CHAPTER 10-2

SEWAGE COLLECTION AND TREATMENT FACILITIES

Section 1 Inventory of Existing Sanitary Sewer Collection and Treatment Facilities

1.1 SANITARY SEWER COLLECTION SYSTEM

The City of Washougal operates and maintains approximately 35 miles of sanitary sewer collection lines and mains. The majority of the collection system consists of 6 and 8-inch diameter pipe with mains constructed of larger diameter pipe, ranging from 8 to 30-inches.

1.2 PUMPING FACILITIES AND FORCE MAINS

Table 10-2.1
SEWAGE PUMP STATION DATA SUMMARY

Pump Station No.	Location	Pumps	Approximate Capacity	Force Main Size
1	14th and 'A' Street	Two – 10 Hp, Smith & Loveless	500 gpm	8-inch
2	6th and 'K' Street	Two – 10 Hp, Smith & Loveless	175 gpm	6-inch
3	S. 32nd Street	Two – 15 Hp, Cornell	600 gpm	4-inch
4	24th and 'L' Street	Two – 47 Hp, Queen Pump Co.	1036 gpm	6-inch
5	1st Street at Marina	Two – 2 Hp, Flygt	250 gpm	4-inch
6	S. 37th Street	Two – 7.5 Hp, Flygt	340 gpm	6-inch
7	Dr. Eldridge Dr.	Two – 10 HP, Flygt	100 gpm	4-inch
8	Shepherd Road	Two – 10 HP, Flygt	890 gpm	8-inch
9	34th and 'L' Street	Two – 1.9 HP, Flygt	81 gpm	1.5-inch
10	Lookout North	Two – 10 HP, Flygt	275 gpm	3-inch
11	Sunset Ridge	Two – 3 HP, Flygt	50 gpm	4-inch

1.3 WASTEWATER TREATMENT PLANT

DESCRIPTION

The City's current system relies upon an activated sludge treatment plant that discharges to the Columbia River. The various components of that treatment plant are described in the following paragraphs.

Administration Building

There is one administration building with a total floor space of about 700 square feet located in the northeast corner of the facility. This building contains separate rooms for restroom, laboratory, control, and disinfection. The building was originally constructed in the 1950's, with additions in the 1970's and 1990's.

A recently completed draft General Sewer Plan (GSP) identified the existing administration building as deficient in both space and quality of construction. It recommended the construction of a new administration building as soon as funds became available. Major deficiencies include: 1) a laboratory room that is too small, 2) insufficient office space, 3) lack of operator locker rooms, 4) insufficient restrooms, and 5) insufficient operator lounge area.

The City recently obtained funding for the design of a new administration building, with design scheduled for completion in 2006.

Headworks

Influent wastewater is conveyed by gravity sewers to the facility headworks where it passes through a manually cleaned trash rack and a mechanically cleaned spiral screen. The mechanical screen is located in an old screw pump structure as a cost savings measure, which presents undue operational difficulties. Currently, there are no grit removal facilities. The 1997 Engineering Report identified the headworks as deficient and recommended a new headworks facility.

Design of a new headworks facility is currently underway.

Secondary Treatment

Biological treatment is provided by an oxidation ditch activated sludge process. The system includes an oxidation ditch, clarifier, return activated sludge (RAS) pumps, and waste activated sludge (WAS) pump. Raw wastewater from the influent pump station enters the 1,800,000 gallon oxidation ditch, which consists of an oval-shaped channel equipped with mechanical aeration and mixing devices. The effluent from the oxidation ditch flows to a clarifier distribution structure and then to two 84-foot diameter clarifiers where solids are settled.

Disinfection

Effluent from the plant passes through ultraviolet radiation (UV) disinfection before discharge. UV radiation has proven to be an effective bactericide and virucide for wastewater, while not contributing to the formation of toxic byproducts.

Solids Treatment

Treatment of waste solids is accomplished by long-term storage in three of the four lagoon cells (Cells #2, #3, and #4). In the lagoon, sludge undergoes facultative biological treatment. Both aerobic and anaerobic processes are present, which work to make the sludge suitable for land

application by reducing volatile solids and pathogens. Compared to alternative types of sludge treatment and disposal systems available, the existing facilities require a relatively high amount of manpower.

The draft GSP addresses the fact that the sludge lagoons had limited capacity and would require supplemental stabilization facilities in the near future. The lagoons are currently treating biosolids adequately, but have created serious odor problems over several months of the year.

Cell #1, which was historically used as an emergency overflow basin to compensate for lack of secondary clarifier redundancy, is planned for modification in the near future. Part of that cell will be utilized for construction of additional mechanical treatment facilities. Part of it will be converted to supplemental sludge storage area for temporary use until such time as mechanical solids treatment facilities are constructed (currently scheduled for 2008).

Sludge Disposal

The City has initiated a sludge management program that includes testing and land application of biosolids to leased property at the Port of Camas/Washougal. That disposal property is located about ¼ mile south of the sludge lagoons. A disposal permit has been acquired from the Southwest Washington Health District and Region 10 of the U.S. EPA. The first land application was accomplished in October of 1994.

In 2005, a study was completed to identify additional land disposal sites. Efforts are currently underway to procure agreements with landowners and permit additional land applications sites.

1.4 Infiltration and Inflow (I&I)

Infiltration is defined as subsurface water which enters the wastewater collection system through cracks, joints, or other deficiencies in the collection system. It is directly influenced by the local groundwater table and the structural integrity of the collection system. All collection systems experience some degree of infiltration. Each system must plan and allow for additional capacity to accommodate this flow contribution.

Inflow is the component of I&I that is attributed to surface water, mainly stormwater runoff, entering the system through roof drains, storm drains, manhole covers, and other direct conduits to the sewer system. Inflow is directly influenced by storm events and usually occurs over a short period, during and after a storm event. Inflow is usually preventable by eliminating non-sewerage connections to the system. With older systems, however, identifying illegal sewer connections can be difficult.

The majority of the wastewater collection system was constructed in 1968. Because it was mostly constructed with concrete sewer pipe, it is prone to infiltration. In recent years, the City has adopted high quality standards for new sewer main construction and has been diligent in their inspection services.

The City undertook significant corrective measures to identify and reduce the infiltration and inflow sources in 1991. Several significant sources of I&I were identified and eliminated. Based on EPA Standards, the City currently does not have excessive infiltration and inflow due to these corrective measures.

Section 2 Forecast of Future Sanitary Sewer System Needs

2.1 Level of Service Standards

Flow Projections

Residential population projections were made using the most current information available and from the Comprehensive Plan. Historically residential population growth has varied between 0.5% and 6%, with an average over the last 30 years of approximately 2%.

Wastewater flows are contributed by both residential land uses, and non-residential land uses, which include industrial and commercial uses. For purposes of sewer planning, flow and wasteload projections are based upon equivalent residential units (ERUs). An ERU represents the equivalent flow and wasteload from a single family. ERU values were calculated based upon the following assumptions:

1. Average household size is to be 2.59 persons per unit (1 ERU = 2.59 people).

2. Commercial, industrial, large industrial, and public equivalent ERU values were taken from the comprehensive plan.

Using these assumptions, the following table represents projected growth within the UGA:

Table 10-2.2
Population and ERU Projections

Year	Actual Population	ERUs							Population Equivalent
		New Res. ERUs	Res. ERU Total	Comm	Comm/ Industrial	Public	Large Ind.	Total ERUs	
2005	11,800		3,668	54	881	141	1,556	6,300	16,317
2006	12,980	456	4,124	56	907	145	1,572	6,804	17,622
2007	14,272	954	4,623	57	935	150	1,587	7,352	19,042
2008	15,414	1,395	5,063	59	963	154	1,603	7,842	20,311
2009	16,338	1,752	5,420	61	992	159	1,619	8,251	21,370
2010	17,155	2,068	5,736	63	1,021	163	1,635	8,618	22,321
2011	17,842	2,333	6,000	64	1,052	168	1,652	8,936	23,144
2012	18,377	2,539	6,207	66	1,084	173	1,668	9,198	23,823
2013	18,927	2,752	6,420	68	1,116	179	1,685	9,468	24,522
2014	19,496	2,971	6,640	70	1,150	184	1,702	9,746	25,242
2015	20,081	3,197	6,865	73	1,184	189	1,719	10,030	25,978
2016	20,683	3,430	7,097	75	1,220	195	1,736	10,323	26,737
2017	21,303	3,669	7,337	77	1,256	201	1,753	10,624	27,516
2018	21,942	3,916	7,584	79	1,294	207	1,771	10,935	28,322
2019	22,600	4,170	7,838	82	1,333	213	1,789	11,255	29,150
2020	23,278	4,432	8,099	84	1,373	220	1,806	11,582	29,997
2021	23,976	4,701	8,369	87	1,414	226	1,825	11,921	30,875
2022	24,695	4,979	8,646	89	1,456	233	1,843	12,267	31,772
2023	25,463	5,275	8,943	92	1,500	240	1,861	12,636	32,727
2024	26,200	5,560	9,228	95	1,545	247	1,880	12,995	33,657
Avg. Annual Growth Rate	4%	--	--	3%	3%	3%	1%	--	

The Residential ERU Total was computed by adding the new residential ERUs for each future year to the 2005 ERU value.

FLOW AND WASTELOAD PROJECTIONS

Future per capita waste contributions were estimated based on existing per capita waste contribution and Department of Ecology (DOE) guidelines. The following table contains the per capita average contribution from 2000-2005, the DOE recommended design values for new wastewater treatment facilities, and the value used for future population loading. DOE guidelines use direct population, which assumes a higher per capita flow contribution. The per capita values in Table 10-2.3 are based upon population equivalents as opposed to direct populations, using lower flow contribution values.

Table 10-2.3
Per Capita Wastewater Loadings

		Present	DOE Guideline	Future (2025)
Flow (gpcd)	Dry Average	70	n/a	80
	Wet Average	85	n/a	90
	Max Month	94	100	100
TSS/BOD_5 (lb/day) Average Annual		0.13	0.20	0.14

To develop projected wastewater loadings, population projections contained in Table 10-2.2 and future loading rates in Table 10-2.3 were used. Future loading values presented in Table 10-2.4 were developed by calculating a direct projection of population equivalent times the "future" unit values from Table 10-2.3.

Table 10-2.4
Projected Wastewater Loadings

	Year:	2006	2015	2030
	Population Equivalent:[a]	**17,622**	**25,978**	**33,657**
Flow (mgd)	Dry Average	1.41	2.08	2.69
	Wet Average	1.59	2.34	3.03
	Maximum Month	1.76	2.60	3.37
	Peak Hour [b]	4.93	7.27	9.42
TSS/BOD_5 (lb/day)		2,467	3,637	4,712

Notes

a. Population equivalents include large industry.
b. Peak Hour Flow - The peaking factor is 3.5 times the Dry Weather Flow.

The peak hourly flows projected above were not based on the historical influent peaks. The WWTP has experienced extremely high peak flows measured at the influent plant over the last few years due to industrial discharges. The City is currently investigating the source or sources of these peak flows, and will be taking measures to reduce them.

Section 3 Locations and Capacities of Future Facilities

3.1 Sewer Planning

By state law, sanitary sewer system improvements need to conform to a State-approved General Sewer Plan which is formally adopted by City Council. A draft General Sewer Plan was recently completed.

3.2 Collection System Growth-Related Improvements

The sanitary sewer system is in relatively good condition, but some of the sewer mains and pump stations do not have adequate capacity to accommodate growth. Several of the system components are only slightly overloaded at future flows and thus will not require up-sizing if the existing infiltration and inflow can be removed. From that perspective, a certain amount of infiltration and inflow removal is deemed growth related. The following paragraphs summarize proposed improvements.

Figure 10-2.1 presents the basin map and Figure 10-2.2 presents the proposed collection system improvements, and both are described in the following paragraphs by the subarea in which they are located.

MAINTENANCE RELATED UPGRADES

Maintenance related improvements are those that are required with or without growth. They include the following six items:

1. Pump Station Flow Meters
2. Pump Station #7 Abandonment
3. Pump Station #9 Abandonment
4. Pump Station #10 Abandonment
5. Pump Station # 11 Abandonment
6. 'U' Street Bypass Sewer

NORTHWEST SUBAREA CAPACITY UPGRADES

The UGA northwest of the City is an isolated service area, separated from the rest of the UGA by the Washougal River. Wastewater from this area must be pumped across the river in order to be conveyed to the treatment facility. Recommended improvements to this portion of the UGA are:

1. Pump Station #13. This pump station would serve an isolated basin serving a 20-year estimate of 250 ERUs. The pump station would be a duplex pump station meeting minimum standards. Each pump would be sized at 150 gpm. It is considered a temporary pump station until such time as the City expands its city limits to the north.

2. Force Main #13. This force main would be a new 3,100-foot, 4-inch force main. It would discharge into the gravity sewer system on the south side of Woodburn Hill.

3. Pump Station #14. This pump station would be a duplex pump station meeting minimum standards. Each pump would be sized at 100 gpm (minimum capacity). It is considered a temporary pump station until such time as the City expands its city limits to the north.

4. Force Main #14. This force main would be a new 4,600-foot, 6-inch force main. It would discharge into the proposed Washougal River North Trunk (T26).

5. Pump Station #15. This pump station would be a duplex pump station meeting minimum standards. Each pump would be sized at 300 gpm. It is considered a temporary pump station until such time as the City expands its city limits to the north.

6. Force Main #15. This force main would be a new 1,600-foot, 6-inch force main. It would discharge into the proposed Washougal River North Trunk (T26).

7. Trunk Sewer T26. This 4,300-foot, 21-inch gravity line would serve basins W and CC, and the northeastern portion of basin N. This sewer will discharge to the upper end of the Washougal River North Interceptor (I8).

8. Interceptor I8 (Washougal River North Interceptor). This interceptor will extend 4,000 feet from PS#4 through existing streets and will terminate where the UGA boundary crosses Washougal River Road. This interceptor will be sized at 36-inch diameter to accommodate basins K, L, J, N, BB, W, and CC at build-out and two-thirds of X plus most of the 50-year service area that lies outside of the proposed UGA. This sizing assumes that it will receive flows from two thirds of Basin X by a sewer extension west across the Washougal River.

9. Trunk Sewer T24. This proposed trunk sewer, previously referred to as the "Browns Lane" sewer is to provide capacity relief to the lower section of Interceptor I5 (Shepard Road Washougal River Interceptor). This sewer will be sized to serve basins K, L, J, BB, and most of N at buildout. Trunk Sewer T24 will be a 1,500-foot, 21-inch gravity line.

10. Pump Station #8 Capacity Upgrade. The proposed Pump Station #8 upgrade will involve replacing the two existing pumps with higher capacity pumps. Each new pump will be sized at 550 gpm capacity. The emergency generator installed with the existing station will require replacement. Also, variable speed motors are proposed to help mitigate downstream surges, and to enable continued use of the wetwell, which is undersized if constant speed pumps are utilized.

11. Force Main #8 Extension. To alleviate a capacity problem in the sewer receiving flow from the existing force main, an extension is proposed to connect to a proposed downstream sewer (T24). This extension would involve the construction of a 1,900-foot, 8-inch force main along Shepard Road.

12. Pump Station #4 Capacity Upgrade. The proposed Pump Station #4 upgrade will involve replacing the two existing pumps with higher capacity pumps, providing a total of 1,100 gpm capacity.

13. Pump Station #4 Force Main. A new 6200-foot, 12-inch force main (Force Main #4-2) will be routed north up 24th Street then east on 'M' Street, crossing the Washougal River on a pedestrian bridge and continuing east along 'L' Street, then south on 34th Street and east on 'J' Street to the intersection of 'J' Street and 39th Street. The proposed force main will be sized at 12-inch for 20-year flows from Basins BB, CC, W, K, L, J, and N. It is

recommended that the existing 6-inch Force Main #4 (designated as FM #4-1) remain active and be utilized as emergency backup.

NORTHEAST SUBAREA

The northeast subarea of the UGA is largely developed. Most of the area that is not can be served by extending existing sewers uphill. Recommended improvements to this portion of the UGA are:

14. Stiles Road Interceptor (I9) This interceptor will extend 5,000 feet from Pump Station #9 (to be abandoned) north to the northern termination of the UGA at 20th Street. It will be sized at 8-inch to accommodate one third of the flow from Basin X. The remainder of the flow from Basin X is assumed to cross the Washougal River and be transmitted south via the Washougal River North Interceptor (I8).

15-16. Interceptor Sewer I3-D Capacity Upgrades. Two segments of I3-D require capacity upgrades to accommodate design flow conditions. These are the segments between manholes T7-6 and T7-5 and the segments between manholes T7-2 and T7-1. Both are replacements of existing 8-inch sewers with 10-inch diameter sewers.

17. Relief Sewer I3-C. This gravity sewer will intercept the flows from Force Main #4-2 and carry them south in a new 2,500-foot, 27-inch relief line along 39th Street between 'J' Street and Evergreen Highway, where they will join the flow in the 39th Street Main. This bypass sewer will be constructed relatively shallow as it will only carry flows from the proposed Force Main #4. It will be sized at 27-inch diameter for the 20-year flows from BB, CC, W, K, L, J, and N. It should be noted that flows beyond the 20-year planning period will be directed to the treatment plant, which is why the relief sewer is not sized for more than 20-year flow conditions.

3.3 COLLECTION SYSTEM IMPROVEMENT COST ESTIMATES

Costs summarized in the following table are in 2006 dollars, and include 40% for engineering, tax, and contingency.

Table 10-2.5
Proposed Collection System Improvements Cost Estimates

Item	*Cost ($)*
Maintenance Upgrades	
1. Pump Station Flow Meters (8 total)	280,000
2. Pump Station 7 Abandonment (800' of 8" gravity sewer)	240,000
3. Pump Station 9 Abandonment (1,000' of 8" gravity sewer)	287,000
4. Pump Station 10 Abandonment (1,600' of 8" gravity sewer)	663,000
5. Pump Station 11 Abandonment (1,000' of 8" gravity sewer)	433,000
6. 'U' Street Bypass (1,400' of 8" sewer)	95,000
Maintenance Upgrades Total	**1,998,000**
Capacity Upgrades	
Northwest Subsystem	
1. Pump Station 13 (150 gpm capacity)	495,000
2. Force Main 13 (3,100' of 4-inch)	485,000
3. Pump Station 14 (100 gpm capacity)	505,000
4. Force Main 14 (4,600' of 6-inch)	720,000
5. Pump Station 15 (300 gpm capacity)	515,000
6. Force Main 15 (1,600 of 6-inch)	251,000
7. Trunk Sewer T26 (4,300' of 21-inch)	1,690,000
8. Interceptor Sewer I8 (4,000' of 36-inch)	2,859,000
9. Trunk Sewer T24 (1,500' of 21-inch)	838,000
10. Pump Station #8 Upgrade (550 gpm capacity)	140,000
11. Force Main #8 Extension (1,900' of 8-inch)	337,000
12. Pump Station #4 Capacity Upgrade (1,100 gpm capacity)	280,000
13. Pump Station #4 Force Main (6,200' of 12-inch)	1,306,000
Northeast Subsystem	
14. Stiles Road Interceptor I9 (5,000' of 8-inch)	1,916,000
15. Interceptor I3.D Replacement: MH T7-6 to T7-5 (400' of 10-inch)	163,000
16. Interceptor I3.D Replacement: MH T7-2 to T7-1(400' of 10-inch)	163,000
17. Relief Sewer I3.C Bypass (2,500' of 27-inch)	1,116,000
Capacity Upgrades Total	**13,779,000**
Collection System Improvements Total	**15,777,000**

3.4 WASTEWATER TREATMENT PLANT UPGRADES

The wastewater treatment plant was constructed and permitted for 2.24 mgd capacity during the maximum wet weather month. Although the facility has deficiencies, the fact is that with no growth it would not require significant upgrades. The current deficiencies are tolerable under current loadings – at 1.7 mgd maximum month these are well below the plant's permitted capacity of 2.24 mgd. Because of this, those improvements necessary to bring the plant up to full compliance and cost-effective operation at 2.24 mgd are deemed capacity improvements. Most of these upgrades will need to be completed within the next five to ten years. Based upon flow projections, the wastewater treatment plant will require a substantial capacity upgrade in the year 2008.

A. IMPACT OF NON-PERFORMANCE

The Department of Ecology's actions relative to a community's inability to provide sanitary sewer service to accommodate growth are very predictable. If excess capacity is not available, a moratorium will be placed on growth, until the community has proven that the existing, or improved facilities, can accommodate the additional flows. In order to avoid a moratorium, the City must thus stay ahead of growth.

B. TREATMENT FACILITY IMPROVEMENTS

Proposed wastewater treatment facilities are separated into three phases. Phase 1 and 2 improvements are maintenance related. Although they are designed for a 20-year design period, for purposes of this facility plan, they do not impact the current NPDES permitted capacity. The Phase 3 Improvements are capacity upgrades.

The proposed improvements are described in the following paragraphs.

PHASE 1 IMPROVEMENTS

1. Operations Building and Laboratory. A new building is proposed to be located just west of the existing administrative building. The building will house operator offices, a lunch room, and a laboratory. The building will be approximately 3,000 square feet in size. It will be slab-on-grade, CMU construction with metal roof. Parking for 10-spaces will be provided, five on each side of the building.

2. Headworks (screening and grit removal). A new free-standing headworks facility is proposed to be located just east of the existing equipment building. The structure will include two mechanical screens, a manually cleaned screen, a Parshall flume, and a vortex grit removal system. Flows from the screen structure will discharge by gravity to the influent pump station. Flows will then be pumped to the grit facility, where they will gravity flow to the oxidation ditch flow distribution structure.

3. Effluent Pump Station Upgrades. The two existing submersible pumps will be replaced by column-type vertical turbine pumps with a capacity to accommodate peak flows

matching the hydraulic capacity expansion for the treatment plant. The pumps will be designed to be relocated to a new wetwell constructed with the proposed Phase 3 Improvements.

PHASE 2 IMPROVEMENTS

The Phase 2 improvements will include one of the following two options. Negotiations are currently underway with the City of Camas to select the preferred option.

Option A – Regional Biosolids Treatment. Construct a 6-inch diameter pipeline along SR-14 right-of-way to the Camas wastewater treatment plant. Construct a sludge pump station housing two 100 gpm pumps. Construct a holding tank to provide 10-days of storage for the wastewater to be discharged to Camas.

Option B – Non-Regional Biosolids Treatment Facilities: These facilities would include the following components.

4. Sludge Holding Tank. A reinforced concrete sludge holding tank with a capacity of 120,000 gallons is proposed. The tank would have stainless steel coarse bubble diffusers mounted on its bottom to provide complete mix and maintain the WAS in suspension. The tank would be a rectangular tank with dimension of 21-inch high x 30-foot square, with about 18 feet of liquid depth.

5. Biosolids Equipment Building with Equipment. An equipment building would be installed to house biosolids treatment facilities.

   Equipment:

   Sludge Transfer Pump. A 200 gpm progressing cavity sludge pump would be installed to transfer sludge from the holding tank to the proposed gravity belt thickener. The pump would be located in the biosolids equipment building.

   Belt Filter Press (BFP). A 1.5 meter (belt-width) BFP would be installed in the biosolids equipment building. It would have the capacity to thicken 600 lb/hour of sludge.

   Polymer System. A polymer feed system would be installed to automatically add polymer to the thickened sludge.

   Alkaline Stabilization System. A lime silo and pug mill would be installed for lime storage and mixing with biosolids. A 10 Hp motor would be used for mixing. A lime dose of 0.3 lbs/dry solids is assumed.

   Blower. A 30 Hp positive displacement blower would be installed in the biosolids equipment building for purposes of aerating the sludge holding tank.

Sludge Conveyor. A screw-type sludge conveyor would be installed in the equipment building to mix lime with thickened sludge and convey it to sludge storage, or alternatively convey it directly into a truck.

6. Sludge Storage. A covered sludge storage building, with the front opened for access by a front-end loader, would be constructed adjacent to the biosolids equipment building. The storage building would have two bays designed to hold a 10-foot depth of sludge. Removable beams at the entrance would allow controlled spillage into a forebay for removal by front-end loader.

7. Front-end Loader and Sludge Hauling Truck. A front-end loader would be purchased for loading dewatered sludge onto a dump truck, which would also be purchased.

PHASE 3 IMPROVEMENTS

Phase 3 improvements will double the treatment plant capacity. Although year 2030 maximum month flow estimate is less than 4 mgd, the facilities are proposed to be designed with a maximum monthly flow capacity of 4.5 mgd. Doing so will enable a more efficient long-term use of the site and will also provide more cost-effective redundancy. Facilities proposed for construction are summarized as follows:

8. Influent Pump Station Upgrades. Two existing influent pumps will be replaced by three higher capacity units. Variable speed drives will also require replacement.

9. Oxidation Ditch Distribution Structure. An oxidation ditch distribution structure will be constructed to distribute flows from the headworks to each of the two oxidation ditches. It will include an influent chamber which would discharge over two 6-foot weirs to the two effluent chambers from which pipes would convey the wastewater to the oxidation ditches.

10. Oxidation Ditch #2. A second oxidation ditch is proposed to provide a future capacity upgrade. The oxidation ditch will be designed and sized to match the existing oxidation ditch.

11. Secondary Clarifier #3. A third clarifier is proposed. It will be 84 feet in diameter to match Clarifiers #1 and #2.

12. RAS/WAS Equipment Building #2. A second RAS/WAS equipment building is proposed for Clarifier #3. It will house two RAS pumps and one WAS pump.

13. Scum Pump Station #2. A second scum pump station is proposed for Clarifier #3. It will include a single 5 Hp submersible pump which would discharge waste activated sludge to the sludge holding tank.

14. UV Capacity Expansion. A second UV Facility is proposed to be located just east of the existing one. It will be similar to the existing one, and will be sized at the same capacity.

15. Effluent Pump Station and Force Main. A 12-foot diameter wetwell would be constructed immediately adjacent to the UV structure. It would house the three effluent pumps currently installed in the existing outfall pump station. A new 24-inch diameter force main would extend from the effluent pump station to the existing 20-inch diameter outfall force main.

16. Outfall Study and Upgrade. A mixing zone study will be necessary to provide the design basis for the proposed outfall upgrade. Based upon a preliminary evaluation, it was assumed that the existing outfall could provide design capacities by removing caps on two of the seven diffusers currently installed.

17. Sitework. Necessary sitework for the project, including electrical and mechanical components.

3.5 Treatment Facility Improvement Cost Estimates

Costs summarized in the following table are in 2006 dollars, and include 40% for engineering, tax, and contingency.

Table 10-2.6
Proposed Wastewater Treatment Plant Improvements Cost Estimates

Item	*Cost ($)*
Phase 1 Improvements	
1. Operations Building & Laboratory	1,400,000
2. Headworks (Screening & Grit Removal)	2,900,000
3. Effluent Pump Station Upgrades	230,000
Phase 1 Total	**4,530,000**
Phase 2 Improvements	
4. Sludge Holding Tank	634,000
5. Biosolids Equipment Building with equipment	2,968,000
6. Sludge Storage	796,000
7. Front-End Loader & Sludge Hauling Truck	250,000
Phase 2 Total	**4,648,000**
Phase 3 Improvements	
8. Influent Pump Station Upgrades	660,000
9. Oxidation Ditch Distribution Structure	1,120,000
10. Oxidation Ditch #2	4,900,000
11. Secondary Clarifier #3	1,780,000
12. RAS/WAS Equipment Building #2	1,800,000
13. Scum Pump Station #2	420,000
14. UV Capacity Expansion	1,260,000
15. Effluent Pump Station and Force Main	700,000
16. Outfall Study & Upgrade	250,000
17. Sitework	1,422,000
Phase 3 Total	**14,312,000**
Wastewater Facilities Phases 1, 2, and 3 Total	**23,490,000**

3.6 EXISTING TREATMENT FACILITY DEBT FINANCING

The 1999 treatment facility expansion has a remaining debt of approximately $4,000,000 for additional capacity expansion costs. This amount will be added to the treatment facility improvement costs above, for a total of $27,490,000. These costs do not include any grant contributions. They assume the entire costs will be funded by the City of Washougal.

3.7 RECOMMENDED FINANCING PLAN

For the improvements recommended in this plan, financing by System Development Charges (SDC) and developer financed improvements should be considered as the most appropriate to the current political and financial environment.

Since service must exist at the time of development, sewer facilities are constructed in advance, and it is not generally possible to finance them at the time of construction. Therefore, costs are paid with service fees and revenues from new users added over a period of time.

The estimated cost of collection system (less maintenance upgrades) and wastewater treatment plant improvements (plus WWTP debt) total $41,269,000. This cost divided by the 6,695 projected new ERU's results in an SDC of $6,164 per ERU.

3.8 6-YEAR CAPITAL FACILITY PROJECTS

The 6-year capital facility projects include most of the 20-year improvements outlined above. These costs do not include any grant contributions. They only reflect the responsibility of the City of Washougal. Table 10-2.7 below summarizes these costs.

Table 10-2.7
Proposed Project Implementation Schedule

Proposed Construction Year	*Capital Improvement*	*Cost ($)*
6-Year Capital Improvement Plan		
2007	Pump Station #8 Upgrade and Force Main	477,000
	Trunk Sewer T24	838,000
	Pump Station #4 Upgrade and Force Main	1,586,000
	Relief Sewer I3-C	1,116,000
	Phase 1 Treatment Plant Expansions	4,530,000
2008	Interceptor 13.D Upgrades	326,000
	Phase 2 Treatment Plant Expansions	4,648,000
2009	Stiles Road Interceptor	1,916,000
2010	Phase 3 Wastewater Treatment Plant Expansion	14,312,000
2011 to 2024 Improvements		
2013 to 2017	'U' Street Bypass	95,000
	Pump Station Flow Meters	280,000
	Pump Station #7 Abandonment	240,000
	Pump Station #10 Abandonment	663,000
	Pump Station #13 and Force Main #13	980,000
	Trunk Sewer T26	1,690,000
	Interceptor I8	2,859,000
2018 to 2022	Pump Station #9 Abandonment	287,000
	Pump Station #14 and Force Main #14	1,225,000
2023 to 2026	Pump Station #11 Abandonment	433,000
	Pump Station #15 and Force Main #15	766,000

The total 6-year cost for improvements are $29,749,000 as shown above. With debt estimated at $4,000,000 this amounts to $33,749,000. The projected 6-year ERU's added to the system are 2,318 which creates an estimated revenue of $14,288,152, so it is apparent that approximately $19 million in debt financing will be necessary over the next six years.

3.9 BENEFIT AREA EVALUATION

A geographic assessment of cost differentials for the provision of public services concludes that one area of the city does not cost more or less to serve than any other. The proposed facilities included in the 6-year plan serve only proposed expansion areas within the 20-year growth boundary.

While there is a single benefit area, for purposes of near-term implementation of the City's SDC program, it was deemed prudent to identify appropriate SDCs for two areas as follows:

Area #1 - Existing UGA Area – the area within the currently approved UGA

Area #2 - Proposed UGA Area – the area outside the currently approved UGA but within the proposed UGA.

For each of the two areas, total land area and ERU estimates are estimated as follows:

Table 10-2.8
Growth Area ERU Summary

Area	*Land Area (acres)*	*Total ERUs*	*20-Year ERU Growth*
Area #1	3,771	10,069	3,769
Area #2	1,039	2,926	2,926

Individual proposed capital improvements varied considerably in how they were impacted by the two referenced areas. For instance, some collection system improvements served only one of the areas, while some served both. Those capital improvements who served both areas, along with the assumed proportional cost for each are identified in the following table.

Table 10-2.9
Growth Area Cost Allocation Summary

Item	*Total Cost*	*Area #1 %ERU Allocation*	*Area #2 %ERU Allocation*	*Area #1 Cost Allocation*	*Area #2 Cost Allocation*
Treatment Plant Phase 1, 2, and 3 (plus current debt)	$ 27,490,000	0.563	0.437	$ 15,475,700	$ 12,014,300
1/2 Trunk T26	$ 845,000	0.066	0.934	$ 55,700	$ 789,300
Washougal River North Interceptor (I8)	$ 2,859,000	0.432	0.568	$ 1,233,786	$ 1,625,214
FM #8 Extension	$ 337,000	0.484	0.516	$ 163,104	$ 173,896
Trunk 24	$ 838,000	0.635	0.365	$ 532,325	$ 305,675
FM #4-2	$ 1,306,000	0.417	0.583	$ 544,303	$ 761,697
Relief Sewer (I3-C)	$ 1,116,000	0.440	0.560	$ 491,310	$ 624,690
Total Cost	$ 34,791,000			$ 18,496,229	$ 16,294,771

Area #2 exclusive CFP costs include PS #13, 14 and 15 and associated force mains, and ½ of Trunk T26. This cost is estimated at $3,816,000.

Area #1 exclusive CFP cost is $2,662,000. This was calculated as follows:

Total 20-year CFP costs – Area #1 & #2 combined 20-yr CFP costs – Area #2 exclusive CFP costs.

Using the above information and information in Tables 10-2.8 and 10-2.9, SDC for each area can be calculated as follows:

Area #1 $21,158,229 (Area #1 Cost Allocation plus Exclusive CFP Cost) divided by 3,769 ERUs for an estimated SDC of $5,613.75.

Area #2 - $20,110,771 (Area #2 Cost Allocation plus Exclusive CFP Cost) divided by 2,926 ERUs for an estimated SDC of $6,873.13.

NORTH

0 1000 2000
SCALE IN FEET

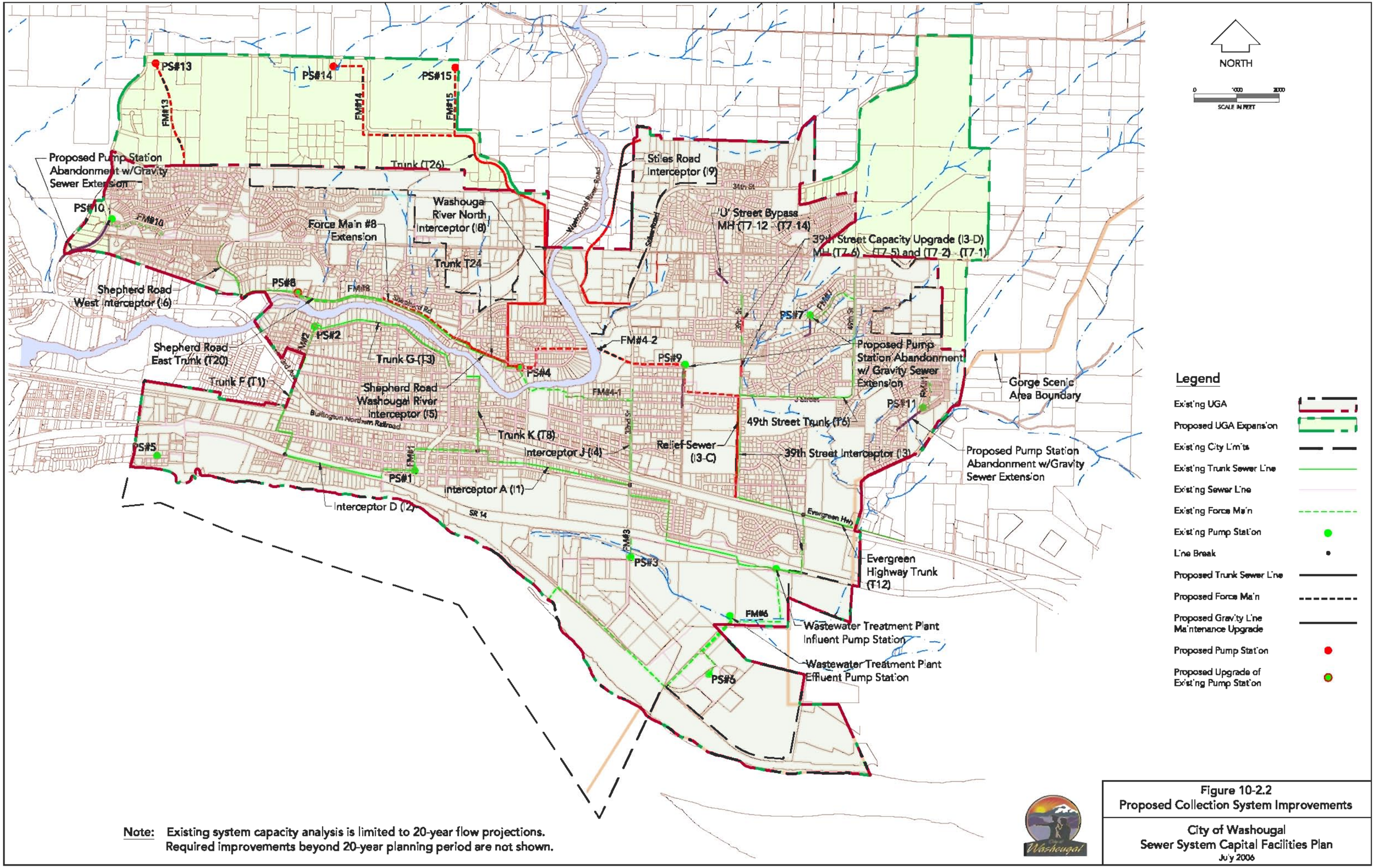
PS#10
FM#10
PS#6
FM#8
Shepherd Road West Main
Shepherd Road East Main
FM#2
PS#2
Main G
Shepherd Road Washougal River Main
PS#4
Main F
FM#4
PS#9
FM#9
Main K
Main J
PS#7
PS#11
Gorge Scenic Area Boundary
49th Street Main
PS#5
PS#1
FM#1
Main D
Main A
39th Street Main
Evergreen Highway Main
FM#3
PS#3
FM#6
Wastewater Treatment Plant Influent Pump Station
PS#5

Legend

- Existing UGA
- Proposed UGA Expansion
- Existing City Limits
- Existing Trunk Sewer Line
- Existing Sewer Line
- Existing Force Main
- Drainage Basin Boundary
- Sewer Service Area Basin Designation (H)
- Existing Pump Station
- Line Break

Figure 10-2.1
Basin Map

City of Washougal
Sewer System Capital Facilities Plan
July 2006



Note: Existing system capacity analysis is limited to 20-year flow projections. Required improvements beyond 20-year planning period are not shown.

Figure 10-2.2
Proposed Collection System Improvements

City of Washougal
Sewer System Capital Facilities Plan
July 2006