SECTION I

SUMMARY AND RECOMMENDATIONS

SUMMARY

This report is intended to serve as a combined General Sewer Plan (GSP) and Facility Plan (FP) for the City of Woodland, Washington. The GSP portion of the report 1) evaluates the level of wastewater treatment the City must plan for, 2) establishes the sewer service area and the physical and environmental conditions within the service area, 3) develops estimates of population and wasteloads for the service area that must be treated, 4) presents an inventory of the existing collection system and identifies future interceptors and pump stations that will be required to serve the planning area, 5) evaluates the performance and adequacy of the existing wastewater treatment plant (WWTP) to serve the area, 6) evaluates treatment alternatives and improvements that are needed to meet both regulatory requirements and City needs, provides recommended design criteria and estimates the cost of those improvements, 7) evaluates the need for an Infiltration and Inflow (I/I) removal program, and 8) recommends treatment processes for implementation that will meet the Department of Ecology's (DOE) Water Quality Standards as well as DOE's requirements for reliability and treatment standards for both the liquid and solid waste streams.

The FP portion of the report presents 1) detailed design criteria, a preliminary site plan and a cost estimate for the recommended alternative, 2) evaluates the impact of the recommended alternative on sewer rates, and 3) presents an implementation schedule for design and construction of the recommended alternative and makes recommendations for funding the project.

The recommended alternative for treating the liquid wastewater stream is a new Sequencing Batch Reactor (SBR) with ultraviolet (UV) disinfection and discharge into the Lewis River. The solids stream will be treated using an aerobic stabilization process called "Pre-Thickened Aerobic Digestion" (PAD).

GENERAL SEWER PLAN

The City of Woodland is located in Cowlitz County (with a small portion in Clark County) in Southwest Washington (see Figure IV-1). The City has an existing sewer service area of approximately 1,644 acres (see Figure IV-2) serving a population of approximately 3,570 people. The City has owned and operated a wastewater collection and treatment system since the mid-1950's. In 1974 the City completed a major treatment plant expansion, and in 1993 a new Submerged Biological Contactor (SBC) was added to the plant to increase the plant's capacity to 0.48 million gallons per day (MGD). The existing plant consists of a headworks that includes a helisieve screening unit and grit removal, one (1) primary clarifier, one (1) Submerged Biological Contactor (SBC), two (2) Rotating Biological Contactors (RBC), one (1) secondary clarifier, a chlorination system for disinfection, and a single aerobic digester for biosolids treatment. After treatment and disinfection, the wastewater is discharged into the Lewis River at river mile 6.5. Treated biosolids are land applied in liquid form at a private site located in Cowlitz County.

Computer modeling (see Section III) was used to evaluate the potential of the City's existing and future discharge to meet water quality standards in the Lewis River under critical river flow conditions. The evaluation shows that all water quality standards evaluated can be met, both now and in the future except for chlorine. It is recommended that the chlorination disinfection system be replaced with a new UV disinfection system.

As discussed in Section IV of this report, the existing WWTP is doing an excellent job of meeting the City's existing National Pollution System Discharge Elimination System (NPDES) Permit. Except for apparent violations that occurred because of record breaking rains and flood conditions, the City consistently meets their permit conditions for Biochemical Oxygen Demand (BOD) removal, Total Suspended Solids (TSS) removal, pH, Fecal Coliform, and flow. However, the capacity evaluation completed in Section VII shows that the plant experiences high BOD and TSS loadings and is nearing its BOD loading capacity. Currently, the biosolids process system is overloaded and rarely meets applicable biosolids treatment requirements.

Based on the overall evaluation in this report, the WWTP needs to be upgraded to meet increased reliability standards, meet existing water quality standards in the river, meet existing biosolids treatment standards, and provide some additional capacity for increased growth.

As mentioned above, the plant currently sees highly fluctuating influent BOD and TSS loadings. This is an indication that high strength commercial and/or industrial wastewater is being contributed to the system. The City is currently investigating potential sources of the high loadings and believes much of the load originates from a dog food manufacturer and a major restaurant located in the City. The City is monitoring these facilities and is working with the dischargers to ensure the waste strength is brought down and made more compatible with the City's treatment process, and that the dischargers pay for services in accordance with existing ordinances. If required, the City may desire to work with DOE to establish pretreatment ordinances along with the issuance of state permits to significant commercial/industrial dischargers to the system.

The Woodland sewage collection system contains approximately 97,600 feet of mainline gravity sewers, an estimated 75,000 feet of sidesewers, 12 pump stations, and approximately 14,000 feet of forcemain (see Section IV). Flow data recorded at the treatment plant (see Figure IV-10) show that the collection system experienced one high flow condition caused by high groundwater levels in December 1996 which resulted in subsequent infiltration. The subsequent infiltration, through the spring and early summer of 1997, resulted because the heavy rains and flooding caused the Army Corps of Engineers to maintain high river levels into July 1997. Except for this abnormal event, the flow data used in this report and previous reports do not show the City of Woodland's sewer system to be subject to excessive I/I that is cost effective to remove from a standpoint of treatment. However, about 20% of the existing collection system was installed in the 1950's. To prevent further deterioration of this older pipe, it is recommended that the City

develop a long-term I/I removal program. This program could be implemented after the treatment plant improvements are made and may involve replacing about 2% of the old pipe each year. If at some point in the future I/I begins to impact treatment, the City will want to accelerate the program. This could be done by securing a PWTF loan and completing all the I/I work as one major project.

During the 1980's and early 1990's, the City of Woodland experienced a severe economic hardship caused by the downturn in the timber industry. In 1993, the City began growing and has experienced an overall average growth rate of 5.5% for the last five years. This increase is primarily due to new jobs that have been created in the City and because growth from the Vancouver/Portland area has moved into Woodland. It is anticipated that over the next 20 years the population served by the WWTP will increase from approximately 3,570 to 12,089 people and that the sewer service area will increase from 1,644 acres to about 2,360 acres.

It has been estimated that five (5) new pump stations and approximately 31,100 feet of new 12-inch interceptors will be required to serve the Urban Growth Area identified in the City's Comprehensive Plan (see Section VI). To minimize the number of pump stations and thereby reduce future Operation and Maintenance (O&M) costs, the City may want to develop a policy to require new pump stations be designed to serve larger areas than just for the proposed development by constructing deeper pump stations. To implement this concept, developers would have to pay the initial high capital cost of the pump station and sewer lines, and perhaps recover their costs through latecomer fees. However, a cost-sharing system may be advantageous to the City and may need to be developed by the City for implementation. It is anticipated that actual construction of the new pump station/interceptor systems, and upgrade of existing pump stations will occur over time as various areas through the City are developed. Except for Pump Station No. 4 and the Pump Station No. 3 forcemain intertie, this report has not prioritized nor scheduled the implementation of any of the identified pump station/collection system improvements.

Existing and future populations and wasteloads are evaluated in Section V of this report. Based on that evaluation, a growth rate of 5% per year is used in this report and the WWTP improvements are proposed to occur in two phases. Recommended design criteria for the treatment plant improvements is discussed in Section VII of the report and is based on the actual capacity of the recommended improvements rather than the projected influent waste loads. The future populations and design capacity of the recommended treatment plant alternatives are summarized in Table I-1.

Table I-1
Projected Population & Wasteloads and Recommended Plant Capacity

	Existing Conditions (Year 1998)	Phase I WWTP Improvements Design Criteria (Year 2009)	Phase II WWTP Improvements Design Criteria (Year 2023)
Population	3,570	6,111	12,089
Flow			
ADWF	0.375 MGD	0.64 MGD	1.28 MGD
AWWF	0.435 MGD	0.77 MGD	1.52 MGD
Average Annual	0.405 MGD	0.71 MGD	1.40 MGD
Maximum Monthly	0.683 MGD	1.01 MGD	2.00 MGD
Peak Daily	1.208 MGD	1.62 MGD	3.20 MGD
Average Annual Loading			
BOD	NA	NA	NA
TSS	NA	NA	NA
NH_3	NA	NA	NA
Dry Weather Loading			
BOD	1,105 lbs/day (@372 mg/L)	2,475 lbs/day (@464 mg/L)	3,720 lbs/day (348 mg/L)
TSS	1,152 lbs/day (@ 388 mg/L)	2,086 lbs/day (@ 390 mg/L)	3,202 lbs/day (300 mg/L)
NH_3	89 lbs/day (@30 mg/L)	160 lbs/day (@ 30 mg/L)	320 lbs/day (30 mg/L)

The WWTP is located on a very small piece of land adjacent to the Interstate Highway 5 (I-5), near the City of Woodland. Because of this, other potential sites were investigated. The first site located near the I-5 bridge south of Woodland is too small for the proposed facilities. Other sites located near the Columbia River and along Caples Road are too expensive to develop. The high cost is associated with the conveyance system required to pump the wastewater to the new site. Because additional land is required for the proposed upgrade, it is recommended that the City of Woodland purchase approximately two acres of land adjacent to the existing WWTP site.

In 1992, the City of Woodland formally adopted the 1985 "*Criteria for Sewage Works Design*" as published by the Washington State Department of Ecology (DOE) as their design criteria (see Appendix G). The most recent version of these criteria is dated December 1998 and is available

off the internet at **www.wa.gov/ecology/wq/orange**. The City may also desire to adopt the 1998 "*Standard Specifications and Standard Plans for Road, Bridge and Municipal Construction*" as published by the Washington State Department of Transportation (WSDOT), and the American Public Works Association (APWA) as their standard for construction of all sewer work within the service area. After the above referenced criteria are adopted by the City and this Plan is approved by DOE, then DOE approval of future sewer extensions is not required provided the City sends to DOE an assurance that each proposed sewer extension conforms with the approved Plan and the adopted design and construction standards.

As presented in Section VII, the two most viable alternatives considered in this report were 1) expansion of the existing SBC system with anaerobic biosolids digestion and 2) construction of a new SBR system with aerobic biosolids digestion. For purposes of the General Sewer Plan, cost for the SBC alternative were developed based on taking the two old RBC units out of service and expanding the existing SBC system. The anaerobic digester would be constructed on the land proposed to be purchased just north and adjacent to the plant. For the SBR alternative, the new treatment process will be constructed on the new land and, after construction is complete and the new system is operating, the existing treatment units would be demolished and the proposed aerobic digesters would be constructed where the RBC's/SBC and secondary clarifier are now located.

Capital cost estimates for both Phase I and Phase II of the SBR and the SBC alternatives are presented in Section VII along with a present worth analysis. This information is summarized in Table I-2 and shows that the total capital cost of both phases and the total present worth costs of both phases are lower for the SBR alternative.

Table I-2 Estimated Capital and Present Worth of Woodland WWTP Upgrade Alternatives				
	Capital Cost Present Worth ($, millions)	*O&M[1] Present Worth ($, millions)*	*Salvage[2] Present Worth ($, millions)*	*Total Present Worth ($, millions)*
SBR Alternative				
Phase I Upgrade	$ 7.378	$ 3.974	($ 1.244)	$10.108
Phase II Upgrade	$ 0.791	$ 2.880	($ 0.092)	$ 3.579
TOTAL	$ 8.169	$ 6.854	($ 1.336)	$13.687
SBC Alternative				
Phase I Upgrade	$ 6.967	$ 3.750	($ 1.206)	$ 9.511
Phase II Upgrade	$ 5.511	$ 2.718	($ 0.853)	$ 7.376
TOTAL	$12.478	$ 6.468	($ 2.059)	$16.887

1. Present Worth of Phase I O&M is for the first 10 years.
   Present Worth of Phase II O&M is for the second 10 years.
2. Salvage value in year 2023.

Based on cost, increased flexibility to meet future regulatory requirements, relative ease of future expansions and the SBR's ability to handle high peak flows without solids washout, it is recommended that the City of Woodland replace the existing SBC treatment plant with a new SBR treatment plant.

FACILITY PLAN - WWTP IMPROVEMENTS

The preferred treatment alternative is discussed in Section VIII of this report along with the recommended design criteria for the proposed improvements. The following is a list of the recommended Phase I improvements:

1. Construction of a new headworks facility. The new headworks would re-utilize the existing Hycor screening equipment and would have new grit removal equipment.

2. Construction of two SBR basins with associated aeration, mixing, decanting and sludge wasting equipment to provide secondary treatment of influent wastewater.

3. Construction of a new disinfection system consisting of two 2.6 MGD closed conduit units.

4. Construction of a new covered aerobic digestion facility consisting of two aerobic digester basins, a pre-mix basin and a gravity thickener.

5. Upgrade the existing effluent pump station and the gravity discharge pipeline.

6. Installation of new influent and effluent flow meters.

7. Demolition of existing RBC, SBC and secondary clarifier basins to make room for new aerobic digestion facility.

8. Demolition of existing headworks and existing primary clarifier.

9. Construction of a new laboratory facility.

10. Required modifications to existing blower/control building to house new electrical control equipment and blower equipment for the SBR and aerobic digesters.

11. Remove interior walls and modify existing undersized lab/control/chlorination building into a maintenance shop for the WWTP.

12. Site work required to incorporate additional land needed to construct recommended treatment units.

13. Yard piping and electrical improvements required to construct recommended treatment units.

14. Upgrade the existing Pump Station No. 4 and tie the forcemain from Pump Station No. 3 directly into the forcemain to the WWTP.

The estimated costs for the Phase I improvements are summarized in Table I-3 below.

Table I-3
Estimated SBR WWTP Construction Costs - Phase I

ITEM NO.	ITEM DESCRIPTION	AMOUNT
1	Mobilization/Demobilization	$ 280,000
2	Site Work	$ 175,000
3	Upgrade Grit Removal Equipment	$ 225,000
4	Construct New SBR Units	$1,400,000
5	Construct New UV Disinfection System	$ 300,000
6	Construct New Aerobic Digestion System	$1,150,000
7	Construct New Lab Building	$ 150,000
8	Yard Piping, Fittings, Valves & Accessories	$ 250,000
9	Upgrade Effluent Pumps	$ 125,000
10	Demolition of Existing Treatment Units	$ 350,000
11	Upgrade Outfall Pipeline with 24" D.I. Pipe	$ 125,000
12	Electrical/Instrumentation & Controls	$ 385,000
	Subtotal	$4,915,000
	Construction Contingency @ 15%	$ 738,000
	Estimated Construction Cost Subtotal	$5,653,000
	Admin., Permits, Legal & Engineering	$1,100,000
	State Sales Tax @ 7.5% of Const. Cost Subtotal	$ 425,000
	Land Acquisition	$ 200,000
	TOTAL ESTIMATED PROJECT COST	$7,378,000

In addition to the treatment plant cost listed above, it is estimated that Pump Station No. 4 improvements will be approximately $241,706 and that the forcemain intertie for Pump Station No. 3 will be about $44,500.

Section IX of this report identifies several potential state and federal funding programs that are available to the City to help fund the proposed improvements. Although there are numerous potential funding options that are possible, two are presented in Section IX. The first funding option is a "worst case" scenario which assumes no grants are obtained. The second funding option is a "best case" scenario, which assumes a single grant is secured from DOE. The funding sources for both options are shown in Table I-4.

Table I-4
Two Potential Funding Options for the Woodland SBR Alternative

Funding Source	Funding Option No. 1	Funding Option No. 2
PWTF Loan	$4,271,760	$4,271,760
DOE Loan 1	$2,651,440	$ 884,689
DOE Loan 2	$ 286,206	$ 286,206
DOE Grant	$ 0	$1,847,500
City of Woodland	$ 454,800	$ 374,051
TOTAL	$7,664,206	$7,664,206

In addition to the above funding sources, the City is currently seeking other grant funding to help reduce the cost to the ratepayers.

Section IX also evaluates the potential impact the proposed project will have on sewer system charges and monthly sewer rates. The City may want to consider evaluating alternative rate structures before implementing any rate increase for this project. The evaluation presented in Section IX assumes 1) the existing rate structure remains in place, 2) that any increase applies equally to all sewer system charges and monthly rates, and 3) that there is only a two (2) percent increase in growth to help pay for the improvements. This last assumption is critical to any potential increase. If the City does, in fact, experience higher growth rates, then more revenue will be generated by system connection charges and inspection fees and the flat monthly rates can be kept lower. The results of the preliminary rate evaluation from Section IX are summarized in Table I-5. The rate evaluation is intended to provide the mayor and council with information they can use when making their determination of future rate increases.

Table I-5 Potential Order of Magnitude Impact on Woodland Sewer Rates			
Item	Year 1999	Year 2000	Year 2002
Funding Option No. 1			
Connection Charge	$2,500	$3,975	$5,009
Inspection Fee	$88	$139	$175
Flat Sewer Rate/Month	$20	$31.80	$40.07
Overage Charge/100 c.f.	$1.56	$2.48	$3.13
Funding Option No. 2			
Connection Charge	$2,500	$3,775	$4,643
Inspection Fee	$88	$132	$163
Flat Sewer Rate/Month	$20	$30.20	$37.15
Overage Charge/100 c.f.	$1.56	$2.36	$2.90

SCHEDULE

A schedule for implementing the recommendations made in this report is included in Figure I-1. This schedule outlines the major milestones that must be completed to obtain funding, design and construction of the proposed project. The schedule is optimistic in that it assumes the City will be successful in obtaining all financial assistance the first time it is requested.

ID	Task Name
1	City receives loan from PWTF for design and construction
2	City designs the proposed improvements
3	Land acquisition complete
4	Gibbs & Olson finalizes General Sewer and Facility Plan (GSP/FP)
5	City and Agencies approve GSP/FP
6	Design plans and specifications determined "approvable" by DOE
7	City submits construction grant/loan application to DOE
8	City finalizes plans and specifications
9	Design plans and specifications "approved" by DOE and the City
10	City notified by DOE they have been identified for funding
11	City receives from DOE prior authorization to incur costs
12	City advertises for construction bids
13	Construction bids are opened
14	City receives construction grant/loan from DOE
15	City awards construction contract
16	Construction of proposed improvements
17	Complete construction of proposed improvements
18	Close-out of project
19	Close-out of project completed