Stormwater Potential Pollutants

Environmental Compliance

Understanding Potential Pollutants and Pollution Sources at Construction Sites

Environmental Affairs Division
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Potential Stormwater Pollutants

Stormwater

What is it?

Stormwater runoff is created when water from rain events or snow melt flows over land or impervious surfaces (paved streets, parking lots, rooftops, etc.) and does not seep into the ground. It eventually ends up in a storm drain or other bodies of water.

Why do we care?

Runoff flowing over TxDOT construction sites can pick up pollutants such as debris, chemicals, sediment, trash and other contaminants.

Without proper best management practices (BMPs), these pollutants can end up in ponds, creeks, streams, rivers, lakes and other water bodies. Pollutants negatively impact water quality and the health of people and organisms that use that water.

Pollutants

Construction site activities are regulated by the Texas Commission on Environmental Quality (TCEQ) Construction General Permit (CGP) and other environmental permits in order to control and prevent pollution from construction projects.

Some common stormwater pollutants encountered on construction sites include:

- Sediment [page 4]
- Nutrients (phosphorus, nitrogen) [page 11]
- Pathogens (bacteria) [page 11]
- Hydrocarbons (petroleum compounds) [page 13]
- Chemicals [page 13]
- Debris/litter [page 15]
- pH (acids & bases) [page 17]

Each pollutant requires Best Management Practices (BMPs) to prevent it from discharging into waterways.

A BMP is:

- A practice that has been determined to be an effective and practicable means of preventing or reducing the amount of pollution generated by nonpoint sources (like construction sites) to a level compatible with water quality goals set forth by the TCEQ, TxDOT, and/or the EPA.
- BMPs can be structural (silt fences, sedimentation ponds, drainage inlet protection) or non-structural (phased construction, picking up trash/debris, good housekeeping, sweeping pavement, maintaining equipment, training site staff).

Sediment

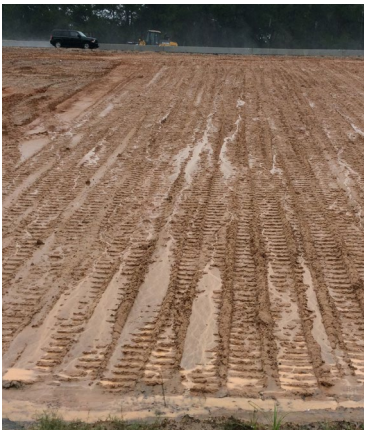
The primary stormwater pollutant at a construction site is sediment. It can impact the health of ecosystems and damage resources.

Sediment is particles of dirt, soil, broken down rock or other materials. Erosion, or the process of wearing away earth by wind, water or rain can carry sediment into water bodies.

Preventing pollution from sediment involves controlling the erosion process and preventing sediment from leaving the construction site by using erosion control BMPs and sediment control BMPs.

General Sources

- Construction sites
- Eroding streambanks and lakeshores
- Winter sand application
- Vehicle and equipment washing
- Urban runoff



Impacts

- Destruction of fish and other aquatic life habitat
- Damage to property and infrastructure
- Reducing oxygen in a waterbody
- Increased water temperature
- Changes in streambed characteristics that can lead to erosion and flooding
- Transportation of attached oils, nutrients and other pollutants

Erosion Control BMPs

- Rock filter dams and rock check dams
- Vertical tracking
- Inteceptor swale
- Riprap
- Diversion dike
- Temporary pipe slope drain
- Embankment for Erosion Control
- Paved flumes
- Protection of existing vegetation
- Vegetated buffer zones
- Soil retention blankets
- Geotextiles
- Mulching and hydro-mulching
- Temporary seeding
- Permanent planting, sodding or seeding
- Biodegradable erosion control logs

Sediment Control BMPs

- Biodegradable erosion control logs
- Dewatering controls
- Inlet protection
- Rock filter dams and rock check dams
- Sandbag berms
- Sediment control fence (silt fence)
- Stabilized construction exit
- Floating turbidity barrier
- Vegetated buffer zone
- Vegetated filter strip

The following pages show some common examples of BMPs for sediment pollution found on TxDOT projects.

BMP – Vegetation

Vegetation reduces the potential for erosion by providing cover to soil which promotes infiltration (water soaking in). Plant roots also hold soil in place. TxDOT has seeding specifications for temporary and permanent vegetation to be established on the roadside to prevent erosion. Use additional BMPs (e.g. soil retention blankets or erosion control blankets) when slopes are steep. Phase vegetation clearing so it makes sense with the construction activities and other environmental commitments. Avoid stripping the entire site at once. Avoid clearing natural vegetation unnecessarily.

Properly installed vegetation – root system is well established.

Failing BMP – stormwater is causing the formation of gullies because vegetation stabilization measures were not properly implemented. Stabilize with bonded fiber matrix or erosion control blankets.

BMP – Mulching

Similar to vegetation, mulch provides a protective cover to bare soil by protecting it from direct rainfall. However, loose mulch can be easily washed away in larger rain events. Mulch can be made from compost mixtures, straw, wood chips or other organic materials. Ensure mulch does not introduce invasive species.

Properly laid mulch – uniform layer with appropriate depth.

Failing BMP – mulch is generally not appropriate in areas of concentrated flow. Mulch needs to be appliled regularly in high traffic areas and should be applied evenly and uniformly and at an appropriate thickness.

BMP – Rock Filter Dams and Rock Check Dams

Rock filter dams are barriers that reduce the velocity of concentrated flows, provide temporary trapping for sediment and reduce the potential for erosion of the swale or ditch. They're most commonly used across small channels and in areas of concentrated flow (like drainage ditches). They are composed of rock and sometimes secured by mesh (depending on the type used, based on the plans). Rock filter dams are often used in a check dam configuration where a series of rock filter dams are placed across a drainage area, such as a ditch or small tributary. Rock filter dams may also be used in series with other BMPs such as silt fence or erosion control logs.

Properly installed check dam using a rock filter dam.

Failing BMP – dam is filled to capacity and in need of maintenance. The check dam should cover the entire length of the drainage. Silt and debris should be removed from the dam on a regular basis.

BMP – Soil Retention Blankets

Soil retention blankets (SRBs) are manufactured mats made of woven, degradable materials. SRBs work in a similar way to mulch and vegetation by protecting the bare soil from the effects of rainfall. All SRBs must be selected from the TxDOT Approved Products List (APL) based on slopes and soil characteristics. There are two main types of SRBs: Class 1 - Slope Protection and Class 2 - Flexible Channel Liners.

Properly installed blankets – installed below the pavement edge and covers entire area.

Failing BMP – blanket has begun to degrade and is pulling off of the soil. Replace or re-anchor loosened blankets.

BMP – Biodegradable Erosion Control Logs

Biodegradable erosion control logs are composed of an outer mesh made of burlap, twine or other similar material, and filled with compost, mulch, aspen, excelsior wood fibers, straw or coconut fibers. They are sometimes referred to as organic filter tubes, wattles, mulch socks or other terms. Similar to rock filter dams and rock check dams, the can act as erosion control devices by slowing flowing water, or as sediment control devices on the downstream perimeters of the project area.

Properly installed erosion control logs – stakes are secure, and logs are overlapping.

Failing BMP – ineffective log needs to be overlapping and anchored. Make sure the tube diameter and embedment in soil meets size specified on plans.

BMP – Inlet Protection

Inlet protection devices control the discharge of sediment to storm sewer systems by trapping or filtering sediment from stormwater. They can be made of silt fence, biodegradable erosion control logs or manufactured products.

Properly installed inlet protection - fabric properly toed in, stakes are secure, adequate overlapping of fabric.

Failing BMP - inlet device has not been properly maintained. It is overwhelmed by sediment and is collapsing.

BMP – Stabilized Construction Exits

Stabilized construction exits are constructed from crushed aggregate, plywood, wafer board, railroad ties, timber, or manufactured products. They prevent tracking of sediment and mud from construction sites by equipment and vehicles exiting the site.

Properly installed construction exit using crushed aggregate. Aggregate is well maintained and in good condition.

Failing BMP - stabilized construction exit was not installed prior to allowing vehicles to exit site at this location leading to offsite vehicle tracking.

BMP – Stockpile Management

Stockpiles need to be managed appropriately to prevent them from polluting stormwater runoff with soils or other erodible materials that are stored on site. Avoid placing stockpiles near sensitive environmental features, like water bodies, within drainage ways, like ditches, and near manmade storm drains and inlets. Stockpiles should be situated in areas where they won't be impacted by concentrated flow and should avoid being placed in areas that could flood and wash them away.

Properly managed stockpile – pile is covered and secured.

Pile is improperly placed and no management is occurring – there is a risk of sediment discharging into the inlet. A cover should be placed over the stockpile and secured. Use secondary BMPs to prevent sediment discharging into the inlet.

BMP – Silt Fence

Silt fences is made of geotextile fabric supported by backing stretched between metal posts. The lower edge of the fabric needs to be secured six inches into the soil. Silt fences are usually located downstream of disturbed areas to intercept runoff in the form of sheet flow.

Properly installed silt fence – fabric is embedded into soil .

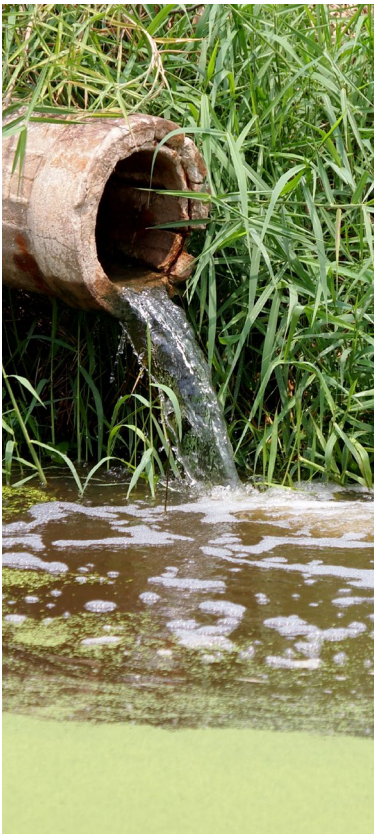
Failing BMP – fabric should be embedded six inches in the soil. Wire mesh backing to reinforce the silt fence should also be used with the metal posts. Remove sediment before it reaches half the height of the fence.

Nutrients and Pathogens

Nutrients include phosphorus and nitrogen. Pathogens refer to bacteria that can cause disease. Sources of nutrients and pathogens can be the same. Therefore, BMPs for nutrients are similar to those of pathogens.

General Sources

- Fertilizer
- Leaking trash containers
- Leaking sewer lines
- Sewer overflows
- Malfunctioning septic systems
- Livestock, bird, and pet waste
- Gray water – relatively clean wastewater generated from bath, sinks, washing machines, etc.



Impacts – Nutrients

- Increased potential for toxic algal blooms
- Increased potential for hypoxia/anoxia – low levels of dissolved oxygen which can kill aquatic organisms

Impacts – Pathogens

- Risk to human health
- Leads to closures of swimming areas
- Drinking water contamination – public health risk

General BMPs for Nutrients and Pathogens

- Conduct regular inspection and cleaning of permanent, structural BMPs to keep them functioning properly.
- Regularly sweep roads and parking lots high in sediment to remove solids on which phosphorus may be attached.
- Do not over apply fertilizer and irrigate with the minimal amount of water needed.
- Avoid drawing wildlife and stray animals to the construction site by practicing good housekeeping.

Remove sediment from road.

Avoid attracting wildlife and stray animals to the job site by managing housekeeping properly.

BMP – Portable Toilets

- Locate portable toilets away from streets or drainage ways
- Use a drip pan if necessary
- Anchor portable toilets to avoid wind from blowing them over
- Do not place portable toilets near sensitive resources like waterbodies. Avoid placing them on or near slopes

Properly anchored portable toilet in safe, flat location away from storm sewers and drainages.

Portable toilet was improperly anchored and has fallen over. Ensure any spills of waste and chemicals are properly addressed.

Hydrocarbons and Chemicals

Hydrocarbons refer to petroleum compounds and fuels.

Spills from hydrocarbons and chemicals can be very costly to clean up and can delay work. Regulatory agencies can issue violations and fines for hydrocarbon and chemical spills.

General Sources – Hydrocarbons

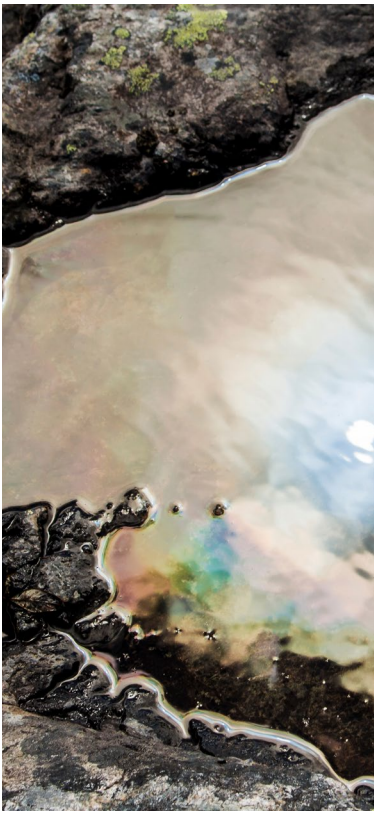
- Vehicle and equipment leaks
- Vehicle and equipment emissions
- Fuel spills
- Improper fuel and oil storage and disposal
- Equipment cleaning

General Sources – Toxic Chemicals

- Pesticides
- Polychlorinated biphenyls (PCBs)
- Other common chemicals used in construction

Impacts

- Harm human and aquatic life when not properly managed
- Can be difficult to clean up once they are in the water



BMPs - Hydrocarbon and Chemical Storage

- Use secondary containment.
- Make sure containers have properly fitted lids.
- Label containers.
- Always conduct vehicle washing in a designated wash bay/area away from waterways.
- If possible, store materials under a cover.
- Use a drip pan when fueling or transporting oils/fuels.

Proper use of secondary containment.

Drums need lids and labels. Storage of hazardous materials should be indoors or in a covered area. Hazardous materials stored onsite should be minimized.

BMPs – Spills

- If fluids spill on an impervious surface, dike or berm the nearest down-gradient storm drain.
- Always use dry cleanup methods. NEVER hose down a spill.
- Report spills in accordance with TxDOT policy and TCEQ requirements.
- Spill reporting hotline number: 1-800-832-8224

Proper implementation of dry cleanup methods using absorbents.

An obvious leak has not been addressed – clean up should already be in place. Always address spills as soon as possible. Drip pans can be placed under the vehicle overnight while parked as a secondary containment.

Debris/Litter

Debris and litter are waste from the construction process. Debris can be leftover, unused or scrap material from demolition activities or construction activities. Litter can generated by the contractors, and includes trash like water bottles and lunch trash that end up on the site. Debris and litter can end up in water bodies when not properly managed.

Sources

- Improper waste disposal and storage
- Uncovered trash containers
- Leaking trash containers
- Cigarette butts
- Littering/ trash from lunches and breaks

Impacts

- Potential risk to human and aquatic life
- Aesthetically displeasing
- Can affect neighboring properties

BMPs for Preventing Debris/Litter

- Always keep trash container lids closed when not in use.
- All waste receptacles should be leak-tight with tight-fitting lids or covers.
- Never place liquids or liquid-containing wastes in a dumpster or trash receptacle.
- Do not place waste receptacles near storm drains or ditches unless at a lower elevation.
- When possible, place waste receptacles under covered areas
- Arrange for regular pick-up of wastes. Do not let waste accumulation get out of hand.
- Do not wash out waste containers or dumpsters outdoors.

Dumpster needs a cover and is overflowing. The receptacle should be emptied and materials should be recycled where possible. Additional dumpsters may be required to prevent overflow.

Disposal receptacles and education about proper use need to be provided. The proper number of trash receptacles should be placed throughout the construction site. Trash receptacles should be emptied on a regular basis.

pH (Acids & Bases)

pH is how acidic or basic a liquid is which, in this case, refers to stormwater and runoff from the construction site. When something is acidic it has a low pH. When something is basic it has a high pH.

Concrete spillage or concrete discharge to surface waters of the state is prohibited. Concrete should never be washed out onto the ground without proper containment or onto streets. This is because concrete can change the pH of the water and the soil.

Sources

- Concrete slurry from sawcutting and surfacing
- Concrete truck washouts
- Other construction activities involving concrete

Impacts

- Violates water quality standards in receiving waters
- Damages stream habitats
- Kills aquatic wildlife; certain organisms can only thrive when water is within a specific pH range
- Can damage soil and make it hard to vegetate an area

BMP – Sawcutting

- Vacuum slurry and cuttings during cutting and surface operations.
- Slurry and cuttings should NOT remain on permanent concrete/ asphalt overnight.
- Slurry and cuttings should NOT drain to any natural or constructed drainage conveyance.
- Properly dispose of waste in a manner that does not violate water quality standards.
- Do not allow process water to drain to any natural or constructed drainage conveyance.

Ensure slurry from saw cutting activities does not run off site.

BMPs don't address potential pollutants from slurry tank; secondary containment is needed. The silt fence is for sediment and will not protect against slurry that can leach out of the tank. Any spills from the slurry tank should be addressed and the tank should be located away from waterways.

BMP – Concrete Washouts

- If concrete washout areas must be on-site, designate them at least 50-feet away from storm drains and waterways. Do not situate in drainages or ditches.
- Make sure washouts are performed only at this location.
- If possible, a below grade washout area is preferred as there is a lower chance of spills.
- Line the washout area with impermeable plastic sheeting.

Designated washout area is fully contained.

Washout area does not have proper containment which led to washout on the road. Post signs clearly labeling the washout location. BMPs surrounding the area should be maintained and managed and BMPs to prevent offsite tracking and runoff should be in place.

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Sources

Additional, more in depth information on each of the BMPs described in this guidebook can be found on TxDOT's Construction Best Management Practice's website: https://www.txdot.gov/business/resources/environmental/stormwater.html

https://www.txdot.gov/business/resources/txdot-specifications.html

https://environment.transportation.org/resources/aashto-publications/construction-stormwater-field-guide/

https://www3.epa.gov/npdes/pubs/sw_swppp_guide.pdf

https://www.epa.gov/npdes/stormwater-discharges-construction-activities

https://www.tceq.texas.gov/permitting/stormwater/construction

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