CHAPTER 9
OPERATION AND MAINTENANCE

INTRODUCTION

Operations and maintenance is a critical element in the compliance with the NPDES Phase II Permit. There are many permit activities that will involve operations and maintenance including, but not limited to the following:

- Tracking cost of the stormwater program
- Public education
- Identification, investigation, reporting and cleanup of illicit discharges
- Verifying completion of maintenance plan and determining responsibilities
- Developing and implementing long term operation and maintenance program for stormwater facilities
- Inspections

These are only a few of the activities. The deadline for the development of the long term program and some of the other activities is August 2009. The activities must be reviewed in order to complete them by the required deadlines. Additional information regarding the permit is included in Chapter 2, Stormwater Regulations.

The objective of a stormwater operation and maintenance program is to assure that all the elements of the stormwater system are functioning properly to avoid any impacts to the environment and properties. Regularly scheduled maintenance tasks and inspections are essential to the program. Major system problems can be avoided if defects are identified and addressed in a timely manner. Operation and maintenance of a storm system is not always the responsibility of the City, it could be the responsibility of a homeowners association or a property management company. Whether the responsibility is private or public, improper maintenance can affect the overall system and natural water bodies which is why inspection of the system should be considered as part of the operation and maintenance program.

An operation and maintenance program begins at the permitting and/or design phase. Operation and maintenance should always be considered in the design of a facility and the permit review of private development projects. Location and accessibility is important to maintaining a facility. Safe access to the facility and into the facility must always be considered in the design. This will affect the schedule and cost for maintaining a facility. If a facility is difficult to access additional staff and equipment may

be needed, this will increase the cost and amount of time to perform the maintenance, and possibly decrease the number of times per year the facility is inspected and maintained.

As part of the private development process, proper easements must be dedicated if necessary; maintenance responsibilities must be clearly defined on plat drawings, inspections of the storm facilities during construction must be done on a regular basis and facilities must be properly constructed and cleaned prior to acceptance. If necessary, a maintenance staff could be assigned to assist in the review process as it relates to operations and maintenance. Educating and providing maintenance information to homeowner's association or property management companies that are responsible for their onsite storm system can prevent or decrease future problems.

The operation and maintenance program is much more than cleaning and repairing the storm system. As discussed previously, inspection and monitoring is an important part of the program. Inspection reports are completed and recorded to provide background on the various stormwater facilities. Based on these reports, a specific maintenance schedule can be developed for the facilities.

Staff time, equipment usage, material quantities and cost can be estimated based on actual occurrences. These are included in the daily log reports completed by field staff. Maintenance items/tasks can become CIP projects if staff time and costs continue to increase and the effort to complete the task begins to take staff time away from other duties.

The City has developed a GIS storm system inventory map. Data for the various facilities has been input into GIS. In the future the City will link construction drawings to the GIS map. Maintaining and updating the storm system inventory map will assist in the maintenance and the understanding of the system. With the map staff can determine where the flows originate and where they discharge. This will help in solving system problems, determining solutions and satisfying some of the Illicit Discharge Detection and Elimination requirements of the NPDES Phase II Permit.

Responding to calls from the public and other agencies is another part of the program. These calls are documented using Cartegraph which is an asset management database software. The actions taken to resolve the identified problem are recorded and entered into Cartegraph. These reports are used to determine problem areas and the extent of effort that was required to resolve the problem. Staff time, equipment usage, material quantities and cost are documented in the report.

By using the information from the daily log reports, inspection reports and Cartegraph system problems can be characterized and identified within basins, neighborhoods, land

use type or other area feature with GIS mapping. This is a way to prioritize maintenance tasks and identify future potential CIP projects.

All components of the stormwater system should be inspected at least twice per year. Additional inspections may be warranted in problem areas and in areas where development is occurring, due to the potential for erosion and sedimentation. Routine maintenance should be performed on all components based on these inspections and the City's guidelines. This will allow the program to continue to be proactive instead of reactive. Several benefits can be realized through a properly planned operation and maintenance program. Following are a few of the benefits of a well-maintained system:

- Properly functioning water quality treatment and flow control facilities
- Public recognizes a well operated maintenance program
- Efficient identification and resolution of problems and complaints
- Minimizing the occurrences of problems such as flooding, icing of roadways, and damage to the system
- Cost savings through minimizing the number of unforeseen problems

OPERATION AND MAINTENANCE GUIDELINES

Chapter 4, Table 4-1 summarizes the quantity of the City's storm system. The Operations and Maintenance Department is responsible for 30 stormwater ponds, approximately 1,650 catch basins, over 12 miles of drainage ditches and over 33 miles of storm pipe. Annually these numbers will increase as development continues to occur, CIP projects are constructed and new areas are annexed by the City. The City has staff and equipment such as a vactor truck, street sweeper, backhoe, slope mower, 1-ton flat bed truck, and various sizes of pickup trucks to provide proper maintenance.

The City's operation and maintenance program is described in the Stormwater Design Manual, Chapter 8 and summarized in a table in the Design Manual Appendix 8A. The table provides a description of the maintenance component, defect, conditions when maintenance is needed, expected results, and frequency. For example, for control structures, trash and debris would be considered a defect; maintenance is needed when the distance between debris build-up and the bottom of the orifice plate is less than 1-1/2 feet; expected results trash and debris is removed; and scheduled frequency is twice per year. For this example, the result extends beyond just the removal of trash and debris, removing the trash and debris prevents the clogging of the orifice, preventing unexpected overflows, and possibly preventing downstream flooding. The scheduled

frequency is a minimum. By inspecting and maintaining records, the schedule can be modified as needed for each facility.

For all of the maintenance components, the result is more than just the removal, cleaning or repair of an item, there is the protection of the system, prevention of water quality and quantity problems and preservation of the environment that is accomplished by completing the maintenance task on a regular schedule.

Alternative Guidelines

Maintenance checklists are included in the 2008 Pierce County Stormwater Management Manual, Volume I and the Pierce County Stormwater Maintenance Manual for Private Facilities. There is also a table in Ecology's 2005 Stormwater Management Manual for Western Washington, Volume V that describes the maintenance standards for drainage facilities. These are similar to the City's operation and maintenance program guidelines and include additional recommended maintenance procedures for stormwater components not included in the City's table. The checklist from the 2008 Pierce County Stormwater Management Manual includes maintenance procedures for various water quality facilities such as wet ponds, wet vaults and proprietary facilities. It also includes maintenance procedures for various Low Impact Development items such as bioretention swales and planters, vegetated roof and pervious pavement. These can be used to update the City's guidelines or as references as new types of facilities are added to the City's storm system. The 2008 Pierce County Stormwater Management Manual is being considered for adoption and a decision will be made by the summer of 2009. The Pierce County maintenance checklist will be included in the adoption of the Manual.

Regional Road Maintenance Endangered Species Act Program Guidelines

In response to the listing of the Puget Sound Chinook as a threatened species under the Endangered Species Act (ESA), local governments and tribes in the Puget Sound area formed a coalition, known as the "Tri-County ESA Response Effort," to implement programs to conserve listed species. From this effort, the Regional Road Maintenance Technical Working Group was formed to develop a road maintenance program that would contribute to the conservation of salmonids and other fish species This working group also included WSDOT staff and the Road Maintenance Guidelines is considered a part of their regional maintenance program.

This group worked with the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) and the United States Fish and Wildlife Service (USFWS) to ensure that the activities would satisfy the federal agencies' requirements under Section 4(d) of the ESA.

The Road Maintenance Guidelines includes site-specific best management practices (BMPs) for road maintenance. Based on the activity the most appropriate BMP can be selected. Depending on the activity and the selected BMP, the purpose of the BMP is to minimize the amount of water flow through the work area, reduce soil transport potential, provide filtering and perimeter protection, reduce water velocity and erosive forces, contain and reduce flows from work area, maintain and protect the habitat, and reduce the potential for contaminants entering the water.

Training is available on the use of the guidelines and BMPs. This is another reference that can be used in the development of the operation and maintenance program.

PRIVATE STORM SYSTEMS

All privately maintained systems are required to submit "as-built" construction plans and an operation and maintenance manual that is prepared by a civil engineer. The plans must show all components of the storm system related to the site and any modifications to the existing system including the connection. Location, access, size, dimensions, lengths, material type, elevations, details, and other pertinent information are provided on the plans. Chapter 8 of the City's Design Manual outlines the required information for the operation and maintenance manual. This includes the following:

- Location, description and purpose of the facility
- Ownership information
- Project history and data
- Operating instructions
- Emergency action plan
- Maintenance schedule and plan
- Inspections

According to Gig Harbor Municipal Code Chapter 14.20.530, a stormwater maintenance covenant is required to be recorded for privately maintained storm systems that will allow the City access for inspection and repair purposes, and require the property owner to perform all inspections and maintenance on the facilities at the property owner's expense. The City can repair any condition of the stormwater facility, if in the opinion of the Public Works Director, creates an immediate threat to the public health, safety or property at the expense of the property owner. If the storm system is not properly

maintained, the City is able to take enforcement action in accordance with Gig Harbor Municipal Code Chapter 12.17.

Regular inspections of private storm systems and maintaining records on the facilities will provide the City with background information, maintenance performance quality, and history of past problems. This information can be used when investigating possible illicit discharge complaints, downstream flow or water quality problems. Regularly scheduled inspections of systems can prevent future problems.

As an incentive for privately owned storm systems, some government agencies have provided stormwater utility credits or refunds to property owners that properly and routinely maintain private facilities. The City does not have an incentive program. Prior to introducing an incentive program, an analysis must be completed to determine if an incentive will promote better maintenance. If the incentive is financial compensation, the cost of the actual maintenance must be compared to the compensation amount. If the maintenance amount is much greater than the compensation, than the property owner may be unlikely to perform the maintenance.

Enforcement and civil penalties are available to force property owners into performing maintenance, but by that time it is highly likely that a drainage problem has occurred. To avoid these problems inspections must be completed on a regular basis, identified maintenance defects must be recorded, owner notified and a follow up inspection to verify that the defect has been corrected. If the inspector is not City staff, the property owner must provide a copy of the inspection report to the City. It is important that the property owner be educated on the importance of maintenance and the impacts to the system and natural waterways.

PROGRAM COSTS

Table 9-1 is a summary of the operation and maintenance program cost based on the quantity of the various components of the storm system. Following cost per hour were applied:

- Staff: $50 (includes salary and benefits)
- Hand Equipment (i.e. weed whacker, lawn mower…): $50
- Slope Mower: $150
- Street Sweeper: $200 (include disposal fees)
- Vactor: $200 (include disposal fees)

Table 9-1. Annual Operation and Maintenance Program Cost

Activity	Quantity	No. of Days	No. of Staff	Staff Hours	Staff Cost	Equipment Cost	Total Costs
Drainage Ditch Maintenance	12 (miles)	24	2	384	$19,200	$50,690	$69,890
Pipe Maintenance	33 (miles)	33	2	528	$26,400	$105,600	$132,000
Vactor Catch Basins	1,650	83	1	664	$33,200	$132,800	$166,000
Clean Ponds	30	30	2	480	$24,000	$41,510	$65,510
Vactor Vaults	3	3	2	48	$2,400	$9,600	$12,000
Street Sweeping	45 (miles)	9	1	72	$3,600	$14,400	$18,000
Misc. Tasks							$66,280
						Total:	$556,080

Estimated hourly costs were provided by the City. Cost of the storm system inventory is approximately $30,000 and is included in the Capital Improvement Plan. Inspection/record keeping program cost is not provided. Quantities for private storm systems and staff information were not available at the time of the development of these costs. Miscellaneous tasks include responding to public calls, emergency response, educating the public and private storm system owners, assisting on CIP and private development projects and other tasks outside of the identified activities.

PROBLEM AREAS

In recent years the storm system has been functioning well. Operation and maintenance staff have reported that recurring problems are minimal. Staff has identified the following problem areas.

Water Quantity

Flooding at Parking Lot at 3016 Harborview Drive Near Intersection of Adams Avenue/Gilisch Street – Runoff from nearby private property sheet flows across adjacent right of way to the parking lot. Investigation of this problem revealed that the drainage infrastructure in this area is not properly collecting the runoff and the storm drain inlet (12-inch inverted concrete culvert with grate) in the parking lot contained sediment and

debris. The parking lot drainage system is privately owned and should be regularly inspected and cleaned. Additional catch basins and drainage improvements can be installed at the time of road improvements in this area. Until that time, the property owners must provide proper collection of stormwater runoff at their sites.

Blockage of Inlet in Ditch along SR16/Rosedale Street NW – Investigation of this problem indicates that a portion of the steep slope below SR16 has been eroding and transporting material into the ditch and inlet. It appears that the storm drain inlets on the highway are not adequate to convey even small storms as evidenced by the presence of sediment and debris deposited in the area around a 6-inch drain inlet. It is recommended that the City contact the Washington State Department of Transportation and request that the drainage be improved in this area and that the slope be better armored or regraded to a lesser slope. With regards to the City's actions, the installation of additional rock check dams in the drainage swale will allow the swale to trap sediment before it gets to the inlet. However, as long as there exists an erosion problem on the steep slope, the swale will require a considerable amount of maintenance to remove the sediment accumulated on a regular basis. At the other end, it is recommended that the outlet of this system, located on the north side of Rosedale Street, be cleared of obstructing rocks and debris and armored so that scouring velocities can be maintained within the pipe to transport material through the system.

Garr Creek Tributary East of 38th Avenue NW – Staff has observed erosion, vertical banks and scour pools in the channel east of 38th Avenue NW, south of 50th Street Court NW. This channel connects to Garr Creek west of 38th Avenue NW. In the 2001 Plan, it was documented that it appeared that the City had taken action to stabilize the shoulder of the road along 38th Avenue NW by placing riprap along the shoulder.

Along the channel there are culvert crossings at 47th Street Court NW and 50th Street Court NW. At each of these crossings scour pools at the outlet were observed, up to approximately 5-feet deep. Residents have observed high flows and erosion. Sediment from the erosion is transported to the two 18-inch culverts at 38th Avenue NW and accumulates at the upstream channel decreasing its capacity and causing flooding in this area. Maintenance has removed the sediment on a regular basis. This item has been identified as a CIP project. In the CIP, a study is proposed for 2009 to determine the cause of the erosion and recommendations to resolve this problem. There are stormwater facilities upstream of the channel that should be inspected to verify that they are operating properly.

Flooding at Eagles Club on Burnham Drive NW – Flooding problems have been reported by the Eagles Club staff. They have constructed a berm to direct water away from the parking area and building. This system appears to be working. However, we recommend that the City inspect this area periodically to verify that the berm is intact.

Otherwise, the City should consider this as a potential problem if new development in the basin increases the amount of stormwater being discharged into this tributary. The Eagles staff report that they have not had any problems since the berm was installed in 1997, but now report surface water runoff on the steep slopes to the north. They stated that this problem did not occur before the RV park began clearing and grading additional areas in recent years.

Erosion and Bank Failure along Crescent Creek in the City Park – Field investigation indicated that the bank failures may be due more to groundwater seepage rather than erosive stormwater flows. One possible correction for this area is to backfill these seepage areas with crushed, free-draining material so that the bank has adequate support but is able to allow the groundwater to pass through to the creek. Alternatively, the City could construct an retaining system along the banks.

Maintenance of Outfalls to Puget Sound – City has observed at some outfall locations the energy dissipator structure is inadequate or does not exist. It is recommended that the City inventory all outfalls and determine the condition of the energy dissipators. Proper permits must be obtained to install or repair the energy dissipators or outfalls if needed.

Water Quality

Illicit Connections - If there are any illicit connections to the storm sewer system in Gig Harbor, it is recommended that the City issue a letter of notification to those individuals or businesses. The letter should state that the City is aware of the illicit connection(s) and that the owner has 60 days (or other time period) to submit a plan to correct the problem.

Underground Storage Tank at 10320 Burnham Drive NW - This facility is listed on the Washington State Department of Ecology's Leaking Underground Storage Tank (LUST) list and is currently undergoing remediation. Should there be reports of additional problems such as an oil sheen in the roadside ditch or in other downstream drainage facilities, it should be reported to the Department of Ecology.

With regards to the gravel pit and the possible sedimentation problems associated with this operation, it is assumed that a grading or mining permit has been issued for the site and that this permit contains specific rules and regulations for this activity. If this is not the case, then it is recommended that the City enact penalties in accordance with the GHMC if it is observed that such a problem exists.

Vehicle Washpad at 3302 Hunt Street - The Department of Ecology has specific guidelines for discharging vehicle washpad water to the storm sewer system. Typically on new sites, Ecology requires that a self-contained washing system be employed that

includes sediment trapping measures, oil/grease removal, and disposal through some type of filtering mechanism prior to release into the storm sewer system. It is recommended that the City consult the guidelines and an Ecology representative to determine the appropriate course of action.

RECOMMENDATIONS

- Review NPDES Phase II required activities and schedule
- Provide operation and maintenance education to City staff involved in site development review
- Evaluate inspection program for public and private systems
    - Develop regular schedule
    - Develop reporting process
    - Provide training
- Evaluate private storm system maintenance program.
- Verify private storm system owners are submitting inspection reports.
- Verify private storm system inspectors are qualified to perform inspections.
- Continue to update the operation and maintenance guidelines to include procedures for new facilities and best management practices.
- Continue to provide training to ensure that staff is up to date on operation and maintenance procedures for new facilities and best management practices.
- Continue storm system inventory GIS mapping program.
    - Update maintenance data regularly
    - Include private systems
    - Include problem areas
    - Include all outfalls
    - Include illicit discharge locations