



Kansas LTAP Fact Sheet

A Service of The University of Kansas Transportation Center for Road, Street & Bridge Agencies

Erosion Control During Construction on Local Roads

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Introduction

Erosion caused by construction activities can result in unnecessary maintenance and repairs that can cause cost overruns and schedule drag. It can also impact waterways by depositing sediment and reducing or changing their flow.

This fact sheet will define erosion, identify the factors that cause erosion during construction, describe the regulation and permitting required for conducting construction activities, provide an overview of a Stormwater Pollution Prevention Plan, and conclude with best practices in erosion control during construction.

What Causes Erosion during Construction?

The nature of construction activities enhances the likelihood that stormwater, wind, or gravity will cause sediment and other contaminants to enter protected waterways. There are five different types of erosion that occur during construction. (Erosion Prevention Practices - Temporary Seeding and Stabilization, 2019)

1) Raindrop Splash

This process is initiated by rain events and specifically by raindrop impacts. The energy created when raindrops hit the soil causes soil particles to be dislodged or detached. Rainfall not only causes erosion, but can change the structure of soil, causing compaction. Compaction separates organic matter in the soil from heavier soil particles. This increases runoff and inhibits plant growth. Stabilization is recommended to reduce the impacts of raindrop splash.

What is Erosion?

Erosion is defined as the detachment of soil particles by some force. This force may be rainfall, wind or gravity. It is a naturally occurring process but is accelerated by human activities. (Brain C Roberts, June 1995)

What is Stabilization?

Stabilization includes numerous erosion prevention practices that cover exposed soil. Cover materials can include straw, mulch, erosion control blankets, plastic sheeting, tarpaulins, or temporary seeding. (Erosion Prevention Practices - Temporary Seeding and Stabilization, 2019)

2) Sheet Erosion

This process occurs when soil erodes from sloping areas in thin layers or sheets. Generally, soil is loosened by a rain activity prior to sheet erosion. Sheet erosion is of concern in construction locations where there are cuts and fills. Stabilization is important to reducing sheet erosion, but it is even more important to divert the flow of water away from the slope.

3) Rill Erosion

This process occurs when soil erosion sheet flow is concentrated into small, defined channels. Rilling is a common occurrence on construction slopes and should be prevented by slope stabilization and diversion. If riling occurs, it can be repaired by tilling the soil. Repair and stabilize any rills immediately so that gullies do not form.

4) Gully Erosion

This process occurs when the concentrated flow of erosion is greater than with a rill. Generally, this occurs when a rill hasn't been repaired. Repairing a gully is extremely costly and may require extensive earthwork.

5) Channel Erosion

The four previously mentioned erosion types are focused around rainfall and gravity. Channel erosion is focused on stream channels or stream modifications. Channel erosion can include toe undercutting, bank erosion, bank sloughing, flow slides, and piping. When working in or adjacent to streams, design of a special erosion control strategy is essential, as any runoff can impact the flow of the channel.

Other Erosion Factors

The extent to which erosion will impact a project is based on climate, soil, topography and vegetative cover. (Brain C Roberts, June 1995)

1) Climate

Rainfall consistency, intensity and duration have a direct impact on the level of erosion generated. Intense rainfalls, even if only over a short period of time, will have a greater erosion impact than less intense rainfalls. The construction site should be prepared based on average precipitation and, if possible, earthwork should be avoided during times of the year when heavy rainfall is expected.

2) Soil

The likelihood that a soil will erode is dependent on many factors. The Natural Resource Conservation Services categorizes soil into four major groups, based on their infiltration rate. (Ann Johnson, 2003)

In general, soils with more organic content and an enhanced soil structure have more permeability and water holding capacity. Identifying the soil types present on the construction site will determine the likelihood of erosion due to low infiltration of water on site. The presence of fine grained or clay soils, in coordination with other erosion factors, must be considerations in the Stormwater Pollution Prevention Plan to reduce costly repairs due to erosion.

3) Topography

On a construction site, slope length and steepness are important factors in erosion. A steep slope will cause water to run at a higher

Soil Type	Title	Description
Type A	Sands and gravels	Low runoff potential, high infiltration rates
Type B	Average to medium coarse-textured soils	Average runoff potential and moderate infiltration rates
Type C	Moderate to fine-grained soils	High runoff potential and slow infiltration rates
Type D	Clay soils	Very high runoff potential and very low infiltration rates

rate of speed, thereby increasing runoff. The types of erosion control used are dependent on the slope of the construction site. Steep slopes generally require stabilization using ridged fixtures, such as linings with concrete or asphalt. Vegetation and riprap can be used on less steep slopes. (Brain C Roberts, June 1995)

4) Vegetation

The presence of vegetation is the most critical factor in influencing erosion. Vegetation provides filtration, reduces the speed of runoff, and reduces the raindrop impact. Because of this, maintaining as much vegetation on construction sites as possible is essential to minimizing the impacts of erosion. In situations when areas must be disturbed, temporary or new permanent vegetation should be established as soon as possible. When vegetation cannot be established, cover materials should be used to stabilize the site. Stabilization materials can include mulch, erosion control blankets, or matting.

Regulation and Permitting

Waterways in the United States require protection from runoff through Federal Water Pollution Control statutes. Specifically, these statutes require that construction projects which disturb a cumulative total area equal to or greater than one acre secure a National Pollutant Discharge Elimination System (NPDES) permit. The NPDES permit authorizes the discharge of stormwater runoff in accordance with both federal guidelines and with plans specific to the project (through a site specific stormwater pollution prevention plan).

For construction projects located in Kansas, the Kansas Department of Health and Environment (KDHE) administers the federal NPDES permit program. KDHE has developed a Kansas General Permit for Stormwater Runoff from Construction Activities that meets the United States' Environmental Protection Agency's current guidelines for construction and development. To request authorization for a construction project to be covered under the general permit, the owner or operator of the construction activity must submit an application package to KDHE. The full requirements are available for download from the KDHE Stormwater website, www.kdheks.gov/stormwater.

Mervin Lare, Stormwater Compliance Engineer with the Kansas Department of Transportation, provided insight into the process from the road and bridge standpoint. "Projects that don't disturb soil are exempt from a permit. Examples of this would be mill and overlays of the existing roadway, bridge replacements in kind, signage, or the addition of guardrail." (Lare, 2019)

Lare and staff at KDOT work with KDHE frequently to secure general permits. He noted that it generally takes around a month to receive a permit after an application is fully submitted. An applicant that is new to the process may need to build in more time, but Lare's experience is that the staff at KDHE are eager and willing to help. He encourages municipalities to build a relationship with the staff and ask questions, so that the process will run smoothly.

The following requirements are included in the application: (Kansas Department of Health and Environment Bureau of Water, 2017)

- A Notice of Intent form, which provides specific information about the project. This information includes:
 - o Owner / Operator Information: This is generally the organization that has day-to-day control over the project and legal rights over the construction. This could be the contractor, the public entity or both.
 - o Site Information: The information in this section includes the address of the site, the legal site description, and existing conditions and uses of the site.

What is included in the NPDES Notice of Intent Authorization Request?

- Notice of Intent Form
- \$60 permit fee
- Stormwater Pollution Prevention Plan

More information about the NOI request can be found at the KDHE Stormwater Website at <http://www.kdheks.gov/stormwater>

The existing conditions and uses section includes subsections that require information about the water and other environmental conditions of the site.

This includes:

- Identifying whether runoff from the site will flow into a municipal separate storm sewer system. KDHE has a list of communities that have a municipal separate storm sewer system. This information can be found at the Municipal Stormwater Program website, <http://www.kdheks.gov/muni/ms4.htm>.
- Identifying the river basin in which the project is located and the name of the first receiving water, stream, or lake. The KDHE Stormwater Program website has a listing of area maps and receiving water information to assist with identifying appropriate waterway, www.kdheks.gov/stormwater.
- Identifying the existence of contaminated soils located within 1,000 feet of the site or that will be disturbed by the construction activity.

To do this, review KDHE's Environmental Interest Finder website to identify potential contamination sources from underground storage tanks, previous spills, solid waste landfills, dry cleaners, underground injections wells, and other sources of contamination. The KDHE Environmental Interest Finder website can be accessed at <https://maps.kdhe.state.ks.us/keif/>.

Additionally, review the Environmental Protection Agency's Superfund/National Priorities List to determine if the site is listed. The list can be accessed at <https://cumulis.epa.gov/supercpad/cursites/srchsites.cfm>.

Finally, conduct a review of the Kansas Geological Survey's Oil and Gas Well Locator website to determine if there are any potential oil, gas, or water wells on or near the site. This website can be accessed at, <http://maps.kgs.ku.edu/oilgas/index.cfm?extenttype=well&xtentvalue=1002945002>. After this review, if there are no potential contamination concerns identified, the site can be cleared.

If there is a potential contamination source based on desktop examination, conducting a

field investigation with possible soil and/or groundwater sampling should be considered.

- Identifying any surface water intakes for public drinking water within one-half mile of any site discharge point. Information about locations of surface water intakes is available on the Kansas Environmental Application Portal, a KDHE web-based application, which is available to the public on their website, <http://www.kdheks.gov/pws/dataaccess/webapplications.html>.

- Identifying any historic or archeological structures located within 1,000 feet of the project site. The Kansas State Historical Society maintains a list of recorded sites. Documentation of coordination between the owner/operator and the Kansas State Historical Society is required as part of the NOI. To submit a project for review by the Kansas State Historical Society, visit their webpage, <https://www.kshs.org/index.php?url=p/section-106-consultation/15543> and submit the project via their online portal.

- Identifying whether any threatened or endangered species are known or are likely to be present within the site boundary or receiving water body. The Kansas Department of Wildlife, Parks and Tourism (KDWPT) maintains a listing of threatened or endangered species and their critical habitats. The KDWPT website provides a listing of threatened or endangered species by county. If the county list provides the level of information necessary to make the determination at the site level, that documentation is sufficient for the NOI. Otherwise the project can be submitted to KDWPT for review based on the requirements listed on their website, <https://ksoutdoors.com/Services/Environmental-Reviews>).

- Identifying if there are any Critical Water Quality Management Areas (CWQMA) near the project site. Currently there are no CWQMAs identified in Kansas, but the applicant should review the KDHE Stormwater Program website to review this status, www.kdheks.gov/stormwater.

- Identifying whether the project will impact the line or grade of a stream or will include dredge or fill of a potential jurisdictional waterway or wetland. The Kansas Department of Agriculture (KDOA) Division of Water Resources administers statutes related to changes to streams and the state's four interstate

Does Your Project Require a Stream or Floodplain Permit?

Coordination and a permit from the Kansas Department of Agriculture (and potentially the US Corps of Engineers) is required if the project includes:

- Construction, modification or repair of a dam that is 25 feet or more in height or 6 feet or more in height with the ability to store 50 acre-feet of water at the auxiliary spillway crest.
- Construction, modification or repair of a bridge, culvert, low-water crossing, boat ramp, pipeline crossing, non-jurisdictional dam, or other stream obstruction that are more than 300 feet from other property lines, not located in an incorporated area and on a stream with less than 5 square miles of drainage areas, OR if a project is limited to a land area measuring less than 25 feet along the stream length, obstructs less than 5 percent of the channel cross section and is floodplain fill outside the channel that does not exceed one foot in depth.
- Construction or repair of a channel change in a designated stream.
- Excavation or dredging within the bank lines of a designated stream.
- Construction, modification, or repair of a regulated levee within the floodplain of a designated stream or designated floodplain.
- Placement of a regulated floodplain within the floodplain or a designated stream.

river compacts. KDOA has specific permits based on the type of submittal. All are located at the KDOA Stream and Floodplain Permits website, <https://agriculture.ks.gov/divisions-programs/dwr/stream-and-floodplain-permits>.

Are you unsure if your project requires a permit? More information is available in the box above. United States Corps of Engineers (USACE) permits are required for any work in navigable waterways. The state of Kansas is split between the Northwestern Division and the Southwestern Division of the USACE. Permitting requirements and coordination are different depending on the division office. The owner/operator should first identify the division office for coordination, <https://www.usace.army.mil/Locations/>, then evaluate the district specific needs for the permit process, <https://www.usace.army.mil/Missions/Civil-Works/Regulatory-Program-and-Permits/Obtain-a-Permit/>.

Project Description: The information required in this section includes the estimated start and end date of construction and the area of the site where soil is identified to be disturbed. Drainage area calculations should also be included if a sedimentation basin is required. This is required when a common drainage area of ten or more acres is disturbed.

Map: A topographic map of the site must be provided that shows the following in clear detail:

- The construction site, access roads and the areas where soil will be disturbed
- Existing area contour elevations
- The location of each existing and proposed discharge point
- Rivers, waterways, and drainage ditches, and the flow direction
- Surface water intakes for public water supplies

- The map scale and a meridian arrow pointing north.

Along with the submission of the NOI, the application must include two additional documents:

- Erosion Control Plan: Details of what to include in this plan will be described in the next section.
- Annual payment fee of \$60 for the general permit. An annual fee is charged until the owner/operator submits a Notice of Termination (NOT).

Developing a Stormwater Pollution Prevention Plan

A Stormwater Pollution Prevention Plan (SWPPP) is intended to contain the information necessary to show that problems related to erosion on a project site have been adequately addressed. Plans differ in complexity depending on the size of the project, the severity of the site condition and the potential of off-site drainage.

The following are considerations for the development of a SWPPP: (Ann Johnson, 2003)

- Determine which agencies will be involved in issuing permits for the project and the rules and regulations that apply to the project.
- Develop mapping that identifies all site constraints. This should include:
 - o Soil types that have a high likelihood of erosion
 - o Steep slopes
 - o Waterbodies including wetlands, lakes and streams.
- Determine erosion control strategies for all site constraints listed above. Determine if there are any other general erosion control methods required for the project based on local or state rules.
- Include the erosion control measures for the project within construction plans. This should include details and specifications of each erosion control method, and specific locations of where the measures will be implemented.
- Include erosion control measures in the special provisions and specifications of the project. This provides a legally binding method for requiring the contractor to adhere to the SWPPP. Clearly defining enforcement

and consequences of non-compliance with the SWPPP is essential to the implementation of the plan.

Best Practices for Erosion Control During Construction

The following are some best practices for reducing or controlling erosion during construction. (Ann Johnson, 2003) (City and County of Honolulu Department of Environmental Services, 2013)

- Stage construction so that only a small amount of area is exposed at a time.
- Only clear what is needed. Leave the rest of the area with existing vegetation.
- Use temporary mulching and seeding early and often. One time during a project may not be enough.
- Stabilize critical areas adjacent to wetlands and culvert outlets prior to construction.
- Check in on the project regularly and use erosion control practices throughout construction, understanding that soil is dynamic and the plan may need to change.
- Eroded areas should be repaired immediately.
- Temporary mulched ground cover should be maintained when the soil is not being worked.
- Silt fences detain runoff and can be used in combination with erosion controls. Make certain to maintain the fence and remove sediment that builds up, leave room for any runoff to pond behind the fence, and turn the ends uphill to prevent the storm water from flowing around the fencing.
- Maintain permits on site.
- Conduct inspections prior to forecasted rain, after rain events, daily during extended rain events, and weekly during the full construction period.

Conclusion

Erosion control during the construction process requires preplanning and permits. While the process may seem arduous, the results are beneficial, both to the water systems of Kansas, and to municipal budgets.

Lare described the extensive training and documentation of erosion control to Area Engineers at KDOT. At first, there were some

who didn't see the value of the emphasis on erosion control. After implementing erosion control plans, the engineers experienced fewer washouts, which would have previously required KDOT to pay for costly repairs on neighboring private properties. Being able to manage water on the construction site also allowed construction to progress more quickly after rain events.

In addition, it allowed KDOT to maintain compliance with federal regulatory mandates. (Lare, 2019) Developing and implementing erosion control plans can provide the same value on local construction projects.

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