Stormwater Comprehensive Plan

September 2000

Prepared for:
City of Bonney Lake

Montgomery Water Group, Inc.
CITY OF BONNEY LAKE

STORMWATER
COMPREHENSIVE PLAN

Prepared for:
City of Bonney Lake

Prepared by:
Montgomery Water Group, Inc.

September, 2000
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EXECUTIVE SUMMARY

This Phase 1 Stormwater Comprehensive Plan for the City of Bonney Lake defines alternative and recommended improvement solutions to existing drainage problems throughout the City of Bonney Lake. It also recommends expansion of the comprehensive stormwater management program for the City to include added Stormwater Utility administration, development review and inspection, public information/education, operations and maintenance, and water quality management. Current City stormwater management policies are also documented. A funding plan is presented to meet the estimated costs of the expanded stormwater management programs as well as the stormwater capital improvement plan (CIP). A Phase 2 component of the Stormwater Comprehensive Plan should be completed that focuses on expansion needs of the City’s drainage system infrastructure to serve projected growth, with particular attention to areas within the urban growth boundary.

A total of 10 defined problem areas were evaluated throughout the 5.7 square mile study area. Flooding and erosion/sedimentation were the major problems of concern. Water quality problems (if any) are not currently documented, and as such, are not specifically evaluated in the Phase 1 plan. Alternative drainage system improvement solutions were developed to address those problems and were evaluated for comparative technical and cost feasibility. Assessment of the City’s responsibility to implement those solutions as part of the CIP was made jointly with the City based on the City’s current stormwater management policies. Based on that evaluation, stormwater capital improvement projects for 6 of the 10 problem areas have been recommended as part of an initial 5-year capital improvements plan (CIP).

Many drainage basins in the City contribute runoff to pothole areas that have no defined surface drainage outlet. These basins are especially prone to flooding during high runoff volume storm events. During the recent January 1997 (New Year’s) storm, approximately 7.5 inches of combined precipitation and snowmelt caused extensive flooding and related erosion/sedimentation problems throughout the City. Two particular potholes flooded more extensively than in the recent memory of residents and City workers. Pothole No. 1 flooded 62nd St. E. to a depth of approximately 4.5 feet and the water took several months to recede below the low point in the road. Pothole No. 4 flooding extended over 82nd St. E. The improvements suggested by this plan would minimize the flooding potential and duration in these areas as well as other priority problem areas.

Stormwater Capital Improvement Plan Recommendations

The capital improvements recommended in this Phase 1 plan (see Section 3.0) are based on solving existing flooding, erosion and drainage system capacity problems. The 6 recommended CIP projects (see appended Drawings) are estimated to cost approximately $474,000 (2000 construction costs) and are targeted to be completed over the next five years. The recommended stormwater CIP should be reviewed annually, and should be updated after completion of the Phase 2 plan to reflect any added improvement needs and costs.

Stormwater Program Recommendations

Recommended changes to the current City stormwater programs (see Section 4.0) are included to address the elements of Stormwater Utility administration, development review and inspection, public information/education, operations and maintenance, and water quality improvement.
An important component of this plan is to initiate a water quality program targeted to meet Federal National Pollutant Discharge Elimination System (NPDES) Phase II Stormwater Regulations for Tier II communities as well as establishing compliance with State regulations currently imposed by the Department of Ecology. Those regulations will require the City of Bonney Lake to make measurable progress in the following six program elements:

1. Public education and outreach on stormwater impacts;
2. Public involvement/participation in water quality program;
3. Illicit discharge detection and elimination;
4. Construction site stormwater runoff control;
5. Post-construction stormwater management in new development and redevelopment; and
6. Pollution prevention/good housekeeping for municipal operations.

The City has adopted the Pierce County Stormwater Management and Site Development Draft Manual as an interim measure until the final manual is reviewed and accepted by Ecology. Since this manual is not yet approved by Ecology, the City should require compliance with the minimum water quality control requirements of the Stormwater Management Manual for the Puget Sound Basin (The Technical Manual) and the Baseline General Permit for Stormwater Discharges Associated with Construction Activity to maintain interim compliance with State water quality program requirements.

Stormwater Policy and Ordinance Recommendations

The City has prepared a stormwater policy document (Appendix B) and currently regulates stormwater management in accordance with a stormwater ordinance and a sensitive areas ordinance. The City should consider changes to these documents based on recommendations presented in Section 5.0. In particular, drainage management in pothole areas and associated sensitive areas should reflect more stringent requirements for construction in and adjacent to those areas. This will allow preservation of those areas as an integral part of the City’s storm drainage systems for flood reduction and water quality benefit, and will ultimately reduce drainage system improvement infrastructure costs.

Funding Plan Recommendations

Prior to the Stormwater Utility formation in January 1996, the storm drainage system maintenance and improvement costs were funded by other City departments. The Stormwater Utility revenues now support the current City stormwater programs. Stormwater Utility billing rates in effect prior to development of this plan were a flat $2.65/month for residential properties and $13.25/month for commercial properties. Total annual Stormwater Utility revenue under that rate structure was approximately $126,000. Since draft plan development, Stormwater Utility rates have been increased to $3.90 and $19.50/month, respectively, which generates an annual utility revenue of approximately $185,000. That level of funding allows basic stormwater management program activities along with smaller CIP projects implementation.

Based on Phase 1 plan recommendations, Stormwater Utility annual operating costs (2000 dollars) for stormwater program elements are estimated to be approximately $174,000. Additional funding is needed for recommended stormwater CIP projects and other minor stormwater system projects.
undertaken by City crews. In order to fund these projects and the recommended stormwater program activities, it is recommended that the Stormwater Utility rates be increased and be fully supported by drainage utility revenues. The City should consider charging commercial properties on an equivalent service unit (ESU) basis as determined by impervious area runoff contribution in addition to a base rate. Based on evaluation of funding needs identified in this plan, the Stormwater Utility Program ESU billing rate should be increased to $4.20/month by the year 2001. An approximate utility revenue increase to $303,000/year is projected for this rate structure by year 2004 based on projected growth of the number of ESU units. A proposed five year schedule of rate increases for the basic programs and CIP projects is included in Section 6.0.

The City should also consider addition of a System Development Charge (SDC) for new development connections to the drainage system, representative of the unit value of existing city investment in the current storm system. Similar charges in other communities range up to $500 per ESU. The Phase 1 funding plan does not include this potential revenue source in Stormwater Utility revenues projections. If implemented, it could be used as a reserve fund for minor storm drainage system improvements or to build revenues to implement additional stormwater CIP projects that may be identified through Phase 2 study.

Other potential grant funding sources to complete additional Phase 2 planning and follow-up CIP projects should be considered by the City. Charges for development review, inspection, and enforcement should also be adjusted (as needed) to cover the actual City staffing costs for those expanded activities.
DEFINITIONS AND ABBREVIATIONS

acre-ft: One foot of water over one acre (43,560 cubic feet)

CB: Catch basin

cfs: Cubic feet per second

County Manual: Pierce County Stormwater Management and Site Development Manual.

ESU: Equivalent Service Unit.

GIS: Geographic Information System

gpm: Gallons per minute

Pothole: Throughout this report a pothole will be defined as a naturally occurring low area that does not have a defined outlet and which can be observed on a five foot contour map.

SDC: System Development Charge
1.0 INTRODUCTION

1.1 Plan Purpose, Need, and Elements

Stormwater management in the City of Bonney Lake has historically consisted of responding to citizen complaints about drainage problems through routine maintenance of ditches and pipes, and small scale improvements to the City's natural and improved drainage systems. Review and regulation of development and associated drainage system improvements has also occurred. Flooding in January 1997, continued growth of the City including expansion into urban growth areas, and the requirements of the Growth Management Act (GMA) and the Puget Sound Water Quality Management Plan (PSWQMP), among other factors, have defined the need for the City to establish a comprehensive stormwater management program. To meet this need, a stormwater utility was established in January 1996 to provide the direction and initial funding for such a stormwater program.

The City of Bonney Lake has recognized the need to develop a Stormwater Comprehensive Plan to guide implementation of the City's stormwater management programs. An effective stormwater management program needs to consist of:

- stormwater management policies and adopted ordinances that authorize City regulation;
- a stormwater facility capital improvements plan;
- a stormwater facility inspection, operation, and maintenance program;
- a water quality control program including public education and information elements;
- a comprehensive development review and inspection program;
- administrative staffing and equipment to accomplish the program elements; and
- a funding plan that provides adequate revenues to implement the programs.

This Stormwater Comprehensive Plan was prepared to provide initial guidance to the City in developing and tailoring stormwater management programs to the City's specific needs and management objectives. It provides recommendations for structuring the overall stormwater management program and the initial 5-year stormwater facility capital improvement plan (CIP). It also summarizes funding needs and possible Stormwater Utility rate changes needed to implement the recommended program actions. The City of Bonney Lake provided the funds to develop this plan through a Public Works Trust Fund Loan.

This plan is described as Phase 1 of a full Stormwater Comprehensive Plan. Phase 1 planning efforts were particularly focused on identifying solutions to existing drainage (flooding) problem areas within the City. Phase 2 should address required expansion in drainage systems with future growth, especially in the urban growth areas, and should include a more detailed assessment of hydrology and hydraulics of the watershed areas and drainage systems. Water quality needs, including source and treatment controls, should also be evaluated in the Phase 2 plan.

1.2 Plan Objectives

The following objectives have been established based on input from the City staff to guide development of the Phase 1 Stormwater Comprehensive Plan:
• Conduct an inventory of the City storm drainage infrastructure and identify the problem areas that have been reported to the City.
• Prepare storm drainage system maps in an ArcView GIS that include the characterization of the drainage systems and inventory, drainage basin delineation, problem areas, and approximate areas of flood inundation (pothole areas).
• Identify which problems require capital projects and of these which are the City’s responsibility to fix based on the City Stormwater Policy.
• Identify the storm drainage management needs, including water quality, operations and maintenance, administration, and public education.
• Recommend modifications to the current drainage utility funding program as a basis for funding capital improvement plan projects and recommended expansion of storm drainage management programs.

1.3 Scope of Work

The following tasks of the Phase 1 plan scope of work are addressed by this report.

• Identify and evaluate drainage problem areas, document drainage system inventory, and complete needs assessment.
• Delineate drainage basins and subareas.
• Acquire available aerial photography and topographic mapping for GIS application.
• Develop and evaluate alternative solutions, their feasibility, and estimated costs.
• Prepare preliminary stormwater capital improvement plan.
• Define water quality program elements for compliance with Ecology requirements.
• Identify funding needs and a plan to meet defined needs.

1.4 Study Area

The study area is located within the City of Bonney Lake and its urban growth areas. Figure 1-1 illustrates the City’s current corporate limits and the major drainage basins and subbasins that comprise the study area. The study area encompasses 3,618 acres (5.65 square miles). The focus of the Phase 1 planning was on urbanized areas along and north of the SR 410 corridor.
2.0 DRAINAGE BASINS, SYSTEMS, PROBLEM AREAS

2.1 Drainage Basin Description and Characteristics

The Bonney Lake area has a unique topography with many small rolling upland hills and low-lying depressional areas resulting from past glacial effects. Soils are typically outwash and till material. Numerous potholes exist where closed depressions have no surface drainage outlet other than groundwater infiltration and evaporation. The potholes are an integral part of Bonney Lake’s natural and improved drainage systems. If not properly managed, these potholes will continue to be flood hazard areas. However, with properly defined inundation limits and well managed development policies these local potholes can provide surface water management benefits such as:

- Retention of large open spaces and habitat for wetlands, plants, and animals, as well as recreational area.
- Use as regional detention facilities that would otherwise be expensive to construct.
- Reduction of the need for improved drainage systems to convey stormwater to downstream receiving waters.
- Capture of runoff for infiltration, providing groundwater recharge.

A naming convention was developed for referencing the major drainage basins in the City. The names are two to four characters consisting of two letters describing what feature the basin drains to, followed by a unique number to distinguish basin areas. For example, basin PH1 is a major drainage basin that drains to a pothole area (PH) and it is the 1st pothole drainage area that was delineated. The two letter prefixes are:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH</td>
<td>Pothole</td>
</tr>
<tr>
<td>DJ</td>
<td>Debra Jane Lake</td>
</tr>
<tr>
<td>BL</td>
<td>Bonney Lake</td>
</tr>
<tr>
<td>FC</td>
<td>Fennel Creek</td>
</tr>
<tr>
<td>HW</td>
<td>Highway 410</td>
</tr>
<tr>
<td>KL</td>
<td>Kelly Lake Rd.</td>
</tr>
<tr>
<td>LT</td>
<td>Lake Tapps</td>
</tr>
<tr>
<td>SB</td>
<td>Sumner-Buckley Highway</td>
</tr>
<tr>
<td>PL</td>
<td>Ponderosa Lake</td>
</tr>
</tbody>
</table>

The sub-basins within the major drainage basins were numbered sequentially as they were delineated. For example, sub-basin 1HW4 is the first sub-basin delineated within basin HW4.

Figure 2-1 shows the major drainage basins that were delineated for this report. Figure 2-2 shows the major drainage basins that outlet to potholes (shaded). This illustrates the large number of Bonney Lake drainage basins that have no outlet. Pothole drainage basins account for 25% (900 acres) of the total area in Bonney Lake. The remaining 2,700 acres drain to areas that have a defined outlet (as delineated on the available five foot contour interval topographic maps). Throughout those 2,700 acres there are many depressions that do not show up on the available topographic mapping (from field review). These areas are beneficial in attenuating the peak stormwater flows by storing water and slowly releasing it through subsurface flow. Often these minor potholes are brought to the attention of the City when a drainage complaint is filed because of standing water on private property.
Of the drainage basins that do not discharge to potholes, virtually all drain to Fennel Creek. Only highway (HW) drainage basins 1-4 and the Lake Tapps (LT) drainage basin runoff do not eventually end up in Fennel Creek.

Existing five foot contour interval topographic maps produced in 1965 were used for basin delineation with Phase 1 plan development. Future (Phase 2) storm drainage planning efforts should consider any upgrades in topographic mapping that become available to the City for use.

Delineated drainage basin areas and their estimated percent impervious cover are shown in Table 2-1. The land use information was obtained from Pierce County GIS maps as summarized in Appendix E. These GIS maps were overlain with storm drainage basin maps in ArcView to determine land use characteristics in each basin. Typical impervious percentage multipliers were used to calculate impervious surface area from the land use information. The largest basin delineated is the Lake Tapps drainage basin (LT1). Its basin area is 1,000 acres, however 420 acres of that area are attributed to the surface area of Lake Tapps. The next largest drainage basin (PH1) drains to Pothole 1 with a basin area of approximately 336 acres. It has a 26 percent impervious cover (existing land use) and consists of single family residential and open space.

2.2 Hydrology

The average annual rainfall in Bonney Lake is 45 inches. The 2-year, 24-hour storm for Bonney Lake is approximately 2.2 inches and the 100-year, 24-hour storm is approximately 4.2 inches. The 100-year, 7-day duration storm is estimated by Pierce County to be 12 inches. In January 1997, a combined precipitation and snowmelt event occurred with a total of 7.5 inches of measured precipitation in a 7-day period. This is equivalent to a storm between the 25- and 100-year event magnitude for that duration. The extent of flooding in January 1997 was exacerbated by the wet antecedent period leading up to the storm. Soils were saturated and potholes had already begun to fill when this storm occurred, resulting in many flooded pothole areas. This event will be referenced throughout this report because many of the problem areas discussed in this report were identified during this storm.

Limited hydrologic analysis of storm event runoff potential were conducted for development and assessment of the Phase 1 plan solutions. These analyses typically consist of HEC-1 hydrograph simulation to define peak flow and runoff volume contributions to potholes, and level pool routing of those hydrographs through available storage volumes at estimated outflow rates. Hydrologic modeling completed for those analyses is included in Appendix F.
### Table 2-1
Major Drainage Basins, Areas and Estimated Impervious Cover (a)

<table>
<thead>
<tr>
<th>Basin Name</th>
<th>Basin Area (acres)</th>
<th>Impervious Area (% of Basin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH1</td>
<td>336</td>
<td>27</td>
</tr>
<tr>
<td>DJ</td>
<td>254</td>
<td>30</td>
</tr>
<tr>
<td>BL</td>
<td>105</td>
<td>37</td>
</tr>
<tr>
<td>PH2</td>
<td>46</td>
<td>37</td>
</tr>
<tr>
<td>FC1</td>
<td>147</td>
<td>31</td>
</tr>
<tr>
<td>FC2</td>
<td>257</td>
<td>30</td>
</tr>
<tr>
<td>PH3</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td>HW1</td>
<td>117</td>
<td>30</td>
</tr>
<tr>
<td>PH4</td>
<td>54</td>
<td>33</td>
</tr>
<tr>
<td>HW2</td>
<td>94</td>
<td>17</td>
</tr>
<tr>
<td>PH10</td>
<td>39</td>
<td>10</td>
</tr>
<tr>
<td>KL</td>
<td>139</td>
<td>14</td>
</tr>
<tr>
<td>PH11</td>
<td>61</td>
<td>34</td>
</tr>
<tr>
<td>HW3</td>
<td>25</td>
<td>49</td>
</tr>
<tr>
<td>PH7</td>
<td>4</td>
<td>56</td>
</tr>
<tr>
<td>PH8</td>
<td>20</td>
<td>52</td>
</tr>
<tr>
<td>PH9</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>PH5</td>
<td>9</td>
<td>32</td>
</tr>
<tr>
<td>LT1</td>
<td>992</td>
<td>42</td>
</tr>
<tr>
<td>FC3</td>
<td>97</td>
<td>18</td>
</tr>
<tr>
<td>FC4</td>
<td>171</td>
<td>24</td>
</tr>
<tr>
<td>PH12</td>
<td>69</td>
<td>18</td>
</tr>
<tr>
<td>SB1</td>
<td>97</td>
<td>22</td>
</tr>
<tr>
<td>SB2</td>
<td>60</td>
<td>13</td>
</tr>
<tr>
<td>HW4</td>
<td>263</td>
<td>37</td>
</tr>
<tr>
<td>PL</td>
<td>140</td>
<td>27</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>3,618</strong></td>
<td></td>
</tr>
</tbody>
</table>

(a) Existing land use based on Pierce County GIS

#### 2.3 Soils

Several soils logs on record at Pierce County were reviewed in the process of compiling this report. One report in particular about soils at Lakeridge Junior High School, had extensive data on soil types, depths and hydraulic conductivity in the northwest corner of the City. Information was gathered through these soils reports and the SCS soils maps.
The surficial soils in Bonney Lake are mostly outwash soils that consist of gravelly sandy loam, which is highly permeable. In some localized areas of the City, such as in the south just east of Bonney Lake Manor and in the north by Lakeridge Junior High, the outwash material is reported to be 20 feet deep or deeper. Typically these soils are 3 to 4 feet deep throughout most of the City. The outwash soils are typically underlain by cemented glacial till which has a very low permeability. A typical thickness of the till material is reported to be 30 feet. The surficial soils in Bonney Lake typically infiltrate quickly, making infiltration systems common for new development. These infiltration systems work well under most conditions because water infiltrates vertically to the relatively impermeable till layer, then moves laterally to a pothole, stream or perched aquifer. In basins draining to potholes, this infiltrated water flows to the low point where it accumulates and can possibly cause flooding problems. It is important that the City continue to review site development and storm drainage improvement proposals on both a peak flow capacity and runoff volume basis since infiltrated water can contribute to downstream flooding problems.

2.4 Drainage System Characterization

The existing drainage system in The City of Bonney Lake is comprised primarily of roadside ditches and culverts. There are three main lakes, Bonney, Debra Jane and Tapps. Many infiltration systems are also used throughout the City. Most of the infiltration systems are within recently constructed residential areas and a long-term record of their performance and effectiveness is not available.

Based on the predicted rate of growth from development and annexation (4% from Comprehensive Land Use Plan) it is expected that the amount of storm drainage infrastructure will need to increase at a similar rate for the foreseeable future. With an expanded stormwater management program, the growth in infrastructure could be even greater. As the population of Bonney Lake increases and roadway improvements are constructed, more of the system will be enclosed with pipes and other subsurface conveyance facilities and comparatively less will be in ditches. However, ditch and culvert systems will likely continue to be the main drainage conveyance components in Bonney Lake.

Bonney Lake’s drainage system characteristics are conducive to maintaining good surface water quality. Grass lined ditches provide benefits similar to water quality swales and the many potholes and surface impoundments act as settling basins. As development continues, the City will maintain and improve the quality of its surface waters by continuing to implement and enforce water quality design requirements.

2.5 Drainage System Inventory

An inventory was conducted to determine the extent of existing stormwater infrastructure within the City of Bonney Lake. The City provided hand-drawn inventory maps that documented most of the existing drainage system infrastructure. These maps were used to create an ArcView GIS file that depicts this information on a city base map. The inventory information was updated and corrected where necessary, based on field review and further discussions with residents and City staff. The resulting Drainage System Inventory Map is included in a map pouch at the end of the report. Table 2-2 quantifies the major components of the drainage system inventory. Based on available inventory data, the City currently has approximately 64 miles of ditch, 10 miles of pipe and 430 catch basins and manholes within its boundary.
Table 2-2
Bonney Lake Storm Drainage System Inventory Summary

<table>
<thead>
<tr>
<th>Type of Structure</th>
<th>Unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catch Basins/Manholes</td>
<td>No.</td>
<td>430</td>
</tr>
<tr>
<td>Drainage Pipes</td>
<td>miles</td>
<td>10</td>
</tr>
<tr>
<td>Roadside Ditches</td>
<td>miles</td>
<td>64</td>
</tr>
</tbody>
</table>

The Drainage System Inventory Map includes information on pipe systems, manholes and catch basins, detention/retention ponds, ditches, drainage basin delineation and type, receiving waters, 100-year flood inundation limits and the Pierce County GIS land use information. The inventory database map can be updated as new developments and drainage system improvements are implemented. The ArcView GIS data can also be used to maintain updated storm drainage system maintenance information and schedules.

2.6 Drainage Problem Areas

The focus of the Phase I drainage planning was to address specific recurrent flooding problem areas within the City and conduct an inventory of the existing system. A more detailed, city-wide analysis of the storm drainage system capacity, including the urban growth area, is planned as a second phase of the Stormwater Comprehensive Plan.

A list of drainage problems was compiled by the City and evaluated for inclusion in the plan. The evaluation effort included researching the problem areas by field visits, interviewing residents and city staff, and reviewing topographic maps and drainage system maps of the areas in question. Some of the problems were determined to be associated with private property and not in the City's jurisdiction. Through this assessment process, the list was reduced to ten problem areas. The location of those problem areas are shown on Figure 2-3. Table 2-3 lists the problem areas and provides a summary of potential solution alternatives that were evaluated for each.

Each problem area was evaluated to determine the best practicable solution to the problem. They were prioritized with the City staff based on the extent of the problem, solution technical feasibility, City responsibility to address the problem, and solution costs. A more detailed description of each problem and its possible solutions is contained in Appendix A. Of the ten problem areas, four were determined to be private drainage system problems beyond the City's jurisdiction in accordance with the City Stormwater Policy Guidelines and six were selected as Capital Improvement Plan (CIP) projects. Section 3 summarizes the six CIP projects that are recommended for implementation over the next six years. In addition to the CIP projects, the City needs to maintain the existing drainage system on a more consistent and frequent basis to maximize the function and benefits provided by those drainage systems.
### Table 2-3
Drainage Problem Areas and Potential Solutions Tabulation

<table>
<thead>
<tr>
<th>Problem No.</th>
<th>Location</th>
<th>Problem Description</th>
<th>Potential Solution</th>
</tr>
</thead>
</table>
| 1           | 62nd St. E. at 187th Ave. E. | Large area drains to major pothole. During heavy rainfall, it fills up and floods 62nd St. blocking access to property at the end of that road. Water also inundates some private access roads and is a threat to structure flooding. | • Raise 62nd St. by approx. 4 ft where it crosses the pothole (a distance of 200 ft).  
• Pump into an improved drainage system along 64th St. to Lake Tapps.  
• Construct access driveway to the isolated property at the end of 62nd St. through an easement from 189th Cr.  
• Build adequate stormwater storage elsewhere in the basin. |
| 2           | 82nd St. E. at Locust Ave. | Area drains to a large pothole causing periodic flooding. Water covers 82nd St., but not enough to close the road. | • Raise 82nd St.  
• Increase storage volume in pothole. |
| 3           | 81st St. E. at 182nd Ave. E. | Low point in cul-de-sac with no drainage outlet. Two structures on the corner are affected by standing water. | • Install drainage system to convey runoff south to existing 182nd Ave. drainage system. |
| 4           | 96th St. E. at 204th Ave. E. in Cedar View development. | Nuisance ponding occurs. It appears runoff used to flow to the south where a structure now exists. | • Provide drainage through the property to the south by obtaining a drainage easement. Improve the ditch or install a pipe along 204th Ave. to convey the flow to the existing culvert across SR 410.  
• Divert water away from the problem area by regrading the ditches. |
| 5           | Between 91st St. E. and 92nd St. E. in Cedar View development. | Nuisance ponding due to undersized culvert threatens to flood structure. | • Install new culvert.  
• Divert water from the problem area by regrading the ditches. |
| 6           | 18214 95th Loop | Surrounding area drains to a vacant lot causing ponding on the property. A new county development has an outfall pipe that drains directly to the lot. | • Divert water from problem area by regrading the ditches.  
• Pump water out of pothole to 184th Ave. or to Sky Island pond  
• Construct a pond at this location  
• Install infiltration gallery. |
| 7           | 109th St. E. just west of 193rd Ave. E. | Low point on 109th St. gets inundated as a result of undersized infiltration system. | • Clean existing infiltration system  
• Build additional infiltration system.  
• Install an overflow pipe to lower infiltration system. |
| 8           | At the southeast corner of 77th St. E. and 183rd Ave. E. | Stormwater is conveyed down 183rd Ave. and 77th St. to a low point on the corner. Standing water accumulates on corner property. | • Install infiltration system along the shoulder of 77th St.  
• Install a culvert under 77th St. |
<table>
<thead>
<tr>
<th>Problem No.</th>
<th>Location</th>
<th>Problem Description</th>
<th>Potential Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>8311 184a Ave. E.</td>
<td>A structure that is located in a pothole gets flooded during high runoff volume storms. Standing water can be 3 feet deep at times.</td>
<td>• Pump runoff from pothole to improved ditch/infiltration system on 183rd Ave. to the south.</td>
</tr>
</tbody>
</table>
| 10         | 20201 Church Lake Dr. E. | Water backs up behind an undersized culvert and accumulates on adjacent property. | • Install larger culvert and catch basin.  
• Construct overflow channel to Lake Tapps. |
3.0 STORM DRAINAGE CAPITAL IMPROVEMENTS PLAN

3.1 Recommended Projects and Priorities

A recommended list of CIP projects has been compiled and prioritized based on problem severity, solution feasibility and estimated cost. Those projects are summarized in Table 3-1, with locations shown on Figure 3-1. The list of CIP projects and priorities may be altered in the future due to numerous factors such as finding availability, development effects, opportunities to integrate CIP projects with other drainage improvement proposals, and introduction of new priority problems. The actual projects to be constructed and their sequence will be at the discretion of the City of Bonney Lake.

<table>
<thead>
<tr>
<th>CIP Priority</th>
<th>Problem Number</th>
<th>Project Description</th>
<th>Estimated Cost (2000 Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Construct Pump station at the southwest corner of Pothole 1 with force main to gravity improved conveyance system along 64th St. to Lake Tapps.</td>
<td>$215,000</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Raise 82nd St. E. 1.0 to 1.5 feet. Excavate benches in existing pothole (beyond sensitive areas) to increase storage volume.</td>
<td>$132,000</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Install catch basins and storm drain along 81st St. E and connect them to the existing drainage system on 182nd Ave. E. to the south.</td>
<td>$52,000</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>Replace existing infiltration system on 109th St., just west of 193rd Ave. E., with new larger system.</td>
<td>$23,000</td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td>Construct an infiltration system along the south side of 77th St. E. at the intersection of 183rd Ave. E.</td>
<td>$10,000</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>Install a parallel culvert next to an existing culvert from Church Lake Dr. E. to Lake Tapps.</td>
<td>$42,000</td>
</tr>
</tbody>
</table>

Total Stormwater CIP Estimated Cost: $474,000

Estimated costs reflect estimated construction costs based on the conceptual improvement plan layouts and quantities, assumed land/easement acquisition costs, and an allowance for engineering, legal, and administrative costs. Appendix C provides the basis for the CIP project costs estimates.

Each CIP project is discussed in detail in the following section. Improvement alternatives and their comparative feasibility are presented. The recommended solution is stated along with its associated
costs and implementation needs. Appendix A contains a more detailed description of the problem areas.

3.1.1 CIP Priority 1 (Problem No. 1 Solution)

Location:

Extends both north and south of 62nd St. E. between 187th Ave. E. and 189th Ave. E. (See Figure 3-1 and Drawing 1).

Description:

Pothole 1 fills during large runoff volume storm events causing 62nd St. E. and both 185th Ave. E. and 187th Ave. E. (private roads) to be periodically flooded and inaccessible for long durations. In most years, the pothole fills enough that standing water is visible in the low areas, but the roadway is not inundated. Periodic flooding of 62nd St. E. blocks access to the residence at the end of 62nd St. E., which has no other access route. In 1992, 62nd St. E. was raised on rock fill and a 36" culvert was installed across it. The storms of December 1996 and January 1997 caused the water level to rise 4.5 feet above the new roadway elevation (at the low point). Vehicle access was eliminated for several months until the water level dropped below the minimum roadway elevation.

Improvement Objectives:

• Reduce roadway flooding frequency and duration
• Improve emergency access to existing homes

Solution Alternatives:

1. **Raise 62nd St. E**
   Raise the section of 62nd St. E where it crosses Pothole 1. To provide a level of protection equivalent to the 1997 flood would require raising 200 linear feet of road up to five feet vertically. This solution only solves one problem: access to the residence at the end of 62nd St. E.; the private access roads would still be subject to inundation.

   Comparative Feasibility: Low

2. **Pump Water out of the Basin**
   Install a pump system at the southeast corner of Pothole 1 to pump impounded water (by a force main) into a drainage system extending along 64th St. E. to Lake Tapps. Conveyance along 64th St. could be accomplished by improving the existing gravity drainage system to handle the additional flow or by continuing the force main to Lake Tapps. Pumping (with adequate capacity) will provide flooding protection for 62nd St. E. and the private roads and houses within the pothole by reducing the pothole water surface elevation during significant runoff events, and providing for more rapid drawdown of impounded water after the event. Use of a pump station will not be able to completely eliminate ponding in the pothole, but it will provide a targeted level of flood protection.
Comparative Feasibility: High

3. **Emergency Access to 62nd St. E.**
   Construct access driveway to the isolated residence at the end of 62nd St. E. through an easement from 189th Ct. This would be a temporary fix to the problem, at best. If limited funds are available then this alternative may be the best option for the short term. An easement would provide access for emergency vehicles and access for the residents when 62nd St. E. is flooded to the point of inaccessibility. This solution does not reduce flooding in the basin, however, it would solve the immediate problems associated with providing emergency access.

Comparative Feasibility: Medium

4. **Add Stormwater Storage**
   Add detention/retention storage elsewhere in the basin to reduce flooding in Pothole 1. It would not be feasible to build enough storage to completely solve the roadway flooding problem. However, storage can be used cost effectively in conjunction with other methods to solve the flooding problems. At a minimum, retention/detention ponds with infiltration discharge should be used to attenuate the flow to the pothole and to better utilize the natural storage in the shallow groundwater zone. Based on available subsurface information, it is estimated that infiltrated water will penetrate up to 10 feet in this particular basin before it hits the low permeability till and moves horizontally towards the pothole at the low point of the basin.

Comparative Feasibility: Medium

5. **Divert Some of the Runoff out of the Basin Upstream of Pothole**
   This alternative would provide gravity diversion of certain inflows from Pothole 1. Evaluation of the basin and existing drainage systems did not identify where a significant volume of inflow could easily be diverted from the pothole. This alternative should be considered when reviewing plans for new developments that are near the basin boundary.

Comparative Feasibility: Low

**Recommended Action:**

- Build a 2,000 gpm pump station and inlet structure
- Install 800 ft. of 10" diam. force main
- Improve 600 ft of gravity drainage system on 64th St. E.
- Construct access road to pump station

**Estimated Cost:** $215,000

**Implementation Issues and Needs:**

- Approval from Puget Sound Energy for indirect discharge to Lake Tapps
- Easement agreements with property owners
• Design-level hydrologic/hydraulic analysis to refine pump station sizing
• 3-Phase power supply for pump station

See Drawing 1 for an illustration and description of the proposed project.

3.1.2 CIP Priority 2 (Problem No. 2 Solution)

Location:

Problem No. 2 is located at the northeast corner of Locust and 82nd St. E. (See Figure 3-1 and Drawing 2).

Description:

Problem No. 2 occurs at the low point of Pothole 4, located at the northeast corner of Locust and 82nd St. E. The pond area has been segmented by the Locust roadway fill and extends east of Locust just north of 82nd St E. During large storm events the pothole fills up, flooding 82nd St. Infiltration is relatively slow, with the pothole draining in a month to a few months, according to City staff. In the January 1997 event, temporary pumps were run around the clock for a week to keep the water level at the elevation of 82nd St.; sand bags kept the water from flooding the residence on the south side of 82nd St.

Improvement Objectives:

• Reduce frequency, extent and duration of flooding on 82nd St. E.
• Expand storage volume of Pothole 4

Solution Alternatives:

1. Pump Out of Basin
A small (1-2 cfs) pump station could be installed to pump water up 82nd St. to the east, then down an access road to the north on the east side of the school. Here the water could be discharged to flow overland into the Bonney Lake overflow channel or be stored in a retention/infiltration pond adjacent to Bonney Lake Elementary. This option would require detailed hydrologic/hydraulic analysis of the receiving basin to determine the possible effects of this diversion.

   Comparative Feasibility: Medium

2. Create More Storage
Create storage elsewhere in the basin. Pothole 4 is reported to drain comparatively faster than other nearby pothole areas, so it may be possible to utilize retention/infiltration ponds in the basin upstream of Pothole 4. The basin is small, only 54 acres, so storage needs would not be too large if adequate infiltration were established to reduce inundation levels at the pothole. Extra storage could also be created by excavating within the pothole (beyond sensitive areas) to create aquatic benches. This benched out area could possibly be used as wetland mitigation/restoration area.
Comparative Feasibility: Medium

3. **Raise 82nd St.**
   Increase the depth of the pothole by raising 82nd St. by 1 to 1.5 feet. This option would reduce the frequency of flooding, by increasing the storage volume before flooding occurs.
   
   Comparative Feasibility: Medium

4. **Infiltration**
   Install infiltration galleries within the pothole area, on both sides of Locust. Soils and subsurface geology analysis would be required to estimate infiltration rates that would dictate whether or not this option is feasible.
   
   Comparative Feasibility: Unknown

5. **Culvert Under Locust**
   Install a culvert under Locust Ave. E. to hydraulically connect the segmented pothole areas and use the maximum storage area.
   
   Comparative Feasibility: Medium

**Recommended Action:**
- Raise 82nd St. E. by 1 to 1.5 feet
- Excavate bench areas on the perimeter of the pothole
- Install tightline drainage pipe on south side of 82nd St. E.

**Estimated Cost:** $132,000

**Implementation Issues and Needs:**
- Detailed hydrologic model of the basin
- Survey of pothole and surrounding area and structures
- Wetland delineation in the pothole

See Drawing 2 for an illustration and description of the proposed project.

### 3.1.3 CIP Priority 3 (Problem No. 3 Solution)

**Location:**

Problem No. 3 is located on 81st St. E. at 182nd Ave. E. (See Figure 3-1 and Drawing 3).
Description:

There is no storm drainage system on 81st St E. Runoff sheet flows to the low point in the cul-de-sac. It then continues to flow down a driveway to a house on the north side of 81st St., then off the shoulder to a house on the south side of 81st St.

Improvement Objectives:

- Contain 81st St. E. runoff within the City right-of-way

Solution Alternatives:

1. **Collect/Convey Flow to 182nd Ave Drainage System.**
   
   Improve the cul-de-sac drainage by installing curbs or berms to keep the water within the road ROW. At the low point install a catch basin on both sides of 81st St.. Install a pipe system to the south that connects with the drainage system on 182nd Ave.

   Comparative Feasibility: High

2. **Collect/Convey Flow to Pothole**

   Improve the cul-de-sac drainage by installing curbs or berms to keep the water within the road ROW. At the low point install a catch basin on both sides of 81st St.. Install a pipe system to the pothole area to the north. Further design-level analysis must be done to determine whether the pothole can accept this flow without creating added flooding problems.

   Comparative Feasibility: Medium

Recommended Action:

- Improve the cul-de-sac drainage by installing berms near the low point to keep the water contained within the 81st St. ROW
- At the low point install a catch basin on both sides of 81st St.
- Construct a 12-inch storm drain to the south that connects with the existing drainage system on 182nd Ave.

Estimated Cost: $52,000

Implementation Issues and Needs:

- Survey the site topography and the existing storm drainage system on 182nd Ave.
- Analyze the downstream system hydraulics to determine its ability to handle the additional flows

See Drawing 3 for an illustration and description of the proposed project.
3.1.4 CIP Priority 4 (Problem No. 7 Solution)

Location:

Problem No. 7 is located on 109th St. E. just west of 193rd Ave. E., in Bonney Lake Manor (See Figure 3-1 and Drawing 4).

Description:

Ponding is reported to occur at this location during most winter seasons. Water ponds on 109th St. E. causing an impediment to traffic and a nuisance for the residents at this location. The problem has been attributed to an undersized and/or malfunctioning infiltration system.

Improvement Objectives:

- Reduce frequency, extent and duration of ponding on 109th St. E.
- Reduce the frequency of required drainage system maintenance

Solution Alternatives:

1. **Replace and Expand Infiltration System**
   Excavate the existing system and replace with a new system after infiltration testing to validate adequacy of underlying soils infiltration rates. Install an additional infiltration system to the east so that the combined new system is sized to handle the targeted design event.
   
   Comparative Feasibility: High

2. **Clean Existing Infiltration System**
   Clean out the existing infiltration system without the need for replacement/additional system.
   
   Comparative Feasibility: Low

3. **Install Overflow Drain**
   Install an overflow pipe on the system. The City already installed an overflow pipe that flows to the catch basin on 193rd Ave., however it frequently clogs because it is installed with very little slope. An overflow pipe should be installed that connects to a lower system on 193rd Ave., to the south of the existing overflow pipe.
   
   Comparative Feasibility: Low

Recommended Action:

- Excavate the existing infiltration system and install new system
- Install new (expanded) trench to the east with a junction box/clean out at its end

Estimated Cost: $23,000
Implementation Issues and Needs:

- Determine runoff flows/volumes to the infiltration system for the selected design event
- Review design infiltration rates from field testing and size infiltration system

See Drawing 4 for an illustration and description of the proposed project.

3.1.5 CIP Priority 5 (Problem No. 8 Solution)

Location:

Problem 8 is located at the corner of 183rd Ave. E. and 77th St. E. (See Figure 3-1 and Drawing 5).

Description:

Nuisance ponding occurs on the property on the southeast corner of 183rd Ave. E. and 77th St. E. The roads drain to a low lying area on this property where water slowly infiltrates. During heavy rains, runoff is greater than infiltration resulting in ponding. No flooding of structures has occurred.

Improvement Objectives:

- Reduce frequency, extent and duration of periodic ponding conditions
- Reduce duration that 77th St. E. road shoulder remains wet

Solution Alternatives:

1. **Infiltration**
   Install an infiltration system at the low point next to 77th St. E. Infiltration should work well here because there is a relatively steep gradient to the north towards Bonney Lake.

   Comparative Feasibility: High

2. **Culvert Across 77th St. E.**
   Install a culvert across 77th St. E. at the low point on the road. Create a flow path from the north side of 77th St. to Bonney Lake.

   Comparative Feasibility: Low

Recommended Action:

- Install an infiltration system at the low point adjacent to 77th St. E.
- Provide catch basin at inlet to the infiltration system for maintenance access

Estimated Cost: $10,000
Implementation Issues and Needs:

- Install infiltration trench deeper than adjacent property
- Explore design alternatives to reduce sediment delivery to the infiltration system
- Determine infiltration potential of the soils

See Drawing 5 for an illustration and description of the proposed project.

3.1.6 CIP Priority 6 (Problem No. 10 Solution)

Location:

Problem 10 is located at 20201 Church Lake Dr. E. on the west side of the road (See Figure 3-1 and Drawing 6).

Description:

An undersized storm drain to Lake Tapps restricts drainage system capacity and backs up water onto private property.

Improvement Objectives:

- Eliminate the hydraulic capacity restriction in the system
- Reduce the frequency of flooding at this location

Solution Alternatives:

1. **Install New Culvert**
   Replace the undersized storm drain with a larger one designed to convey the selected design event.

   Comparative Feasibility: High

2. **Install a Parallel Culvert**
   Install a parallel storm drain that will increase the total system capacity to the selected level of flood protection. Provide a new catch basin at the connection to the existing drainage system.

   Comparative Feasibility: High

3. **Modify Existing System to Improve Capacity**
   Inspect existing system for obstructions that could cause capacity reduction. Improve inlet conditions to increase capacity (assumes inlet control exists).

   Comparative Feasibility: Low
4. **Construct Overflow Channel**  
Construct an overflow channel that meanders through the park to the lake.

**Comparative Feasibility:** Medium

**Recommended Action:**
- Install a parallel 24-inch storm drain and new catch basin to increase the capacity of the system
- Install a larger pipe (30-inch) from the existing roadside ditch to the new catch basin

**Estimated Cost:** $42,000

**Implementation Issues and Needs:**
- Estimate design flows at this point in the drainage system
- Validate size of the new storm drain to handle the design event runoff consistent with the upstream drainage system hydraulic capacity

See Drawing 6 for an illustration and description of the proposed project.

3.2 **Recommended Stormwater CIP**

Table 3-2 presents the recommended 5-year stormwater CIP established for the 6 recommended drainage improvement projects. Project priorities and implementation years may vary from those shown and will be dependent on funding availability and coordination with other projects.

<table>
<thead>
<tr>
<th>CIP Priority</th>
<th>Problem Number</th>
<th>Implementation Year</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
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<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>$132,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>$52,000</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>7</td>
<td>$23,000</td>
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<tr>
<td>5</td>
<td>8</td>
<td>$10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>$42,000</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Annual CIP Costs</strong></td>
<td></td>
<td></td>
<td>$52,000</td>
<td>$33,000</td>
<td>$132,000</td>
<td>$42,000</td>
<td>$215,000</td>
</tr>
</tbody>
</table>

City of Bonney Lake  
Stormwater Comprehensive Plan
4.0 STORMWATER PROGRAMS REVIEW AND RECOMMENDATIONS

This section identifies the recommended modifications to the existing stormwater program to achieve compliance with Ecology guidelines for comprehensive stormwater programs. The formation of a Stormwater Utility in January 1996 was the first step in comprehensive stormwater program development. In addition to stormwater CIP recommendations, this Phase I plan provides guidance to the City to modify or add other required stormwater program elements.

4.1 Stormwater Program Administration

In order to continue to effectively manage the activities associated with operation of the Stormwater Utility, implement the stormwater CIP projects, and provide other added elements to the City’s stormwater program, adequate staffing will be required. For purposes of this plan, staffing needs for administration of the program elements funded by the Stormwater Utility include engineering support. Program activities for development review, inspection, and enforcement, for public information and education, for stormwater facilities operations and maintenance, and for water quality program compliance are described independently, although the associated costs are also funded by the Stormwater Utility. The following major administration activities are needed for the stormwater program.

- Program planning and development
- Financial planning and budget management
- Inter-local and regional coordination and management
- Reporting to City Council
- Phase 2 Stormwater Comprehensive Plan development
- Drainage system records management and GIS development/maintenance
- Flooding hazard reduction and response planning support
- CIP projects implementation including design, contracting, and construction management
- Operations support for storm drainage systems management
- Technical support for stormwater systems development review

The recommended program considers the initial need for 1.25 FTE’s for administration of the program. Estimated costs for this program element are included in Section 6.0, Stormwater Funding Program. These funding needs of the administrative program element will likely increase with added stormwater management program functions, in particular, with the initiation of stormwater CIP projects implementation.

4.2 Development Review, Inspection and Enforcement

Development review, inspection, and enforcement are part of the City’s current activities and are funded by the Stormwater Utility and developer deposits. The need exists for expanded review and coordination with the Stormwater Utility regarding storm drainage system infrastructure improvements as part of development proposals. This is true for projects within the City as well as for proposed development areas within the urban growth area currently regulated by Pierce County. The following elements are typical of effective stormwater development review, inspection, and enforcement programs, and should be considered for implementation where beyond current City activities:
- Periodic code, ordinance, and development standards review and updating
- Establishment and update of public and private drainage system regulation criteria
- Grading, Drainage, and Temporary Erosion and Sedimentation Control (TESC) plan review
- Permit administration technical review and support
- Inter-agency coordination
- Field inspection of development project stormwater system improvements and TESC facilities
- Enforcement actions where facilities are non-compliant with development approval conditions

4.3 Public Information/Education

A public information program is an important component to the City of Bonney Lake’s overall stormwater program. The public should be informed of the benefits and funding requirements for the recommended stormwater improvements for the entire community. In addition, this effort should make the public aware of their responsibility in using and maintaining their storm drainage system properly (e.g. impacts of illegal dumping, filling in ditches for parking or planting, altering natural drainage courses, filling in natural depressions) and of opportunities to participate in city stormwater enhancement programs.

The existing public information program has primarily consisted of periodic newsletters with articles that highlight the City’s progress with various aspects of the stormwater management program. The expanded program should include more frequent dissemination of information to the public through various sources. In addition, expanded staff response to inquiries relating to drainage complaint response and service charge billings should be provided, with particular focus on the proposed service charge rate increase. Mailers and media releases should precede the council hearings on adoption of this plan and the associated rate revisions. The expanded program should include more focus on disseminating information for public education and outreach aspects of the City’s water quality control program.

4.4 Operations and Maintenance

The system inventory that has been compiled is an important step in organizing a operations and maintenance program. A maintenance record can be created and updated by using the ArcView data tables provided to the City. Keeping storm drains clean will not only help maintain a functional system, but will also improve water quality by reducing sediment loads in runoff. By keeping detailed records on system maintenance, problem areas in the system will be able to be identified and actions can be taken to better maintain these systems. This is particularly important for infiltration systems that depend on regular cleaning to function properly. The City should consider using the Maintenance Program outlined in the Pierce County Manual (included here as Appendix E) as a guideline for observation frequency and system facilities cleaning requirements.

4.5 Water Quality

Until recently, the specific need did not exist for a water quality component to the City’s stormwater management program. The focus of the City’s initial stormwater program has been to control flooding and erosion. No significant water quality problems have been brought to the City’s
attention. The City of Bonney Lake has many natural pothole areas where water naturally collects and infiltrates into the ground (which benefits water quality). The majority of Bonney Lake’s conveyance system is made up of grass and earth lined ditches. The grass-lined ditches help to clean stormwater runoff through biofiltration processes as the water flows over the vegetated surfaces. As more development encroaches on these areas, and more pipe systems are constructed, additional water quality control facilities will need to replace the existing natural system functions. Conveying runoff (and associated pollutants) downstream that once ponded and infiltrated can degrade water quality of the receiving waters.

The City recognizes that protecting wetland and pothole areas is one of the most effective ways of maintaining the surface water quality within the City. Of equal importance is frequent cleaning of the storm drainage system. Water quality control benefits will result from improved watershed management actions, frequent drainage system maintenance and a water quality education element of the public information program.

As the community grows and as water quality regulations change, the City will need to develop a water quality program that complies with regulations. New requirements under the NPDES Phase II Stormwater Regulations (as implemented by the State Department of Ecology) will require the City of Bonney Lake to make measurable progress in the following six water quality program elements:

- Public education and outreach on stormwater impacts;
- Public involvement/participation in water quality program;
- Illicit discharge detection and elimination;
- Construction site stormwater runoff control;
- Post-construction stormwater management in new development and redevelopment; and
- Pollution prevention/good housekeeping for municipal operations.

These NPDES Phase II requirements are similar to those in the current Puget Sound Stormwater Management Program. That program already contains more stringent regulations than certain of the NPDES Phase II requirements. The recent listing of various stocks of Puget Sound Salmon as endangered species puts a higher focus on the importance of improved water quality management for protection of in-stream resources. Table 4-1 summarizes the requirements of a Phase I water quality program for the City along with recommendations/status of actions for implementing a successful program.
Table 4-1
Water Quality Program Requirements, Recommendations and Status

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Recommendations</th>
<th>Status</th>
</tr>
</thead>
</table>
| Adopt a Stormwater Ordinance for New Development and Redevelopment          | * Review current City Stormwater ordinance and County Manual and recommend possible changes for consistency with Ecology requirements.  
* Add sensitive areas ordinance requirements for enhanced development standards relating to Pothole drainage basins. | Complete                     |
| Adopt Ecology's Technical Manual or Its Equivalent                           | * Adopt the Pierce County Stormwater Management and Site Development Manual or other Ecology equivalent manual.  
* Increase staffing in the Stormwater Program to allow adequate development review, inspection and enforcement of stormwater standards. | Complete (Pending Ecology Review)                                               |
| Develop Operation and Maintenance Program and Ordinances                     | * Adhere to the maintenance requirements of the Pierce County Stormwater Management and Site Development Manual or other Ecology equivalent manual.  
* Expand current stormwater maintenance program through addition of equipment and staff to provide more frequent maintenance of existing drainage systems.  
* Document and periodically update maintenance schedule. | Complete (PC Manual and BLMC)                                                  |
| Water Quality Education Programs                                             | * Prepare newsletters, mailers, and establish outreach programs to involve local residents.  
* Document methods used to educate and involve the public on water quality issues and controls. | Current (Ecology Centennial Grant)                                             |
| Identify and Rank Pollutant Sources                                          | * Identify and document potentially significant pollution sources by using comprehensive plan land use information, visual inspection and review of public complaints.  
* Evaluate and respond to illicit discharges, erosion/sedimentation and habitat degradation problems.  
* Train maintenance crews to identify and document potential pollution sources. | Complete                     |
| Investigations and Corrections of Problem Storm Drains                        | * Take corrective actions necessary to improve and protect water quality when problems are detected. | Ongoing                      |
| Maintain a Water Quality Spill Response Program                              | * Develop and maintain user friendly maps of drainage systems for distribution to fire department and others to enhance the ability of response teams to locate the source of spills.  
* Train staff on hazardous materials spill response.  
* Develop a spill response plan.  
* Consider rerouting trucks transporting hazardous materials along appropriate, safer routes. | Current Action                 |
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Recommendations</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secure Adequate Local Funding</td>
<td>• Consider use of a system development fee (based on in-place value of system)</td>
<td>Current Action</td>
</tr>
<tr>
<td>Local Coordination Agreements</td>
<td>• Establish an agreement with WSDOT for watershed protection pertaining to</td>
<td>Complete</td>
</tr>
<tr>
<td>Construction and Post-construction Regulation</td>
<td>activities in the State ROW within the City limits.</td>
<td></td>
</tr>
<tr>
<td>Pollution Prevention for Municipal Operations</td>
<td>• Inform applicants of their responsibility to complete a stormwater pollution</td>
<td>Complete</td>
</tr>
<tr>
<td></td>
<td>prevention plan (SWPPP), where required.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inspect job sites to enforce application of appropriate erosion/sedimentation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>control BMP's to reduce degradation of water quality.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Periodically inspect municipal facilities to ensure 'good housekeeping'</td>
<td>Ongoing</td>
</tr>
<tr>
<td></td>
<td>practices are being carried out.</td>
<td></td>
</tr>
</tbody>
</table>
5.0 STORMWATER ORDINANCE AND POLICY RECOMMENDATIONS

A summary of existing City stormwater policies is presented in Appendix B. The City has adopted the draft version of the Pierce County Manual to guide stormwater policies related to development. The City should adopt the final version of the County manual as soon as it is approved by Ecology. All development must follow the County guidelines, however, where the City has more restrictive stormwater policies, then the most restrictive policy should be followed.

To establish which projects to consider for publicly funded CIP projects, the City policies were applied accordance with State law requiring that public funds cannot be used to fund projects that only benefit private interests. The following guidelines have been used in evaluating projects to determine which are eligible for public funds:

Problem Types that May be Eligible for Public Funds:

- Any problems that result in flooding of publicly owned facilities and/or right-of-way, especially those that hinder the emergency response capabilities of the City.
- Problems that are a direct result of excess runoff from public right of way and/or diversion of the natural stormwater path by public right of way.

Public funds may still be used for other projects that do not fit either of the above criteria, as funds become available. Projects that can demonstrate most benefit to the most number of residents should be the first considered for publicly funded capital improvements. These decisions by the City will be based on the project cost, how long the problem has persisted, its recurrence frequency, the magnitude of affected area and the number of people affected.

5.1 Potholes as Sensitive Areas

The City's Stormwater Ordinance and/or the Bonney Lake Sensitive Areas Ordinance should be reviewed and updated to reference to pothole drainage considerations as follows:

Pothole drainage management is of great concern in the Bonney Lake area, as 25% of the City's drainage area contributes to potholes, and the highest priority drainage problems are located within these basins. The Pierce County Stormwater Management and Site Development Manual (County Manual), Section 6.6.1, Category B, addresses the issue of discharges to closed depressions (potholes). Main components of the County Manual requirements are:

- When a proposed development is contributory to a pothole area, the proponent's engineer should be required to determine the 100-year flood elevation for the pothole.
- Each depression must be analyzed for the 2-, 10- and 100-year, 24-hour designstorm events and the 100-year 7-day design storm event. The worst case shall govern for design purposes.
- Discharge to a pothole area may be permitted, on a case by case basis, if the discharge matches the pre-development peak flow rates and runoff volumes for storm events ranging from 2-year to 100-year, 24-hour and 7-day frequencies.
Additional requirements that are recommended to be added to City ordinances are:

- No buildings should be permitted within the inundation limits of the 100-year flood elevation as determined by continuous simulation hydrologic modeling (HSPF model) for future conditions land use. This policy is consistent with the National Flood Insurance Program requirements. This could reduce flooding of structures in the future and will allow water to naturally infiltrate within existing potholes. This policy would reduce future expenditures on storm drainage projects needed as a result of potential loss of pothole storage and infiltration.
- No filling which results in reduction of pothole volume should be permitted unless allowed on a case by case basis provided compensatory storage is provided elsewhere in the same pothole.
- In all defined potholes the wetlands must be delineated before any construction project is considered for permitting; appropriate wetland setbacks, hydrology, and functions and values should be maintained.
- Restrictions on vegetation clearing should be required of all developments that are within pothole drainage basins (50 percent maximum recommended). Plants' canopy increase the water retention and release to the atmosphere through interception of rainfall and direct evaporation from their surface area and from the evapotranspiration process. Undisturbed vegetation also stabilizes the soil and serves as a natural filter providing water quality benefits.
6.0 STORMWATER PROGRAM FUNDING

6.1 Existing Stormwater Utility Funding

Existing City stormwater program operations are funded primarily by the Stormwater Utility. A breakdown of existing funding and its sources was not readily available because Bonney Lake has a combined utility department with pooled labor and funds. Prior to utility formation, much of the storm drainage costs were funded by other utilities revenues such as streets. With Stormwater Utility formation, rates were initially set at a flat rate of $2.65/month for residential properties, and $13.25/month for commercial properties. Rates were recently adjusted based on the results of the draft stormwater plan to their current level of $3.90/month for residential property and $19.50/month for commercial property. Based on the current residential and commercial billing accounts, total annual storm drainage utility revenue at the current rate is approximately $185,000. This level of funding allows for basic system stormwater program activities and implementation of some smaller CIP projects. However, increased revenues will be needed to allow construction of larger stormwater CIP projects.

6.2 Stormwater Programs Funding Need

Review of potential funding needs for the expanded stormwater program for operation/maintenance, public information/education, water quality, and administration was completed. The resulting combined annual costs were are estimated to be $174,000. Additional funding may also be needed to finance other minor drainage system improvement projects completed by City crews. Table 6-1 summarizes the breakdown in estimated funding needs for the City of Bonney Lake storm drainage program.

Table 6-1
Estimated Stormwater Program Costs\(^{(a)}\)

<table>
<thead>
<tr>
<th>Program Item</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative Staff</td>
<td>$12,000</td>
</tr>
<tr>
<td>Field Crew (O &amp; M)</td>
<td>$81,000</td>
</tr>
<tr>
<td>Professional Services and Engineering</td>
<td>$12,000</td>
</tr>
<tr>
<td>Taxes, Insurance, Billing and Collections, Building Maintenance and Indirect Costs</td>
<td>$38,000</td>
</tr>
<tr>
<td>Equipment</td>
<td>$11,000</td>
</tr>
<tr>
<td>Supplies, Fuel, Tools, Training and Repairs</td>
<td>$20,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$174,000</strong></td>
</tr>
</tbody>
</table>

\(^{(a)}\) does not including stormwater CIP projects (2000 dollars)
6.3 CIP Projects Funding Needs

The recommended capital improvements plan funding needs totaling approximately $474,000 over the 5-year CIP period are summarized in Table 6-2.

6.4 Projected Stormwater Management Program Funding Needs

Table 6-2 shows the estimated combined funding needs for all stormwater management program elements based on the Phase 1 plan recommendations. The estimated annual stormwater program costs have been increased by three percent per year to account for inflation effects.

Table 6-2

<table>
<thead>
<tr>
<th>Funding Element</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIP Projects</td>
<td>$52,000</td>
<td>$33,000</td>
<td>$132,000</td>
<td>$42,000</td>
<td>$215,000</td>
</tr>
<tr>
<td>Stormwater Program Elements</td>
<td>$174,000</td>
<td>$179,000</td>
<td>$184,000</td>
<td>$190,000</td>
<td>$196,000</td>
</tr>
<tr>
<td><strong>Estimated Total Annual Stormwater Program Funding</strong></td>
<td><strong>$226,000</strong></td>
<td><strong>$212,000</strong></td>
<td><strong>$316,000</strong></td>
<td><strong>$232,000</strong></td>
<td><strong>$411,000</strong></td>
</tr>
</tbody>
</table>

6.5 Recommended Funding Plan

In order to fund the CIP projects and expanded stormwater program elements, it is recommended that the Stormwater Utility rates be increased so that this program can be fully supported through utility revenues. Other sources of grant funding should also be pursued.

The following changes should be considered to increase Stormwater Utility revenues:

- Charge commercial customers on an impervious area equivalent ESU basis equal to residential customers;
- Increase monthly charge per ESU from $2.65/ESU to $4.20/ESU by 2001;
- Introduce a System Development Charge (SDC) for new connections to the storm drainage system;
- Charge development plan review fees that fully recover the City's cost of services.

Table 6-3 summarizes the financial evaluation performed to establish the recommended change in ESU monthly service charge. The evaluation for commercial sites considers the existing billing basis (flat rate) as compared to equivalent ESU's based on impervious area contribution. The
Equivalent ESU billing basis should be considered for implementation since it more equitably reflects stormwater runoff contribution to the affected drainage systems.

### Table 6-3
Funding Evaluation For Stormwater Utility ESU Charge

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Number Billed ESU</th>
<th>Stormwater Programs $/month</th>
<th>CIP Improvements $/month</th>
<th>Funds Generated $/month</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1998 Monthly Income from Storm Utility Billing (Flat Rate)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>3150</td>
<td>$2.65</td>
<td>0</td>
<td>$8,348</td>
</tr>
<tr>
<td>Commercial</td>
<td>159</td>
<td>$13.25</td>
<td>0</td>
<td>$2,107</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>3309</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>$10,454</strong></td>
</tr>
<tr>
<td><strong>2000 Monthly Income from Storm Utility Billing (Flat Rate)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>3150</td>
<td>$3.05</td>
<td>0.85</td>
<td>$12,285</td>
</tr>
<tr>
<td>Commercial</td>
<td>159</td>
<td>$15.25</td>
<td>4.25</td>
<td>$3,100</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>3309</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>$15,385</strong></td>
</tr>
<tr>
<td><strong>2004 Monthly Income from Storm Utility Billing, if Commercial is Billed per ESU and Charge per ESU is Raised to $4.20/month</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>4018 (b)</td>
<td>$3.05</td>
<td>$1.15</td>
<td>$16,876</td>
</tr>
<tr>
<td>Commercial</td>
<td>1990 (a) (b)</td>
<td>$3.05</td>
<td>$1.15</td>
<td>8,358</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>6008 (b)</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>$25,234</strong></td>
</tr>
</tbody>
</table>

(a) Equivalent ESU's based on impervious area  
(b) Estimated increase in ESU's based on City of Bonney Lake Comprehensive Plan growth projections

Based on funding evaluation, charge rates are recommended to increase incrementally from the current level of $3.90/month per equivalent service unit (ESU) to $4.20/month per ESU by 2002. The increase in charge represents increased operations and stormwater programs management costs as well as costs associated with CIP improvements. It is projected that the basic charge will not need to increase during the next five years because the growth in ESU's will approximately equal cost inflation. However, the CIP charge should increase by $0.15/year for two years to the level of $1.15/ESU/month by 2002. Table 6-4 summarizes the proposed changes in ESU monthly billing rate to meet current funding need projections. The CIP charge should be reconsidered annually to determine if additional funding is needed to address stormwater program expansion.
### Table 6-4
Proposed Changes to Stormwater Utility ESU Billing Rate

<table>
<thead>
<tr>
<th>Rate Element</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Programs</td>
<td>$3.05</td>
<td>$3.05</td>
<td>$3.05</td>
<td>$3.05</td>
<td>$3.05</td>
</tr>
<tr>
<td>CIP Projects</td>
<td>$0.85</td>
<td>$1.00</td>
<td>$1.15</td>
<td>$1.15</td>
<td>$1.15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$3.90</strong></td>
<td><strong>$4.05</strong></td>
<td><strong>$4.20</strong></td>
<td><strong>$4.20</strong></td>
<td><strong>$4.20</strong></td>
</tr>
</tbody>
</table>

A System Development Charge (SDC) should be considered for new development, representative of the unit value of existing City investment in the current drainage system. The rate would need to be substantiated through assessment of the City’s current drainage system investment. It is not uncommon for SDC charges to range up to $500 per ESU. Provisions for an increase in that rate with the increased annual city investment in the storm system should also be considered. An SDC charge has not been accounted for in utility revenue projections. The SDC charges typically can be reduced or waived if the developer improves the local storm drainage system as part of the project.

Other funding opportunities, including Local Improvement Districts (LIDs) and grant funding should be evaluated on a project specific basis. Development review fees and charges should be adjusted to fully recover the actual costs of the City services that are provided.