

# Storm Water Management Strategies To Meet National Pollution Discharge Elimination Systems Requirements

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Storm water runoff from highways and other paved surfaces may contain levels of petroleum, metals, and particulates that could affect the environment. To address potential environmental impacts, the federal National Pollutant Discharge Elimination System (NPDES) regulations were enacted in 1990. The Washington State Department of Ecology (Ecology) is the regulatory authority for the NPDES program. Municipalities with populations exceeding 100,000, as well as transportation departments, are obligated to obtain a municipal NPDES permit, which will provide conditions for storm water management. Ecology issues permits on a watershed basis, and a single municipal permit will be issued for that watershed. Washington State Department of Transportation (WSDOT) staff coordinate with the municipalities to develop a practical storm water management plan for each watershed that places sites in priority order for improvement and that reflects a sharing of costs. Approximately 2,500 storm water outfalls along 1288 km of state highway have been inventoried to characterize the discharge quality and therefore potential impact on surface waters of the state. A prioritization scheme was developed that will be used in selecting areas for highway storm water improvement. WSDOT maintenance facility storm water issues are not covered under the WSDOT municipal permit. However, through the development of the city and county municipal permits, all WSDOT property storm water will have to be managed. The WSDOT has and will continue to recognize quality-of-environment issues in all phases of planning, construction, and operation. The storm water quality impacts of WSDOT facilities and highways must be balanced with other traditional goals of the department.

Washington State, with a population of 5.2 million, is considered by many to be a leader in environmental protection. In 1970 the Washington State Department of Ecology (Ecology) was established, and remediation regulations governing solid waste, hazardous waste, air quality, groundwater protection, and hazardous waste sites were developed. In 1985, under the direction of then-Governor Booth Gardner, the Puget Sound Water Quality Authority was formed to coordinate the development of the Puget Sound Water Quality Management Plan (PSWQMP). The 1980s represented, without a doubt, the renaissance of the environmental movement in the state.

Within the bold framework of the PSWQMP, municipalities within the Puget Sound region were to develop watershed management plans that included practices and programs to protect the aquatic environment. A "highway runoff rule" was enacted by the legislature under the authority of Ecology in 1991. The rule required the Washington State Department of Transportation (WSDOT) to prepare a highway runoff manual to "direct stormwater management for its existing and new facilities and rights of way in the Puget Sound basin." WSDOT opted to develop its own highway runoff manual rather than adopt by reference the Ecology-developed manual. This provided several benefits to WSDOT beyond avoiding the obvious confusion created by interpretation of a complex technical document. Ecology's manual was developed to provide storm water guidance for all land uses, whereas WSDOT's addressed only highway runoff. In addition, WSDOT improved on technical standards to make many

of them more workable and efficient. Implementation of the rule, however, was contingent on the availability of appropriated funds. Legislative funding for storm water management and control was very limited, allowing only for the development of a few waste treatment facilities, the preparation of a highway runoff manual, and limited field inventories of drainage outfalls.

Because Washington is a delegated state under the National Pollutant Discharge Elimination System (NPDES), the Department of Ecology coordinated with WSDOT toward the development of a municipal NPDES permit. Essentially the highway system, within certain-sized cities and counties, is considered equivalent to municipalities in the discharge of storm water. The municipal NPDES regulation has three purposes:

- Prohibit nonstorm water discharges into storm sewers,
- Reduce or eliminate discharge of storm water-borne pollutants, and
- Establish a permit system for industrial and municipal storm water discharges.

It is interesting to distinguish between the municipal and industrial NPDES permit programs. In 1992 Ecology promulgated its industrial NPDES permit program (similar to the federal program), which required certain industries and commercial entities to obtain NPDES permits with controls on storm water discharge from these facilities. WSDOT facilities were not included under this permit system.

#### DEVELOPMENT OF THE MUNICIPAL PERMITS

Ecology's initial efforts were directed toward issuing permits on a jurisdictional basis; for example, to King County, Seattle, and so forth. Then the watershed approach was adopted. This required the coordination and cooperation of major municipalities and WSDOT in the development of one permit per watershed. The first watersheds requiring the municipal permits are the Cedar and Green rivers in King County (see Figure 1). WSDOT, King County, city of Seattle, and METRO (Sewer and Stormwater Authority) are players in developing this permit, which will be issued in mid-1994. Other watersheds and permit issuance dates are

- Tacoma-Pierce County, fall 1994;
- Snohomish County, summer 1995; and
- Vancouver-Clark County, 1996.

In 1993 the Washington State Legislature appropriated \$650,000 for WSDOT to characterize these drainage sys-

tems and to develop the permit. Six contract interns were hired for 9 months to find, quantify, and characterize the discharge from the WSDOT highway system in these watersheds. All outfalls greater than 30 cm were located and mapped using a global positioning system (GPS).

The field team inspected 438 km of highway in the watersheds of the Green and Cedar rivers, and 1,086 outfalls were characterized. In addition, existing best management practices (BMPs) were located, mapped, and characterized as treatment swails, oil water separators, vaults, and so forth.

Following this inventory, the discharges from the highway system were ranked according to a somewhat complex formula that included these rating factors:

- Highway design features,
- Operation conditions,
- Drainage system characteristics,
- Water quality and aquatic biological data, and
- Surrounding land use characteristics.

Of the 1,086 outfalls, 31 were ranked sufficiently high to require retrofitting. Estimated costs to install the storm water treatment and control features for these outfalls range from \$3.1 million to \$3.9 million. Total costs to correct all outfalls that contribute particulates and other contaminants to water bodies is estimated at more than \$70 million statewide. These funding needs are being addressed as a part of the development of a new environmental funding program.

WSDOT's manual will be used to design the above retrofits and to tailor maintenance practices to improve or correct storm water. In some cases, the simplest and most effective retrofit is enhanced maintenance. As additional BMPs are installed and as WSDOT staff are encouraged to consider water quality during routine maintenance, annual maintenance costs will increase substantially. This redirection of focus and effort is particularly challenging in light of limited maintenance funding. Additional funds are being sought for maintenance of catch basins, grassy swails, detention ponds, and other storm water runoff features.

Increased attention to storm water also places greater demands on environmental staff within the department. As more emphasis is placed on improving storm water quality, more solid waste is created, much of which presents disposal problems. For example, the more frequently that catch-basins are cleaned, the better the storm water leaving the system. More frequent highway sweeping reduces the potential for particulates to enter storm water. Both vector and road abrasives contain metals and petroleum hydrocarbon, which render them unsuitable for normal solid waste disposal. Additional solid waste treatment/disposal facilities will therefore be necessary and are

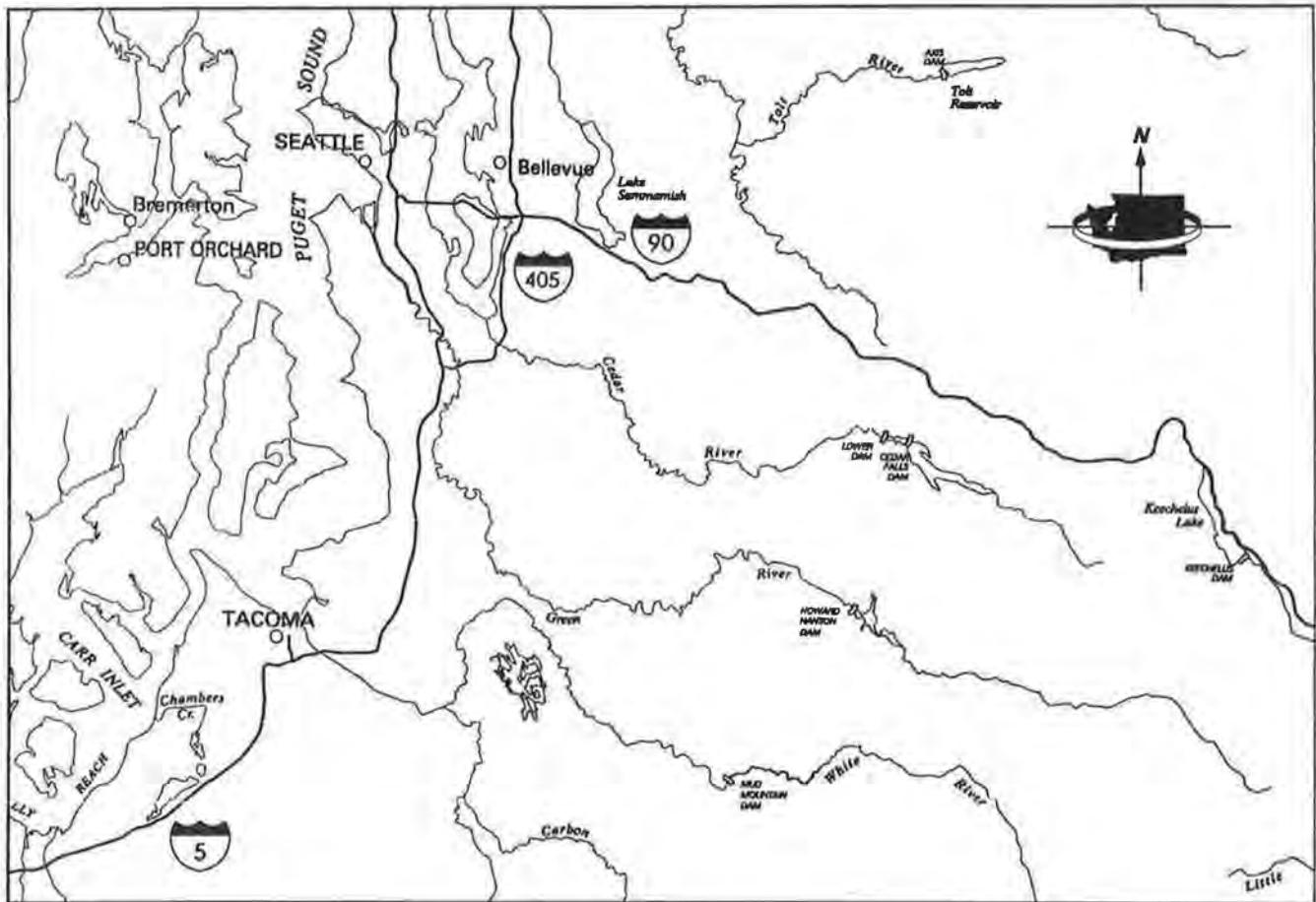


FIGURE 1 Cedar and Green rivers watershed in King County.

being developed as a direct consequence of improving storm water quality.

#### MAINTENANCE FACILITY STORMWATER ISSUES

The federal industrial NPDES permit program, as distinguished from the nonindustrial NPDES program, did not include transportation maintenance facilities as entities requiring storm water improvements. Similarly, the jointly developed municipal NPDES permit omitted facilities and focused solely on highway runoff.

Under the authority of the PSWQMP, and the subsequent development by municipalities of storm water manuals, many types of WSDOT activities and facilities are proposed to be regulated. This regulated is intended to improve overall storm water from all sources within municipal jurisdictions.

For the purpose of demonstrating the potential significant impacts of these municipal storm water manuals, the recently developed Tacoma-Pierce County storm water

manual is presented. Several practices and capital improvements are discussed:

- Equipment cleaning,
- Vehicle washing,
- Structure pressure washing,
- Bulk shipments,
- Mobile fueling at construction sites,
- Permanent fueling areas,
- Vehicle maintenance,
- Pouring of concrete and asphalt at temporary sites,
- Vegetation management,
- Above-ground storage tanks,
- Storage of barrels,
- Stockpiles,
- Storage of treated wood,
- Petroleum-contaminated soils stockpiles,
- Building maintenance,
- Parking lots, and
- Sidewalks and driveways.

This proposed storm water manual would have significant impacts on facilities and maintenance practices:

- Discharge from the cleaning and washing of equipment cannot enter (directly or indirectly) the storm system;
- No vehicle wash water containing soaps can enter the storm system;
- All vehicle fueling areas must be covered and interceptor drains installed at fuel islands to intercept run-on surface water;
- Floor drains in vehicle maintenance shops are prohibited;
- Stockpile sites require containment berms or downstream filter devices;
- Treated wood must be stored on paved surfaces draining to treatment system; and
- All parking lots, sidewalks, and driveways require monthly sweeping.

WSDOT technical staff have been part of the development of this manual through membership on the advisory committee. Staff have attempted to present arguments of practical limitations and implications of some of the proposed BMPs.

Estimated costs to comply with these proposals would be \$2 million initially and \$100,000 annually. It is anticipated that this draft manual will be modified as it proceeds through the public review process and adoption by the city and county councils.

## REGULATORY CLIMATE

The 1994 legislative session is a dramatic example of the change occurring in the environmental movement in Washington State. Whereas the 1980s was the decade of environmental perpetuation, the 1990s is an era of socioeconomic interest. No new regulatory environmental regulations were submitted for legislative review. Business interests, criminal justice interests, and a stale economy weighed heavily among the successful legislation. The voices calling for "no more environmental regulations" and "more jail time" are powerful now in Washington State.

To be realistic, however, attention to water quality as a driving force in local growth management legislation and the severely dwindling salmon resources present strong arguments for water quality protection. It is likely that

we will continue to see increased pressures for storm water treatment and control.

## CONCLUSION

WSDOT's primary emphasis has been on building and maintaining a highway system that recognizes mobility and safety. In recent years, environmental considerations and costs associated with project environmental improvements have together created an increased interest in environmental quality at WSDOT.

Storm water regulations and emphasis are the most recent of a series of environmental requirements being addressed by WSDOT. Through legislative funding, the department is developing an inventory and priority ranking of storm water discharges from the highway system. Water quality improvements will be made as funds are reallocated or directed toward storm water features and maintenance. Historically the department has only made environmental improvements as part of construction projects. Now, through the leadership and direction of the Transportation Commission, a service objective has been established that recognizes and funds needed retrofits for storm water improvement.

This refocus on highway runoff has precipitated a review of how and where water quality improvements are made. Instead of small, independent "fixes" by different transportation entities, partnerships are developing to make more comprehensive and therefore more significant water quality improvements. WSDOT has historically coordinated construction projects with cities and counties, and the coordination of water quality improvements blends well with traditional alignments.

Through its participation in advisory committees developing municipal storm water manuals, the department has opportunities to present balanced arguments for achievable goals for storm water improvements, given current funding availability.

Storm water management improvements must be made to protect the Puget Sound water quality and the diminishing fish resources. WSDOT's contribution to this improvement will be significant and challenging. It will be challenging in the sense that traditional behaviors and practices are being questioned and different ways of doing business will be necessary.