



© SHANNON PATRICK, FLICKR

GUIDANCE FOR ROADS, HIGHWAYS & BRIDGES

TEXAS COASTAL NONPOINT SOURCE POLLUTION PROGRAM

Document is available for download at www.txcoastalbmp.org.

June 20, 2019

PREPARED BY

Tom Hegemier, PE, D.WRE, CFM, Doucet and Associates, Inc.,
Austin, Texas

The Meadows Center for Water and the Environment at
Texas State, San Marcos, Texas

Michael Barrett, Ph.D., P.E, Austin, Texas

A publication funded in part by a Texas Coastal Management Program Grant/Cooperative Agreement from the National Oceanic And Atmospheric Administration (NOAA), the Texas General Land Office and the Texas Commission of Environmental Quality (TCEQ). The views expressed herein are those of the author(s) and do not necessarily reflect the views of NOAA or any of its sub-agencies.





CONTENTS

INTRODUCTION	6
.....	
A. PLANNING, SITING, & DEVELOPING ROADS & HIGHWAYS	10
.....	
B. BRIDGE PLANNING	12
.....	
C. CONSTRUCTION PROJECTS: SEDIMENT & EROSION CONTROL	13
.....	
D. POLLUTION PREVENTION MEASURES: CHEMICAL CONTROL	15
.....	
E. OPERATIONS & MAINTENANCE	18
.....	
F. RETROFIT PLANNING	20
.....	

INTRODUCTION

The purpose of this document is to provide suggested guidance to communities in the Texas Coastal Zone on the management of stormwater runoff from roads, highways, and bridges (e.g. non-MS4). There are separate regulatory programs for MS4s and CWA Section 404. Federal, state, and local regulatory requirements would still apply. This Manual was developed so that local communities could use sections of the Manual or use it as a wholesale approach.

Roads, highways, and bridges in the Texas Coastal Nonpoint Program Management Area (Management Area) are potential sources of nonpoint source pollutants. The Management Area is shown in Figure 1. To reduce the potential impact of construction, roadway siting, and operations and maintenance, the EPA encourages the State of Texas (the State) to plan, site, and develop roadways, highways, and bridges to:

1. Protect areas that provide important water quality benefits or are particularly susceptible to erosion or sediment loss;
2. Limit land disturbance such as clearing and grading and cut and fill to reduce erosion and sediment loss;
3. Limit disturbance of natural drainage feature and vegetation;
4. Site, design, and maintain bridge structures to protect sensitive and valuable aquatic ecosystems;
5. Reduce erosion and retain sediment onsite during construction based on an approved erosion control plan;
6. Limit the application, generation, and migration of toxic substances and ensure proper storage and disposal of toxic materials;
7. Include pollution prevention procedures into operation and maintenance activities, and
8. Implement management measures for existing roads, highways, and bridges including operations and maintenance.

Training, manuals, and guidance for road managers can be found at <http://txcoastalbmp.org/>.

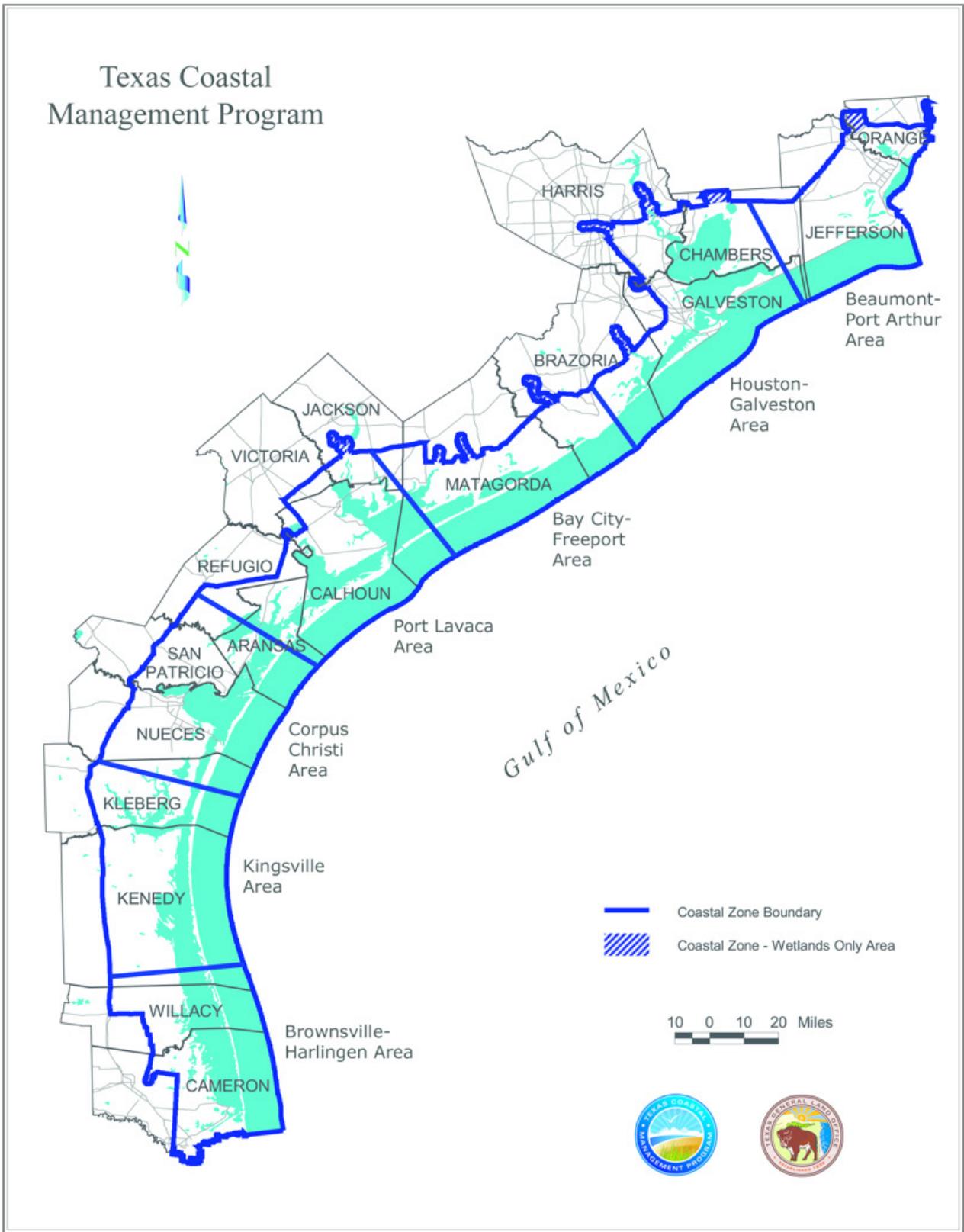


Figure 1: Section 6217 Texas Coastal Nonpoint Program Management Area.

Roads and bridges in Texas are generally designed, constructed, and maintained by either the Texas Department of Transportation (TxDOT) or by individual counties. "On-system" roads refer to roads administered by TxDOT, while "off-system" roads are those that are not administered by TxDOT; these are almost exclusively county roads.

TxDOT roads are designed, constructed, and maintained according to a set of standards which apply statewide <http://www.txdot.gov/business/resources/txdot-specifications.html>. These TxDOT standards are recognized by the Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) as being protective of water quality.

In addition, roads constructed as part of land development activities are addressed through the State's new development and site protection program. Consequently, this document presents just the program being implemented by the State to address potential impacts of off-system roadways and bridges constructed and maintained primarily by counties. It is important to note that off-system roadways in areas outside of MS4 permit areas and in counties that do not follow TxDOT standards constitute less than 7% of all roadways in the Management Area.

There are 12,790 miles of roadways in the Texas Management Area. Of these, only 3,263 miles of roads are considered off-system. Of these, 75% of off-system roads, or 93% of all roads in the Management Area, are either covered by an MS4 permit, use TxDOT standards, or managed by a county employee who has received TxDOT equivalent training. This is detailed in Table 1. The priority counties for outreach, based on miles of roadways and lack of TxDOT equivalent training/standards include just 6 of the 18 counties in the Management Area: Aransas, Calhoun, Jackson, Jefferson, Victoria, and Willacy.

Table 1: Miles of Roads in the 6217 Texas Management Area (MA).

County Name	Miles of Roads in MA	Miles of Off-system Roads in MA	Miles of Off-system roads that are NOT in MS4 areas in MA	Miles of Off-system roads in MA, but NOT in MS4 areas, and NOT TxDOT Standards or Training
Aransas	357	170	170	170
Brazoria	765	251	241	
Calhoun	465	221	221	221
Cameron	692	236	163	
Chambers	460	210	191	
Galveston	1,477	225	114	
Harris	2,874	176	39	
Jackson	159	104	104	104
Jefferson	1,401	235	194	194
Kenedy	46	5	5	
Kleberg	199	133	133	
Matagorda	427	271	271	
Nueces	1,743	316	309	
Orange	560	163	108	
Refugio	249	123	123	
San Patricio	718	295	294	
Victoria	43	28	28	28
Willacy	153	101	101	101
TOTAL	12,788	3,263	2,809	826
of CZMB roads that are off-system %				25.5%
off-system roads that are covered by an MS4 permit, use TxDOT stand-ards, or % provide TxDOT equivalent training				75%
% all CZMB roads that are covered by an MS4 permit use, TxDOT standards, or provide TxDOT equivalent training				93.5%

A. PLANNING, SITING, & DEVELOPING ROADS & HIGHWAYS

Purpose

Water quality enhancement and protection for existing and new roads.

Plan, site, and develop roads and highways to:

1. Protect areas that provide important water quality benefits or are particularly susceptible to erosion or sediment loss;
2. Limit land disturbance such as clearing and grading and cut and fill to reduce erosion and sediment loss; and
3. Limit disturbance of natural drainage features and vegetation.

Applicability

This measure is intended to be applied by the State to site development and land disturbing activities for new, relocated, and reconstructed (widened) roads (including residential streets) and highways in order to reduce the generation of nonpoint source pollutants and to mitigate the impacts of urban runoff and associated pollutants from such activities.

Practices

1. Consider type and location of permanent erosion and sediment controls (e.g., vegetated filter strips, grassed swales, pond systems, infiltration systems, constructed urban runoff wetlands, and energy dissipators and velocity controls) during the planning phase of roads, highway, and bridges.
2. All wetland impacts that are within the highway corridor and that cannot be avoided should be mitigated. These actions will be subject to Federal Clean Water Act section 404 requirements and State regulations.
3. Assess and establish adequate setback distances near wetlands, waterbodies, and riparian areas to ensure protection from encroachment in the vicinity of these areas. Setback distances should be determined on a site-specific basis since several variables may be involved such as topography, soils, floodplains, cut-and-fill slopes, and design geometry. In level or gently sloping terrain, a general rule of thumb is to establish a setback of 50 to 100 feet from the edge of the wetland or riparian area and the right-of-way. In areas of steeply sloping terrain (20 percent or greater), setbacks of 100 feet or more are recommended. Right-of-way setbacks from major waterbodies (oceans, lakes, estuaries, rivers) should be in excess of 100 to 1000 feet.
4. Avoid locations requiring excessive cut and fill.
5. Avoid locations subject to subsidence, sink holes, landslides, rock outcroppings, and highly erodible soils.
6. Size rights-of-way to include space for siting runoff pollution control structures as appropriate. Erosion and sediment control structures (extended detention dry ponds, permanent sediment traps, catchment basins, etc.) should be planned and located during the design phase and included as part of the design specifications to ensure that such structures, where needed, are provided within the highway right-of-way.

7. Plan residential roads and streets in accordance with local subdivision regulations, zoning ordinances, and other local site planning requirements (International City Managers Association, Model Zoning/Subdivision Codes). Residential road and street pavements should be designed with minimum widths.

Local roads and streets should have right-of-way widths of 36 to 50 feet, with lane widths of 10 to 12 feet. Minimum pavement widths for residential streets where street parking is permitted range from 24 to 28 feet between curbs. In large-lot subdivisions (1 acre or more), grassed drainage swales can be used in lieu of curbs and gutters and the width of paved road surface can be between 18 and 20 feet.

8. Select the most economic and environmentally sound route location.
9. Use appropriate computer models and methods to determine urban runoff impacts with all proposed route corridors.

Computer models to determine urban runoff from streets and highways include TR-55 (Soil Conservation Service model for controlling peak runoff); HEC-HMS, and the Rational Method; the FHWA highway runoff model; and others (e.g., SWMM, EPA's stormwater management model; HSP continuous simulation model by Hydrocomp, Inc.).

10. Comply with National Environmental Policy Act requirements including other State and local requirements.
11. Coordinate the design of pollution controls with appropriate State and Federal environmental agencies.

Official mapping can be used to reserve land areas needed for public facilities such as roads, highways, bridges, and urban runoff treatment devices. Areas that require protection, such as those which are sensitive to disturbance or development-related nonpoint source pollution, can be reserved by planning and mapping necessary infrastructure for location in suitable areas.

B. BRIDGE PLANNING

Purpose

Site, design, and maintain bridge structures so that sensitive and valuable aquatic ecosystems and areas providing important water quality benefits are protected from adverse effects.

Applicability

This management measure is intended to be applied by States to new, relocated, and rehabilitated bridge structures in order to control erosion, streambed scouring, and surface runoff from such activities.

Practices

1. Coordinate design with FHWA, USCG, COE, and other State and Federal agencies as appropriate.
2. Review National Environmental Policy Act requirements to ensure that environmental concerns are met.
3. Avoid highway locations requiring numerous river crossings.
4. Direct pollutant loadings away from bridge decks by diverting runoff waters to land for treatment.

Bridge decks should be designed to keep runoff velocities low and control pollutant loadings. Runoff waters should be conveyed away from contact with the watercourse and directed to a stable storm drainage, wetland, or detention pond. Conveyance systems should be designed to withstand the velocities of projected peak discharge.

5. Restrict the use of scupper drains on bridges less than 400 feet in length and on bridges crossing very sensitive ecosystems.

Scupper drains allow direct discharge of runoff into surface waters below the bridge deck. Such discharges can be of concern where the waterbody is highly susceptible to degradation or is an outstanding resource such as a spawning area or shellfish bed. Other sensitive waters include water supply sources, recreational waters, and irrigation systems. Care should be taken to protect these areas from contaminated runoff.

6. Site and design new bridges to avoid sensitive ecosystems.
Pristine waters and sensitive ecosystems should be protected from degradation as much as possible. Bridge structures should be located in alternative areas where only minimal environmental damage would result.
7. On bridges with scupper drains, provide equivalent urban runoff treatment in terms of pollutant load reduction elsewhere on the project to compensate for the loading discharged off the bridge.

C. CONSTRUCTION PROJECTS: SEDIMENT & EROSION CONTROL

Purpose

1. Reduce erosion and, to the extent practicable, retain sedimentation onsite during and after construction and
2. Prior to land disturbance, prepare and implement an approved erosion control plan or similar administrative document that contains erosion and sediment control provisions. Depending upon the amount of acres to be disturbed by construction, the erosion control plan should be based on the TCEQ Construction General Permit TXR150000 that includes guidance on the preparation of a Stormwater Pollution Prevention Plan (SWPPP).

Applicability

This management measure is intended to be applied by the State to new, replaced, restored, and rehabilitated road, highway, and bridge construction projects in order to control erosion and offsite movement of sediment from such project sites.

Practices

1. Write erosion and sediment control requirements into plans, specifications, and estimates for Federal aid construction projects for highways and bridges and develop erosion control plans for earth-disturbing activities.

Erosion and sediment control decisions made during the planning and location phase should be written into the contract, plans, specifications, and special provisions provided to the construction contractor. This approach can establish contractor responsibility to carry out the explicit contract plan recommendations for the project and the erosion control practices needed.

2. Coordinate erosion and sediment controls planning and scheduling with FHWA, AASHTO, and State guidelines.

Coordination and scheduling of the project work with State and local authorities are major considerations in controlling anticipated erosion and sediment problems. In addition, the contractor should submit a general work schedule and plan that indicates planned implementation of temporary and permanent erosion control practices, including shutdown procedures for winter and other work interruptions. The plan also should include proposed methods of control on restoring borrow pits and the disposal of waste and hazardous materials.

3. Coordinate erosion and sediment controls stabilization practices with FHWA, AASHTO, and State guidelines.

Permanent or temporary soil stabilization practices should be applied to cleared areas within 15 days after final grade is reached on any portion of the site. Soil stabilization should also be applied within 15 days to denuded areas that may not be at final grade but will remain exposed to rain for 30 days or more. Soil stabilization practices protect soil from the erosive forces of raindrop impact and flowing water. Temporary erosion control practices usually include seeding, mulching, establishing general vegetation, and early application of a gravel base on areas to be paved. Permanent soil stabilization practices include vegetation, filter strips, and structural devices.

Sediment basins and traps, perimeter dikes, sediment barriers, and other practices intended to

trap sediment on site should be constructed as a first step in grading and should be functional before upslope land disturbance takes place. Structural practices such as earthen dams, dikes, and diversions should be seeded and mulched within 15 days of installation.

4. Coordinate temporary erosion and sediment control structures with permanent practices.
All temporary erosion and sediment controls should be removed and disposed of within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed. Trapped sediment and other disturbed soil areas resulting from the disposition of temporary controls should be permanently stabilized to prevent further erosion and sedimentation.
5. Wash all vehicles prior to leaving the construction site to remove mud and other deposits. Vehicles entering or leaving the site with trash or other loose materials should be covered to prevent transport of dust, dirt, and debris. Install and maintain mud and silt traps
6. Mitigate wetland areas destroyed during construction.
Marshes and some types of wetlands can often be developed in areas where fill material was extracted or in ponds designed for sediment control during construction. Vegetated strips of native marsh grasses established along highway embankments near wetlands or riparian areas can be effective to protect these areas from erosion and sedimentation.
7. Minimize the area that is cleared for construction.
8. Construct cut-and-fill slopes in a manner that will minimize erosion.
Cut-and-fill slopes should be constructed in a manner that will minimize erosion by taking into consideration the length and steepness of slopes, soil types, upslope drainage areas, and ground-water conditions. Suggested recommendations are as follows: reduce the length of long steep slopes by adding diversions or terraces; prevent concentrated runoff from flowing down cut-and-fill slopes by containing these flows within flumes or slope drain structures; and create roughened soil surfaces on cut-and-fill slopes to slow runoff flows. Wherever a slope face crosses a water seepage plane, thereby endangering the stability of the slope, adequate subsurface drainage should be provided.
9. Minimize runoff entering and leaving the site through perimeter and onsite sediment controls.
10. Inspect and maintain erosion and sediment control practices (both on-site and perimeter) until disturbed areas are permanently stabilized.
11. Divert and convey offsite runoff around disturbed soils and steep slopes to stable areas in order to prevent transport of pollutants off site.
12. After construction, remove temporary control structures and restore the affected area. Dispose of sediments in accordance with State and Federal regulations.
13. All storm drain inlets that are made operable during construction should be protected so that sediment-laden water will not enter the conveyance system without first being filtered or otherwise treated to remove sediment.

D. POLLUTION PREVENTION MEASURES: CHEMICAL CONTROL

Purpose

1. Limit the application, generation, and migration of toxic substances,
2. Ensure the proper storage and disposal of toxic materials; and
3. Apply nutrients at rates necessary to establish and maintain vegetation without causing significant nutrient runoff to surface water.

Applicability

This management measure is intended to be applied by States to new, resurfaced, restored, and rehabilitated road, highway, and bridge construction projects in order to reduce toxic and nutrient loadings from such project sites.

Practices

1. Properly store, handle, apply, and dispose of pesticides.

Pesticide storage areas on construction sites should be protected from the elements. Warning signs should be placed in areas recently sprayed or treated. Persons mixing and applying these chemicals should wear suitable protective clothing, in accordance with the law.

Application rates should conform to registered label directions. Disposal of excess pesticides and pesticide-related wastes should conform to registered label directions for the disposal and storage of pesticides and pesticide containers set forth in applicable Federal, State, and local regulations that govern their usage, handling, storage, and disposal. Pesticides and herbicides should be used only in conjunction with Integrated Pest Management (IPM). Pesticides should be the tool of last resort; methods that are the least disruptive to the environment and human health should be used first.

Pesticides should be disposed of through either a licensed waste management firm or a treatment, storage, and disposal (TSD) facility. Containers should be triple-rinsed before disposal, and rinse waters should be reused as product.

Other practices include setting aside a locked storage area, tightly closing lids, storing in a cool, dry place, checking containers periodically for leaks or deterioration, maintaining a list of products in storage, using plastic sheeting to line the storage area, and notifying neighboring property owners prior to spraying.

2. Properly store, handle, use, and dispose of petroleum products.

When storing petroleum products, follow these guidelines:

- Create a shelter around the area with cover and wind protection;
- Line the storage area with a double layer of plastic sheeting or similar material;
- Create an impervious berm around the perimeter with a capacity 110 percent greater than that of the largest container;
- Clearly label all products;
- Keep tanks off the ground; and
- Keep lids securely fastened.

Oil and oily wastes such as crankcase oil, cans, rags, and paper dropped into oils and lubricants should be disposed of in proper receptacles or recycled. Waste oil for recycling should not be mixed with degreasers, solvents, antifreeze, or brake fluid.

3. Establish fuel and vehicle maintenance staging areas located away from all drainage course and design these areas to control runoff.

Proper maintenance of equipment and installation of proper stream crossings will further reduce pollution of water by these sources. Stream crossings should be minimized through proper planning of access roads.

4. Provide sanitary facilities for construction workers.
5. Store, cover, and isolate construction materials, including topsoil and chemicals, to prevent runoff of pollutants and contamination of ground water.
6. Develop and implement a spill prevention and control plan. Agencies, contractors, and other commercial entities that store, handle, or transport fuel, oil, or hazardous materials should develop a spill response plan.

Post spill procedure information and have persons trained in spill handling on site or on call at all times. Materials for cleaning up spills should be kept on site and easily available. Spills should be cleaned up immediately and the contaminated material properly disposed of. Spill control plan components should include:

- Stop the source of the spill.
- Contain any liquid.
- Cover the spill with absorbent material such as kitty litter or sawdust, but do not use straw. Dispose of the used absorbent properly.

7. Maintain and wash equipment and machinery in confined areas specifically designed to control runoff.

Thinners or solvents should not be discharged into sanitary or storm sewer systems when cleaning machinery. Use alternative methods for cleaning larger equipment parts, such as high-pressure, high-temperature water washes, or steam cleaning. Equipment-washing detergents can be used, and wash water may be discharged into sanitary sewers if solids are removed from the solution first. (This practice should be verified with the local sewer authority.) Small parts can be cleaned with degreasing solvents, which can then be reused or recycled. Do not discharge any solvents into sewers.

Washout from concrete trucks should be disposed of into:

- A designated area that will later be backfilled;
- An area where the concrete wash can harden, can be broken up, and then can be placed in a dumpster; or
- A location not subject to urban runoff and more than 50 feet away from a storm drain, open ditch, or surface water.

Never dump washout into a sanitary sewer or storm drain, or onto soil or pavement that carries urban runoff.

8. Develop and implement nutrient management plans.

Properly time applications, and work fertilizers and liming materials into the soil to depths of 4 to 6 inches. Using soil tests to determine specific nutrient needs at the site can greatly decrease the amount of nutrients applied.

9. Provide adequate disposal facilities for solid waste, including excess asphalt, produced during construction.

10. Educate construction workers about proper materials handling and spill response procedures. Distribute or post informational material regarding chemical control.

E. OPERATIONS & MAINTENANCE

Purpose

Incorporate pollution prevention procedures into the operation and maintenance of roads, highways, and bridges to reduce pollutant loadings to surface waters.

Applicability

This management measure is intended to be applied by States to existing, restored, and rehabilitated roads, highways, and bridges.

Practices

1. Seed and fertilize, seed and mulch, and/or sod damaged vegetated areas and slopes.
2. Establish pesticide/herbicide use and nutrient management programs.
Refer to the Management Measure for Construction Site Chemical Control.
3. Restrict herbicide and pesticide use in highway rights-of-way to applicators certified under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) to ensure safe and effective application.
4. The use of chemicals such as soil stabilizers, dust palliatives, sterilants, and growth inhibitors should be limited to the best estimate of optimum application rates. All feasible measures should be taken to avoid excess application and consequent intrusion of such chemicals into surface runoff.
5. Sweep, vacuum, and wash residential/urban streets and parking lots.
6. Collect and remove road debris.
7. Cover salt storage piles and other deicing materials to reduce contamination of surface waters. Locate them outside the 100-year floodplain.
8. Regulate the application of deicing salts to prevent over-salting of pavement.
9. Use specially equipped salt application trucks.
10. Use alternative deicing materials, such as sand or salt substitutes, where sensitive ecosystems should be protected.
11. Prevent dumping of accumulated snow into surface waters.
12. Maintain retaining walls and pavements to minimize cracks and leakage.
13. Repair potholes.
14. Encourage litter and debris control management.
15. Develop an inspection program to ensure that general maintenance is performed on urban runoff and NPS pollution control facilities.
16. To be effective, erosion and sediment control devices and practices must receive thorough and periodic inspection checks. The following is a suggested checklist for the inspection of erosion and sediment controls:
 - Clean out sediment basins and traps; ensure that structures are stable.
 - Inspect silt fences and replace deteriorated fabrics and wire connections; properly dispose of deteriorated materials.
 - Renew riprapped areas and reapply supplemental rock as necessary.
 - Repair/replace check dams and brush barriers; replace or stabilize straw bales as needed.
 - Regrade and shape berms and drainage ditches to ensure that runoff is properly channeled.
 - Apply seed and mulch where bare spots appear and replace matting material if deteriorated.
 - Ensure that culverts and inlets are protected from siltation.
 - Inspect all permanent erosion and sediment controls on a scheduled, programmed basis.

17. Ensure that energy dissipators and velocity controls to minimize runoff velocity and erosion are maintained.
18. Dispose of accumulated sediment collected from urban runoff management and pollution control facilities, and any wastes generated during maintenance operations, in accordance with appropriate local, State, and Federal regulations.
19. Use techniques such as suspended tarps, vacuums, or booms to reduce, to the extent practicable, the delivery to surface waters of pollutants used or generated during bridge maintenance (e.g., paint, solvents, scrapings).
20. Develop education programs to promote the practices listed above.

F. RETROFIT PLANNING

Purpose

Develop and implement runoff management systems for existing roads, highways, and bridges to reduce runoff pollutant concentrations and volumes entering surface waters. See the “Guidance for Sustainable Drainage on the Texas Coast”, guidance manual, for input on the retrofit selection and design process that outline how an entity would evaluate and implement sustainable drainage practices to improve runoff quality.

1. Identify priority and watershed pollutant reduction opportunities (e.g., improvements to existing urban runoff control structures; and
2. Establish schedules for implementing appropriate controls.

Applicability

This management measure is intended to be applied by States to existing, resurfaced, restored, and rehabilitated roads, highways, and bridges that contribute to adverse effects in surface waters.

Practices

1. Locate runoff treatment facilities within existing rights-of-way or in medians and interchange loops.
2. Develop multiple-use treatment facilities on adjacent lands (e.g. parks and golf courses).
3. Acquire additional land for locating treatment facilities.
4. Maximize the length and width of vegetated filter strips to slow the travel time of sheet flow and increase the infiltration rate of urban runoff.



