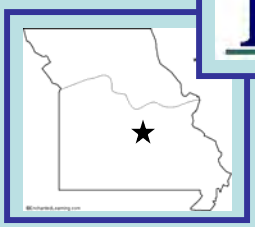
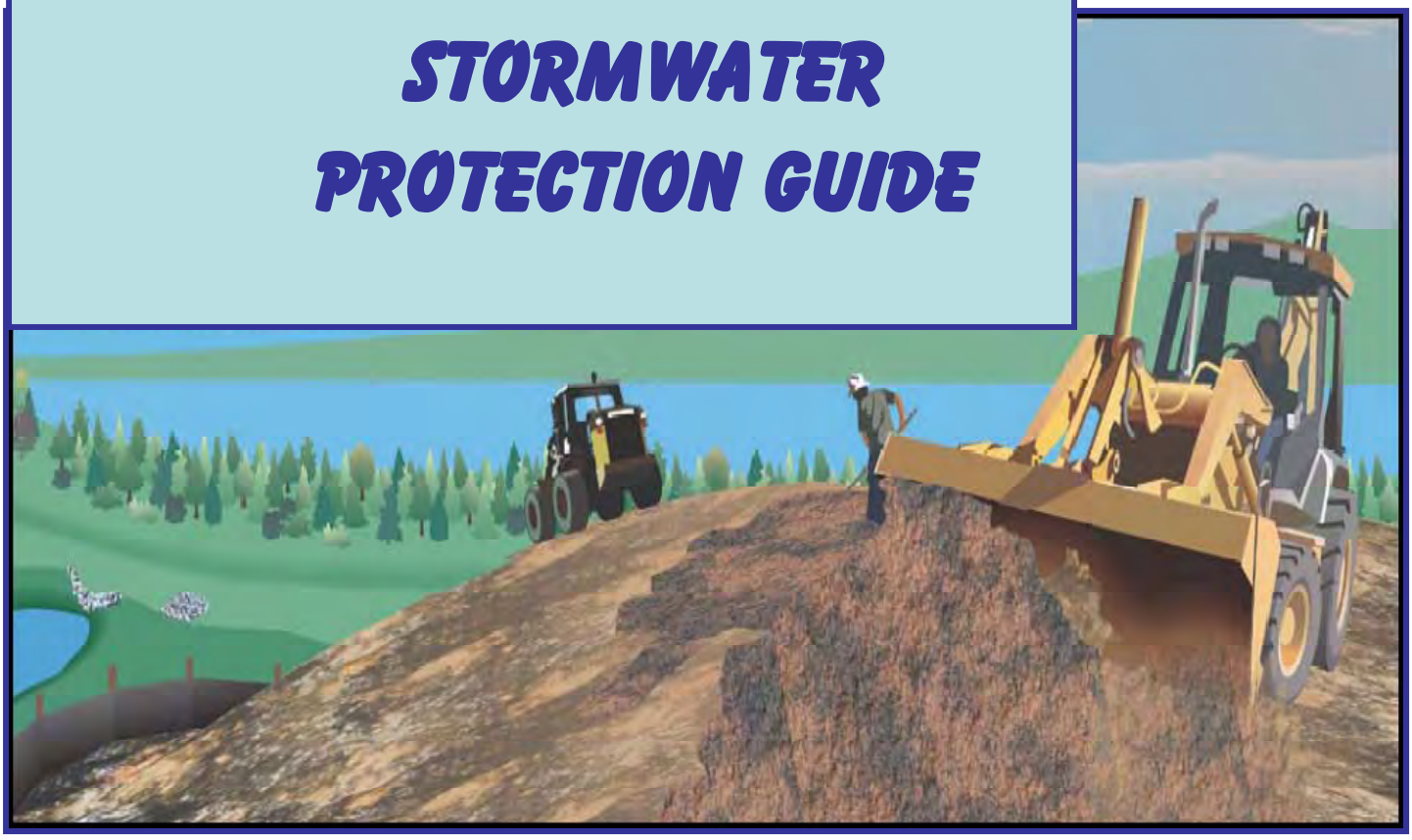
City of ROLLA



EROSION CONTROL STORMWATER PROTECTION GUIDE



DEPARTMENT OF PUBLIC WORKS
901 North Elm
P.O. Box 979
Rolla, MO 65402

OCTOBER 2007

FORWARD

This booklet represents an accumulative effort of

the

City of Rolla

Public Works Department

2007

For Further Information:

Protecting Water Quality

A field guide to erosion, sediment & stormwater best management practices for development sites in Missouri & Kansas which was most recently revised by The Mid America Association of Conservation Districts (MAACD), Kansas City, MO, to include Missouri & Kansas

EROSION CONTROL/STORMWATER PROTECTION GUIDE

Erosion and sediment control plan

The purpose of an erosion and sediment control plan is to define and schedule the control measures that will be used to minimize erosion, detain excess stormwater runoff and prevent off-site sedimentation. A detailed site plan displays the location of each practice. This applies to developments of one acre or more. After approval of this plan and receipt of land development permit (LDP) application and fees, the LDP can be issued. No site development can take place until the LDP is issued, and all erosion control is in place.

Erosion and sediment control measures shall be used and maintained on all construction sites under one acre where needed, although site plans and LDP's are not required.

On-Site Inspections

Periodic inspections must be made to check soil erosion, sedimentation and stormwater control measures are in place and functioning properly. Site inspections will be made bi-weekly and after every rainfall that produces runoff. Inspections must be made before seeding and during early growth stages to determine if any reseeding is necessary.

Inspections will be documented by a written report, logs and checklist. (The checklist below contains the guidelines the inspector will follow when visiting the site.) These reports will contain the date and time of inspection, what corrective action is needed, and any verbal communications that took place during the inspection. If corrective action is necessary, a written notice of violation along with the inspector's checklist will be mailed to the developer explaining corrective procedures and penalties. No work shall proceed until all violations are corrected within the time frame given by the City. If the violations are not corrected by the end of the prescribed time frame, the City of Rolla may take necessary corrective action, the cost of which shall become a lien upon the property until paid.

CHECKLIST FOR ON-SITE INSPECTIONS

ITEM

Pollutant Sources

- Are there any debris piles with petroleum cans, chemical containers or other sources of possible pollution?

Erosion Control

- Are there any bare areas which require temporary or permanent stabilization? (seeding, mulch, other?)
- Are all finished cut and fill slopes adequately stabilized?
- Do any structural practices show evidence of overtopping, breaks or erosion?
- Are all earthen structures seeded and mulched?
- Is vegetation providing adequate protection?

Sediment Control

- Are perimeter sediment trapping measures in place and functioning properly?
- Have sediment-trapping practices been installed in the proper location and before extensive grading begins?
- Is sediment leaving the site and/or damaging adjacent property?
- Is there mud on public roads or at intersections with public roads?

Runoff Conveyance and Control

- Are all on-site drainage channels and outlets adequately stabilized? (channel lining, seeding, other; outlet stabilization?
- Are all operational storm sewer inlets protected so that sediment will not enter the system?
- Is there evidence of increased off-site erosion since the project began?
- Are downstream waterways and property adequately protected from increases in stormwater runoff?

CHECKLIST FOR ON-SITE INSPECTIONS

Maintenance

- Do any seeded areas require fertilizer, reseeding or additional mulch?
- Do any structural practices require repair or clean-out?
- Have temporary structural practices that are no longer needed been removed?

Other

- Is any work occurring in streams?
- Is channel damage being minimized?
- Is stabilization or a temporary stream crossing needed?
- Are utility trenches being backfilled and seeded properly?

Additional Comments

_____

_____

_____

_____

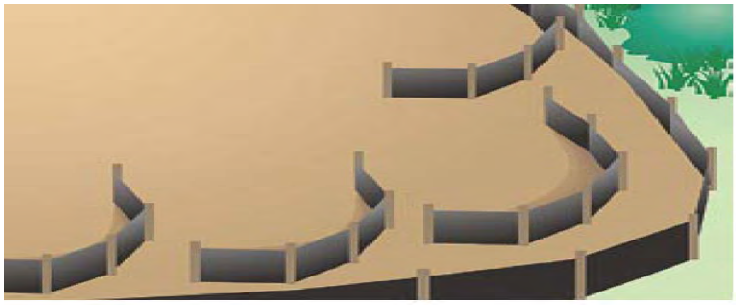
Practice Installation and Maintenance

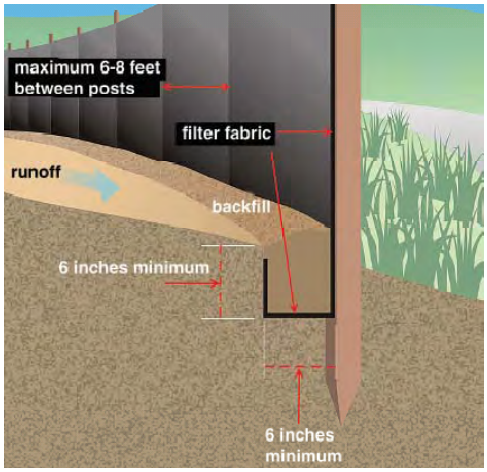
❖Site Preparation

·Temporary Gravel Construction Entrance/Exit Pad

One or more of the following sediment control measures as needed:

·Silt Fence

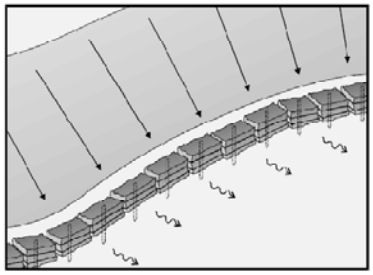


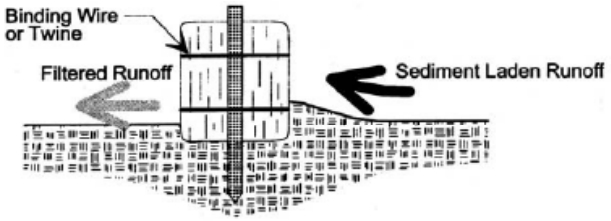


Place silt fences to ensure perimeter protection. Placing silt fences on slopes with the ends turned up to trap sheet flow provides better performance. Stagger fence sections to ensure total coverage. Clean out before sediment reaches halfway up. Repair as needed, and remove when grass is well established.

·Straw Bale Sediment Trap

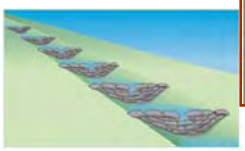
Preferred Method of City of Rolla





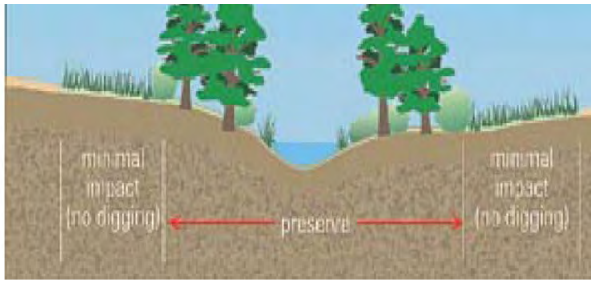
·Mulch (Wood Chip) Trap

·Rock Dam



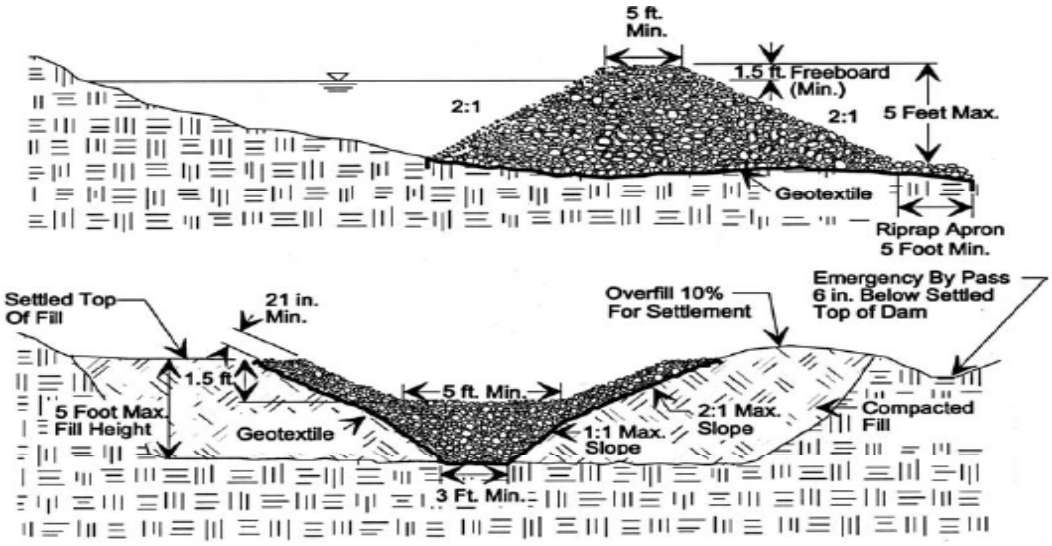
Ditch slope	Silt check dam spacing	Additional information
30%	10 ft.	·Calculated for 3' high silt check dams. ·Center of dam should be 6" lower than sides. ·Use 5"-10" rock, stone bags, or commercial products.
20%	15 ft.	
15%	20 ft.	
10%	35 ft.	
5%	55 ft.	
3%	100 ft.	
2%	150 ft.	
1%	300 ft.	

·Buffer Strip



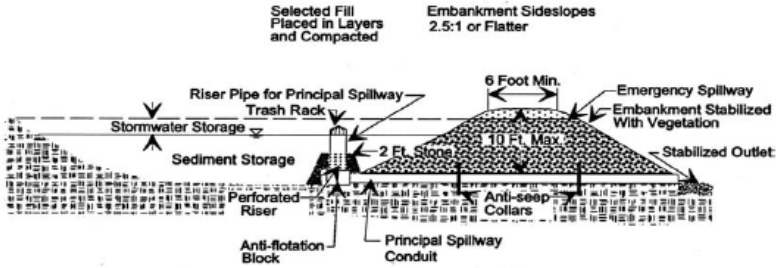
• Temporary Sediment Trap

A temporary sediment trap can control sediment in small drainage ways, then be removed once the disturbed areas are stabilized. Periodic cleaning of sediment must be done to insure trap works as intended.



• Sediment Basin

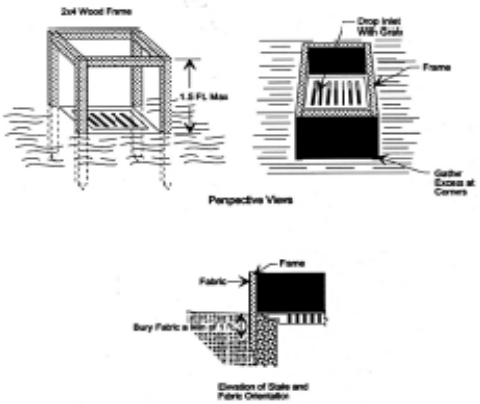
A sediment basin is suitable for small drainageways and can be used to pretreat sediment-laden water before it enters a permanent pool. A rock chute was used to drop the water to a lower elevation. Periodic cleaning of sediment must be done to insure basin works as intended

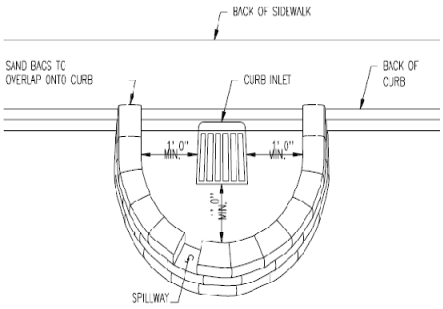


·**Stockpile Topsoil**

❖Storm Drain Inlet Protection

·**Fabric Drop Inlet Protection**

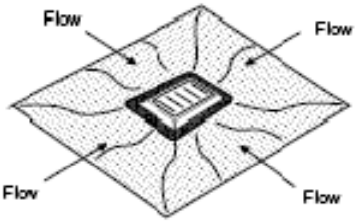


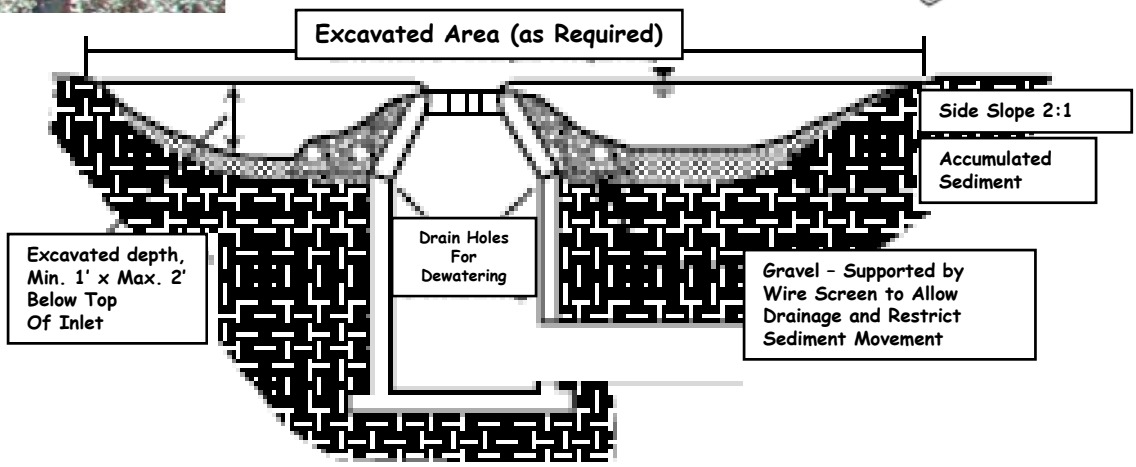


CURB INLET SAND BAG BARRIER

Definition & Purpose: Devices used at storm drain inlets that are subject to runoff from construction activities to detain and/or to filter sediment-laden runoff to allow sediment to settle and/or to filter sediment prior to discharge into storm drainage systems or watercourses.

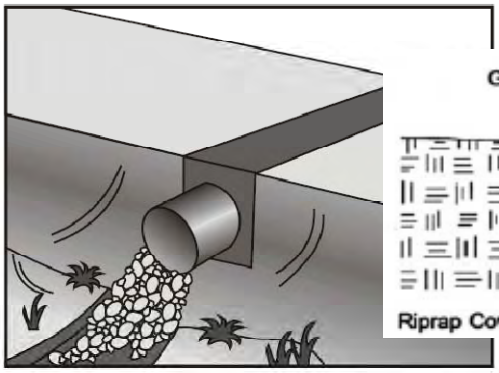
·**Excavated Drop Inlet Protection**

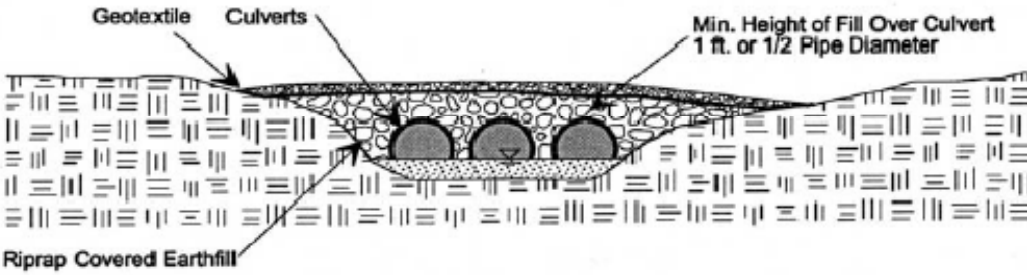




❖Stream Protection

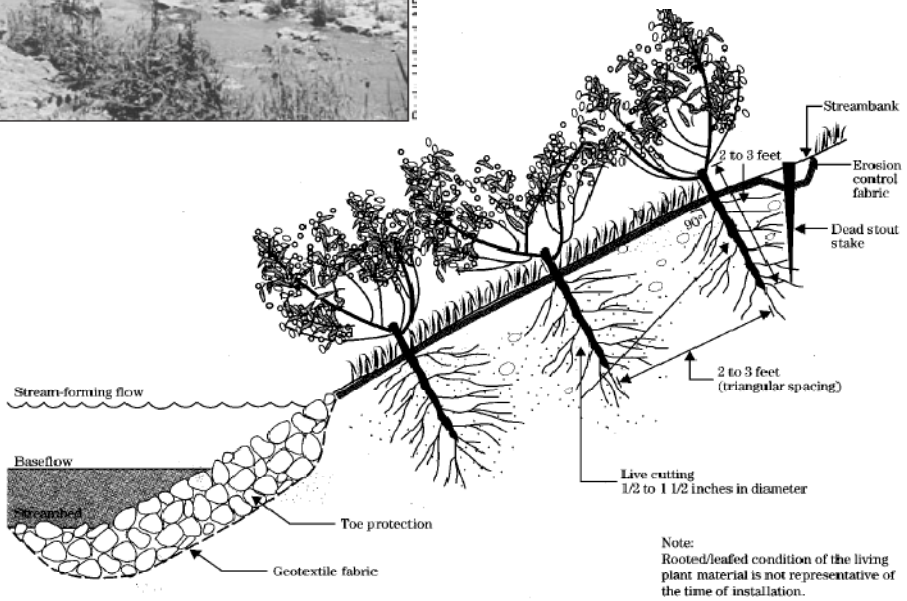
·Temporary Stream Crossing





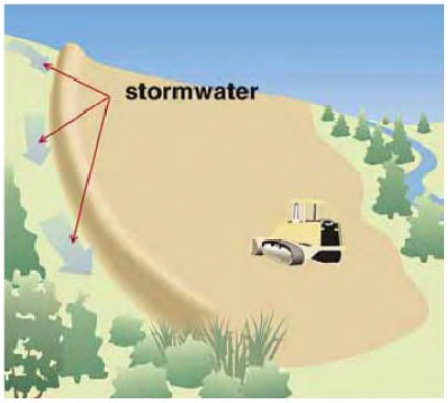
·Stream Bank Protection

Riprap is one of the most commonly used methods of protecting streambanks.



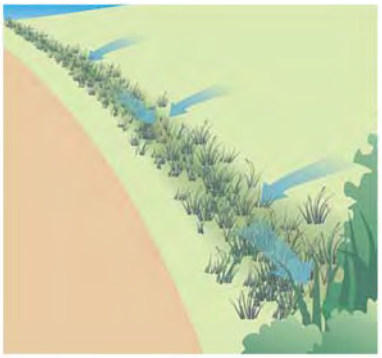
❖Runoff Control

·Temporary Diversion



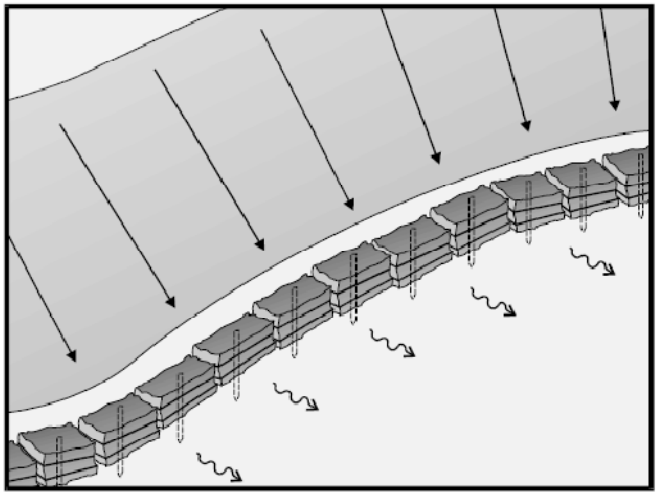
An unfinished temporary diversion routes sediment-laden stormwater to a sediment basin. Temporary diversions should be shaped, seeded and mulched. Establish permanent vegetation if the diversion will be used for one year or more.

·Permanent Diversion



Diversion ditches should be lined with grass at a minimum, and blankets if slopes exceed 10:1 (10%).

·Perimeter Protection



Straw Bales

Silt Fence

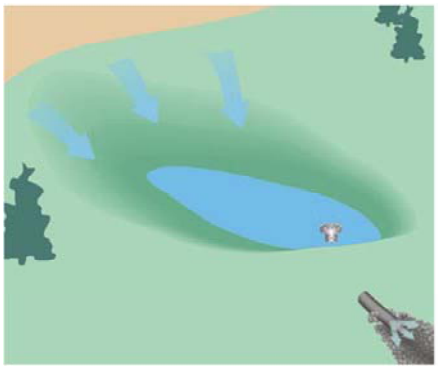
• Concrete/Contaminate Washout Basin

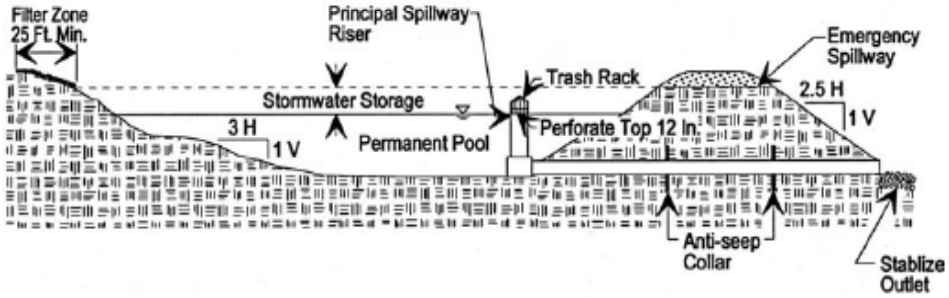
Line concrete/contaminate washout areas with impervious material like plastic. Maintain and periodically remove hardened soils.

• Hazardous Material Spill (See Groundskeeping BMPS)

❖Stormwater Management

·Detention Ponds and Basins





·Extended Detention Ponds and Basins

Extended detention ponds are designed to hold excess runoff. They reduce the impact of increasing impervious surfaces in the watershed.

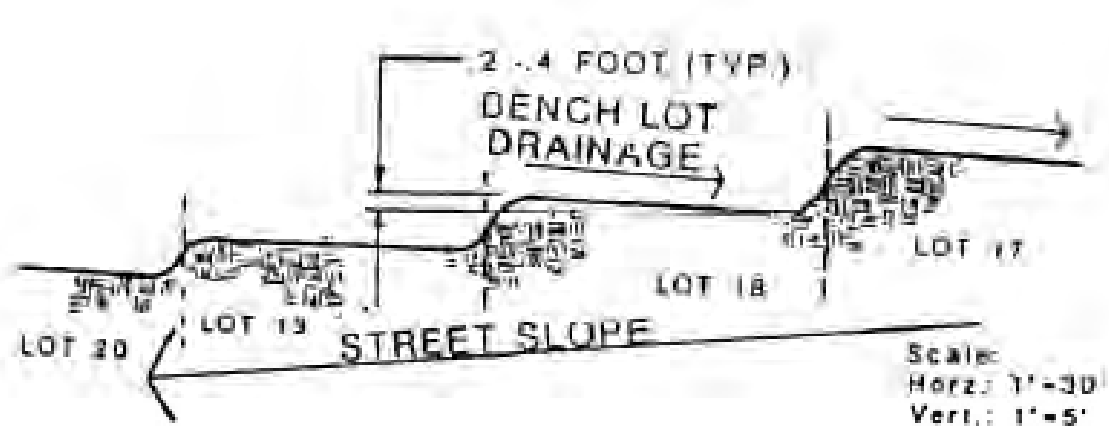
❖Surface Stabilization

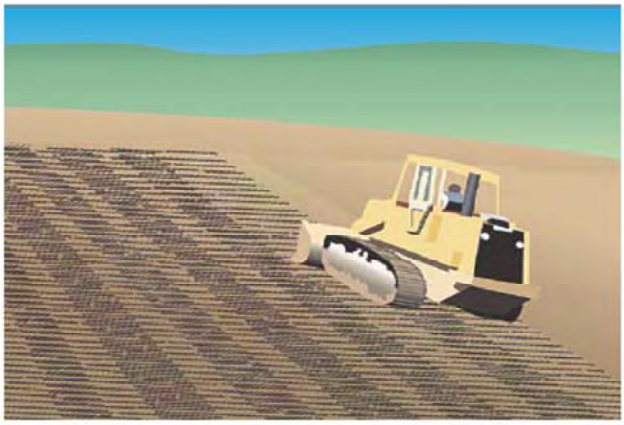
·Seed and Straw

Very good treatment of roadside areas with blown straw after seeding. In areas near lakes, streams, and rivers, straw in roadway must be cleaned up after application.

Excellent application of hand scattered straw mulch in new residential subdivision. Work sites must be seeded and mulched as soon as final grade is established. Crimp mulch into soil with dozer tracking or disk harrows set straight to prevent straw from blowing.

• Land Grading





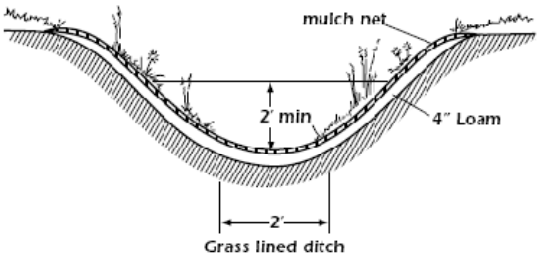
Tread-track slopes up and down hill to improve stability.

• Dust Control

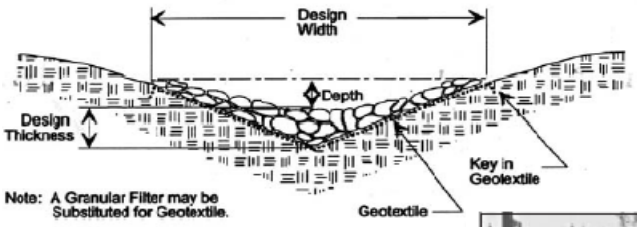
Spraying water is effective for dust control on haul roads, although it must be frequently repeated during hot days or heavy traffic periods.

❖ Runoff Conveyance

• Grass-lined Channel

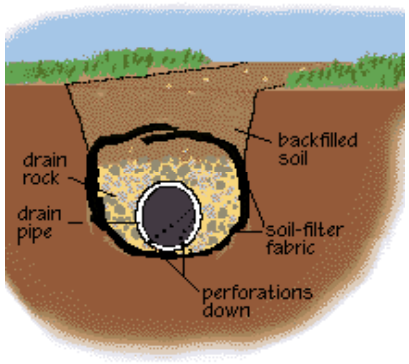


• Riprap Lined Channel

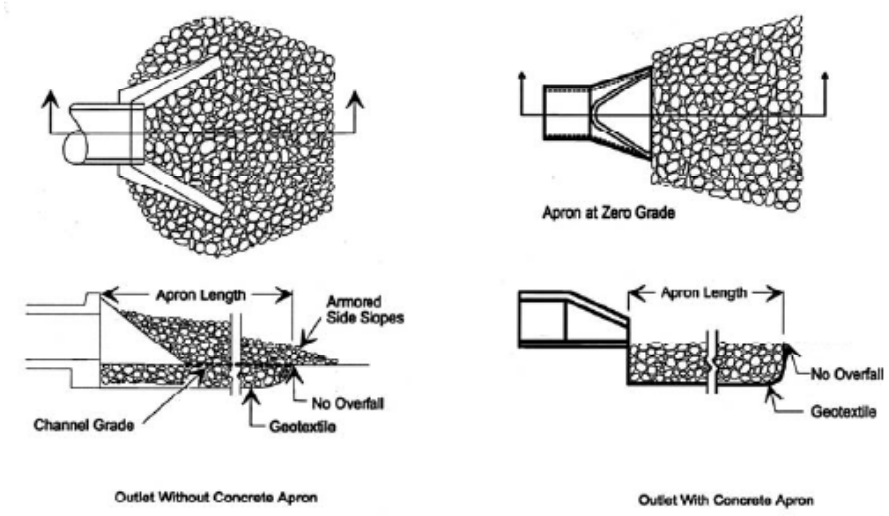


Rock-lined channels, like this one can be used in areas with high flow velocities or where vegetation is hard to establish.

• French Drains



• Rock Outlets



Typical Rock Outlet

GROUNDSKEEPING BEST MANAGEMENT PRACTICES FOR WATER QUALITY PROTECTION

When National Pollutant Discharge Elimination (NPDES) stormwater permits are applicable, the Stormwater Pollution Prevention Plan (SWPPP) is the stormwater permit for construction activities and is the key to controlling pollutants in stormwater discharges. Therefore, proper and careful development and implementation of the plan will maximize the potential benefits of pollution prevention and sediment and erosion control measures. The permit consists of specific requirements for the plan, including deadlines and certain stormwater control measures. The process of developing and implementing a SWPPP for construction activities can be divided into seven phases. These are: 1) site evaluation and design development; 2) assessment; 3) control selection/plan design; 4) certification/notification; 5) construction/implementation; 6) operation and maintenance of measures; and 7) final stabilization/termination. The topics presented so far in this book cover various aspects of the seven phases of the SWPPP, especially sediment and erosion control. This chapter focuses on practices for general "housekeeping" and grounds management practices which are also essential to the pollution prevention aspect of the plan. Whether or not a NPDES permit is required, these practices are recommended as a means to protect water quality.

Inspection and Maintenance Procedures

The following inspection and maintenance procedures need to be followed by the permit holder or his contractor to maintain adequate sediment and erosion controls:

- **All control measures need to be inspected at least once per week and following any storm event of ½" or more.**
- All measures need to be maintained in good working order. If a repair is necessary, it should be initiated within 24 hours of report.
- Silt fence and straw bales need to be inspected **weekly** for proper anchorage and leakage underneath. Silt fencing should also be inspected for tears.
- Built-up sediment needs to be removed from silt barriers when it has reached 1/3 of the height of the barrier. Sediment needs to be placed in a stabilized site to prevent re-entry into the same site or another entrapment area.
- Sediment basins need to be inspected for depth of sediment on a **monthly** basis and built up sediment needs to be removed when 1/3 of the basin volume is filled.
- Temporary and permanent seeding and planting needs to be inspected for bare spots, washouts and healthy growth. A person should be designated to be responsible for maintaining planted areas until growth has reached 1" in height and the area disturbed adequately protects 70% of the ground surface.

Materials. Inventory

A materials list should be compiled for items that will be stored outside on the site during construction. For example:

_____Pipe, fitting and joint compounds for underground utility piping.

_____Gravel and stone bedding material.

_____Concrete forming materials.

Materials Inventory Continued

_____Other (specify) _____

_____

_____

_____

NOTE: Fuels, oils and other petroleum products, forming oils and compounds, fertilizers, pesticides, or any hazardous or toxic compounds should not be stored outside on the site unless specifically agreed upon by all responsible parties, including City of Rolla Public Works or Community Development (Building Codes) personnel. On-site storage should meet all local, state and federal rules regarding secondary containment. Additionally, local ordinances may require fencing and security measures for storage of these products.

Spill Prevention and Material Management Practices

PETROLEUM PRODUCTS: All vehicles kept on the site need to be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products should be stored in tightly sealed containers which are clearly labeled. Any asphalt substances used on-site should be applied according to the manufacturer's recommendations.

FUELING & SERVICING: No fueling, servicing, maintenance, or repair of equipment or machinery should be done within 50 feet of a stream, or within 100 feet of a classified stream, losing stream or sinkhole.

MUD TRACKING: A stabilized construction entrance needs to be designated on the plan. Only designated entrances should be used for construction access to the site. The General Contractor is responsible for keeping mud cleaned from adjoining streets on a daily basis if needed.

CONCRETE TRUCKS: Concrete trucks should be allowed to wash only in locations where discharge is directed to a sediment basin. It is not permissible to discharge concrete wash directly to streams or storm drains. Alkalinity and chemical additives could be harmful to fish, stream bottom macro-invertebrates and wildlife.

DISPOSAL OF OIL: No fuels, oils, lubricants, solvents, or other hazardous materials can be disposed of on the site. All hazardous material must be properly disposed of in accordance with State law. For guidance, contact 1-800-361-4817 in Missouri.

TRASH/SOLID WASTE: The General Contractor is responsible for disposing of all solid waste from the site in accordance with State law. Dumpsters or other collection facilities must be provided as needed. Soil waste may not be buried on the site.

Spill Prevention and Material Management Practices Continued

SANITARY WASTE: The General Contractor is responsible for providing sanitary facilities on the site. Sanitary waste may be disposed only in locations having a State permit.

OTHER DISCHARGES: Water for pressure testing sanitary sewers, flushing water lines, etc., may be discharged only in approved areas.

Spill Controls

A Sediment & Erosion Control Officer needs to be designated as the spill prevention and cleanup coordinator.

In addition to the good housekeeping practices and material management practices listed previously, the following practices need to be followed for spill prevention and clean-up:

- Manufacturer's recommended methods for spill cleanup needs to be clearly posted and site personnel need to be made aware of the procedures and the location of the information and cleanup supplies. Refer to material safety data sheets (MSDs).

- Material and equipment necessary for spill cleanup needs to be kept in the material storage area on site. Equipment and materials include, but are not to limited to: brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.

- All spills need to be cleaned up immediately after discovery and properly containerized for proper disposal. Burial is not acceptable.

- The spill area must be kept well ventilated and personnel need to wear appropriate protective clothing to prevent injury from contact with a hazardous substance.

- Spills of toxic or hazardous material must be reported immediately to the appropriate state or local government agency, regardless of the size. Each county should have a Local Emergency Planning Committee (LEPC). If you are unable to access your local LEPC directly, contact your local fire department, city hall or county courthouse. When permits are applicable., the permittee or his/her authorized representative is required to notify the MDNR or City of Rolla Fire Department, Headquarters: 1490 East 10th Street, Rolla, MO, Phone: 573-364-3980, in accordance with 40CFR117 and CFR302 as soon as they have knowledge of the discharge of any hazardous substance or petroleum product in excess of the reportable quantity. In Missouri, contact the MDNR emergency spills hotline at 1-573-634-2436.

- The spill prevention plan needs to be adjusted to include measures to prevent this type of spill from being repeated, and the plan needs to show how to clean up the spill if another one does occur.

Hazardous Products

- Products must be kept in original containers unless they are not resealable. If product is transferred to a new container, it must be properly marked and labeled.

- Original labels and material safety data sheets should be retained.

- If surplus, product must be disposed of, disposal must be done in accordance with State law. For local disposal information, contact your solid waste district, your local emergency planning committee (LEPC) or in Missouri call 1-800-361-4827.

Air Emissions

BURNING: Burning on the site may require a permit from the Missouri Department of Natural Resources (MDNR) or the Rolla Fire Department. For guidance in Missouri, contact your MDNR regional office or the MDNR Air Pollution Control Program at (573) 751-4817.

DUST CONTROL: In Missouri, the contractor is required by State law to control fugitive dust blown from the site. Dust can be minimized by stabilizing areas with mulch as soon as possible. Watering should be provided in unstabilized areas. Contact MDNR for guidance at the number listed above.

Other Good Groundskeeping Practices

In addition to the foregoing, the following good housekeeping practices need to be followed during the construction of the project:

- An effort should be made to store only enough product to do the job.

- All materials stored on-site should be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or enclosure.

- Products should be kept in their original containers with the original manufacturer's label.

- Whenever possible, all of a product should be used up before disposing of the container.

- Manufacturer's recommendations for proper use and disposal must be followed. (see MSDs.)

- The site superintendent should inspect daily to ensure proper usage, storage and disposal of materials.

- Fertilizers need to be applied only in the minimum amounts recommended by the manufacturer.

- All paint containers need to be tightly sealed and stored when not required for use. Excess paint should not be dumped into the storm sewer system but should be properly disposed of according to manufacturer's instructions (see MSDs) and State regulations.

Glossary
- A -

Acidic A material with a pH of less than 7.0. soil nutrients is generally less soluble and less available to plants in moderately or strongly acid soils. Agricultural lime is commonly applied to acidic soils to increase the pH.

Acre An area of measurement equal to 43,560 square feet.

Aggregate Sand, gravel, crushed stone or slag, usually having a known range of particle sizes. Used with a cementing medium to form concrete or alone as in a roadway bed or railroad ballast.

Aklaline A material with a pH greater than 7.0.

Anchor Trench A long, narrow ditch in which the edges of a material (e.g. silt fence, erosion control blanket or geotextile etc.) are buried to hold it in place.

Angle of Repose The maximum angle of slope (measured from a horizontal plane) at which loose, cohesionless material will come to rest. The angle of repose for unconsolidated soil varies with the soil grain size, grain shape and moisture content. To maintain stability, cut or fill slopes should not exceed the angle of repose or slippage may occur.

Anti-Seep Collar A plate of metal, high-density plastic or butyl rubber attached perpendicularly to the outside of a pipe placed through an embankment. Used to prevent water from flowing unabated along the outside of the pipe causing soil piping and structure failure.

Application Rate The quantity (mass, volume or thickness) of material applied per unit area.

Apron Protective material laid on a streambed or ground surface to prevent scour at a culvert outlet, abutment, toe of a structure or slope or similar location.

Aquifer An underground, porous, water-bearing geological formation composed of a layer of a permeable rock, sand or gravel that provides a groundwater reservoir.

Armor A protective coat or artificial surface on streambeds, banks, shores or embankments used to resist erosion or scour. Examples of hard armor include concrete and riprap. Soft armor includes flexible geosynthetic support systems used with vegetation.

Articulated Block Systems Concrete blocks linked by cables or interlocking pieces that are flexible, porous and can accommodate growth of herbaceous and woody vegetation while offering the strength and durability of a hard armor.

- B -

BMP (Best Management Practice) The preferred methods and/or products that will correct or control erosion, sedimentation or water quality degradation on a specific site for particular site conditions.

Backfill Earth or other material used to replace material removed during construction, such as in culvert, sewer and pipeline installations.

Base Course (Base) A layer of material of specified thickness placed on the subgrade to distribute load, provide drainage and minimize frost action.

Bedding The soil or other material on which a pipe or conduit is supported.

Bench A step in a slope. Formed by a horizontal surface and a surface inclined at a steeper angle than that of the entire slope.

Bentonite (Sodium Bentonite) A highly plastic clay that swells extensively when wet. Used to seal soil to reduce seepage losses from ponds and lagoons.

Berm (1) A ridge of earth constructed to direct the flow of surface water. (2) A shelf that breaks the continuity of a slope. (3) The embankment of a pit or pond which may be wide and solid enough for vehicular traffic.

Binder (Emulsion, Tackifier) Natural or synthetic additive that causes an otherwise non-cohesive material to become bound into a cohesive matrix.

Biodegradable Ability of a material to breakdown or decompose under natural conditions and processes, within an acceptable time frame, without polluting the environment.

Bioengineering A method of construction using living plants or plant materials in combination with inorganic materials. The practice brings together biological, ecological and engineering concepts to produce living, functioning systems used to prevent erosion, to control sedimentation or to provide wildlife habitat.

Biological Stability Ability to resist degradation from exposure to micro-organisms.

Blanket Rolled materials consisting of coir (coconut fiber), jute, straw, wood fiber or various synthetic materials used to prevent erosion, trap sediment, protect seed and promote the growth of vegetation. They can be either degradable or permanent.

Binding (Clogging) The condition whereby soil particles block the voids at the surface of a geotextile, thereby reducing the rate of water flow through the geotextile.

Bridging (Soil) The formation of large voids due to inadequate compaction of earth material or the inclusion of improper fill inclusions.

Broadcast The application of material scattered or sprayed on the soil surface. Broadcast seeding is a uniform distribution of seeds over the entire planted area.

CP Construction Program

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

CPESC A Certified Professional Soil Erosion and Sediment Control Specialist as designated by the Soil & Water Conservation Society.

Canopy (Plant) The foliage of a tree, shrub or herbaceous plant. The area covered by the plant canopy is protected from splash erosion.

Canopy (Inlet) A principal spillway pipe with the inlet cut at an angle of 33, 45 or 56 degrees designed as an anti vortex device which maximizes water flow through the pipe.

Carbon Black Material consisting primarily of elemental carbon used as an additive for plastic geosynthetic production. It imparts a black color to the compound which retards aging by ultraviolet light from the sun.

Catch Basin A receptacle for diverting surface water to a sewer or subdrain, having at its base a sediment bowl to prevent the admission of coarse material into a sewer or stream.

Cellular Confinement System A synthetic grid with open spaces filled with soil, sand, gravel or concrete. The matrix mechanically stabilizes these materials and is used for erosion control and/or load support applications.

Certified Seed Seed which has been analyzed by a state association test laboratory for percent germination, weed seed content and purity.

Channel A natural stream or excavated ditch that conveys water.

Channel Erosion See *Erosion.*

Channel Stabilization Protection of the sides and bed of a channel from erosion by controlling flow velocities and directions or by lining the channel with vegetation, riprap, concrete or other material.

Check Dam (Rock Check Structures) Temporary barriers of 3-6 inch rock constructed across a swale or drainage ditch. Used to reduce the velocity of concentrated stormwater flows, reduce degradation and to trap sediment.

Chemical Stability The ability to resist chemicals (e.g. acids, bases, solvents, oils and oxidation agents) and chemical reactions, including those catalyzed by light.

Chute A steeply inclined channel, usually lined with rock or concrete, for conveying water from a higher to a lower level.

Clay (1) Mineral particles less than .002 mm in equivalent diameter. (2) A soil containing more than 40 percent clay. Clay soils exhibit plasticity when moist, but are hard when dry.

Clogging See *Blinding.*

Coefficient of Permeability (k) The rate of discharge of a fluid per unit cross sectional area of a geotextile under a hydraulic gradient.

Cohesive Soil An unconfined soil that has considerable strength when air dried and that has significant resistance to disintegration when submerged in water.

Coir Organic fiber from the outer shell of the coconut, used as a mulch and in the manufacture of erosion control blankets, geotextiles and coir tubes for scour protection and planting in bioeningeering applications.

Compaction The application of mechanical forces to the soil to make it more dense and less porous.

Concrete A hard, strong building material composed of water, a cementing material such as portland cement and a mineral aggregate such as sand or gravel.

Concrete Armor Blocks Interlocking blocks of precast concrete used for channel linings and streambank stabilization.

Conduit Any channel or pipe for transporting water.

Conservation District A public organization created under state enabling law as a special purpose district to develop and carry out a program of soil, water and related resource conservation, use and development within its boundaries. Often called a soil conservation district or soil and water conservation district, it is usually a subdivision of state government with a local governing body, but with limited authorities.

Consistency The relative ease with which a soil can be deformed. Soil moisture content directly influences how a soil behaves when subjected to compression.

Contaminant A secondary material added by human or natural activities which may, in sufficient concentrations, render the primary material or atmosphere unacceptable.

Contour An imaginary line on the surface of the earth connecting points of the same elevation.

Coverage The surface area to be covered by a specified material. For roll goods, allowance is made for a defined overlap of the edges of the material.

Creep (1) Slow mass movement of rock or soil material down slopes primarily driven by gravity which is not usually perceptible except to observations of long duration. (2) The slow change in length or thickness of a material under prolonged stress.

Crest Elevation (1) The Maximum elevation of surface water under consideration. (2) The highest elevation of a structure or component.

Critical Areas Regions highly susceptible to erosion such as an area subjected to concentrated water flow.

Critical Depth Water depth in a conduit at which certain conditions of maximum flow will occur.

Critical Slope (1) The slope at which a maximum flow will occur at minimum velocity. (2) The maximum angle with the horizontal axis at which a sloped bank of soil or rock of a given height will stand unsupported. See Angle of Repose.

Critical Velocity The average velocity of flow when flow is at critical depth.

Culvert A conduit for conveying surface water through an embankment.

Cut and Fill A process of moving earth by excavating part of an area and using the excavated material for adjacent embankments or deposit areas.

- D -

D_{50} The sieve opening size which allows 50% of a given sample to pass through.

DMR Discharge Monitoring Report

Dam An embankment constructed of compacted soil materials usually across a stream or area of concentrated water flow.

Darcy's Law A law describing the rate of flow of water through saturated porous media.

Deformation A change in the shape of specimen, e.g., an increase in length produced as a result of the application of a tensile force.

Degradable The ability of a material to break down or decompose into lesser components.

Degradation (1) The loss of desirable properties by a material as a result of some process or physical/chemical phenomenon. (2) The progressive general lowering of a stream channel by erosion.

Density The mass of a substance per unit volume.

Department of Natural Resources (DNR) The state agency in Missouri responsible for preserving and protecting the state's natural and cultural resources. DNR is responsible for regulating the NPDES program (which includes stormwater runoff permitting). DNR also provides grants and low-interest loans to public entities for sediment control, water pollution control and related information/education projects.

Design Discharge A quantity of flow that is expected at a certain point as a result of a design storm or flood frequency. Usually expressed as a rate of flow in cubic feet per second.

Design Frequency The recurrence interval for hydrologic events used for design purposes. As an example, a design frequency of 50 years means a storm of a magnitude that would be expected to occur on the average of once in every 50 years.

Design Life The length of time for which it is economically sound to require a structure to serve without major repairs or replacement.

Design Standards The defined conditions where a specific conservation practice or set of practices are to be used.

Design Storm A selected rainfall pattern of specified amount, duration, intensity and frequency that is used to calculate the volume of water runoff and peak discharge rate.

Dewatering The removal of surface or subsurface water as in removing water temporarily impounded in a holding basin or pond.

Dew Point The temperature at which water vapor starts to condense in cooling air at the existing atmospheric pressure and vapor content.

Dike An embankment or wall constructed to prevent flooding.

D - Continued

Discharge A volume of fluid passing a given point per unit time. The flow rate of stormwater is commonly expressed as cubic feet per second.

Diversion A channel and ridge of earth constructed to divert surface runoff water from one area to another for disposal at a non-erosive velocity.

Drainage Interception and removal of groundwater or surface water, by artificial or natural means.

Drainage Area A geographical area that contributes runoff water to a common point.

Drainage (Soil) The frequency and duration of periods when the soil is not saturated.

Dredging The process of removing sediment from a watercourse such as a river or reservoir.

Drop Inlet A structure in which the water drops (1) through a vertical riser connected to a discharge conduit or (2) over the crest of a vertical wall to a lower elevation.

Drop Structure A structure in a channel or conduit which permits water to drop to a lower level.

Dry Well A steel catch basin with open bottom and perforated walls. Used to store surface runoff for infiltration, or recharge, into the ground.

- E -

ECC (Effective Calcium Carbonate) A measure of the ability of a liming material to neutralize soil acidity, expressed as a percentage. Agricultural lime is approximately 50% ECC.

ESA Endangered Species Act

Ecosystem The interaction between living organisms and their non-living environment.

Effluent A material which flows out from the point of concern. For example, sewage water or other waste liquids flowing out of a reservoir basin or treatment plant.

Embankment A mound of earth or stone built to hold back water or to support a roadway.

Emergence The process of a plant seedling rising above the soil surface.

Emulsion See *Binder.*

Environmental Protection Agency (EPA) The federal agency responsible for the enforcement of the Clean Water Act. See *Resource Inventory List* for more information.

Energy Dissipator A Structure installed at the outlet of a channel, drop structure or conduit to absorb the force of high-velocity flow. It may consist of riprap, linings, baffles, staggered blocks, etc.

Equivalent Opening Size (EOS) Number of the US. Bureau of Standards sieve (in mm or inches) having openings closest in size to the diameter of uniform particles which will allow 5% by weight to pass through the material. Used to select filter fabric for use in filtration and separation.

Equivalent Neutralizing Material (ENM) See *ECC.*

Erosion The process by which soil particles are detached, transported and deposited by wind, water, ice or gravity. The following terms are used to describe different types of erosion:

Erosion: Erosion much more rapid than natural or geologic erosion, primarily as a result of human activities.

Channel erosion: The widening, deepening and headward cutting of small channels and waterways due to erosion caused by moderate to large floods.

Gully erosion: The erosion process whereby runoff water accumulates in narrow channels, and, over relatively short time periods, removes the soil to considerable depths. When surface channels cannot be smoothed out by normal agricultural tillage operations, they are called gullies.

Sheet erosion: The gradual removal of a fairly uniform layer of soil from the land surface by runoff water.

Shoreline erosion: The loss of soil materials due to the wave action of a permanent waterbody such as a pond, lake or ocean.

Splash erosion: The spattering of small soil particles caused by the impact of raindrops on wet soils. The loosened and spattered particles may or may not be subsequently removed by surface runoff.

Rill erosion: The erosion process whereby numerous small channels only several inches deep are formed. Commonly occurs on recently disturbed and exposed soils.

Saltation: The movement of soil particles by rolling or a series of short bounces along the ground surface due to the wind.

Suspension: The transport of soil particles by the wind for relatively long distances.

Erosion Control The prevention and/or reduction of soil particle movement. Erosion control reduces soil detachment, transport and deposition.

Erosion Control Blanket Temporary or permanent fabricated materials that protect the soil and enhance the establishment of vegetation.

Erosion Control Revegetation Mat (ECRM) A permanent blanket made of synthetic material used for long term protection against soil movement.

Erosion Control Technology Council (ECTC) A division of the International Erosion Control Association which develops standards and guidelines for products and testing of materials.

Evaporation The conversion of water from a liquid to a vapor form.

- F -

Fabric See *Geotextile.*

Fabric Formed Concrete Systems	Geotextile tubes and mattresses that are filled with concrete to provide a hard armor protection system.
Fabric Wrapped Drain	An inner core of a porous medium such as sand, gravel or a corrugated pipe with an outer geotextile wrap or sheath used to collect and remove excess water.
Fascine	(Wattle) Bundles of tree or shrub branch cuttings which are tied together and anchored in trenches with wooden stakes. Used for a variety of slope stabilization project.
Fertilization	The process of adding soil nutrients to the soil to stimulate plant growth. The percentage of available nutrients in bulk fertilizer is labeled as % nitrogen, % phosphorus and % potassium. A 100-pound bag of 12-12-12- is 12% nitrogen, 12% phosphorus and 12% phosphate. The bag contains 12 pounds of each nutrient along with 64 pounds of inert ingredients.
Fill	(Embankment) A bank of soil, rock or other material constructed above the natural ground surface.
Filter Cloth	See *Geotextile.*
Filter Strip	A wide belt of vegetation designed to provide infiltration, intercept sediment and other pollutants, and reduce stormwater flow and velocity. Designed to accept an even distribution of surface runoff; their effectiveness is reduced if a channel forms, or if high velocity flows occur.
Filtration	The process of retaining soils or other materials while allowing the passage of water or fluids.
Finished Grade	The final elevation of the ground surface conforming to the approved construction plan.
Flood	An overwhelming quantity of water. Measured in terms of either water level or discharge rate.
Floodplain	A relatively level surface of stratified alluvium which adjoins a water course and is subject to periodic flooding, unless protected artificially by a dike or similar structure.
Footing	The supporting base or ground work of a structure.
Freeboard	The vertical distance between the elevation of the design high-water level and the top of a dam, diversion ridge or other water control device.
Freeze-Thaw Resistance	Ability to resist movement and/or degradation caused by cycles of extreme temperature fluctuations above and below the freezing point.
Friction Angle	An angle, the tangent of which is equal to the ratio of the friction force per unit area to the normal stress between two materials.
Frost Heave	The raising of a surface or object due to the accumulation of ice in the underlying soil.

- G -

Gabion A galvanized or polyvinylchloride-coated steel wire mesh basket filled with stones, broken concrete or other dense, erosion-resistant material. Baskets usually form part of a larger unit of several such baskets. Used to protect channel banks, shorelines or steep slopes from erosion.

Gauge Standard measurement of the thickness of metal sheets or wire (and bearing a relation to the weight of the metal).

Geocomposite A manufactured material using geotextiles, geogrids and/or geomembranes in laminated or composite form.

Geogrid A net-like polymeric material used to reinforce, stabilize and/or contain soil, rock, earth or other material in a wide variety of applications including internally reinforced soil walls, segmental retaining walls, steep slopes, etc.

Geomembrane A synthetic impermeable membrane used to contain liquids and/or sediment.

Geosynthetics Any synthetic materials, including geotextiles and geomembranes, or any combination thereof, used with foundation, soil, rock, earth or any other geotechnical engineering related material, as an integral part of a structure or system.

Geotechnical Engineering The application of the laws and principles of science and mathematics to solve problems related to the materials of the earth's crust. It includes the fields of soil mechanics, rock mechanics, and many of the engineering aspects of geology, geophysics, hydrology and related sciences.

Geotextile (Fabric, Filter Cloth) A woven or nonwoven water permeable material either natural or synthetic used to filter liquids and to prevent the movement of sediment, to separate different materials or to reinforce and strengthen them.

Germination The beginning of plant growth. The sprouting of roots, stem and leaves from seed.

Glacial Till Material deposited by glaciation, usually composed of a wide range of particle sizes, that has not been subjected to the sorting action of water.

Gradation The distribution of particle sizes in a material.

Grade (1) To level off to a smooth horizontal or sloping surface. (2) A reference elevation. (3) Particle size distribution of an aggregate. (4) The slope of a plane.

Grade Stabilization Structure A structure usually a combination of an earth embankment and mechanical spillway, installed to discharge water from a higher to a lower elevation in order to control erosion, head-cutting or to reduce channel grade.

Gradient See Slope

GRAND (Great Rivers Alliance of Natural Resources Districts) Regional association of conservation districts serving the urban conservation needs of eight Missouri and Illinois counties in the St. Louis metropolitan area.

Granular A description of the uniformity of grain size of gravel, sand or crushed stone.

Gravel (1) Soil particles with diameters between 2 mm and 3 inches. (2) Loose, rounded fragments of rock commonly used to surface roads.

Ground Cover Any vegetation producing a protective mat on or just above the soil surface. Usually refers to low-growing herbaceous plants.

Ground Water Level See *Water Table*.

Grout A fluid mixture of cement, water and sand or other fillers that can be poured or pumped easily. Used to fill the voids between riprap, culverts or other structures in channels or slopes to prevent or reduce erosion or inadvertent water flow.

Gully Erosion See *Erosion.*

- H -

Head Pressure measured as an equivalent height of water. Measured in feet or pounds per square inch.

Headcut The uphill end of a gully where water overfalls to a lower level and active erosion occurs.

Herbaceous A non-woody plant.

High-Density Polyethylene (HDPE) A synthetic polymer used for geomembranes and pond liners.

Horizon A layer of soil that is distinguishable fro-m adjacent layers by characteristic physical and chemical composition. Soil horizons are commonly referred to as topsoil, subsoil and parent material. “A” horizon: the uppermost layer usually contains organic matter. “B” horizon: the layer which accumulates material leached from the “A” horizon. “C” horizon: undisturbed parent material from which the overlaying layers have developed.

Humus See *Organic Matter*.

Hydraulic Gradient A line which represents the relative force available due to the potential energy available. This is a combination energy due to the height of the water and internal pressure. In an open channel the line corresponds to the water surface. In a closed conduit, if several openings are placed along the top of the pipe and open end tubes inserted, a line connecting the water levels in the tubes represents the hydraulic energy.

Hydraulic Mulch Processed materials such as wood and paper products, cotton or straw fibers that are applied by special equipment utilizing a water-based slurry which is sprayed on the soil surface.

Hydraulic Radius The cross-sectional area of a stream of water divided by the length of that part of its periphery in contact with its containing conduit. The ratio of area to wetted perimeter.

Hydraulics The science and technology of the mechanics of fluids.

Hydric Soil Soils that are wet long enough to periodically produce anaerobic conditions, thereby influencing the growth of plants.

Hydrograph A chart showing for a given point on a stream the runoff rate, depth, velocity or other property with respect to time.

Hydrologic Soil Groups Categories of soil based upon their runoff producing characteristics. Group A soils have low runoff potential. Group D soils, the other extreme, have high runoff potential. Hydrologic soil groups are listed in NRCS soil surveys, a publication available at NCRCS/Conservation District office.

Hydrology Science dealing with the distribution and movement of water.

Hydrophilic Molecules and surfaces that have a strong affinity for water molecules.

Hydrophobic Molecules and surfaces that have little or no affinity for water molecules.

Hydrophytic A plant adapted to growth in water or saturated soil.

Hydroseeding Spreading of seed hydraulically in a water medium. Mulch, lime and fertilizer can also be incorporated into the sprayed mixture.

Hydrostatic Pressure A state of stress in which all the principal stresses are equal (and there is no shear stress), as in a liquid at rest; the pressure in a liquid under static conditions; the product of the unit weight of the liquid and the difference in elevation between the given point and the free water elevation. Measured in pounds per square inch.

Hygroscopic A material attracts, absorbs and retains atmospheric moisture.

- I -

IDDE Illicit Discharge Detection and Elimination

IECA The International Erosion Control Association, P.O. Box 774904, Steamboat Springs, Colorado 80477-4904 or phone 800-455-4322. Serving as a global resource for people who share a common responsibility for the prevention and control of erosion. The Great Rivers Chapter serves Iowa, Kansas, Missouri and Nebraska. Contact Great Rivers Chapter of IEAA at 600 Broadway, Suite 300, Kansas City, MO 65104-or call 816-474-4240.

Impermeable Does not permit passage of a fluid or a gas.

Impervious Impenetrable. Soil which is resistant to the entrance of water, air or plant roots.

I**ncorporate** To mix materials such as fertilizer or lime into the soil with tillage operations.

Infiltration The downward entry of water into the surface of soil.

Inflow The water discharged into a point of concern.

Inoculation (of seeds) The addition of nitrogen-fixing bacteria (inoculant) to legume seeds or to the soil in which the seeds are to be planted. The bacteria convert atmospheric nitrogen into a form available for plant growth.

Inorganic Composed of matter that is not of plant or animal origin.

Inorganic Soil See *Mineral Soil*.

Intermittent Stream A stream, or reach of a stream, that does not flow year round.

- K -

Kansas Department of Health and Environment (KDHE) The state agency in Kansas which regulates the NPDES Program including stormwater runoff permitting. See Resource Inventory List for more information.

- L -

Landscaping The placement of sod, seed, trees and other vegetation after final grading is completed.

Lapped Joint A joint made by placing one surface to be joined partly over another surface and bonding or fastening them together.

Leachate Liquid that has percolated through a material and contains soluble components removed from that material.

Leaching The removal in solution of soluble materials by percolating water. Generally refers to the movement of soil nutrients to a deeper soil horizon, making them unavailable for plant growth. It can also refer to the movement of contaminants through the soil and into the groundwater.

Legume Any member of the pea or bean family which includes peas, beans, clovers, alfalfas, lespedezas and vetches. Most are nitrogen-fixing plants.

Lift An applied and/or compacted layer of soil, asphalt or waste. Also referred to as a course.

Lime, Agricultural A soil amendment containing calcium carbonate and other materials used to neutralize soil acidity and furnish calcium for plant growth.

Liner A layer of emplaced materials which serves to restrict the escape of liquids or solids placed within the impoundment. This includes reworked or compacted soil and clay, asphaltic and concrete materials, spray-on membranes, polymeric membranes or any substance that serves the above stated purpose. The portion of a reservoir responsible for the first line of defense against seepage; that is, the part immediately adjacent to the liquid being held.

Loam A soil textural classification in which the proportions of sand, silt and clay are well balanced. Loams have the best properties for cultivation of plants.

Loess Material transported and deposited by wind and consisting of predominantly silt-size particles. Loess has an open structure and relatively high cohesion due to cementation of clay or calcareous material at grain contacts A characteristic of loess deposits is that they can stand with nearly vertical slopes.

- M -

MAACD Mid-America Association of Conservation Districts. A regional association of conservation districts serving the urban conservation needs of ten Kansas and Missouri counties in the Kansas City metropolitan area.

MCM Minimum Control Measure

MEP Maximum Extent Practicable

MS4 Municipal Separate Storm Sewer System

Manning's Equation An equation for determining the flow rate of water in a uniform, steady state condition.

Mass The quantity of matter in a body.

Mass Per Unit Area The amount of material per unit area. Units can be ounces per square yard or grams per square meter.

Mean The average value of a group of numbers.

Mil Abbreviation for one-thousandth.

Mineral Soil (Inorganic Soil) A soil with less than 20% organic matter.

Mitigation The process of reducing the negative impacts of a project.

Moisture Content The percentage by weight of water contained in the pore space of a solid material with respect to the total weight of the solid material.

Monomer A relatively simple compound which can react to form a polymer.

Mulch A natural or artificial layer of plant residue or other materials covering the land surface which conserves moisture, reduces erosion and aids in the establishment of plant cover.

- N -

NHPA National Historic Preservation Act

Natural Erosion The natural influence of climatic forces on the surface of the earth.

National Pollution Discharge Elimination System (NPDES) Federal legislation that requires cities with populations over 100,000 to establish a permit process to control sediment pollution. A permit is also required for development sites five acres or greater in size. Permits are authorized and enforced by the Environmental Protection Agency or a designated state agency as directed by the Clean Water Act.

Natural Resources Conservation Service (NRCS) A federal agency, formally known as the Soil Conservation Service, that provides technical assistance on natural resource management tissues. See the Resource Inventory List for more information.

Nonpoint Source Pollution (NPS) Pollution that enters a waterbody from sources that are diffuse. A point source, by contrast, can be easily identified as distinct such as an industrial or sanitary sewer pipe.

Normal Water Level The average summer water level. The free surface associated with flow in natural streams.

- O -

Observation Well A vertical pipe placed in the ground to observe groundwater level.

Open Channel A drainage course which has no restrictive top. It is open to the atmosphere and may or may not permit surface flow to pass over its edge and into another channel in an unrestricted manner. In many cases where dikes are constructed to increase channel capacity, entrance of surface waters is necessarily controlled.

O - Continued

Ordinance A law set forth by a governmental authority.

Organic Matter (Humus) The portion of soil, usually dark in color, resulting from the decomposition of plant and animal materials.

Outfall The point where drainage discharges from a drainageway or conduit to a receiving stream or body of water.

Outlet The point of water disposal from a stream, river, lake or artificial drain.

Outlet Channel A waterway constructed or altered primarily to carry water from structures such as smaller channels, tile lines, dams and diversions.

Overburden (1) The loose soil, sand, silt or clay that overlies bedrock. (2) All material overlying an underground excavation.

Overfall A sudden drop in grade, usually associated with a gully.

Overlap That section of adjacent geosynthetic materials that are in contact; one under the other forming a seamed or unseamed joint.

- P -

PCP Post Construction Program

PEI Public Education and Information

PIP Public Involvement and Participation

PLS (Pure Live Seed) A measure of seed quality expressed as a percentage. The product of the percentage of seed purity and the percentage of germination (including the germination of hard seed) divided by 100.

PPGH Pollution Prevention and Good Housekeeping

Particle Size The effective diameter of a particle measured by sedimentation, sieving, or micrometric methods.

Peak Discharge The maximum instantaneous flow from a given storm condition at a specific location.

Percent Open Area The net area a fabric that is not occupied by fabric filaments, normally determinable only for geotextiles having distinct visible and measurable openings that continue directly through the fabric.

Percolation The downward movement of water through the soil horizons. The percolation rate of soil is usually expressed as inches per hour.

Permanent Seeding The establishment of perennial vegetation on disturbed areas for periods longer than 12 months.

Permeability (Soil) The property of the soil that expresses the ease with which water moves downward through the profile. The rate (inches per hour) at which a saturated soil transmits water.

Permittivity The flow rate of water through a geotextile.

Pervious A property of a material through which water passes relatively freely (e.g., sands and gravels).

pH A measure of the acidity or alkalinity of a substance. A pH value of 7.0 is neutral, less than 7.0 is acidic, greater than 7.0 is alkaline.

Photodegradable The ability of a material to break down due to exposure to sunlight.

Pipe A culvert having a non-rectangular cross-section, often assumed to be circular unless specified otherwise, which carries a liquid or gas.

Piping (Tunneling) The movement of soil particles by seepage leading to the development of subsurface voids, tunnels or pipelike cavities.

Plastic A material that contains as an essential ingredient one or more organic polymeric substances of large molecular weight, is solid in its finished state and, at some stage in its manufacture or processing into finished articles, can be shaped by flow.

Plasticity The capacity of a soil or rock to be deformed continuously and permanently by relatively moderate pressure without cracking or appreciable volume change.

Polymer A macromolecular material formed by the chemical combination of monomers. Plastics, rubbers and textile fibers are all high molecular weight polymers. Only synthetic polymers are used to make synthetics.

Polyvinylchloride (PVC) A synthetic thermoplastic polymer prepared form vinyl chloride. PVC can be compounded into rigid forms used in pipes or into flexible forms used in the manufacture of geotextiles.

Ponding (D) Water backed up in a channel, depression or a ditch as the result of a constriction, obstruction or lack of outlet.

Porosity The percentage by volume of voids of a given material with respect to the total volume of the material.

Pourous Pavement A permeable surface material which provides support for traffic without deformation and allows for stormwater and surface runoff to gradually infiltrate into the subsoil.

Potable Water Water suitbale for human consumption.

Precipitation Process by which water in liquid or solid state (rain, sleet, snow) is discharged out of the atmosphere upon a land or water surface.

- Q -

Qualified Design Professional Someone who is trained and highly qualified in their field such as horticulturists, landscapers, various design specialists and technicians.

- R -

RCRA Resource Conservation and Recovery Act

RUSLE (Revised Universal Soil Loss Equation) An updated, computerized method of estimating soil movement due to water erosion. RUSLE incorporates the updated climate, soil erodibility and vegetative cover factors of the Universal Soil Loss Equation.

Registered Design Professional A qualified design professional who is normally certified and/or degreed as an engineer, landscape architect, arborist, forester, biologist, erosion and sediment controls specialist, etc.

Reinforcement To strengthen by the addition of materials or support. For example, the strengthening of a soil-geosynthetic system by contributions of the geosynthetic inclusion.

Residual Soil Soil derived in place by the effects of weathering.

Retaining Wall A constructed wall used to eliminate steep slopes while providing stability.

Revetment A lining of stone, concrete, geosynthetics or organic materials used to stabilize a streambank, riverbank or channel.

Rill Erosion See *Erosion*.

Riparian Area Land Adjacent to a body of water that is at least periodically influenced by concentrated water flows or by flooding.

Riprap Dense stone of various size, resistant to weathering, that is placed on earth surfaces, such as the face of a dam or the bank of a stream, to prevent scour erosion.

Riser A vertical pipe connected to an underground pipe used to control the discharge rate from a pond or basin.

Rock Natural, solid, mineral matter occurring in large masses or fragments.

Rock Check Structures See *Check Dam*.

Roll Goods A general term applied to manufactured materials such as erosion control blankets, turf reinforcement mats (TRMs), netting, geotextiles and other geosynthetics which are furnished in rolls.

Roughness Coefficient A factor in flow formulas representing the effect of channel or conduit roughness on the velocity of flowing water.

Runoff That portion of precipitation not absorbed or retained on the land surface, but collects and flows from a drainage area. Water which is lost without entering the soil is called surface runoff. Water which enters the soil before reaching a stream channel is called groundwater runoff. The rate of surface water runoff in open channels or in stormwater conveyance systems is measured in cubic feet per second.

- S -

SHPO State Historic Preservation Officer

SWMP Stormwater Management Program

SWPPP Stormwater Pollution Prevention Plan

Sand (1) Mineral particles that range in size from 2 mm to .05 mm in equivalent diameter. (2) A loose, granular material that results from the disintegration of rocks, consisting of particles smaller than gravel but coarser than silt. (3) A soil containing 85 percent or more of sand and 10 percent or less of clay.

Sand Diaphragm A vertical wall of sand around a pipe placed through an embankment. Used instead of anti-seep collars. Drainage from the wall is outletted at the downstream toe of the embankment.

Saltation See Erosion.

Saturation (Soil) The point at which all the voids between soil particles are filled with water.

Scarify (1) Roughening the land surface. (2) To abrade the seed coat to improve seed germination.

Scour The clearing digging action of flowing water, especially the erosion caused by stream water in sweeping away sediment from the streambed and outside bank of a cured channel.

Sediment Mineral or organic material which, after being in suspension and transported from its original location by wind, water, gravity or ice, has come to rest in a new location.

Seed Bed Soil that has been prepared to promote the germination of seed and the growth of seedlings.

Seed Purity The percentage of the desired species, in relation to the total quantity of bulk material which may include other species, weed seeds or inert matter such as leaves, stems, soil, etc.

Seepage The slow movement of gravitational water through soil, rock, embankments or structures.

Separation The function of a geotextile or other product as a partition between two adjacent dissimilar materials to prevent mixing of the two materials.

Shear Stress (Tangential Stress) The stress component tangential to a given plane. Basic formula to determine the shear stress of a channel (unit wt. of water [62.4 lbs/ft^3] X Slope (ft/ft.] X Depth [ft.] = Shear Stress [lbs/ft^2]).

Sheet Erosion See *Erosion*.

Sheet Flow Water flowing across a wide, uniform area such as a highway, parking lot or field.

Shoreline Erosion See *Erosion*.

Shotcrete Mortar or concrete conveyed through a hose and pneumatically projected at high velocity onto a surface. Used to stabilize the surface. Can be applied by a “wet” or “dry” mix method.

Shrink-Swell The volume change of soil based on moisture capacity. Soils that shrink when dry and swell when wet can damage plant roots, roads, dams and building foundations.

Silt (1) Mineral particles that range in size from .005 mm to .002 mm in equivalent diameter. (2) A soil containing 80 percent or more of silt and less than 12 percent clay. (3) A deposition of sediment.

Silt Fence A temporary barrier consisting of a geotextile which is attached to supporting posts and trenched into the ground at the base. As the runoff water slowly filters through the geotextile, the sediment settles out on the uphill side of the silt fence.

Sink Hole A depression in the substrate, usually deep in comparison to its diameter Caused by the setttlement or substrate particle removal by migrating water.

Site Synonymous with job site.

Slag Rough, cindery lava from a volcano.

Slide Movement of a part of the earth under force of gravity, usually due to saturated conditions, or an earthquake.

Slope Degree of deviation from horizontal expressed as a percentage, as a numerical ratio or in degrees. As a percentage, slope is the number of feet of rise or fall in 100 feet of horizontal distance. As a ratio, it is the number of feet of horizontal to the number of feet vertical. For example, a 25 percent slope is equal to a 4:1 slope and is equal to a slope of approximately 14 degrees.

Sloughing The separation and downhill movement of a small portion of the slope from surrounding material.

Slumping The movement of a mass of rock or earth descending to a lower level.

Slurry A watery mixture of suspended matter.

Soil (Earth) Sediments or other unconsolidated accumulations of solid particles produced by the physical and chemical disintegration of rocks or organic materials.

Soil Liquefaction Loss of strength of a saturated soil resulting from the combined effects of vibrations and hydraulic forces, thereby causing the material to flow.

Soil Mechanics The application of the laws and principles of mechanics and hydraulics to engineering problems dealing with soil as an engineering material.

Soil Profile Vertical section of the soil from the surface through all horizons.

Soil Stabilization Chemical or mechanical treatment designed to increase or maintain the stability of a mass of soil or otherwise to improve its engineering properties.

Soil Test The process to determine the soil pH and the nutrient-supplying capability of a specific soil for a specific crop or plant species. Used to determine recommended liming and fertilization rates. Available through University Extension offices and private laboratories.

Soil and Water Conservation Society (SSWCS) A multidisciplinary membership organization advocating the protection, enhancement and wise use of soil, water and related natural resources located at 7515 Northeast Ankeny Road, Ankeny, Iowa 50021-9764 or phone 515-289-2331.

Species The basic biological classification of organisms. For example, species of grass include tall fescue, smooth bromegrass and timothy.

Specific Gravity The ratio of the density of a material to the density of water when both densities are obtained by weighting in air. A specific gravity less than one implies that the material will float.

Spillway (Principal) an open or closed channel or conduit used to convey excess water from a pond, reservoir or basin.

Spillway (Emergency) A designed depression at one side of the embankment of a pond or basin that will pass peak discharges greater than the maximum design storm controlled by the principal spillway and detention storage.

Splash Erosion See *Erosion*.

Splash Pad A nonporous material placed at the outfall of a conduit, channel or grade stabilization structure to decrease energy of water flow to a non-erosive velocity.

Spoil Excess rock or soil material not needed after a practice is constructed.

Sprig A portion of the stem and/or roots of a plant used for propagation. For example, Bermuda grass is commonly established with sprigs rather than seed.

Stable Non-eroding.

Stable Outlet An outlet, either natural or constructed, which will dispose of water at non-erosive velocities and without flooding.

Stabilize (1) To establish a non-erosive condition so that stormwater runoff from a design storm will not cause erosion of soil. Usually achieved by protecting erodible areas with structures or vegetation. (2) To establish a soil condition that will not slide or slump, usually by removing saturated conditions or by flattening slopes.

Stage The height of the surface of a river above an arbitrary zero point.

Staple A fastening device typically manufactured of 8- to 11-gauge wire, “U” shaped with 4” to 10” legs and a 1” to 2” crown. Used to secure erosion control blankets, geotextiles and related materials to the grounds.

Steady Flow A flow in which the volume passing a given point per unit of time remains constant.

Storage Basin Space for detention or retention of stormwater runoff water for controlled release during or following the design storm. Storage may be upstream, downstream, offstream, onstream and/or underground.

Stone Crushed or naturally angular particles of rock between the size 4.75 and 75 millimeters.

Storm Sewer A conduit that carries stormwater, surface drainage, street wash and other washwaters but usually excludes sewage and industrial wastes. Also, a storm drain.

Stormwater Management A master plan or systems approach to the planning of facilities, programs and management organization for comprehensive control and use of stormwater within a defined geographical area.

Stream Hydraulics The science and technology of water behavior in streams.

Structure (1) The relation of particles or groups of particles which impart to the whole soil a characteristic manner of breaking: some types are crumb, block, platy and columnar. (2) A constructed practice designed to control erosion, sedimentation, stormwater runoff or an overfall.

Subgrade The soil prepared and compacted to support a structure or a pavement system.

Subsoil (1) Soil below a subgrade or fill. (2) That part of the soil profile occurring below the ”A” horizon.

Subsurface Drain (Underdrain) A perforated pipe used for subsurface drainage, usually surrounded by aggregate or wrapped in a geotextile filter fabric to prevent the migration of soil particles.

Suspension The state of substance when its particles are kept from falling or sinking. See *Erosion*.

Swale A low-lying, often wet, area of land.

Synthetic Any material created by artificial means.

- T -

TMDL Total Maximum Daily Load (Relating to allowable amount of pollutant discharge-predetermined)

Tackifier See *Binder.*

Tangetial Stress See *Shear Stress*.

Temporary Seeding The establishment of fast-growing annual vegetation to provide economical erosion control for up to 12 months and to reduce the amount of sediment moving off the site.

Tensile Strength The maximum force a material can bear without tearing apart. Units are reported as maximum stress (e.g., pounds per square inch) or force per unit thickness (e.g., pounds per inch width).

Tenting Separation of installed manufactured blankets from contact with the ground surface.

Texture The percent of sand, silt and clay in a soil.

Tillage The mechanical manipulation of soil with equipment such as plows, discs, cultivators or harrow. Also, tilled land.

Toe Drain A subdrain installed near the downstream toe of a dam or levee to intercept seepage and to outlet it away form the structure.

Toe of Slope The junction of a slope and the bottom of the slope.

Top of Slope The junction of a slope and the top of the berm, channel or embankment.

Topographic Map A map of contour lines.

Topsoil Surface soil usually containing organic matter. The fertile soil most capable of growing vegetation and crops.

Toxic The characteristic of being poisonous or harmful to plant or animal life.

Trash Rack A structural device used to prevent debris from entering a pipe, spillway or other water structure.

Turbidity The degree of cloudiness in water caused by suspended particles. Turbidity can be precisely measured and is often used as an indicator of pollution.

Turf Reinforcement Mat (RMU) Permanent synthetic erosion control blankets which resist erosion and reinforce the root zone of vegetation to allow heavier flows without losing the vegetation or underlying soil. Increases the ability of vegetation to resist the erosive force of flowing water.

- U -

Underdrain See *Subsurface Drain*.

Undermining A process of scour by hydraulic action that progressively removes earth support from a structure. Undermining commonly occurs at the outlet of a culvert or sewer.

Ultraviolet Degradation Breakdown of polymeric structures when exposed to light.

Ultraviolet Radiation Stability (UV) the ability of a material to resist deterioration from exposure to sunlight.

Uniform Flow Flow in which the velocities are the same in both magnitude and direction from point to point along the stream or conduit.

Unsheltered Distance The distance from the downwind edge of an area and a stable point in the direction of the prevailing wind. Used as a factor in estimating wind erosion.

Unsteady Flow A flow in which the velocity changes with respect to both space and time.

- W -

WLA Pollutant Wasteload Allocation

303 Listed – Impaired Body of water, must not exceed TMDL and add to pollutants