

# 4 Maintenance and Operations

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## 4.1 Introduction

This chapter of the plan discusses current Whatcom County M&O procedures and programs as they relate to the Lake Whatcom Watershed. Whatcom County Public Works M&O staff provided background information for current level of service documentation and helped formulate recommendations regarding what the M&O team would like to continue doing and where they would like to see enhancements. This chapter includes recommendations for Whatcom County's M&O program that define levels of service, costs, and implementation approaches.

## 4.2 Stormwater Maintenance and Operations Program Purpose

The NPDES Phase II Permit requires Whatcom County, as a permittee, to implement an effective stormwater facilities M&O program within the urban portions of the Lake Whatcom Watershed. This chapter of the Lake Whatcom Comprehensive Stormwater Plan addresses the NPDES requirements using the following sources as guidelines:

- Ecology, *Stormwater Management Manual for Western Washington* (February 2005)
- Ecology, *NPDES and State Waste Discharge General Permit of Discharges from Small Municipal Separate Storm Sewers in Western Washington* (Phase II Permit) (February 2007)
- Whatcom County Development Standards, Chapter 2, Stormwater Management: Section 220, Maintenance of Stormwater Facilities, and Section 221, Stormwater Special District Standards (Stormwater Special District, WCC 20.80.636)
- WCC 20.80.735, Water Resource Special Management Area (including Lake Whatcom, Birch Bay, Drayton Harbor, and Lake Samish)
- Whatcom County Comprehensive Plan (2005)
- Whatcom County Comprehensive Water Resources Plan (1999)

Maintenance of stormwater facilities is called for in the Whatcom County Comprehensive Plan, Chapter 11, Environment (Whatcom County, 2005), as indicated below:

- Goal 11G: Protect water resources and natural drainage systems by controlling the quality and quantity of stormwater runoff.
  - Policy 11G-7: Establish, as a high priority, a stormwater maintenance program which assures that stormwater systems function at or near design capacity.
- Goal 11M: Protect and enhance shellfish habitat in commercial and recreational areas to ensure a productive resource base for long-term use.
  - Policy 11M09: Modify current roadside ditch maintenance procedures to protect water quality.

- Action Plan: Environment
  - Develop a comprehensive stormwater management program designed to manage runoff from public facilities and industrial, commercial, and urban residential areas, including streets and roads in compliance with NPDES requirements.
  - At a minimum, the components of this program shall include programs for operation and maintenance of storm drains, detention systems, ditches and culverts.

The NPDES Phase II Permit covers only the urban portions of Whatcom County, as specified by the U.S. Census Bureau based on the 2000 Census. Urban areas within the watershed are those areas inside the City of Bellingham UGA, as well as areas surrounding and within Sudden Valley. Though NPDES Phase II compliance is only required in these areas, it is a recommendation of this plan that Whatcom County use the level of service for drainage system maintenance specified in the NPDES Phase II Permit as guidance for drainage system maintenance throughout the Lake Whatcom watershed. This M&O chapter includes a plan for Phase II compliance in required areas. In addition, this chapter outlines a plan for phased implementation of a similar level of service for drainage system maintenance throughout the rest of the watershed.

### **4.3 Five-Year Program Plan for NPDES Phase II Compliance**

The County responds to citizen complaints and provides regular stormwater M&O services, such as annual catch basin cleaning and frequent street sweeping in the Lake Whatcom watershed. With the recommended goal of NPDES Phase II compliance throughout the Lake Whatcom watershed, enhancements to the program would increase efficiency and overall effectiveness in M&O, in turn further increasing operational efficiency.

The County should follow a phased approach to comply with the NPDES Phase II Permit. This comprehensive stormwater plan recognizes that the different program actions/tasks have varying completion date requirements within the overall permit compliance period. For instance, a public education and outreach program is required by February 15, 2009, while developing and implementing a SWPPP for heavy equipment maintenance and storage yards is not required until February 15, 2010. Complying with the permit using a prioritized or staged approach would allow more cash flow, staff, and other resources to become available as the program becomes more involved and resource intensive.

CH2M HILL determined a pre-permit baseline corresponding to the existing (i.e., the beginning of 2007) Whatcom County Stormwater Program. With this baseline established and documented, the County can begin to move toward full permit compliance in 2012. As the County works through the Five-Year Program Plan, the operational effectiveness of M&O should increase and the risk of being out of compliance decrease.

To understand and document the County's existing stormwater program within the Lake Whatcom Watershed, CH2M HILL held a meeting on April 18, 2007, with the County's M&O superintendent, assistant superintendents, and crew leaders (i.e., bridges, drainage, roads, traffic, and vegetation). The purpose of the meeting was to gain an understanding of current County M&O practices, standards, resources, methods, and tracking tools. After the meeting, the County provided requested material such as equipment lists, overall program summary costs for specific work elements, examples of service request forms, a list of ESA-trained M&O employees, the

2006/2007 Integrated Roadside Vegetation Management Plan, and a GIS version of the storm system inventory.

The staff who lead and work within the County Public Works M&O Division have accumulated a great deal of institutional knowledge. All but a few at the April 17, 2007, meeting had more than 25 years of experience with the County. They shared the view that the stormwater problems are being addressed and that the work is looked upon favorably by residents in the watershed. A large portion of day-to-day M&O efforts are proactive and are conducted with regularity. M&O addresses maintenance issues during and after storm events in addition to conducting proactive maintenance activities. M&O staff spend a large portion of their time responding to these storms during the wet season.

GIS mapping is available and is a good representation of the County systems; however, it will rapidly become outdated if updates reflecting new development are not incorporated by the County. Whatcom County Planning and Development Services (PDS) should follow up with developers to receive as-built drawings of drainage systems and structures. PDS should then update County records, including GIS, with this information.

As discussed later in this chapter, opportunities to fine tune the current M&O program to achieve full Phase II Permit compliance while improving efficiency and potentially addressing budget constraints include the following:

- Purchase additional new equipment to increase productivity.
- Increase the number of full-time equivalent employees (FTEs) as maintenance and operations demands increase.
- Enhance record-keeping and scheduling capabilities.
- Streamline maintenance methods to provide better coordination and use of limited resources.

## 4.4 Published Guidelines for Maintenance and Operations

### 4.4.1 Ecology Requirements

As mentioned in the introduction to this chapter, this M&O chapter was created using several sources as guidelines, including the *Ecology Storm Water Management Manual for Western Washington* (Ecology 2005) and the Ecology NPDES Phase II Permit.

#### 4.4.1.1 Ecology Manual Requirements

Chapter 2 of Volume IV of the Ecology manual (2005) specifies the following BMPs for maintenance of stormwater drainage and treatment systems:

- Inspect and clean treatment BMPs, conveyance systems, and catch basins as needed, and determine whether improvements in M&O are needed.
- Promptly repair any deterioration threatening the structural integrity of the facilities. This includes replacement of clean-out gates, catch basin lids, and rock in emergency spillways.
- Ensure that storm sewer capacities are not exceeded and that heavy sediment discharges to the sewer system are prevented.

- Regularly remove debris and sludge from BMPs used for peak-rate control, treatment, and so forth; discharge to a sanitary sewer if approved by the sewer authority, or truck to a local or state government-approved disposal site.
- Clean catch basins when the depth of deposits reaches 60 percent of the sump depth as measured from the bottom of the basin to the invert of the lowest pipe into or out of the basin. However, in no case should there be less than 6 inches clearance from the debris surface to the invert of the lowest pipe. Where these catch basins are part of a stormwater collection and treatment system, the system owner or operator may choose to concentrate maintenance efforts on downstream control devices as part of a systems approach.
- Clean woody debris in a catch basin as frequently as needed to ensure proper operation of the catch basin.
- Post warning signs—“Dump no Waste – Drains to Ground Water,” “Streams,” “Lakes”—or emboss on or adjacent to all storm drain inlets where practical.
- Disposal of sediments and liquids from the catch basins must comply with *Recommendations for Management of Street Wastes* described in Appendix IV-G of the Ecology manual.

The Ecology manual also outlines appropriate BMPs for maintenance of roadside ditches in Volume IV, Chapter 2. These BMPs are as follows (Ecology 2005):

- Inspect roadside ditches regularly, as needed, to identify sediment accumulation and localized erosion.
- Clean ditches on a regular basis, as needed. Ditches should be kept free of rubbish and debris. (Keeping ditches clear of debris promotes increased hydraulic conveyance capacity often with increased velocities. Higher velocities promote scouring. Coordinate with activities to reduce scouring, such as installing check-dams within ditches.)
- Vegetation in ditches often prevents erosion and cleanses runoff waters. Remove vegetation only when flow is blocked or excess sediments have accumulated. Conduct ditch maintenance (e.g., seeding) in late spring and/or early fall, where possible. This allows vegetative cover to re-establish by the next wet season, thereby minimizing erosion of the ditch as well as making the ditch effective as a biofilter.
- In the area between the edge of the pavement and the bottom of the ditch, commonly known as the “bare earth zone,” use grass vegetation wherever possible. Vegetation should be established from the edge of the pavement, if possible, or at least from the top of the slope of the ditch.
- Diversion ditches on top of cut slopes that are constructed to prevent slope erosion by intercepting surface drainage must be maintained to retain their diversion shape and capability.
- Ditch cleanings are not to be left on the roadway surfaces. Sweep dirt and debris remaining on the pavement at the completion of ditch cleaning operations.
- Roadside ditch cleanings not contaminated by spills or other releases and not associated with a stormwater treatment system, such as bioswales, may be screened to remove litter and

separated into soil and vegetative matter. The soil fraction may be handled as “clean soils,” and the vegetative matter can be composted or disposed of in municipal waste landfill.

- Roadside ditch cleanings contaminated by spills or other releases known or suspected to contain dangerous waste must be handled following Dangerous Waste Regulations unless testing determines it is not a dangerous waste.
- Examine culverts on a regular basis for scour and sedimentation at the inlet and the outlet, and repair as necessary. Give priority to culverts conveying perennial and/or salmon-bearing streams, and culverts near streams in areas of high sediment load, such as those near subdivision during construction.

The Ecology manual also outlines maintenance needs for specific types of stormwater treatment facilities (Section 4.6 of Volume V). The facility-specific standards outline types of potential defects, conditions of those defects that indicate maintenance is needed, and the results that are expected once maintenance is performed. Facility-specific standards are outlined for the following types of facilities (Ecology, 2005):

- Detention ponds
- Infiltration pond or other structure promoting infiltration
- Closed detention systems (tanks/vaults)
- Control structures/flow restrictors
- Catch basins
- Debris barriers (e.g.: trash racks)
- Energy dissipaters
- Typical biofiltration swales
- Wet biofiltration swales
- Filter strips
- Wetponds
- Wetvaults
- Sand filters (above ground/open)
- Sand filters (below ground/enclosed)
- StormFilter™ (media filters)
- Baffle oil/water separators
- Coalescing plate oil/water separators
- Catch basin inserts

#### **4.4.1.2 NPDES Phase II Permit Requirements**

In January 2007, Ecology issued Washington State’s Western Washington Phase II Municipal Stormwater Permit for small, municipal separate storm sewer systems. The permit became effective in February 2007. Chapter 3 of this plan describes the NPDES Phase II permit requirements in detail. Section S5 of this permit (Stormwater Management Program for Cities, Towns, and Counties) contains five requirements, one of which directly pertains to M&O. Each requirement in Section S5 is described by a set of performance measures. The M&O requirement and the specific set of performance measures are described in detail in Table 3-1.

## 4.4.2 Other Requirements

### 4.4.2.1 Responsibility for Maintenance

In an effort to more fully define the stormwater system in the County's portion of the Lake Whatcom Watershed, the County should endeavor to delineate what is the County's responsibility and what is the responsibility of private owners, including homeowners associations. The following information is a good basis for that determination.

#### 4.4.2.1.1 Public Facilities

Responsibility for M&O of publicly owned and operated surface drainage facilities within Whatcom County falls under the jurisdiction of the Whatcom County M&O Division. M&O of roadways, structures, traffic, vegetation, and surface drainage infrastructure are all the responsibility of this division. The Surface Drainage Management division within the M&O Division handles surface drainage maintenance. If maintenance for public facilities is contracted out (as is the plan for the Cable Street Stormwater Improvement projects), maintenance is still the County's responsibility. That is, the County cannot transfer its obligations under the NPDES Phase II permit.

Table 2-5 in Chapter 2 of this Plan lists the public stormwater facilities within the Lake Whatcom Watershed.

#### 4.4.2.1.2 Private Facilities

Private stormwater facilities are those facilities that were built as part of a development (such as a pond serving several houses on a street) or else on-site residential stormwater controls such as dry wells. Private facilities are located on private property.

The Road Standards section of the Whatcom County Development Standards (Chapter 5, Road Standards) outlines guidelines for maintenance of culverts under driveways. These standards state that "Maintenance of driveway approaches, including stormwater culverts, shall be the responsibility of the owner(s) whose properties they serve."

The Development Standards outline responsibilities for stormwater maintenance of private facilities (Section 220, Maintenance of Stormwater Facilities). Table 2-4 in Section 2 of this comprehensive stormwater plan lists the 13 privately owned stormwater facilities within the Lake Whatcom Watershed. General provisions are outlined and include minimum standards for maintenance of stormwater facilities, minimum requirements for a maintenance plan and for frequency of inspection, and financial responsibility for inspection, maintenance, operation, and repair of stormwater systems.

These general provisions call for a frequency of inspection as outlined in the Maintenance Plan submitted with development applications, as follows:

- Stormwater facilities are to be inspected annually and cleared of debris, sediment, and vegetation.
- Grass swales and other biofilters are to be inspected annually and mowed or replaced as necessary.
- Inspection and cleaning of catch basins and manholes are required annually, and inspection is required after major storm events for cleaning of sediment accumulation if the depth of the deposits is greater than one-third the depth from the basin to the invert of the lowest pipe into or out of the basin.

- Flow control facilities should be inspected annually and during major storms, inspected every 2 years for accumulated sediment that exceeds 10 percent of the designed pond depth, and inspected annually for any deterioration threatening the structural integrity of the facility.

The Development Standards specify that property owners are financially responsible for the inspection, maintenance, operation, or repair of stormwater systems not specifically accepted by the County through the development process. In addition, financial responsibility includes reimbursing Whatcom County for its costs to perform routine inspections to verify compliance, as described in the Maintenance Plan submitted with the development application. The owner should maintain appropriate records of all inspection and maintenance activities. Whatcom County is authorized to inspect all stormwater systems to determine compliance with the provisions of the Maintenance Plan submitted with the development application.

It is the responsibility of the County to ensure that stormwater facilities are maintained. Whatcom County is required to ensure maintenance of private stormwater facilities in NPDES Phase II areas according to their NPDES Phase II stormwater permit. According to the permit, the County must have a regular inspection plan for both public and private facilities. This must include inspection of private facilities. In addition to inspection program, the County must have a program to work with private property owners to ensure that maintenance of the private facilities is occurring.

Whatcom County has the opportunity to educate the owners as well as the obligation to enforce the maintenance requirements of private systems. The County should develop a program to communicate in writing and during personal visits with these private owners to require them to perform maintenance. (This alternative would likely require adoption of a mechanism establishing authority for the County to require and enforce maintenance through citations and penalties for failure to do so.)

The alternative to education and enforcement is for the County to take on the responsibility for maintenance of private systems. If Whatcom County chooses to maintain private facilities, the maintenance of private systems could be completed by County M&O crews or private contractors.

Section 220 of the Development Standards describe that Whatcom County may assume maintenance responsibility of a private stormwater system if it is in the County's best interest to do so. If the County decides to assume responsibility, the County shall assume maintenance after the expiration of a 2-year period during which the owner has performed maintenance. As of the date of this report, Whatcom County has chosen not to take on the responsibility for any private stormwater systems.

The County should inspect all new development sites and recently developed sites for compliance with the M&O plan for stormwater management submitted by the developer during permit application (i.e., site development plan). These inspections and any corresponding enforcement actions may help alleviate drainage and water quality issues potentially caused by lack of maintenance of private facilities. These inspections should occur at the intervals specified in the Development Guidelines or more frequently if deemed necessary to ensure compliance. The Stormwater Manual outlines maintenance needs for specific types of stormwater treatment facilities (Section 4.6 of Volume V of the Ecology manual). The standards in Section 4.6 of Volume V should also be used as a reference for determining maintenance needs for private stormwater facilities. The facility-specific standards outline types of potential deficiencies, conditions of those deficiencies that indicate maintenance is needed, and the results that are

expected once maintenance is performed. Current staffing levels may not be adequate for this pursuit. The County should adjust crew size accordingly.

Maintenance of stormwater structures (including ditches, inlets, catch basins, and culverts) on private roads is not the responsibility of Whatcom County. This includes the private road network inside Sudden Valley. Whatcom County is, however, responsible for the County-owned roads near Sudden Valley. Sudden Valley should enhance its stormwater infrastructure inspection and maintenance program, especially for catch basins and culverts. In addition, education and other efforts should be made to increase homeowner knowledge of the onsite stormwater detention systems that are located on each single-family residential parcel in Sudden Valley. Individual homeowners are required to maintain these facilities. Many homeowners in Sudden Valley may not be aware of the existence of these onsite residential stormwater facilities.

Regular updates to the County's recently completed GIS map of the stormwater system are needed to help private developers better design and build their stormwater systems and to assist County crews in locating facilities for inspection.

Updated and accurate lists and databases of stormwater facilities, maintenance needs, and maintenance schedules should be kept in electronic format (they are currently kept in hard-copy format).

#### **4.4.2.2 Documentation of Inspections and Maintenance Activities/Database Management**

All inspections and maintenance activities on surface water facilities should be documented. Information such as time, date, location, type of facility, team, reason for visit, and weather conditions should be recorded. This information will be helpful for assessing the long-term maintenance needs of an individual stormwater facility and for formulating a proactive and preventive maintenance plan.

Each facility or individual component of the surface water drainage system should be documented and given a unique name or code for identification. Often, a series of numbers is used with a letter identifier indicating the type of facility or asset (such as CB for catch basin or P for pipe). This database of surface drainage assets and facilities can be tied to the GIS for geospatial interfacing.

A centralized database should be created that allows information associated with any one facility or asset to be pulled up with little effort. Maintenance history, age, condition, material, and size of this asset would all be tied to the unique ID of the asset. Any work performed on the asset could be tracked in this manner.

A comprehensive recording and database management system can be used as a tool for scheduling M&O activities. Keeping track of resources and assets will allow for the prioritization of M&O activities based on information for each asset in the database, such as maintenance history and complaint log. The use of resources can then be optimized.

A computerized maintenance management system (CMMS) is currently planned for implementation by Whatcom County Public Works M&O Division. This system, when implemented, will meet these recommendations listed in this sub-section based on NPDES Phase II requirements. Implementation of a CMMS has been delayed, however. Implementation of this documentation and database tool is an NPDES Phase II requirement and makes good sense. Implementation should be fast-tracked.

#### 4.4.2.3 Maintenance Standards

It is recommended that Whatcom County follow the maintenance standards in Chapter 2 of Volume IV of the Stormwater Management Manual for Western Washington (Ecology, 2005). The following list summarizes these standards:

- Inspect and clean catch basins and conveyance systems (including roadside ditches) as needed, and use the opportunity to determine whether improvements in M&O are needed. Note whether capacity has been exceeded or heavy sediment discharges have occurred. Use the following procedures:
  - Clean catch basins when the depth of the accumulation reaches 60 percent of the sump depth as measured from the bottom of the basin to the invert of the lowest pipe into or out of the basin.
  - Keep ditches free of rubbish and debris; conduct vegetation maintenance (e.g., seeding) in late spring or early fall, where possible; promote vegetation where possible; conduct proper handling of ditch cleanings.
- Inspect and clean treatment facilities, as needed, and use the opportunity to determine whether improvements in M&O are needed. Note whether capacity has been exceeded or heavy sediment discharges have occurred. Debris should be regularly removed from surface basins used for either peak-rate control or stormwater treatment; wastes disposed of properly.
- Identify any deterioration threatening structural integrity of facilities and immediately repair (e.g., replacement of clean-out gates, catch basin lids, and rock in emergency spillways).
- Determine maintenance needs for specific types of drainage facilities as outlined in Section 4.6 of Volume V of the Ecology manual (Ecology, 2005).

#### 4.4.2.4 Frequency of Maintenance

Maintenance frequency describes how often a maintenance function must be performed. Conducting systematic preventive maintenance is important to ensure that stormwater facilities function as designed. Preventive maintenance has the potential to reduce emergency work orders. Whatcom County should begin compliance with the NPDES Phase II Permit regulations by instituting preventive maintenance in the form of inspections and cleaning as outlined and scheduled in the NPDES Phase II Permit requirements and the Ecology manual. The NPDES Phase II Permit outlines the following performance measures related to frequency of maintenance:

- Perform annual inspection of all county-owned or -operated permanent stormwater treatment and flow-control facilities; take appropriate maintenance actions in accordance with the adopted maintenance standards.
- Establish an inspection (and enforcement) program for privately owned facilities on an annual, semiannual, or even on a quarterly basis.
- Conduct spot checks of potentially damaged permanent treatment and flow-control facilities (other than catch basins) after major storm events (10-year, 24-hour, for example).
- Establish an inspection (and cleaning) program for catch basins, inlets, and roadside ditches.

#### 4.4.2.5 Additional Resources

As the drainage infrastructure ages, more resources should be dedicated to its upkeep. Existing facilities that may be at or beyond design life should be inspected to determine whether repair, replacement, or upgrade is necessary. Many assets that are currently part of the drainage infrastructure system may be undersized or otherwise not able to convey current demands because they were originally sized for pre-development or less developed conditions. This may become more of a problem as Whatcom County continues to grow and the infrastructure continues to age.

#### 4.4.2.6 Drainage Complaints and Other Citizen Inquiries

Most citizen complaints about drainage are referred to the County Public Works Department. Currently, the County logs complaints and then routes the complaints to the responsible road crew team. Complaints that are called-in after hours go to a 24/7 on-duty supervisor pager unless they are deemed “not an emergency”.

When appropriate, the County personnel meet with the property owner to investigate the complaint. The County performs the work if it is a maintenance issue. If the solution to the complaint requires construction, the County may hire a contractor.

## 4.5 Drainage System Inventory and Maintenance Costs

### 4.5.1 Baseline Drainage System Inventory

Types of stormwater facilities include the stormwater conveyance system (e.g., stormwater pipe, ditches, catch basins, and other structures) and retention/detention facilities. Whatcom County has completed an inventory of the drainage system in the Lake Whatcom watershed. The inventory should be kept current by the County upon completion of this comprehensive stormwater plan. Developers should submit mapping information detailing new construction as it occurs, and Whatcom County PDS should integrate this information into the GIS and database within a pre-specified time period.

Table 4-1 lists the length of roads in the Lake Whatcom watershed, including public and private roadways. Counts of drainage infrastructure within the Lake Whatcom watershed are shown as well.

TABLE 4-1. DRAINAGE INFRASTRUCTURE IN LAKE WHATCOM WATERSHED	
Type of Structure	Lake Whatcom Watershed
Drainage Ditches (length)	Approximately 20,864 linear feet in 872 different ‘ditch points’
Culverts (length)	8,016 linear feet
Catch Basins (each)	677
Drainage Pipe (length)	3,062 linear feet
Biofiltration Swales (length)	410.5 linear feet

TABLE 4-1. DRAINAGE INFRASTRUCTURE IN LAKE WHATCOM WATERSHED	
Type of Structure	Lake Whatcom Watershed
Facilities (ponds, tanks, vaults) (each)	12 <sup>1</sup>
Roads (length)	111.6 miles (in unincorporated Lake Whatcom watershed, including both public and private)
<sup>1</sup> 13 privately owned stormwater facilities exist within the Lake Whatcom watershed. However, one of these facilities has an outlet that has been diverted to the north and away from the watershed. Flow out of the facility does not reach Lake Whatcom. Therefore, 12 private facilities are listed here.	

## 4.5.2 Existing County M&O Resources

Whatcom County Public Works M&O Division provided CH2M HILL with M&O budget information, including annual budgets for maintenance county-wide and the number of FTEs for the M&O Division.

Whatcom County M&O maintains the County road system. A part of its work is drainage of that road system. A 2007 M&O program summary was provided to CH2M HILL during development of this stormwater plan. The year 2007 budget for Whatcom County M&O is \$12.6 million. However, only a portion of this total is spent on drainage-related activities. For purposes of this stormwater plan, it was assumed that all activities under budget elements 525.400 (Storm Drainage) and 525.671 (Road Cleaning/Sweeping) are drainage-related activities. Several other elements such as Roadside Vegetation (542.710) could be considered drainage-related activities but are not entirely for drainage purposes. In addition, less mowing and brush cutting are conducted in the watershed and no weed spraying or weed control is conducted. Therefore, these other elements are not included as drainage-related activities for purposes of this plan. The following elements were assumed to be drainage-related activities for purposes of this stormwater plan:

- 542.400 Storm Drainage
  - 542.411 Manual Ditch Cleaning/Culvert Maintenance
  - 542.412 Ditching – Mechanical
  - 542.421 Catch Basins/Manholes/Oil Water Separators
  - 542.422 Culvert Upsize/Install
  - 542.491 Flood Control
- 542.671 Road Cleaning/Sweeping

The items above comprise approximately 27 percent of the annual operating budget of the M&O Division. Including 27 percent of the maintenance administration budget, the 2007 budget for drainage-related activities is an estimated \$3.3 million.

In 2006, the M&O Division had 66 FTEs. An additional 5 FTEs were approved in May of 2007. Using an assumption that the ratio of FTEs on drainage-related activities is the same as the ratio

of total budget spent on these activities, approximately 19 FTEs work on drainage for Whatcom County M&O Division county-wide.

This estimated budget for drainage-related activities of \$3.3 million and the estimated 19 FTEs that conduct drainage-related activities for the M&O Division are county-wide estimates. Approximately 5 percent of the total roads in Whatcom County are within the Lake Whatcom Watershed (see Table 4-1). However, more than 5 percent of the budget and FTEs are dedicated to the Lake Whatcom Watershed because of the higher level of service and greater attention to environmental concerns that are placed on activities in the watershed. A conservative assumption is that 10 percent of the budget for drainage-related activities is spent within the Lake Whatcom Watershed; 10 percent of \$3.3 million is \$330,000, and \$330,000 is a rough estimate of the budget for drainage-related activities within the Lake Whatcom Watershed in 2007.

### 4.5.3 Costs of M&O Activities

Limited information is available on the costs per unit to maintain and operate drainage infrastructure elements in the Whatcom County area. Table 4-2 includes examples of costs for M&O activities from different jurisdictions (i.e., Seattle Public Utilities and King County). These data represent costs per unit for various M&O activities conducted in large jurisdictions with relatively short distances between structures; therefore, these cost estimates may underestimate the true cost to perform these activities in Whatcom County, where much of the land use is of low or medium density. However, these numbers provide an order-of-magnitude estimate for the cost associated with several M&O activities that are performed within the Lake Whatcom Watershed.

TABLE 4-2. DRAINAGE M&O ACTIVITIES		
Type of Structure	Activity	Cost per Unit <sup>a</sup>
<b>Drainage Pipes</b>	Jet Rod (for debris)	\$2.07/linear foot
	Machine Rod (roots)	\$0.90/linear foot
	Hydrocut (debris and roots)	\$1.07/ linear foot
<b>Culverts</b>	Clean Culvert using Vactor Truck	\$15.00 each
	Hand Clean Culvert	\$50.00 each
<b>Catch Basins</b>	Inspect Catch Basin	\$7.00 each
	Clean Catch Basin	\$45.10 each
<b>Drainage Ditches</b>	Inspect Ditch	\$0.25/ linear foot
	Perform Ditch Maintenance	\$1.50/ linear foot
<b>Facilities (ponds, tanks, vaults)</b>	Inspect Retention/Detention Pond	\$300.00 each
<sup>a</sup> Costs were derived from both Seattle Public Utilities and King County data. Unit costs for Seattle Public Utilities were based on activities conducted during 2004 and the first three quarters of 2005. Unit costs for King County were based on budget and performance for the years 1999 and 2000 with adjustments to 2005 dollars. Stated costs are estimates and do not include costs of transportation/disposal of waste materials from catch basins, ditches, and other facilities.		

Maintenance cost per unit could not be calculated for Whatcom County or for the Lake Whatcom watershed. Instead, information in Table 4-2 is used as an estimate of cost-per-unit for purposes

of this plan. Once the currently planned CMMS tool has been implemented, this information will be readily available.

Once maintenance costs per unit are calculated, Table 4-3 can be used as a tool to evaluate financial implications of additional maintenance. By using Table 4-3 as a template, the County can determine costs by adding new service items as required in order to achieve progressive Phase II Permit compliance. The M&O Division should determine actual daily production, crew size, and equipment needed to perform existing and new action items. Once a CMMS is implemented, each type of structure (catch basin, pipe, ditch, culvert, etc.) can be listed separately, rather than by element such as those listed in Section 4.4.2 of this chapter.

## 4.6 Permit Implementation

### 4.6.1 Early Steps in Permit Implementation

As the County continues to address NPDES Phase II Permit requirements, efficiencies and coordination in the program could offset the cost of completion of additional service items. In the short term, no new FTEs above the number already identified by the County to execute the existing level of service would be required. In the later steps of NPDES Phase II compliance, however, one additional FTE is required. The M&O Division could update the surface/stormwater database, perform some inspection of new development sites, and incorporate new action items necessary to satisfy the NPDES Phase II Permit requirements. The cost of the M&O program is not expected to increase (in comparison to the pre-permit level of service), as efficiencies and coordination would offset the cost of completion of additional service items.

### 4.6.2 Later Steps in Permit Implementation

After the initial few years of working towards permit compliance, the M&O program should become more proactive, using the database to determine and administer a maintenance schedule. The M&O team would continue to perform new action items necessary to satisfy the NPDES Phase II Permit requirements, but staff would receive additional training to improve their efficiency and their ability to use the database. A more cost-effective maintenance route would also be determined, with a centralized dispatching mechanism to implement and oversee this new route. The County would continue to assume responsibility for the County surface/stormwater system elements and begin taking responsibility for private developers' additions to the system, if that is the direction decided upon by the County.

The County should develop a semiannual inspection program of new development and recently developed sites.

As indicated in the permit compliance time frame, the County will have to comply with regulations of the NPDES Phase II Permit presented in Items 4.b, 4.c, and 4.f of Table 3-1 in this Comprehensive Stormwater Plan. Those requirements are:

- Include a permitting process with plan review, inspection, and enforcement capability to meet the standards listed for both private and public projects, using qualified personnel, within 30 months from the effective date of this permit. At a minimum, this program shall be applied to all sites that disturb a land area of 1 acre or greater, including projects of less than 1 acre that are part of a larger common plan of the development or sale.

**TABLE 4-3. LAKE WHATCOM WATERSHED M&O PROGRAM ESTIMATING TOOL**

Item No.	Maintenance Activity	Number of Units in watershed	Production Unit	Frequency (times/yr)	Daily Production	Crew Size	Equip-ment	Annual Crew Days	Annual Person Days	Full-time Labor Equivalent	Annual Labor Cost (\$)	Annual Equipment Cost (\$)	Annual Other Cost (\$)	Total Annual Cost
1	Catch Basin - inspect	677	each	1										
2	Catch Basin – clean	677	each	1										
3	Ditch – inspect	20,864	linear feet	1										
4	Ditch – clean (manual)	20,864	linear feet	0.2										
5	Ditch – clean (mechanical)	20,864	linear feet	0.2										
6	Ditch – vegetation control	20,864	linear feet	2										
8	Culvert – inspect	8,067	linear feet	1										
9	Culvert – clean (manual)	8,067	linear feet	1										
10	Culvert – clean (mechanical)	8,067	linear feet	1										
11	Shoulder Grading for Storm	111	miles	0.1										
12	Inspect/Clean Maintenance Holes	492	each	1										
13	Manhole Maintenance	492	each	0.2										
14	Maintain Drywells	?	each	0.5										
15	Inspect and Maintain Stormwater Facilities (if County decides to take on responsibility)	12	each	1.0										
16	Street Sweeping	20	miles	12										
17	Leaf Pick-up	111	miles	1										
18	Additional Fall Maintenance	N/A	N/A	N/A										
19	Storm Reaction	N/A	N/A	N/A										
20	Disposal Costs (catch basin)													
21	Disposal Costs (street sweeping)													
22	Disposal Costs (leaf pick-up)													
23	Other supplies and Services													
24	Equipment Rental Fund													
25	Administrative Expenses													
<b>Total</b>														

- Include provisions to ensure adequate long-term M&O of post-construction stormwater facilities and BMPs that are permitted and constructed pursuant to Table 3-1, item 4b in this plan, within 30 months from the effective date.
- Within 30 months from the effective date of this NPDES Permit, ensure that all staff responsible for implementing the program to control stormwater runoff from new development, redevelopment, and construction sites, including permitting, plan review, construction site inspections, and enforcement, are trained to conduct these activities. Follow-up training shall be provided as needed to address changes in procedures, techniques or staffing. Permittees shall document and maintain records of the training provided and the staff trained.

### 4.6.3 Final Steps in Permit Implementation

The final steps in permit implementation are similar to those listed above, with the understanding that to achieve all the NPDES Phase II Permit requirements, an increase in FTEs assigned to manage stormwater will be needed. The County would also continue improving the organizational and efficiency issues by providing cross-training of maintenance needs and activities and developing a more formal communication systems.

During the final steps, the County would be mostly proactive, be responsible for the County's stormwater system, perform construction inspections of developers' additions during new development, and provide regular inspections of recently developed sites to ensure long-term continued compliance.

## 4.7 Recommendations for Maintenance and Operations

To meet all of the NPDES Phase II Permit requirements, it is recommended that the County move at a progressive pace through the Five-Year Program Plan. Table 4-4 provides an overview of the compliance program status from the baseline (i.e., existing 2007 conditions) through full compliance in 2012.

To help determine the financial implications, annual budgets should be prepared with the County's M&O cost information for its 2007 program year. Table 4-3 is a tool that can be used to evaluate financial implications. By using Table 4-3 as a template, the County can determine costs by adding new service items as required in order to achieve progressive Phase II Permit compliance. The M&O Division should determine the actual daily production, crew size, and equipment needed to perform new action items.

GIS mapping is available and is a good representation of the County systems. As new developments occur, Whatcom County PDS should follow up with developers to receive as-builts of drainage systems and structures. PDS should then update County records, including GIS, with this information. Regular updates to the County's recently completed GIS map of the stormwater system are needed to help private developers better design and build their stormwater systems and to assist in County crews in locating facilities for inspection.

Whatcom County needs to take action regarding maintenance of private stormwater facilities. The maintenance of private systems could be completed by county M&O crews, a private firm, or owners of private systems. Whatcom County should take steps to either educate or otherwise inform and enforce maintenance by private owners or should take on responsibility for maintenance of these private facilities.

TABLE 4-4. SUMMARY OF PRE-PERMIT, EARLY STEPS, LATER STEPS, AND FINAL STEPS TOWARDS NPDES PHASE II COMPLIANCE FOR M&O THROUGH 2012				
	Pre-Permit (2007)	Early Steps	Later Steps	Final Steps (by 2012)
<b>Responsibility for Maintenance and Inspection Requirements</b>	Be responsible only for the County stormwater system.	Be responsible only for the County stormwater system.	Be responsible for the County's stormwater system and for the private developers' additions (if County decides to go this route).	Be responsible for the County's stormwater system and for the private developers' additions (if County decides to go this route).
	No inspection of new development sites and recently developed sites for compliance with maintenance requirements.	Inspection of new development sites and recently developed sites for compliance with maintenance requirements; conduct "surprise" inspections at irregular intervals to encourage compliance.	Inspection of construction sites and semiannual inspection of new development sites and recently developed sites for compliance with maintenance requirements.	Inspection of construction sites and quarterly inspection of new development sites and recently developed sites for compliance with maintenance requirements.
<b>Documentation/Database Management</b>	Database completion in progress.	Complete and well-managed database.	Complete and well-managed database.	Complete and well-managed database.
<b>Frequency of Maintenance</b>	Resources used for proactive maintenance, storm response, and in response to requests	Resources used for proactive maintenance, storm response, and in response to requests.	Mainly proactive, some storm response, and some in response to requests.	Mainly proactive, some storm response, and some in response to requests.
<b>Full-Time Equivalent (FTE)<sup>1</sup></b>	Watershed Drainage M&O <sup>2</sup> : 19 (Total Whatcom Co M&O: 71)	Watershed Drainage M&O <sup>2</sup> : 19 (no additional)	Watershed Drainage M&O <sup>2</sup> : 20 (assume 1 additional FTE than for 2007)	Watershed Drainage M&O <sup>2</sup> : 20 (assume 1 additional FTE than for 2007)
<b>Cost to Deliver the Level of Service</b>	Lake Whatcom M&O: \$330,000 <sup>3</sup> (Total Whatcom Co M&O: \$3,300,000)	Drainage M&O: \$330,000 (no additional)	Drainage M&O: \$396,000 (Expected increase of 20%) Additional need over 2007 level of service : \$66,000	Drainage M&O: \$396,000 (Expected increase of 20%) Additional need over 2007 level of service : \$66,000
<p><sup>1</sup> Pre-Permit FTEs of 71 consists of the 66 FTEs through 2007 plus an additional 5 FTEs approved for Whatcom County Public Works M&amp;O Division in May of 2007. This is the number of FTEs county-wide</p> <p><sup>2</sup> Drainage M&amp;O FTEs is estimated based on the total percentage of annual operating budget spent on drainage-related activities, estimated as 27 percent.</p> <p><sup>3</sup> These costs are estimated based on total 2007 M&amp;O operating budget spent on drainage-related activities county-wide, scaled according to the assumption that 10 percent of the county-wide drainage budget is spent in the Lake Whatcom Watershed.</p>				

It is the responsibility of the County to ensure that stormwater facilities are maintained. The County must have a regular inspection and maintenance plan for both public and private facilities, as well as properly allocated resources, to be effective. This must include inspection of private facilities. The County must have a program to work with private property owners to ensure that maintenance of the private facilities is occurring.

Updated and accurate lists and databases of stormwater facilities, maintenance needs, and maintenance schedules should be kept.

It is a recommendation of this plan that Whatcom County use the level of service for drainage system maintenance specified in the NPDES Phase II Permit as guidance for drainage system maintenance throughout the Lake Whatcom watershed.

The County should inspect all new development sites and recently developed sites for compliance with the M&O plan for stormwater management submitted by the developer during permit application (i.e., site development plan). These inspections and any corresponding enforcement actions may help alleviate drainage and water quality issues potentially caused by lack of maintenance of private facilities. These inspections should occur at the intervals specified in the development guidelines or more frequently if deemed necessary to ensure compliance. The Ecology Stormwater Manual outlines maintenance needs for specific types of stormwater treatment facilities (Section 4.6 of Volume V of the Ecology manual). The standards in Section 4.6 of Volume V should also be used as a reference for determining maintenance needs for private stormwater facilities. The facility-specific standards outline types of potential deficiencies, conditions of those deficiencies that indicate maintenance is needed, and the results that are expected once maintenance is performed. Current staffing levels may not be adequate for this pursuit. The County should adjust crew size accordingly.

Opportunities to fine-tune the current M&O program in the Lake Whatcom Watershed include the following:

- Purchase additional new equipment to increase productivity.
- Increase number of full-time equivalent employees (FTEs) as maintenance and operations demands increase.
- Enhance record-keeping and scheduling capabilities.
- Enhance maintenance methodologies to provide better coordination and use of limited resources.

