satisfied:_____

_____

List attachments supporting variance request (preliminary design report excerpt, construction drawings, calculations, photographs, map, etc.):

Town/City fills in this area

Date	Reviewer	Dept./Section	Action Taken

Justification of Decision:_____

_____

Approval of Final Decision:_____ Date:_____

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Texas Pollutant Discharge Elimination System
Stormwater Construction General Permit

The Notice of Intent (NOI) for the facility listed below was received on December 14, 2018. The intent to discharge stormwater associated with construction activity under the terms and conditions imposed by the Texas Pollutant Discharge Elimination System (TPDES) stormwater construction general permit TXR150000 is acknowledged. Your facility's TPDES construction stormwater general permit authorization number is:

TXR15977T

Coverage Effective: December 14, 2018

TCEQ's stormwater construction general permit requires certain stormwater pollution prevention and control measures, possible monitoring and reporting, and periodic inspections. Among the conditions and requirements of this permit, you must have prepared and implemented a stormwater pollution prevention plan (SWP3) that is tailored to your construction site. As a facility authorized to discharge under the stormwater construction general permit, all terms and conditions must be complied with to maintain coverage and avoid possible penalties.

Project/Site Information:
RN110600095
Estates of Pepperport
5900 Pepperport Ln
Flower Mound, TX 75022
Denton County

Operator:
CN605605195
Walling & Son Corp., Limited Liability Company
230 E Kings Rd
Double Oak, TX 75077

This permit expires on March 05, 2023, unless otherwise amended. If you have any questions related to processing, you may contact the Stormwater Processing Center by email at swpermit@tceq.texas.gov or by telephone at (512) 239-3700. For technical issues, you may contact the stormwater technical staff by email at swgp@tceq.texas.gov or by telephone at (512) 239-4671. Also, you may obtain information on the TCEQ web site at http://www.tceq.texas.gov/goto/wq-dpa. A copy of this document should be kept with your SWP3.

Issued Date: December 14, 2018

FOR THE COMMISSION

Texas Commission on Environmental Quality

Construction Notice of Intent

Site Information (Regulated Entity)

What is the name of the site to be authorized?	Estates of Pepperport
Does the site have a physical address?	Yes
Physical Address	
Number and Street	5900 PEPPERPORT LN
City	FLOWER MOUND
State	TX
ZIP	75022
County	DENTON
Latitude (N) (##.######)	33.05345
Longitude (W) (-###.######)	-97.121371
Primary SIC Code	1629
Secondary SIC Code	
Primary NAICS Code	
Secondary NAICS Code	
Regulated Entity Site Information	
What is the Regulated Entity's Number (RN)?	
What is the name of the Regulated Entity (RE)?	Estates of Pepperport
Does the RE site have a physical address?	Yes
Physical Address	
Number and Street	5900 PEPPERPORT LN
City	FLOWER MOUND
State	TX
ZIP	75022
County	DENTON
Latitude (N) (##.######)	33.05345
Longitude (W) (-###.######)	-97.121371
Facility NAICS Code	
What is the primary business of this entity?	Custom Home Building/Lot Clearing

Customer (Applicant) Information

How is this applicant associated with this site?	Operator
What is the applicant's Customer Number (CN)?	
Type of Customer	General Partnership
Full legal name of the applicant:	

Legal Name	WALLING & SON Corp., Limited Liability Company
Texas SOS Filing Number	800560241
Federal Tax ID	
State Franchise Tax ID	12040257052
State Sales Tax ID	
Local Tax ID	
DUNS Number	
Number of Employees	0-20
Independently Owned and Operated?	Yes
I certify that the full legal name of the entity applying for this permit has been provided and is legally authorized to do business in Texas.	Yes
Responsible Authority Contact	
Organization Name	WALLING & SON Corp., Limited Liability Company
Prefix	
First	Drew
Middle	
Last	Walling
Suffix	
Credentials	
Title	President
Responsible Authority Mailing Address	
Enter new address or copy one from list:	
Address Type	Domestic
Mailing Address (include Suite or Bldg. here, if applicable)	230 E KINGS RD
Routing (such as Mail Code, Dept., or Attn:)	
City	DOUBLE OAK
State	TX
ZIP	75077
Phone (###-###-####)	2147183739
Extension	
Alternate Phone (###-###-####)	
Fax (###-###-####)	
E-mail	walling.drew@gmail.com

Application Contact

Person TCEQ should contact for questions about this application:	
Same as another contact?	WALLING & SON Corp., Limited Liability Company
Organization Name	WALLING & SON Corp., Limited Liability Company

Prefix	
First	Drew
Middle	
Last	Walling
Suffix	
Credentials	
Title	Project Manager
Enter new address or copy one from list:	
Mailing Address	
Address Type	Domestic
Mailing Address (include Suite or Bldg. here, if applicable)	230 E KINGS RD
Routing (such as Mail Code, Dept., or Attn:)	
City	DOUBLE OAK
State	TX
ZIP	75077
Phone (###-###-####)	2147183739
Extension	
Alternate Phone (###-###-####)	
Fax (###-###-####)	
E-mail	walling.drew@gmail.com

CNOI General Characteristics

1) Is the project located on Indian Country Lands?	No
2) Is your construction activity associated with a facility that, when completed, would be associated with the exploration, development, or production of oil or gas or geothermal resources?	No
3) What is the Primary Standard Industrial Classification (SIC) Code that best describes the construction activity being conducted at the site?	1629
4) If applicable, what is the Secondary SIC Code(s)?	
5) What is the total number of acres disturbed?	7
6) Is the project site part of a larger common plan of development or sale?	No
7) What is the estimated start date of the project?	12/10/2018
8) What is the estimated end date of the project?	09/10/2019
9) Will concrete truck washout be performed at the site?	No
10) What is the name of the first water body(s) to receive the stormwater runoff or potential runoff from the site?	Timber Creek

11) What is the segment number(s) of the classified water body(s) that the discharge will eventually reach?	0822
12) Is the discharge into a Municipal Separate Storm Sewer System (MS4)?	Yes
12.1. What is the name of the MS4 Operator?	Double Oak & Denton County
13) Are any of the surface water bodies receiving discharges from the construction site on the 2014 Texas Integrated Report of Surface Water Quality?	No
14) Is the discharge or potential discharge within the Recharge Zone, Contributing Zone, or Contributing Zone within the Transition Zone of the Edwards Aquifer, as defined in 30 TAC Chapter 213?	No
15) I certify that a stormwater pollution prevention plan has been developed, will be implemented prior to construction, and to the best of my knowledge and belief is compliant with any applicable local sediment and erosion control plans, as required in the general permit TXR150000. Note: For multiple operators who operate under a shared SWP3, the confirmation of an operator may be limited to its obligations under the SWP3 provided all obligations are confirmed by at least one operator.	Yes
16) I certify that I have obtained a copy and understand the terms and conditions of the Construction General Permit (TXR150000).	Yes
17) I understand that a Notice of Termination (NOT) must be submitted when this authorization is no longer needed.	Yes

Certification

I certify that I am authorized under 30 Texas Administrative Code Subchapter 305.44 to sign this document and can provide documentation in proof of such authorization upon request.

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 gather and evaluate 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 there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

1. I am Drew Walling, the owner of the STEERS account ER062476.
2. I have the authority to sign this data on behalf of the applicant named above.
3. I have personally examined the foregoing and am familiar with its content and the content of any attachments, and based upon my personal knowledge and/or inquiry of any individual responsible for information contained herein, that this information is true, accurate, and complete.

4. I further certify that I have not violated any term in my TCEQ STEERS participation agreement and that I have no reason to believe that the confidentiality or use of my password has been compromised at any time.
5. I understand that use of my password constitutes an electronic signature legally equivalent to my written signature.
6. I also understand that the attestations of fact contained herein pertain to the implementation, oversight and enforcement of a state and/or federal environmental program and must be true and complete to the best of my knowledge.
7. I am aware that criminal penalties may be imposed for statements or omissions that I know or have reason to believe are untrue or misleading.
8. I am knowingly and intentionally signing Construction Notice of Intent.
9. My signature indicates that I am in agreement with the information on this form, and authorize its submittal to the TCEQ.

OPERATOR Signature: Drew Walling OPERATOR

Account Number:	ER062476
Signature IP Address:	47.185.178.215
Signature Date:	2018-12-14
Signature Hash:	D49FB05241753A2A658917D3DB2FF77C8E2ECE39E4C7D2FF3A9F8BDD4EC96175
Form Hash Code at time of Signature:	6FFA02031E27B5D964A07B8AAD82F10C4F70189CCFC09F0CB878B0CF1F9D2143

Fee Payment

Transaction by:	The application fee payment transaction was made by ER062476/Drew Walling
Paid by:	The application fee was paid by ANDREW WALLING
Fee Amount:	$225.00
Paid Date:	The application fee was paid on 2018-12-14
Transaction/Voucher number:	The transaction number is 582EA000324640 and the voucher number is 396425

Submission

Reference Number:	The application reference number is 265582
Submitted by:	The application was submitted by ER056499/Sophie Denny
Submitted Timestamp:	The application was submitted on 2018-12-14 at 10:25:01 CST
Submitted From:	The application was submitted from IP address 50.225.199.38
Confirmation Number:	The confirmation number is 232233

Steers Version:	The STEERS version is 6.23

Additional Information

Application Creator: This account was created by Sophie Denny

DOUBLE OAK

Stormwater Inspection Form

Type of Inspection:

☐ Illicit Discharge ☐ Construction Site ☐ Stormwater Outfalls/Dry Weather

☐ Stormwater Outfalls/Post Storm ☐ Municipal Operation

Report ID (Yr-ID#):		Date:		
Property Owner's Name:				
Address				
City:		State:	Zip	
Phone:		Cell Phone:	Fax:	
Community:		Watershed:		
Subwatershed:		Receiving Stream:		
Inspector's Name:				
Discharge Description:				
Corrective Actions:				
Conversation:				
Investigator 1:				
Investigator 2: (if applicable)				
Warning Citation Issued				
Citation Issued				
Citation Number: (if applicable)				
Signature(s):				
Additional Notes:				
Resolve Date:				
Files:				
Photo Locations:				

Double Oak

The best little town in North Texas!

Resident Feedback

We value the opinions of our residents!

Please use the form below to send us your compliments, criticisms, and comments.

**To reduce spam, email addresses are not provided on our website.*

* indicates required field

Select a contact:*

Select

Name:*

Email:*

Subject:*

Message:*

I'm not a robot

reCAPTCHA
Privacy - Terms

Submit

Water Use

Burn Ban

West Nile Virus (WNV)

Event Calendar

Like us? Follow us online!

CompliAssure™ Secured
CLICK TO VERIFY >
powered by Aperia Solutions

DOUBLE OAK

66°

few clouds
humidity: 52%
wind: 16mph N
H 73 • L 68

72° 73° 74°

TUE WED THU

Weather from OpenWeatherMap

©2019 Town of Double Oak. All Rights Reserved | Website by The Image Doctor

Stormwater Illicit Discharge Complaint Log							
Contact Information for Complainant		City Staff		Dates		Location of Illicit Discharge	Comments
Name	Phone Number	Received Call	Inspector	Received Call	Resolved		
Joe Smith	(555) 123-4567	Kate Brown	Charlie Wright	1/1/2017	1/1/2017	123 Main Street (near Gotcher Avenue)``	Oil Spill, See Storm Water Inspection Form, Report ID: 2016 01

DOUBLE OAK

Stormwater Inspection Form

Type of Inspection:

☐ Illicit Discharge ☐ Construction Site ☐ Stormwater Outfalls/Dry Weather

☐ Stormwater Outfalls/Post Storm ☒ Municipal Operation

Report ID (Yr-ID#):	2018-001	Date: 2018-07-03		
Property Owner's Name:	Town of Double Oak			
Address	320 Waketon Road			
City:	Double Oak	State: Texas	Zip	75077
Phone:	972-539-9464	Cell Phone:	Fax:	
Community:	Double Oak	Watershed:		
Subwatershed:		Receiving Stream:		
Inspector's Name:	Mike Donnelly			
Discharge Description:	No discharge found			
Corrective Actions:				
Conversation:				
Investigator 1:				
Investigator 2: (if applicable)				
Warning Citation Issued				
Citation Issued				
Citation Number: (if applicable)				
Signature(s):				
Additional Notes:				
Resolve Date:				
Files:				
Photo Locations:				