CHAPTER 6

CAPITAL IMPROVEMENT PLAN

6.1 INTRODUCTION

The Town of Friday Harbor's Capital Improvement Plan (CIP) is developed in this section. The CIP has been updated to reflect the projects, which have been completed, and cost increases based on the Engineering New Record Index. Several additional projects in Basin 7 have been added to the CIP list. The CIP is prepared in order to prevent flooding within the Town and thus minimize the environmental and property damage from flooding, erosion, and sedimentation. The emphasis of the CIP is to provide the Town of Friday Harbor with stormwater facilities consisting of adequately sized ditches, piping and detention systems. In order for the facilities to operate properly, it is essential that appropriate operations and maintenance schedules are developed. Facilities maintenance and preferred management strategies are detailed in this chapter. Best Management Practices (BMPs) for runoff treatment and source control are also provided.

6.2 CAPITAL IMPROVEMENT PROJECTS

6.2.1 INTRODUCTION

The 6-month design storm was modeled to assist the Town in sizing stormwater facilities for water quality control. No significant water quality problems have been identified in the harbor, so these facilities are not given a high priority in this CIP. However, in light of ESA requirements the Town may consider acquiring land to locate such facilities in the future.

A priority must be given to specific problem areas and their improvements for this CIP to be effective. The areas in which Town staff identified existing problems and the areas with stormwater facilities which cannot convey the 2-year storm under existing land use conditions were given the highest priority in the 1997 plan for immediate improvements. In addition, the downtown area had priority over other areas because of the economic importance of this area. Ultimately, and as a last priority, the Town would construct projects to provide drainage improvements for future land use conditions for the 25-year storm. Lower priority was given problems in areas that were not already developed.

The Town completed the highest prioritized 1997 CIP projects in 1999, and have substantially revised the priority of the Projects based on flooding problems in Basin 7 during the winter of 2005.

Per the stormwater management ordinances, new developers are required to install facilities to minimize the downstream effects of stormwater runoff, but the Town will need to correct existing problems in areas already developed. The Town's current policy is to require detention of the 10-year, 24-hour, and 100-year, 24-hour peak flows for all new development and, in addition, detention of the 2-year, 24-hour peak flows in areas where downstream conveyance capacity is not available.

Figure 4-3 illustrates the areas which have been identified as inadequate to convey the 2-year storm under existing conditions and the 25-year storm under future conditions. Figure 6-1 shows areas which are recommended for improvements in the next 6-years. The CIP recommends upgrading the conveyance system in identified problem areas to a level which makes the system adequate for the 25-year storm event under future land use conditions. Detailed cost estimates for each project are included in Appendix F. Cost estimates include 20 percent construction contingency, sales tax (7.7 percent) and 25 percent engineering, legal, and administration costs. The ENR cost index is $8,194.11.

6.2.2 DRAINAGE BASINS NO. 1 AND 2

The proposed improvements for the conveyance systems of Drainage Basins No. 1 and No. 2 will be discussed collectively. The conveyance system in Drainage Basin No. 1 consists of 8-, 12- and 18-inch pipes and open ditches. Hydraulic modeling shows that the pipe/ditch system is adequate to convey the 2-year storm under existing conditions. The highest priority drainage improvement identified in the 1997 Plan was the improvement of the drainage system from Malcolm Street, to "A" Street and East Street to Friday Harbor. This project was completed in 1999.

The conveyance system for Drainage Basin No. 2 consists of ditches and 8- and 12-inch pipes. The 8-inch sections of pipe along Linder and Franck are too small to convey the 2-year storm and should be increased in size. The system in general does not have adequate capacity for the 25-year storm for future land use conditions.

To accommodate future 25-year storm flows, the 8-inch pipe along Nelson should be replaced with 300 feet of 12-inch pipe, and the 8-inch section along Linder should be replaced with 360 feet of 18-inch pipe. Also, the ditches alongside Franck, "C," and Nelson Streets, and the 8-inch pipe on Nelson Street should be replaced with 1000 feet of 18-inch pipe. The estimated cost of replacing these lines is $397,000.00. These costs include six Type I catch basins and connection to three existing catch basins.

Since a large portion of this basin is not yet developed, the projected higher flows under future conditions could be mitigated through the construction of detention systems by the developers. Alternatively, the Town could install detention systems prior to new development to mitigate existing problems. A possible location of these detention systems might be along Linder or "C" Streets.

6.2.3 DRAINAGE BASIN NO. 3

Drainage Basin No. 3 consists of several sub-basins which drain south into a wetland which eventually drains into North Bay. Presently, ditches collect runoff on both sides of Mullis Street and convey this water towards the wetland which lies south of Rose Lane. The southern end of Argyle Avenue and the entire development around Spruce Street drains into this same wetland. Drainage from the Friday Harbor Airport conveyed under Millis Street to the Port detention pond.

Drainage from the wetland outlets to the south via a 15-inch culvert located under the Brown's Home Center property. The discharged drainage continues southeast until it reaches the detention pond owned by the Port of Friday Harbor.

Drainage in this basin tributary to Mullis Street is directed south through a series of ditches and culverts to the Port of Friday Harbor detention pond.

The portion of the basin directly north of the Friday Harbor airport drains through 8-inch diameter pipes and ditches through the airport to the Port of Friday Harbor ditch along Mullis Street. Drainage from the Friday Harbor Airport is conveyed under Mullis Street to the Port detention pond.

The pond was designed to detain peak stormwater flows from the 50-year design storm. The pond does not appear to have additional capacity to detain the peak flow from the 10-year, 24-hour, and 100-year, 24-hour storm events as is the Town's Stormwater Manual policy. It is recommended that new development and redevelopment provide detention on-site for peak flows from the 10-year, 24-hour, and 100-year, 24-hour storm events, similar to the requirements for developments in the other basins in Town.

6.2.4 DRAINAGE BASIN NO. 4

The conveyance system for Drainage Basin No. 4 consists almost exclusively of pipes, with only one ditch. These pipes range in size from 8-inch to 30-inch. The system can be divided into three main laterals. One lateral drains the land west of Argyle Avenue, another the land north of Spring Street, and the third drains the downtown area and the area directly west of downtown.

The areas identified by the model to be inadequate for the 2-year storm lie along Spring Street from Argyle Avenue to First Street and the 8-inch section of pipe along Reed Street. Considering the economic activities occurring in the downtown area, correcting these drainage problems is a major priority. However, improvements need to be accomplished with a minimum amount of disturbance in the downtown areas.

Part of the conveyance problems along Spring Street can be alleviated by diverting some of the flow out of the 15-inch pipe under Second Street to First Street and also diverting the flow off of Spring Street at Caines Street and off of Argyle Avenue at Web Street.

Using all of these diversions, however, cannot create enough capacity for the 15-inch pipes along Spring to convey the 25-year storm flows for future conditions.

The 15-inch sections of pipe on Spring between Argyle Avenue and First Street are a bottleneck in this conveyance system. These pipes do not have adequate capacity to convey the 2-year storm. Conveyance system improvements on Spring Street from First Street to the Waterfront were installed in 1999. It is recommended that the storm drainage system on Spring Street between Argyle Avenue and First Street be replaced with 600 feet of 36-inch pipe in order to correct this problem and convey the 25-year storm for future conditions. In addition, the 18-inch section on Spring at Argyle should also be replaced with 50 feet of 24-inch pipe. The estimated cost for these improvements is $321,000.

The diversion on West Street can be accomplished through an 18-inch pipe connecting to the existing 12-inch pipe on First Street, which is part of the conveyance system for Drainage Basin No. 5. The estimated cost of installing 260 feet of 18-inch pipe is $73,000. These costs include one Type I catch basin and connection to two existing catch basins. This diversion is highly recommended in order to fully utilize the existing outfall and to create additional capacity in the 15-inch lines running down Spring Street.

The estimated costs of diverting flow from Spring Street to Caines Street through 250 feet of 18-inch pipe is $70,000. These costs include one Type I catch basin and connection to two existing catch basins. The estimated cost of diverting flow from Argyle Avenue to Web and "A" Streets through 620 feet of 24-inch pipe is $191,000. These costs include one Type II 48-inch catch basin and connection to two existing catch basins.

The 1997 plan identified system deficiencies in the Reed Street conveyance system. The recommended system upgrade was completed in 1998.

Several other areas will need improvements to convey the 25-year flows for future conditions. The time at which these improvements are needed depends upon the time and pattern of development in the respective sub-basins:

- Replace 12-inch pipe with 150 feet of 15-inch pipe on Price Street at Spring Street.
- Replace 8-inch sections along Spring just east of Mullis with 250 feet of 18-inch pipe.
- Replace 15-inch pipe on Argyle Avenue north of Caines Street with 150 feet of 18-inch pipe.
- Replace 8-inch pipes on Park Street with 560 feet of 12-inch pipe.
- Replace 12-inch pipe with 47 feet of 15-inch pipe on Second Street at Court Street.
- Replace 8-inch pipes on Court Street with 369 feet of 12-inch pipes.

Once again, new development could alleviate some of the projected flows which contribute to the need for system improvements by installing detention systems upstream of the pipe sections noted in this section.

6.2.5 DRAINAGE BASIN NO. 5

Drainage Basin No. 5 lies entirely in the downtown area and its conveyance system consists of 8- and 12-inch pipes. The model indicates that these pipes are adequate to handle the existing and future 25-year storms. This basin has excess capacity which can take the flows diverted off of Second, as mentioned above. No improvements are recommended at this time.

6.2.6 DRAINAGE BASIN NO. 6

The conveyance system for Drainage Basin No. 6 consists of 8-inch pipes and ditches. Currently, the system is adequate to convey the 2-year storm. Future development in this basin will have a major impact on the amount of runoff flowing out of this basin. Presently, the basin is mostly rural, with large lots of pasture, woods, and wooded residential homes. Future development of these areas will consist of single and multi-family dwellings which will increase the stormwater runoff by approximately 100 percent.

It should be noted that all of the existing ditches in this basin have adequate capacity to convey the future 25-year storm. If the rural character of this area is to be maintained, replacing the existing pipe sections with ditches may be less costly and provide better stormwater runoff control than the installation of larger pipes to handle projected flows.

Since the preparation of the 1997 Plan, a piped drainage system has been installed along Guard Street from approximately Marguerite Place to the 24-inch pipe at Guard and Tucker. This installation has alleviated drainage and flooding problems in the area northwest of the high school.

Replacing other pipes to convey the 24-year storm for future conditions in this basin would require 760 feet of 12-inch pipe along Marguerite Place and at the intersection of Guard and Park. The estimated cost for this project is $232,000. These costs include the three Type I catch basins and connections to three existing catch basins.

6.2.7 DRAINAGE BASIN NO. 7

The stormwater conveyance system for Drainage Basin No. 7 consists of several thousand feet of ditches and pipes ranging in size from 8-inch to 36-inch drainage in the basin is collected through a ditch/culvert and pipe system. The system has four main lines that transport runoff along Carter Avenue, Harbor Street, Guard Street, and Tucker Avenue. Runoff is collected along Carter Avenue and conveyed through ditches behind

the homes on Harbor Street to Tucker Avenue. Runoff is also collected at Tucker Avenue and Guard Street and transported to the outfall. Runoff from the northeast part of Town is collect at Marble Street and Larson Street and transported through ditches and pipes to the outfall. The outfall for Basins No. 7 is through a ditch/pipe which runs across Friday Avenue into Friday Harbor north of Harbor Street.

The 1997 model results identified several system upgrades that would be required to provide a drainage system adequate to convey the 25-year, 24-hour storm event. System deficiencies identified in the 1997 plan included the culvert crossing at Carter Avenue and Larson Street, the conveyance system on Harbor Street, culverts on Tucker and Marble Streets, pipe on Tucker Street and piping from Friday Avenue to the harbor.

An intense winter storm that included rain on the snow-covered frozen ground on January 17, 2005 highlighted conveyance system problems that need to be solved. Drainage problems occurred in the vicinity of Larson Street and Tarabochia Lane. It appears that the ditch along Carter Avenue immediately south of Larson Street overtopped and stormwater discharged onto the property located on the southeast corner of the intersection of Carter Avenue and Larson Street. In addition, stormwater from north of Larson Street discharged through 790 Larson Street across Larson Street to the property located at 805 Larson St. The drainage from Carter Avenue and Larson Street also affected the property located on Tarabochia Lane. Drainage improvements along Larson Street will include facilities to direct the drainage tributary to the intersection of Carter Avenue and Larson Street, including the discharge from the Fox Hall detention pond, to the east through a combination of 1,300 LF of 24-inch diameter and 36-inch diameter storm drain along Larson Street from Carter Avenue to Tucker Avenue. Type I catch basins with open top beehive grates will be installed to collect the drainage from the existing ditch on the south side of Larson Street and surface drainage from the north into the main conveyance pipe. The preliminary sizing of this conveyance system assumes that detention facilities that meet the Town of Friday Harbor requirements will be provided for the future school and play field projects north of Larson Street. The stormwater runoff generated south of Larson Street will continue to flow to the Carter Street ditch, the ditch that runs across private property north of Harbor Street and Harbor Street. The estimated cost of this project is $472,000.

The properties at 690 and 680 Larson Street experienced drainage problems during the 2005 storm event. Drainage from the Village Grove detention pond and drainage from the surrounding undeveloped area is tributary to the ditch that runs along the north and east sides of 690 Larson Street and the east side of 680 Larson Street. The recommended capital improvement project includes the installation of approximately 1,000 lf of 18-inch diameter pipe from the outlet of the Village Grove detention pond to Larson Street. The pipe would follow the alignment of the existing ditch. Catch basins with open top beehive structures would be installed along the alignment to collect the surface flow from adjacent properties. The estimated cost of this project is $165,000.

Several other areas need improvements for runoff from the 25-year storm event. The projects include the following:

Replace the existing 18-inch diameter conveyance system on Tucker Avenue with a 36-inch diameter piped drainage system from Larson Street to the outfall just north of Harbor Street. The estimated cost of this project is $223,000.

Replace 8-inch culverts at Tucker Avenue and Marble Street with 250 feet of 15-inch culverts. The estimated cost of this project is $59,000.

Replace 24-inch pipe from Friday Avenue to the harbor with 370 feet of 36-inch diameter pipe. The estimated cost of this project is $121,000.

6.2.8 CIP RECOMMENDED PROJECTS

The following projects are recommended and placed in order of priority according to the criteria stated in the introduction to this section. Figure 6-1 shows the recommended improvements. The CIP projects costs have been updated. The projects which have been completed have been retained in the CIP list.

Years 1 through 6

1) Drainage Basins No. 1 and No. 2, re-route storm runoff around storage facility to Friday Harbor. Completed.

2) Drainage Basin No. 6, install new 24-inch pipe along Guard Street. Completed.

3) Drainage Basin No. 7, install 24-inch and 36-inch pipe along Larson Street from Carter Avenue to Tucker Avenue. Estimated cost: $472,000.

4) Drainage Basin No. 7, install 18-inch diameter pipe from Village Grove detention pond to Larson Street. Estimated total cost: $165,000.

5) Drainage Basin No. 7, replace 8-inch culverts at Tucker Avenue and Marble Street with 250 feet of 15-inch culverts. Estimated total cost: $59,000.

6) Drainage Basin No. 7, replace 18-inch diameter conveyance system on Tucker Avenue from Larson Street to the outfall with 36-inch diameter pipe. Estimated total cost: $223,000.

7) Drainage Basin No. 7, replace existing 24-inch pipe with 36-inch pipe from Friday Avenue to the harbor. Estimated total cost: $121,000.

Years 7 through 20

8) Drainage Basin No. 4, replace 8-inch pipes on Reed Street. Completed.

9) Drainage Basin No. 2, replace 8-inch diameter pipes on Nelson Street with 12-inch and on Linder Street with 18-inch and replace ditches and pipes on Franck Street with 18-inch diameter pipes and 18-inch diameter pipe on Nichols Street. Estimated total cost: $397,000.

10) Drainage Basin No. 4, replace 15-inch pipe on Spring Street (Argyle to First). Portion of project from First Street to waterfront – complete. Estimated total cost: $321,000.

11) Drainage Basin No 4, construct diversion on West Street to divert flows from Second to First Street. Estimated total cost: $73,000.

12) Drainage Basin No. 4, construct diversion on Caines Street from Spring Street. Estimated total cost: $70,000.

Years 21+

13) Drainage Basin No. 4, construct diversion on Web Street from Argyle Avenue to "A" Street. Estimated total cost (not including right-of-way costs): $191,000.

14) Drainage Basin No. 6, replace 8-inch pipes and ditches along Marguerite Place and at the intersection of Guard Street and Park Street with 12-inch pipe. Piped drainage system on Guard Street from Marguerite to Tucker has been completed. Estimated total cost: $232,000.

TABLE 6-1

Recommended Stormwater Improvement Projects Estimated Project Costs

Project Number	Project Description	Estimated Project Costs[(1)]
1.	Malcolm Street to "A" Street/East Street to Outfall	Completed
2.	Guard Street to Tucker Avenue	Completed
3.	Larson Street	$ 472,000
4.	680/690 Larson Street	$ 165,000
5.	Marble Street and Tucker Avenue	$ 59,000
6.	Tucker Avenue	$ 223,000
7.	Friday Avenue to Outfall	$ 121,000
8.	Reed Street	Completed
9.	Linder/Nelson/Franck/"C"/Nichols Streets	$ 395,000
10.	Spring Street-Argyle Avenue to First Avenue	$ 397,000
11.	West Street Diversion from Second Street to First Street	$ 73,000
12.	Caines Street Diversion from Spring Street	$ 70,000
13.	Web Street Diversion from Argyle Avenue to "A" Street	$ 191,000
14.	Marguerite Place and Guard Street	$ 232,000
	TOTAL ESTIMATED PROJECT COST	**$2,324,000**

(1) *April 2005 ENR Index Cost, DDI – 8194.11

6.3 FACILITY MAINTENANCE

6.3.1 MAINTENANCE PROGRAM

Regular maintenance of drainage facilities is an effective means of reducing stormwater quantity and quality impacts. Improperly maintained stormwater facilities cause water quality degradation, frequent flooding, interruption of essential emergency services, and costly rehabilitation. The Town of Friday Harbor is responsible for maintenance of public facilities within Town right-of-way. Most of the Town's maintenance work to date has been reactive. Facilities in the Town which require maintenance include the following:

- Catch basins
- Control structures
- Stormwater pipes
- Culverts
- Open ditches
- Detention basins

The Table 6-2 outlines a recommended maintenance program for the drainage facilities in the Town. Appendix J contains DOE Standards for determining when maintenance of

specific drainage facilities may be required. The table contains information regarding the maintenance requirements for detention systems and control structures. This information is included for the Town's future reference. Table 6-3 outlines the approximate costs of the maintenance program identified in Table 6-2.

TABLE 6-2

Maintenance Activities

Unit	Production Unit	Activity	Recommended Schedule
Clean Catch Basins	5 each/day		Once every two years
Roadside Ditches	0.5 linear mile day	Clean, reshape, remove sedimentation	Every 3 years (1/3/year)
Roadside Ditches (shoulder mower)	1 linear mile/day	Vegetation Control	2 times/year
Drain Pipes	1,500 linear feet/day	Clean	Every 5 years (1/5/year)
Detention Basins (slope mower)	1 each/day	Vegetation Control	1 time/year
Detention Basins	1 each/day	Remove Sedimentation	Every 5 years
Repair, Replace Catch Basins	2 each/day		As needed

Maintenance activities are categorized as routine, preventive, planned, remedial, mandatory, and emergency.

Routine maintenance tasks include ditching, cleaning, repair, and/or replacement, placement of rock and other erosion control measures and technical assistance for drainage complaints/service requests.

Preventive maintenance includes cleaning catch basins, inlets, and culverts in areas of repeated problems. This is required maintenance because the facilities are inside the Town's right of way.

Planned maintenance is scheduled maintenance based on the life cycle of the facility.

Remedial maintenance replaces a facility without upgrading it to current standards. It is usually low cost repair.

Mandatory maintenance means required by local ordinance, liability, or state/federal statute.

Emergency maintenance is difficult to budget for, because it is nearly impossible to predict the type and amount of flood damage that may occur in any give year. Emergency response to stormwater drainage system problems is provided to private properties as a service. Property owners are then billed for the work.

Stormwater maintenance activities appear in Table 6-2 along with the corresponding production units, the number of units which can be maintained per working day. The estimated annual cost of a routine maintenance program is shown in Table 6-3. A cost for maintaining detention basins is not included since the Town does not have responsibility for the maintenance of detention ponds at this time. This routine maintenance program would cost approximately $39,000/year. The 2005 stormwater fund budget for all maintenance is $48,750.00.

TABLE 6-3

Stormwater Facility Maintenance Activities

Activity	Production Rate	Number/Year	Manpower Requirement	Total Cost[(1)]
Clean Catch Basins	5/day	98	3 man crew & equipment	$24,000
Clean Ditches, Clean Reshape	1.5 miles/day	1.2 miles	3 man crew & equipment	$ 3,000
Mow ditches	1 mile/day	7.5 miles	1 man & equipment	$ 5,500
Clean Pipes	1,200 ft/day	7,800 feet	3 man crew & equipment	$ 6,400
			Total	$38,900

(1) Assume: Crew member $30.00 hour including benefits, and $500/day for equipment use (i.e., trucks, mowers, backhoe).

6.3.2 PRIVATE DRAINAGE FACILITIES

Private drainage system in the Town of Friday Harbor include perforated pipes in drain rock, catch basins, detention systems, orifices, manholes, oil/water separators and pipes and open channels located outside the road right-of-way. The property owner is responsible for maintenance of the facilities on his property. If the Town must maintain a private system, per the Stormwater Management ordinance the owner pays for time and materials.

6.3.3 PREFERRED MANAGEMENT STRATEGY

The management strategy for the Town of Friday Harbor should be to provide routine maintenance of catch basins, roadside ditches, and drainage pipe as indicated in Table 6-2, Maintenance Activities. Funding for this preventative maintenance should come from the stormwater utility.

6.3.4 MANAGEMENT OF MAINTENANCE RESIDUALS

The Department of Ecology recognized that the lack of accepted procedures and locations for the disposal of waste from maintenance activities is one of the greatest problems confronting stormwater operation and maintenance programs. Disposal of the liquid and solid waste material from vactor trucks is a concern because of the potential contamination of surface or groundwater. DOE has developed guidelines for the disposal of street wastes. The following guidelines are from Appendix 5 of the draft *Western Washington Phase II Municipal Stormwater Permit.*

6.3.4.1 Street Waste Liquid

Street waste collection should emphasize retention of solids in preference to liquids. Street waste solids are the principal objective in street waste collection and are substantially easier to store and treat than liquids.

Street waste liquids require treatment before their discharge. Street waste liquids usually contain high amounts of suspended and total solids and adsorbed metals. Treatment requirements depend on the discharge location.

The following is the order of preference for disposal of catch basin decant liquid and water removed from stormwater treatment facilities.

1) Discharge of catch basin decant liquids to the sanitary sewer is the DOE preferred alternative.

2) Discharge of catch basin decant liquids into a Basic or Enhanced Stormwater Treatment BMP, if option 1 is not available. Decant liquid collected from cleaning catch basins and stormwater treatment wet vaults may be discharged back into the storm sewer system under the following conditions:

   - The preferred disposal option of discharge to sanitary sewer is not reasonably available, and

   - The discharge is to a Basic or Enhanced Stormwater Treatment Facility. If pretreatment does not remove visible sheen from oils, the treatment facility must be able to prevent the discharge of oils causing a visible sheen, and

   - The discharge is as near to the treatment facility as is practical, to minimize contamination or recontamination of the collection system, and

3) Water removed from stormwater ponds, vaults, and oversized catch basins may be returned to the storm sewer system. Stormwater ponds, vaults, and oversized catch basins contain substantial amounts of liquid, which hampers the collection of solids and pose problems if the removed waste must be hauled away from the

site. Water removed from these facilities may be discharge back into the pond, vault, or catch basin provided:

- Clear water removed from a stormwater treatment structure may be discharged directly to a downgradient cell of a treatment pond or into the storm sewer system.

- Turbid water may be discharge back into the structure it was removed from if;

  – The removed water has been stored in a clean container (eductor truck, Baker tank, or other appropriate contained used specifically for handling stormwater or clean water) and

  – There will be no discharge from the treatment structure for at least 24 hours.
- The discharge must be approved by the storm water system owner/operator.

Vegetation management and structural integrity concerns sometimes require that the ponds be refilled as soon after solids removal as possible. For ponds and other systems relying on biological processes for waste treatment, it is often preferable to reuse at least some portion of the removed water.

6.3.5 MAINTENANCE OF NATURAL SYSTEMS

Natural systems include ditches, swales, and wetlands. Maintenance requirements for ditches and swales are shown in Table 6-2 and Appendix J.

Maintenance of a natural system may require a permit from one of several agencies. Permits are required for a hydraulic project approval (HPA) from the Washington Department of Fisheries. Maintenance work under $2,500 would be exempt.

6.4 BEST MANAGEMENT PRACTICES

6.4.1 INTRODUCTION

Stormwater runoff water quality related problems in the Town of Friday Harbor are generated from non-point sources. This plan recommends that the Town require new development to install and maintain the water quality treatment options which are summarized here and fully documented in the DOE *Stormwater Manual.*

Water quality treatment options for existing development in the Town include source control, retrofitting on-site treatment facilities, or retrofitting regional treatment facilities.

Regional treatment facilities for existing development should be sited at the downstream end of the system to be the most effective. Siting of this sort of facility is difficult in the Town since the downstream end of most the drainage systems is located in the downtown area where land for treatment facilities is limited.

Retrofitting of treatment facilities onto existing properties and source controls are the recommended options for water quality treatment for developed areas of the Town. The success of both of these options will depend on public education which alerts the citizens to the steps they can take to improve stormwater runoff water quality. Source controls and onsite treatment options are discussed in Chapter 5 of this plan.

Planning for urban area drainage and storm water control must be considered in terms of overall community goals and objectives. The urban drainage and flood control systems are closely related to many other urban subsystems and cannot be planned in isolation. General community and regional policies and goals should be formulated: planning principals for guiding the planning process should be clearly stated; and drainage criteria should be developed to provide a basis for consistent and uniform planning, design, implementation, and operation.

For the Puget Sound area, a plan has been developed and is titled the *Puget Sound Water Quality Management Plan*. This plan and its companion documents developed by DOE, *The Stormwater Management Manual for the Puget Sound Basin, the Technical Manual and the Stormwater Program Guidance Manual for the Puget Sound Basin*, have been prepared to provide the necessary guidance in resolving stormwater issues.

The DOE stormwater manuals emphasize the use of Best Management Practices (BMPs) for the control and treatment of stormwater runoff.

Best management practices are physical, structural and/or managerial practices, that when used single or in combination, prevent or reduce pollution of water. The types of BMPs are as follows:

- Runoff treatment
- Streambank erosion control
- Source control

The primary purpose of using BMPs is to protect beneficial uses of water resources through the reduction of pollutant loads and concentrations, and by reducing streambank erosion and protecting stream habitat in general. BMPs have been classified based on their ability to implement the pollution control strategy described above. Pollution prevention is accomplished through the use of source control BMPs. Treatment is provided by runoff treatment BMPs. Streambank erosion control BMPs overlap both pollution prevention and treatment.

6.4.2 RUNOFF TREATMENT

Runoff treatment BMPs are designed to remove pollutants that are contained in runoff. Treatment BMPs utilize a variety of mechanisms to remove pollutants from stormwater including sedimentation, filtration, plant uptake, ion exchange adsorption and bacterial decomposition. Examples of runoff treatment BMPs were discussed in Chapter 4 and include infiltration trenches, wet ponds, biofiltration swales, and vegetative filter strips. The goal of runoff treatment BMPs is to provide effective treatment of at least 90 percent of the runoff generated by development.

The Town of Friday Harbor should encourage the use of runoff treatment BMPs. Where soil conditions permit, the Town should require the use of the DOE *Stormwater Management Manual for the Puget Sound Basin* which contains design and construction criteria for the various runoff treatment BMPs. The Town and developers in the Town should use the DOE manual as a guide for the design and construction of runoff treatment BMPs.

6.4.3 STREAMBANK EROSION CONTROL BMPS

Streambank erosion control BMPs are designed to prevent or control the excessive erosion that typically occurs in ditches and streams located in urbanizing watersheds. This erosion results not only because of the dramatic increase in peak flow rates from runoff but also due to increases in the frequency and duration of high flow conditions. The goal of streambank erosion control BMPs is to replicate, to the extent possible, the pre-existing hydrologic regime in streams by attenuating runoff from development sites and slowly releasing it back to the natural systems.

DOE's streambank erosion control standards attempt to replicate, to the greatest extent practicable, the stream flow conditions that would occur under natural conditions for specified design storms. DOE requires streambank erosion control BMPs to be designed to meet specific on-site detention requirements.

A correction factor is applied to the BMP volume and should range from 20 to 50 percent for sites with impervious cover ranging from 20 to 100 percent. A correction factor is necessary to account for the inadequacies of current hydrologic analysis methods.

Streambank erosion control BMPs include, as a first priority, the use of infiltration to the fullest extent practicable, only if site conditions are appropriate and ground water quality is protected. Guidelines for infiltration BMPs are given in DOE *Stormwater Management Manual for the Puget Sound Basin,* Chapter III-4. In addition to attenuation of storm flows treatment of the water quality design storm must be accomplished prior to discharge to highly permeable soils.

6.4.4 SOURCE CONTROL BMPS

Source control BMPs aim to prevent pollution or other adverse effects of stormwater from occurring. Not every user contributes an equal amount of runoff or pollution to the stormwater system. Commercial users generally have a much higher percentage of impervious surface per parcel of land than would a single family residence, and more impervious surface amounts to a higher rate of runoff. Likewise, many industrial users will not only have more impervious surface, but will contribute more toxic and hazardous pollutants to the system than would other users.

Source control BMPs are generally considered to be most applicable for commercial or industrial sources. However, given the large percentage of land area zoned residential in the Town source control BMPs for residential runoff are appropriate for the Town of Friday Harbor. Residential source control BMPs are concerned mainly with the minimization of the use and dumping of household hazardous wastes, fertilizers and pesticides. The DOE *Stormwater Program Guidance Manual for the Puget Sound Basin* contains a chapter on the proper use of household chemicals. The Town would not be able to enforce such BMPs but information on the harmful effects of household hazardous chemical usage could be incorporated into the Public Involvement and Education program which was discussed in Chapter 5 of this report.

Source control BMPs for commercial or industrial non-point pollution sources in the Town can be enforced. The commercial sources of non-point pollution in the Town of Friday Harbor include businesses along Spring Street and various other parcel commercial properties.

Commercial BMPs are discussed in detail in Volume IV of the DOE *Stormwater Management Manual for the Puget Sound Basin* in Volume IV Chapter 4. The information available in the *Stormwater Management Manual for the Puget Sound Basin* Volume IV provides the information necessary to guide a designer through the process of determining which regulations apply, what water quality standards must be met and which BMP or combination of BMPs provides the necessary level of source control or stormwater treatment.

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