2.0 Stormwater Quality Management

Most of the public's concerns with stormwater are usually related to flooding, not water quality. People complain when their basements flood or roads become impassable and the public suffers when severe catastrophic floods cause widespread damage to property and loss of life. Very few people are aware of the water quality impacts that stormwater has on our rivers, streams, or lakes. Stormwater runoff quality can have significant impacts on the receiving waters that affect not only the aquatic ecosystem, but also the quality of our communities.

2.1 Environmental Impacts of Runoff

Stormwater impacts streams by affecting the stream hydrology, stream morphology, water quality and aquatic ecology. The extent of impact is related to the climate, land use, and the measures implemented to address the impacts.

Briefly, the impacts on streams are:

- Stream Hydrology: Urban development affects the environment through changes in the size and frequency of storm runoff events, changes in base flows of the stream and changes in stream flow velocities during storms results in decrease in travel time for runoff. Peak discharges in a stream can increase from urbanization due to decrease in infiltration of rainfall into the ground, loss of buffering vegetation and resultant reduced evapotranspiration. This results in more surface runoff and larger loads of various constituents found in stormwater.
- Stream Morphology: When the hydrology of the stream changes, it results in changes to the physical characteristics of the stream. Such changes include streambed degradation, stream widening, and streambank erosion. As the stream profile degrades and the stream tries to widen to accommodate higher flows, instream bank erosion increases along with increases in sediment loads. These changes in the stream bed also result in change to the habitat of aquatic life.
- Water Quality: Water quality is impacted through urbanization as a result of erosion during construction, changes in stream morphology, and washing off of accumulated deposits on the urban landscape. Water quality problems include turbid water, nutrient enrichment, bacterial contamination, organic matter loads, metals, salts, temperature increases and increased trash and debris.

2.2 Stormwater Runoff Constituents and Sources

Urban runoff contains many types and forms of constituents; some occurring in higher concentrations than found in runoff before development and some that are not naturally present in surface runoff from undeveloped land. Runoff from undeveloped watersheds contains sediment particles, oxygen-demanding compounds, nutrients, metals, and other

constituents. Once developed, constituent loads increase because surface runoff volumes increase and the sources of many of these pollutants also increase. Also, additional sources of constituents may exist in a catchment and find their way into runoff. They may include the following:

- Metals, lubricating compounds, solvents, and other constituents originating from vehicles, machinery, and industrial and commercial activities.
- Pesticides, herbicides, and fertilizers.
- Household solvents, paints, roofing materials, and other such materials.
- Pet litter, garbage, and other debris.
- Suspended solids washed off impermeable surfaces.
- Increased soil erosion during construction activities.

Table SQ-1 lists the common constituents in stormwater runoff and their impacts.

TABLE SQ-1
Urban Runoff Pollutants

Constituents	Sources	Effects
Sediments – TSS, Turbidity, Dissolved Solids	Construction sites urban/agricultural runoff landfills, septic fields	Habitat changes, stream turbidity, recreation and aesthetic loss, contaminant transport, bank erosion
Nutrients – Nitrate, Nitrite, Ammonia, Organic Nitrogen, Phosphate, Total Phosphorus	Lawn/agricultural runoff, landfills, septic fields, atmospheric deposition, erosion	Algae blooms, ammonia toxicity, nitrate toxicity
Pathogens – Total and Fecal Coliforms, Fecal Streptococci Viruses, E.Coli, Enteroccus	Urban/agricultural runoff, septic systems, illicit sanitary connections, domestic/wild animals	Ear/intestinal infections, shellfish bed closure, recreation/aesthetic loss
Organic Enrichment – BOD, COD, TOC and DO	Urban/agricultural runoff, landfills, septic systems	Dissolved oxygen depletion, odors, fish kills
Toxic Pollutants – Metals, Organics	Urban/agricultural runoff, pesticides/herbicides, underground storage tanks, hazardous waste sites, landfills, illegal disposals, industrial discharges	Toxicity to humans and aquatic life, bioaccumulation in the food chain
Salts – Sodium Chloride	Urban runoff snowmelt	Contamination of drinking water, harmful to salt intolerant plants

Source: Handbook: Urban Runoff Pollution Prevention and Control Planning, 1993.

2.3 NPDES Permit Regulations

In 1972, Congress passed what is currently referred to as the Clean Water Act (CWA). The Act established the National Pollutant Discharge Elimination System (NPDES) program. Until recently, efforts under the NPDES program have focused on non-stormwater discharges from industries and municipal wastewater treatment plants. In the last several

years, the U.S. Environmental Protection Agency (EPA) has expanded the NPDES program to cover stormwater discharges.

Phase I Stormwater Regulations

As effective controls have been implemented on non-stormwater discharges, it has become more evident that diffuse sources can create impacts on water quality. In 1987, the CWA was revised to address stormwater discharges. The CWA defined municipal and industrial stormwater runoff discharges as "point sources" and called for a two-phase permitting strategy. Phase I affected:

- Any discharge of stormwater that was permitted under the NPDES program prior to February 4, 1987.
- Discharges associated with industrial activity including construction sites.
- Any discharge from a large or medium municipal separate storm sewer system (MS4). A large system serves a population greater than 250,000. A medium system serves a population between 100,000 and 250,000.
- Those discharges that the permitting authority determines contributes to a violation of a water quality standard or is a significant contributor of pollutants to waters of the U.S.

Regulations which addressed permit application requirements for these affected facilities were published on November 16, 1990. These regulations have resulted in thousands of industries and a large number of municipalities covered by stormwater permits. In Colorado, the Colorado Department of Public Health and Environment (CDPHE) administers the NPDES program for the EPA and issues Colorado Discharge Permit System (CDPS) Permits. The City of Colorado Springs was issued a CDPS permit by the CDPHE on September 12, 1997, which became effective on October 12, 1997.

MS4 permits are developed on a case-by-case basis. The City of Colorado Springs' CDPS permit requires that they develop and implement certain programs. These programs are:

1. Drainage and Street Maintenance and Pesticides/Herbicides/Fertilizers Program. This program includes the following areas:
    a. Maintenance of structural controls.
    b. Public street maintenance procedures and practices relating to snow and ice handling, street sweeping, street maintenance/improvements and street drainage facilities.
    c. Program to address water quality concerns associated with the application of pesticides, herbicides and fertilizers by the City.
2. Planning, Design, Flood Management Projects, Structural Controls and Construction Activities Program. This program generally includes the following areas:
    a. A New Development/Site Planning Program that requires permanent water quality elements.

b. Review of new flood control structures for inclusion of water quality elements and evaluation of existing facilities for retrofitting opportunities.

c. Requirement for Construction BMPs to ensure that adequate measures are taken to control runoff from construction sites that pose water quality concerns.

d. Construction site inspection and enforcement of erosion and stormwater quality control measures and BMPs.

3. Identification and Monitoring of Industries and Landfills/Illicit Discharges Program.

   a. A program for the prevention of illicit discharges and illegal disposal. The program must include detection and removal of illicit discharges.

   b. Implementation of an ongoing field screening program. This involves sampling of dry weather flows from the MS4 outfalls.

   c. Investigation of municipal storm sewer illicit discharges.

   d. A program for preventing, responding to and containing spills into the MS4.

   e. A program that controls sanitary sewer seepage into the MS4.

   f. A program to identify, monitor, and control pollutants in stormwater discharges to the MS4 from municipal landfills, hazardous waste treatment, disposal and recovery facilities, and industrial facilities.

4. Public Education and Information Program

   a. Educational activities to promote public reporting of illicit discharges and improper disposal as well as promote proper management and disposal of toxic materials.

   b. A program to inform and educate the public on the proper management and disposal of used oil and toxic materials.

   c. A program to encourage the education and training of construction site operators on erosion and sedimentation control BMPs.

5. Municipal Facility Runoff Control Program. This program requires the development and implementation of runoff control plans for specific municipal facilities.

6. Wet Weather Monitoring Program. This program involves the long-term monitoring and assessment of trends in water quality due to stormwater runoff.

Phase II Stormwater Regulations

On October 29, 1999, EPA Administrator Browner signed the Final Storm Water Phase II Rule which was published in the Federal Register on December 8, 1999. The Storm Water Phase II regulations center on three major items. These are:

1. Reduction in the size of construction sites required to obtain an NPDES stormwater permit from 5 acres to 1 acre.

2. An expansion of the exemption from permitting for industrial facilities which have all sources covered.

3. Expansion of the MS4 permits to communities with populations under 100,000.

The Phase II regulations extend the municipal stormwater program to small municipalities that are:

1. Within urbanized areas (except tribally owned systems serving less than 1,000 or others where requirements are waived by the State or EPA).

2. Designated via criteria not yet developed by the State or EPA.

3. Contributing significant loadings to a regulated MS4.

For Colorado, this means that approximately 50 additional communities could potentially fall under this program. Of interest to the City of Colorado Springs is the inclusion of El Paso County, Fountain, Manitou Springs and possibly others that could be designated later. The regulation proposes covering these Phase II communities under a general permit rather than individual permits. The required programs, referred to as the "Six Minimum Controls" include:

1. Public Education and Outreach on Stormwater Impacts.
2. Public Involvement/Participation.
3. Illicit Discharge Detection and Elimination.
4. Construction Site Program.
5. Post-Construction Stormwater Management in New Development and Redevelopment.
6. Pollution Prevention/Good Housekeeping for Municipal Operations.

The permit application deadline for Phase II municipalities is March 10, 2003.

Non-Stormwater Discharges

It is sometimes difficult to determine which discharges fall under the stormwater program and which require a traditional CDPS permit. It is clear that discharges from municipal wastewater treatment plants or industrial processes require a CDPS permit, but others are less obvious. A stormwater discharge is one which is a direct result of stormwater (rainfall or snow melt) and stops shortly after the event ends. Everything other than stormwater discharges require a permit if it enters State Waters. The Colorado Water Quality Control Act defines "State Waters" as any and all surface and subsurface waters which are contained in or flow through this state, but does not include waters in sewers systems, waters in treatment works or disposal systems, waters in potable water distribution systems, and all water withdrawn for use until use and treatment have been completed. However, State regulations do not allow a discharge into a ditch or man-made conveyance for the purpose of evading the requirement to obtain a permit, per CRS 25-8-501(1). Litigation has shown that the definition of State Waters is interpreted very broadly.

Table SQ-2 lists common discharges that are not covered by industrial or MS4 stormwater permits. The table includes a description of the activity and suggested measures to best manage the discharge.

TABLE SQ-2
Non-Stormwater Discharges

Discharge	Description	Suggested Measures
Vehicle Washing (Non-residential)	Spraying a vehicle to rinse off grime/dirt and allowing to flow into the MS4 or State Waters. This is whether or not soaps or solvents are used. Does not affect residents washing their vehicles.	Do washing at stationary third party facilities which are connected to the sanitary sewer. Ensure that waters are captured and not allowed offsite. With appropriate approval collect wastewater and send to a sanitary sewer.
Rinsing of trucks carrying materials such as concrete trucks	Involves the washing of concrete or other materials from the mixing or tank portions of a vehicle.	With appropriate approval, dispose into the sanitary sewer (not concrete trucks). Ensure that all waters are captured and not allowed offsite.
Swimming Pool/Spa Draining (Non-residential)	Involves the emptying of the contents of a swimming pool or hot tub. Private residential discharges are not affected.	Dechlorinate water. Use water for irrigation purposes. With appropriate approval, dispose into the sanitary sewer. Obtain a CDPS Permit (required by State).
Hydrostatic Testing	Involves the addition of water to a tank or pipeline to ensure water tightness and strength of joints.	Ensure that waters are captured and not allowed offsite. With appropriate approval, dispose into a sanitary sewer. Obtain a CDPS Permit (required by State).

The NPDES stormwater regulations allow for certain non-stormwater discharges to be released under a municipal permit. Table SQ-3 lists these discharges.

TABLE SQ-3
Allowable Non-Stormwater Discharges

The following non-stormwater discharges or flows are not considered illicit or illegal unless they are identified by the municipality or the State as sources of pollutants.

- Landscape irrigation.
- Diverted stream flows.
- Rising ground waters.
- Uncontaminated ground water infiltration to separate storm sewers.
- Discharges from potable water sources.
- Foundation drains.
- Air conditioning condensation.
- Irrigation water.
- Natural springs.
- Water from crawl space pumps.
- Footing drains.
- Lawn watering.
- Individual residential car washing.
- Flows from riparian habitats and wetlands.
- Emergency fire fighting activities.
- Uncontaminated water from irrigation system meter pits.
- Uncontaminated pumped groundwater.

TABLE SQ-3
Allowable Non-Stormwater Discharges (continued)

Non-stormwater discharges allowed under the municipal stormwater permits.

- Individual residential swimming pool and hot tub discharges.
- Individual residential street washing.
- Water-line flushing.
- Water line flushing (excludes flushing of disinfection water for new pipes).
- Street wash water for construction activities (with City approved BMPs).

Other sources of allowable dry weather flow include:

- Discharges of process wastewater as long as authorized under separate CDPS permits.

In order to address many small discharges, the Colorado Water Quality Control Division developed the minimal discharge general permit. This permit covers the following types of discharges:

- Facilities discharging wastewater from washing the exteriors of trucks, cars, airplanes, boats, driveways, parking lots, and roads.
- Facilities discharging wastewater from the washing of bleachers, elevated seating and grandstands, such as those found at outdoor sporting or entertainment events.
- Commercial facilities discharging wastewater from draining, cleaning, and filter backwash of swimming pools, spas, hot tubs, and similar structures including water slides and water theme amusement parks.
- Commercial facilities discharging wastewater from the washing of temporary stables, traveling petting zoos, or any other facility that discharges wash water associated with animal wastes.
- Facilities discharging wastewater from commercial mobile cleaning vehicles such as steam cleaning, carpet cleaning and pressure washing (including building washing).
- Facilities discharging groundwater from foundation, basement, or underground structure dewatering.
- Facilities discharging non-contact cooling or heating water.
- Facilities discharging hydrostatic test water from the testing of new or used pipes, tanks or other similar vessels.
- Facilities discharging water such as facilities that employ super chlorination (50 to 500 mg/L) of water for the disinfection of these facilities and wish to discharge effluent.
- Facilities discharging wastewater from washing of root crops such as potatoes, sugar beets, onions, and other fruit/vegetable agricultural produce.

The general permit allows for quick coverage of these types of discharges. Compliance is required with state water quality standards and effluent guidelines. Monitoring and reporting of the quality of the discharge is also required.

2.4 Summary

This *Manual* has been structured to provide owners, developers, engineers and contractors with information which can be used to control water quality impacts from stormwater and comply with applicable regulatory requirements.