

1. GLOSSARY

A. Acronyms, Abbreviations and Symbols

A	Area of cross section
A	Watershed area
a	Depth of depression
C	Runoff coefficient or coefficient
d	Depth of gutter flow at the curb line
D	Diameter of pipe
$E_o$	Ratio of frontal flow to total gutter flow, $Q_w/Q$
h	Height of curb opening inlet
H	Head loss
I	Rainfall intensity
K	Coefficient
L	Length of curb opening inlet
L	Pipe length
L	Pavement width
L	Length of runoff travel
n	Roughness coefficient in Manning formula
P	Perimeter of grate opening, neglecting bars and side against curb
P	Tire pressure
Q	Rate of discharge in gutter
$Q_i$	Intercepted flow
$Q_s$	Gutter capacity above the depressed section
$Q_T$	Total flow
R	Hydraulic radius
S or $S_x$	Cross slope
S	Crown slope of pavement
S or $S_L$	Longitudinal slope of pavement
$S_w$	Depression section slope

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<b>T</b>	Top width of water surface (spread on pavement)
<b>t<sub>c</sub></b>	Time of concentration
<b>T<sub>s</sub></b>	Spread above depressed section
<b>V</b>	Vehicle speed
<b>V</b>	Velocity of flow
<b>W</b>	Width of depression for curb opening inlets
<b>W<sub>d</sub></b>	Rotational velocity on dry surface
<b>WD</b>	Water depth
<b>W<sub>w</sub></b>	Rotational velocity on flooded surface
<b>y</b>	Depth of flow in approach gutter
<b>Z</b>	T/d, reciprocal of the cross slope

## **B. Terms and Definitions**

<b>Asphaltic curb and flume</b>	A permanent or temporary erosion control measure.
<b>Baffle piers</b>	See dragon teeth.
<b>Beneficial Uses</b>	<p>Streams, lakes, rivers, and other water bodies, have uses to humans and other life; these uses are referred to as the Beneficial Uses of a water body. Beneficial uses are assigned to surface waters within or bordering upon the State of Nebraska. Some uses require higher quality water than others. When multiple uses are assigned to the same waters, all assigned uses will be protected. The beneficial uses defined by these standards are:</p> <ul style="list-style-type: none"><li>➤ Primary Contact Recreation</li><li>➤ Aquatic Life<ul style="list-style-type: none"><li>○ Cold water (Class A and B)</li><li>○ Warm water (Class A and B)</li></ul></li><li>➤ Water Supply<ul style="list-style-type: none"><li>○ Public Drinking Water</li><li>○ Agricultural</li><li>○ Industrial</li></ul></li><li>➤ Aesthetics</li></ul>
<b>Bypass</b>	Flow that bypasses an inlet on grade and is carried in the street or channel to the next inlet downgrade. Inlets can be designed to allow a certain amount of bypass. Also, inlets may be designed to allow a certain amount of bypass for one design storm and larger or smaller amounts for other design storms.

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<b>Cellular confinement system</b>	Three-dimensional cells constructed of heavy-duty polyethylene filled with various materials.
<b>Clean Water Act</b>	A federal law that controls the discharge of pollutants into surface water in a number of ways, including discharge permits.
<b>Combination inlet</b>	A drainage inlet usually composed of a curb-opening inlet and a grate inlet.
<b>Common Plan of Development</b>	A contiguous area where multiple separate and distinct land disturbing activities may be taking place at different times, on different schedules, but under one proposed plan. One plan is broadly defined to include design, permit application, advertisement or physical demarcation indicating that land-disturbing activities may occur.
<b>Concrete ditch lining</b>	Ditch floors and banks paved with cast-in-place reinforced concrete.
<b>Concrete slope protection</b>	The placement of concrete slabs on bridge embankments for erosion control.
<b>Covercrop seeding</b>	The establishment of temporary vegetative cover on disturbed areas with appropriate rapidly growing annual plants.
<b>Culvert protection</b>	A temporary sediment filter located at culvert inlets to prevent sediment from entering, accumulating in and being transferred by the drainage system prior to permanent stabilization.
<b>Curb-opening inlet</b>	A drainage inlet consisting of an opening in a roadway curb.
<b>Diffused surface waters</b>	Waters which have been precipitated on the land from the sky or forced to the surface in springs, and which have then spread over the surface of the ground without being collected into a definite body or channel. They appear as puddles, sheet or overland flow and rills; and continue to be surface waters until they disappear from the surface by infiltration or evaporation, or until by overland or vagrant flow, they reach well-defined watercourses or standing bodies of water like lakes or seas.
<b>Dragon teeth</b>	Alternating rows of rectangular-shaped objects that are used to dissipate energy at the outlet of culverts.
<b>Drop inlet</b>	A drainage inlet with a horizontal or nearly horizontal opening.
<b>Drop structures</b>	Structures designed to transport stormwater runoff down a highway embankment.

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<b>Endangered Species Act</b>	The Endangered Species Act (ESA) is an environmental law that protects threatened and endangered plants and animals and the habitats in which they are found. The lead federal agencies for implementing ESA are the <b>U.S. Fish and Wildlife Service (FWS)</b> and the <b>U.S. National Oceanic and Atmospheric Administration (NOAA) Fisheries Service</b> . The <b>FWS</b> maintains a worldwide list of endangered species. Species include birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees.
<b>Environmental Protection Agency (EPA)</b>	The <b>U.S. Environmental Protection Agency (EPA)</b> or sometimes <b>USEPA</b> ) is an agency of the federal government of the United States charged with protecting human health and the environment, by writing and enforcing regulations based on laws passed by Congress.
<b>Ephemeral Stream</b>	Stream that flows only during and immediately after precipitation events.
<b>Equivalent cross slope</b>	An imaginary straight cross slope having conveyance capacity equal to that of the given compound cross slope.
<b>Erosion</b>	A natural process whereby soil particles are dislodged by rainfall and carried away by runoff.
<b>Erosion checks</b>	Hay or straw barriers placed in ditches at predetermined intervals to slow the velocity of water and cause silt deposition.
<b>Erosion control</b>	Techniques and measures utilized to provide direct protection to the soil surface and prevent erosion of soil particles.
<b>Erosion control netting</b>	Photodegradeable lightweight flexible netting used over slope protection.
<b>Erosion control products</b>	Erosion control blankets or mats used to control erosion on critical areas by providing a microclimate which protects young vegetation and promotes its establishment.
<b>Flanking inlets</b>	Inlets placed upstream and on either side of an inlet at the low point in a sag vertical curve. The purpose of these inlets is to intercept debris as the slope decreases and to act in relief of the inlet at the low point.
<b>Flood waters</b>	Former stream waters which have escaped from a watercourse (and its overflow channel) and flow or stand over adjoining land; they remain as such until they disappear from the surface by infiltration, evaporation or return to a natural watercourse. They do not become surface waters by mingling with such waters; nor do they become stream waters by eroding a temporary channel.

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<b>Foreign waters</b>	Those waters imported by a user from one watershed into another.
<b>Frontal flow</b>	The portion of the flow that passes over the upstream side of a grate.
<b>Gabions</b>	Rectangular, rock-filled wire baskets suitable for use as lining of high steep channel banks; channel drop structures; and energy dissipation at the outlet of culverts.
<b>Grate inlet</b>	A drainage inlet composed of a grate in the roadway section or at the roadside in a low point, swale or channel.
<b>Grate perimeter</b>	The sum of the lengths of all sides of a grate, except that any side adjacent to a curb is not considered a part of the perimeter in weir flow computations.
<b>Ground cover</b>	Plants used on embankments to eliminate mowing; not considered adequate erosion protection.
<b>Ground waters</b>	Waters situated below the surface of the land, irrespective of their source and transient status.
<b>Gutter</b>	That portion of the roadway section adjacent to the curb, which is utilized to convey stormwater runoff. It may include a portion, or all, of a traveled lane, shoulder or parking lane, and a limited width, adjacent to the curb, may be of different materials and have a different cross slope.
<b>Hydraulic grade line</b>	The locus of elevations to which the water would rise in successive piezometer tubes if the tubes were installed along a pipe run (pressure head plus elevation head).
<b>Impervious Surface</b>	A hard surface area that prevents or retards the entry of water into the soil, thus causing water to run off the surface in greater quantities and at an increased rate of flow.
<b>Inlet efficiency</b>	The ratio of flow intercepted by an inlet to total flow in the gutter.
<b>Intercepting dike</b>	A temporary or permanent ridge of soil constructed at the top or base of a sloping disturbed area used to divert storm runoff from upstream drainage areas away from unprotected disturbed areas.
<b>Intercepting ditch</b>	A channel constructed either across, at the top, at the midpoint, or at the toe of a slope to intercept and convey water at non-erosive velocities to an adequate and stable outlet.
<b>Intermittent Stream</b>	An intermittent or seasonal stream is one that has a consistent base flow, but only for part of the year.
<b>Lakes and ponds</b>	Relatively permanent bodies of water substantially at rest in depressions of natural origin.

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<b>Land Disturbance</b>	Areas of exposed, erodible soil, including stockpiles, that are within the limits of construction and that result from construction activities.
<b>Linear Facility</b>	Highway, Local Road.
<b>Local Public Agency (LPA)</b>	Any local political subdivision, board, commission, governmental entity, or civic organization sponsoring a federally funded transportation project and determined to be qualified to assume the administrative responsibilities for such projects by <b>NDOT</b> .
<b>Marshes</b>	Lands saturated by waters flowing over the surface in excess of infiltration capacity, as in sloughs of rivers and tidal channels.
<b>Maximum Extent Practicable (MEP)</b>	MEP is the process of evaluating the selected STFs based on legal and institutional constraints, technical feasibility, relative effectiveness, and cost/benefit ratio. For the purpose of the <b>NDOT's</b> Stormwater Management Program, implementation of STFs consistent with Chapter 3 shall constitute MEP.
<b>MS4 Community</b>	An Urbanized Area with a population of 10,000 or greater and a population density of at least 1,000 people/square mile. See Appendix O, "Regulated MS4s in Nebraska", for the official maps of MS4 communities.
<b>MS4 Permit</b>	<p>An MS4 Permit (NPDES Permit) is EPA's program to control the discharge of pollutants to waters of the United States. NPDES is a part of the federal CWA, which requires point and non-point source dischargers to obtain permits. These permits are referred to as NPDES permits.</p> <ul style="list-style-type: none"><li>➤ Phase I, issued in 1990, required medium and large cities or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges.</li><li>➤ Phase II, issued in 1999, required regulated small MS4s in urbanized areas, as well as small MS4s outside the urbanized areas that are designated by the permitting authority, to obtain NPDES permit coverage for their stormwater discharges.</li></ul>
<b>Mulching</b>	Application of plant residues or other suitable materials to the soil surface to protect the surface from raindrop impact and to reduce the velocity of overland flow.

**Municipal Separate Storm Sewer System (MS4)**

A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) which:

- Are owned and operated by a state, city, town, borough, county, parish, district, association, or other public body (created by... or pursuant to state law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under state law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act (CWA) that discharges to waters of the United States;
- Are designed or used for collecting or conveying stormwater;
- Is not a combined sewer; and
- Which is not part of a publicly owned treatment works (POTW). [40 CFR 122.26(b)(8)].

**National Pollutant Discharge Elimination System (NPDES)**

The National Pollutant Discharge Elimination System (NPDES) Stormwater Program regulates stormwater discharges from three potential sources: municipal separate storm sewer systems (MS4s), construction activities, and industrial activities. Most stormwater discharges are considered point sources, and operators of these sources may be required to receive an NPDES permit before they can discharge. This permitting mechanism is designed to prevent stormwater runoff from washing harmful pollutants into local surface waters such as streams, rivers, lakes or coastal waters.

**Nebraska Department of Environmental Quality (NDEQ)**

The **Nebraska Department of Environmental Quality** was created pursuant to passage of the Nebraska Environmental Protection Act in 1971. This State Agency is responsible for the protection of Nebraska's air, land and water resources.

**New Pavement**

New Pavement is defined as an impervious surface which is placed in an area currently devoid of such surfacing, or the complete removal and replacement of existing surfacing with modification of the base and/or subgrade.

**Non-Linear Facilities**

Rest Areas, Maintenance Yard, Offices, etc.

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<b>Off Line Treatment</b>	An Offline STF is one where only a selected amount of stormwater runoff, frequently the WQV, is diverted through the STF and all additional runoff bypasses the STF.
<b>Off-Site Mitigation</b>	Construction of STF(s) in a location not immediately adjacent to (but within the MS4 of) a given project, in lieu of construction of STF(s) on the given project. When stormwater treatment is not feasible in a given project, there may be an option to mitigate the Water Quality Volume on a separate <b>NDOT</b> project within the same MS4 community. Currently, this is not an acceptable treatment option. The <b>NDOT</b> will first need to develop an agreement with the <b>Nebraska Department of Environmental Quality</b> on how this would be administered before this practice will be allowed.
<b>On Line Treatment</b>	An Online STF is one where all stormwater runoff generated by the project is conveyed through the STF.
<b>Percolating waters</b>	Waters which have infiltrated the surface of the land and moved slowly downward through devious channels (aquifers) unrelated to stream waters, until they reach an underground lake or regain and spring from the land surface at a lower point. Percolating waters confined below impermeable formations with sufficient pressure to spring or well up to the surface are termed artesian waters; those detained or retained above an impermeable formation, so as to stand above and detached from the main body of ground water, are called perched waters.
<b>Perennial Stream</b>	Stream or river (channel) that has continuous flow in parts of its bed all year round during years of normal rainfall.
<b>Permanent slope protection</b>	Spreading and crimping of hay on bare soil in conjunction with seeding.
<b>Plunge basin</b>	A type of energy dissipator that may be used where flows issue from a freely discharging pipe where the water jet subsequently discharges into the air and then plunges downward into the basin.
<b>Pollutant</b>	Any constituent present in sufficient quantity to impair the beneficial uses of a receiving waterbody. The most common contaminants in highway runoff are suspended solids, heavy metals, inorganic salts, and aromatic hydrocarbons that accumulate on the road surface as a result of regular highway operation and maintenance activities.
<b>Post Project</b>	Refers to the time period after a construction project is completed (represented by the full establishment of vegetation).
<b>Pressure head</b>	The height of a column of water that would exert a unit pressure equal to the pressure of the water.

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<b>Priority Stormwater Outfall</b>	Concentrated stormwater flow locations from areas with a net increase of at least 5,000 square feet of New Pavement (including bridge surfaces) directly discharging from State ROW to the following locations within the MS4 boundary: <ul style="list-style-type: none"><li>• Streams – Perennial and Intermittent,</li><li>• Lakes and Ponds,</li><li>• Wetlands,</li><li>• Municipal Separate Storm Sewer System,</li><li>• Ephemeral drainage that directly discharges to one of the above located beyond the ROW line and within the distance identified in Appendix N.</li></ul>
<b>Receiving Water</b>	Creeks, streams, rivers, lakes, estuaries, or other surface water bodies into which stormwater is discharged.
<b>Revet mattress</b>	A special type of gabion with a large surface area-to-thickness ratio.
<b>Riprap</b>	A layer, facing or protective lining of stones over filter fabric placed to prevent erosion, scour or sloughing.
<b>Scour hole</b>	An energy dissipator consisting of a preformed excavated hole or depression that is lined with riprap of a stable size to prevent scouring.
<b>Scupper</b>	A vertical hole through a bridge deck for the purpose of deck drainage. Sometimes, a horizontal opening in the curb or barrier is called a scupper.
<b>Sediment</b>	Eroded soil deposited by gravity in streams, lakes and reservoirs.
<b>Sediment basin</b>	A temporary barrier or dam with a controlled stormwater release structure formed by constructing an embankment of compacted soil across a drainage way.
<b>Sediment control</b>	Techniques and measures utilized to remove sediment from waters by filtering or slowing the velocity of the water.
<b>Sedimentation</b>	The natural process of deposition of eroded soil.
<b>Seeding</b>	Permanent placement of seed on unsurfaced foreslopes, ditches, backslopes, shoulders, medians, and other areas, as specified, once the finish grade is established
<b>Side-flow interception</b>	Flow that is intercepted along the side of a grate inlet, as opposed to frontal interception.
<b>Silt fence</b>	A temporary or permanent sedimentation barrier consisting of synthetic or natural fabric.
<b>Silt trap</b>	A temporary ponding area formed by excavating a ditch along the path of water.

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<b>Slope drain</b>	A pipe installed above grade, extending from the top to the bottom of a cut or fill slope to temporarily transport concentrated stormwater runoff safely down the face of a cut or fill slope.
<b>Slotted drain inlet</b>	A drainage inlet composed of a continuous slot built into the top of a pipe which serves to intercept, collect, and transport the flow.
<b>Sodding</b>	Transplanting of ready to grow grasses, done mostly in urban areas limited to occupied residential property and business sites.
<b>Splashover</b>	Portion of the frontal flow at a grate, which skips or splashes over the grate and is not intercepted.
<b>Spread</b>	The width of flow in the gutter measured laterally from the roadway curb.
<b>Springs</b>	Percolating waters issued by natural forces from the earth.
<b>Storage or excess supply</b>	Mainly project storage, where waters are retained from investigation, residential, municipal or industrial use.
<b>Storm drain</b>	That portion of the storm drainage facility that receives runoff from the inlets and conveys the runoff to an adequate outfall. Culverts discharging to the storm drainage system are considered part of the system.
<b>Stormwater Outfall</b>	A point source at the point where a facility and/or municipal separate storm sewer discharges to waters of the state. For <b>NDOT</b> this means anywhere that intentionally collected stormwater flow exits the right-of-way and discharges to a water of the state.
<b>Stormwater Run-on</b>	Stormwater run-on is defined as any stormwater which intermingles with the Treatment Drainage Area runoff prior to treatment. This can occur as either overland flow or underground flow via culvert or storm sewer pipe. <b>NDOT</b> projects can receive stormwater run-on from both adjacent properties and other parts of the highway or right-of-way.
<b>Stormwater Runoff</b>	Rainfall, snowmelt, and other surface water drainage; that does not evaporate or infiltrate the ground because of impervious land surfaces or a soil infiltration rate lower than rainfall intensity, but instead flows onto adjacent land or into waterbodies or is routed into a drain or sewer system.
<b>Stormwater Treatment Facility (STF)</b>	A STF is a measure that is implemented to protect water quality and reduce potential for pollution associated with stormwater runoff and includes any program, technology, process, siting criteria, operating method, or device that controls, prevents, removes, or reduces pollution. STFs are a combination of permanent structural and/or non-structural facilities used to improve stormwater quality throughout the functional life of the roadway.

<b>Stream waters</b>	Former diffused surface waters that have entered and now flow in a well-defined natural watercourse, together with other waters reaching the stream by direct precipitation or rising from springs in the bed or banks of the watercourse. They continue as stream waters as long as they flow in the watercourse, and include overflow and multiple channels as well as the ordinary or low-water channel.
<b>Surface waters</b>	Waters commonly held to be those above the rock or soil surface of the earth.
<b>Swamps</b>	Lands saturated by ground water standing at or near the surface.
<b>Temporary seeding</b>	The establishment of permanent vegetation using perennial grasses for a short duration, usually two years or less; generally used in staged construction. May also consist of covercrop seed with hydraulically applied heavy mulch for temporary roads.
<b>Temporary slope protection</b>	Spreading and anchoring of hay, straw or rushes without seeding. Typically used on temporary roads in or near sandhills, but may be used other places.
<b>Total Suspended Solids (TSS)</b>	TSS is the weight of particles that are suspended in water. Suspended solids in water reduce light penetration in the water column, can clog the gills of fish and invertebrates, and are often associated with toxic contaminants because organics and metals tend to bind to particles.
<b>Treatment Drainage Area</b>	The Treatment Drainage Area is defined as the area of New Pavement on the project.
<b>Underground streams</b>	Flows of ground waters parallel to and adjoining stream waters and usually determined to be integral parts of the visible streams.
<b>Velocity head</b>	A quantity proportional to the kinetic energy of flowing water expressed as a height or head of water.
<b>Waste and artificial waters</b>	Waters due to escape or seepage from constructed works.

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<b>Watercourse</b>	A definite channel with bed and banks within which water flows, either continuously or in season. A watercourse is continuous in the direction of flow and may extend laterally beyond the definite banks to include artificial channels such as canals and drains, except when these are natural channels lawfully trained or restrained by the works of man. It does not include all depressions or swales through which surface or errant waters pass.
<b>Waters of the State</b>	Waters within the jurisdiction of the state including all streams, lakes, ponds, impounding reservoirs , marshes, wetlands, water courses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulation of water, surface and underground, natural or artificial, public or private, situated wholly or partly within or bordering upon the state.
<b>Water Quality Volume (WQV)</b>	WQV is defined as the amount of storm water runoff from a given storm that should be captured and treated in order to remove a majority of storm water pollutants on an average annual basis. This is equal to one-half inch of runoff from the Treatment Drainage Area.
<b>Water Quality Volume Discharge Rate</b>	The WQV Discharge Rate is the peak stormwater discharge generated by the water quality volume rainfall event using the <b>Natural Resources Conservation Service (NRCS)</b> Curve Number (CN) procedure.
<b>Weighted Q Method</b>	A calculation method that determines the peak stormwater runoff under the NRCS Curve Number procedure based on totaling the peak runoff values calculated from each individual land use type.
<b>Weighted CN Method</b>	A calculation method that determines the peak stormwater runoff under the NRCS Curve Number procedure based on averaging the curve numbers of individual land use types before calculating peak runoff.
<b>Wetland</b>	Areas that are inundated or saturated by surface or ground water at a frequency or duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. Wetlands are regulated by either State or Federal Agencies.