CITY OF CAMAS

CLARK COUNTY, WASHINGTON

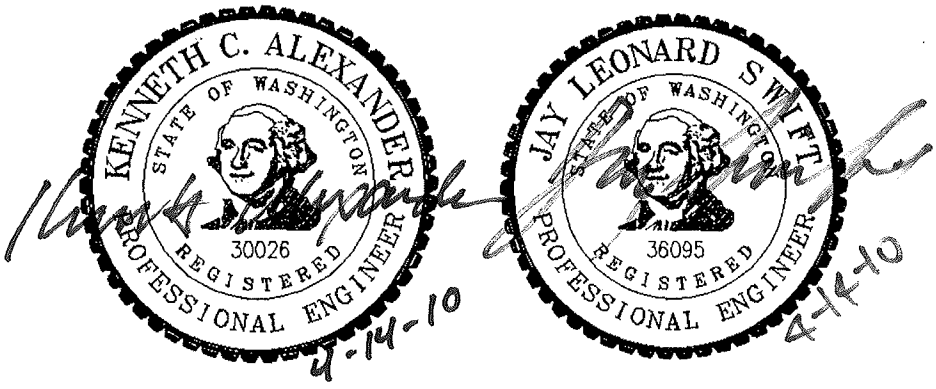
GENERAL SEWER PLAN AMENDMENT

G&O No. 05471.01
APRIL 2010

Gray & Osborne, Inc.
CONSULTING ENGINEERS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT



April 2010

G&O #05471.01

Gray & Osborne, Inc.
Seattle

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CHAPTER 1

REVISED SEWER SERVICE AREA AND LAND USE

INTRODUCTION

This amendment to the City of Camas General Sewer and Wastewater Facility Plan has been prepared to address revisions to the City's north urban growth area (NUGA) boundary as well as a new commercial development in the Grass Valley portion of the City's service area. These revisions will impact both the sewer collection system and treatment facilities as well as potential strategies for wastewater reuse within the City. The new wastewater collection and conveyance facilities in the NUGA will be operated by the City; construction will be funded, in part, by NUGA developers and System Development Charges (SDCs).

The first chapter of this amendment describes changes to the City's urban growth boundaries and land use patterns. The second chapter presents revised flows due to the NUGA expansion and Grass Valley commercial development. The third chapter presents an evaluation of the sewer collection system requirements associated with the NUGA expansion and Grass Valley development. The fourth chapter covers associated impacts to the City's wastewater treatment facilities and the fifth chapter provides a discussion of potential water reuse strategies resulting from additional flows from the NUGA expansion. The sixth chapter provides an analysis of funding strategies to finance recommended wastewater system capital improvements to accommodate the projected growth.

This first chapter identifies the revisions to the sewer service area that were originally presented in the May 2007 *City of Camas General Sewer and Wastewater Facility Plan* (as revised and approved in November 2009). The previous sewer service area is shown in Figure 1-1. These changes are required due to the north urban growth area (NUGA) expansion as well as a prospective commercial development in the Grass Valley area.

This Plan Amendment is consistent with the Federal Water Pollution Control Act, State Environmental Policy Act (SEPA) and the federal National Environmental Policy Act (NEPA). A copy of the SEPA checklist is included in Appendix A. A NEPA Environmental Report will be produced in the future when more details of the locations and character of the new facilities are known, if a federal nexus is identified or federal funding is sought.

NORTH URBAN GROWTH AREA EXPANSION

On December 17, 2007, the City adopted a new urban growth are (UGA) boundary in its Comprehensive Plan. The new urban growth boundary and City limits are shown in Figure 1-2. Land use areas associated with the NUGA expansion are shown in

Figure 1-3. The new UGA boundary becomes the City's effective sewer service area. Table 1-1 presents a land use summary for the Camas UGA with and without the NUGA expansion.

The majority of the NUGA expansion is devoted to residential development, but a substantial portion of the expansion is intended to support commercial, light industry and business park development. Over 1,700 acres of the NUGA expansion is designated for new residential development and more than 640 acres is set aside for commercial and light industry/business park (LI/BP).

Subtracting parks, streets, utilities, wetlands, steep slopes from the area yields 1,129 net developable acres out of a total acreage of 2,349 acres in the NUGA expansion. This includes 722 acres for residential, 66 acres for commercial and 340 acres for light industry/business park.

GRASS VALLEY COMMERCIAL DEVELOPMENT

Grass Valley is an area of west Camas along 38th Street and west of Parker Avenue that is the subject of significant potential commercial development activity. The area currently includes undeveloped grassland, substantial wetlands and some residential development; however, construction of two major office complex and mixed use developments, Fisher Investments and Eiford Properties, are planned in the Grass Valley area within the next 5 years. Figure 1-4 shows the Grass Valley area, including the existing wetlands. The City has signed a pre-annexation development agreement with the developers. The Fisher Investment development alone includes plans for three 100,000 square foot office buildings and 1,000 employees.

As shown in Figure 1-3, the majority of the property in this area is designated for light industrial/business park or commercial. The entire Grass Valley area shown in Figure 1-4 includes 641 acres of which 248 are wetlands unsuitable for development. The remaining 360 acres are considered developable.

CAMAS WATER SYSTEM AND NUGA WATER SERVICE

The construction of wastewater collection, conveyance and treatment facilities to serve the NUGA and Grass Valley must be coordinated with expansion of the City's water system. The City of Camas owns and operates water source, treatment, transmission, distribution, and storage facilities. The water system serves the entire City limits and much of the UGA. Figure 1-5 shows the City's current water system facilities. Future improvements are needed to provide transmission and distribution capacity for the NUGA. These proposed improvements are described in the City's current Water System Plan.

The new Crown Road Booster Pump Station has already been designed, and will pump from the Washougal Wellfield to serve areas to the northern and western edges of the

N

0 2,500 5,000 Feet

LACAMAS LAKE

COLUMBIA RIVER

WASHINGTON
OREGON

WWTF
OUTFALL

TO TWO CREEKS P.S.
LACAMAS SHORES P.S.
LARKSPUR P.S.
SW ERTSEON P.S.
UNDERWATERS P.S.
SKYRIDGE P.S.
GRASS VALLEY P.S.
SUNNINGDALE GARDENS P.S.
PARKER ESTATES P.S.
FITNESS CENTER P.S.
SUMMIT OAKS P.S.
PRUNE HILL PARK P.S.
CROWN VIEW P.S.
BAT P.S.
C SECT P.S.
STONE LEA F.P.S.
HERAEUS P.S.
FURUNO P.S.
LINEAR P.S.
WINCHESTER HILLS P.1 P.S.
WINCHESTER HILLS P.2 P.S.
SHARP P.S.
HILLSHIRE P.S.
KASTRUP P.S.
GRAND RIDGE P.S.
CENTENNIAL P.S.
SOUTH PRUNE HILL P.S.
WEST CAMAS P.S.
MAIN LIFT STATION
LACAMAS CREEK P.S.
ONE STOP P.S.
OAK PARK P.S.
WWTF

LEGEND:

- CITY LIMITS
- URBAN GROWTH BOUNDARY
- URBAN RESERVE
- PUMP STATION (PRIVATE)
- PUMP STATION (PUBLIC)
- Gravity
- Force Main
- STEP
- STEF
- STEG
- SEWER PIPES
- STEP SYSTEM AREA (EXISTING)
- 10' CONTOURS
- PARCELS

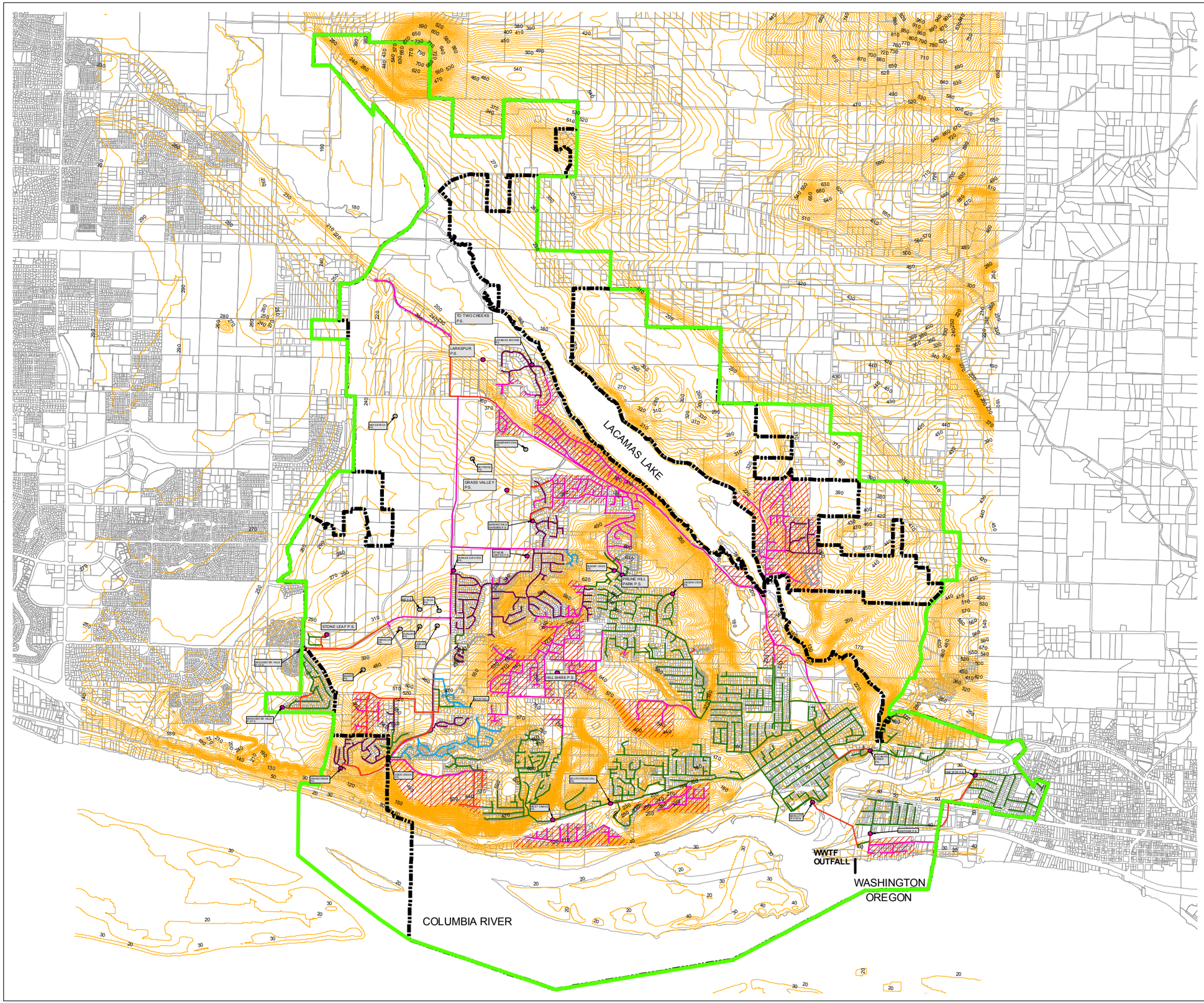
SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 1-1
SEWER SERVICE AREA
PRIOR TO DECEMBER 2007

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\05471 WW FAC PLAN\GIS\FIG1-1.MXD



N

0 2,500 5,000 Feet

LEGEND:

- CITY LIMITS
- URBAN GROWTH BOUNDARY
- PUMP STATION (PRIVATE)
- PUMP STATION (PUBLIC)
- GRAVITY
- FORCE MAIN
- STEP
- STEF
- STEG
- SEWER PIPES
- STEP SYSTEM AREA (EXISTING)
- 10' CONTOURS
- PARCELS

SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 1-2
CURRENT SEWER SERVICE AREA

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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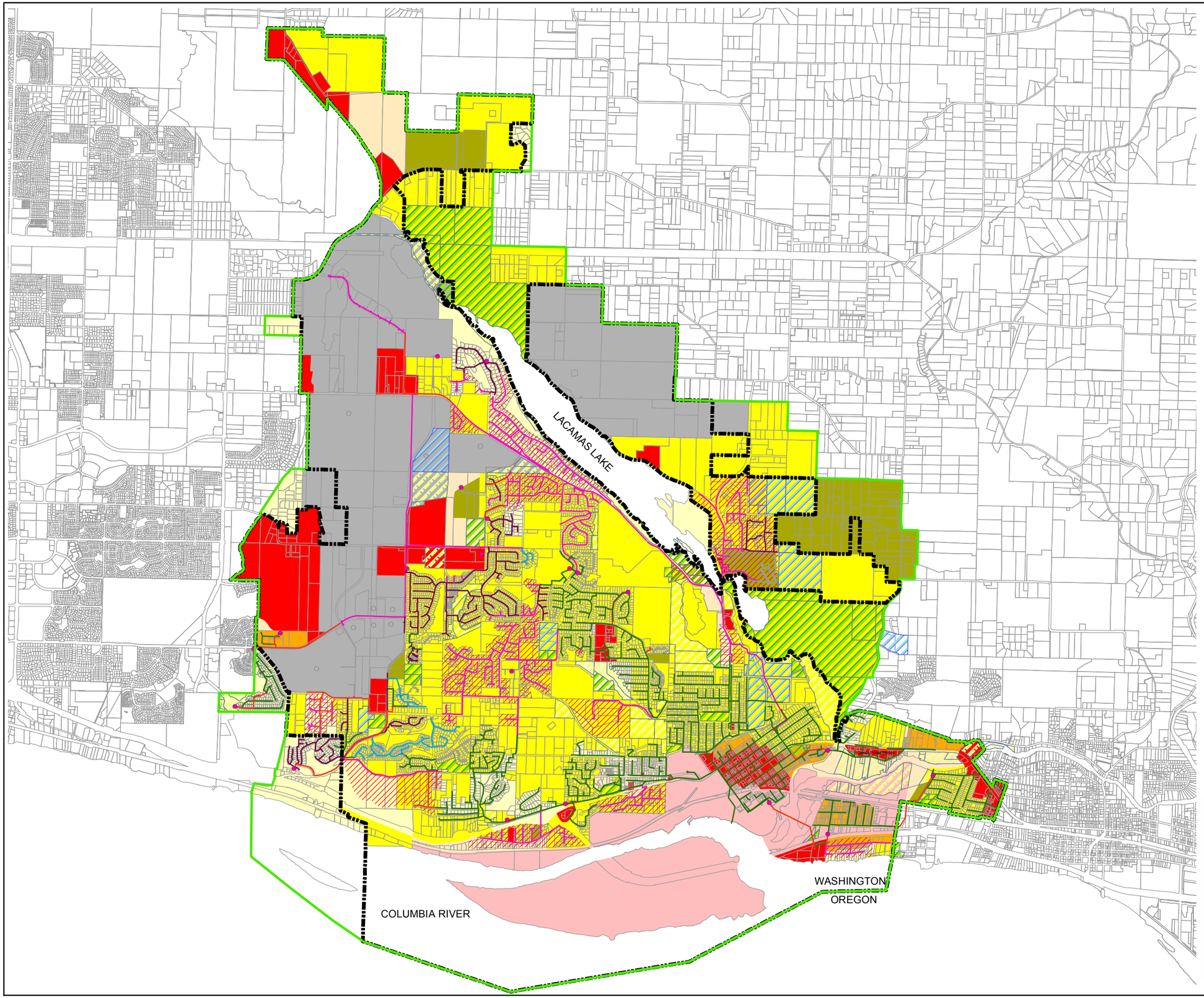


N

0 3,400 6,800 Feet

LEGEND:

- CITY LIMITS
- URBAN GROWTH BOUNDARY
- PUMP STATION (PRIVATE)
- PUMP STATION (PUBLIC)
- GRAVITY
- FORCE MAIN
- STEP
- STEF
- STEG
- SEWER PIPES
- STEP SYSTEM AREA (EXISTING)
- SCHOOL PROPERTY
- PARK
- GREEN SPACE
- PARCELS

CITY OF CAMAS LAND USE:

- SINGLE-FAMILY - LOW
- SINGLE-FAMILY-MED
- SINGLE-FAMILY - HIGH
- MULTI-FAMILY-LOW
- MULTI-FAMILY-HIGH
- COMMERCIAL
- LIGHT INDUSTRIAL / BUS. PARK
- INDUSTRIAL

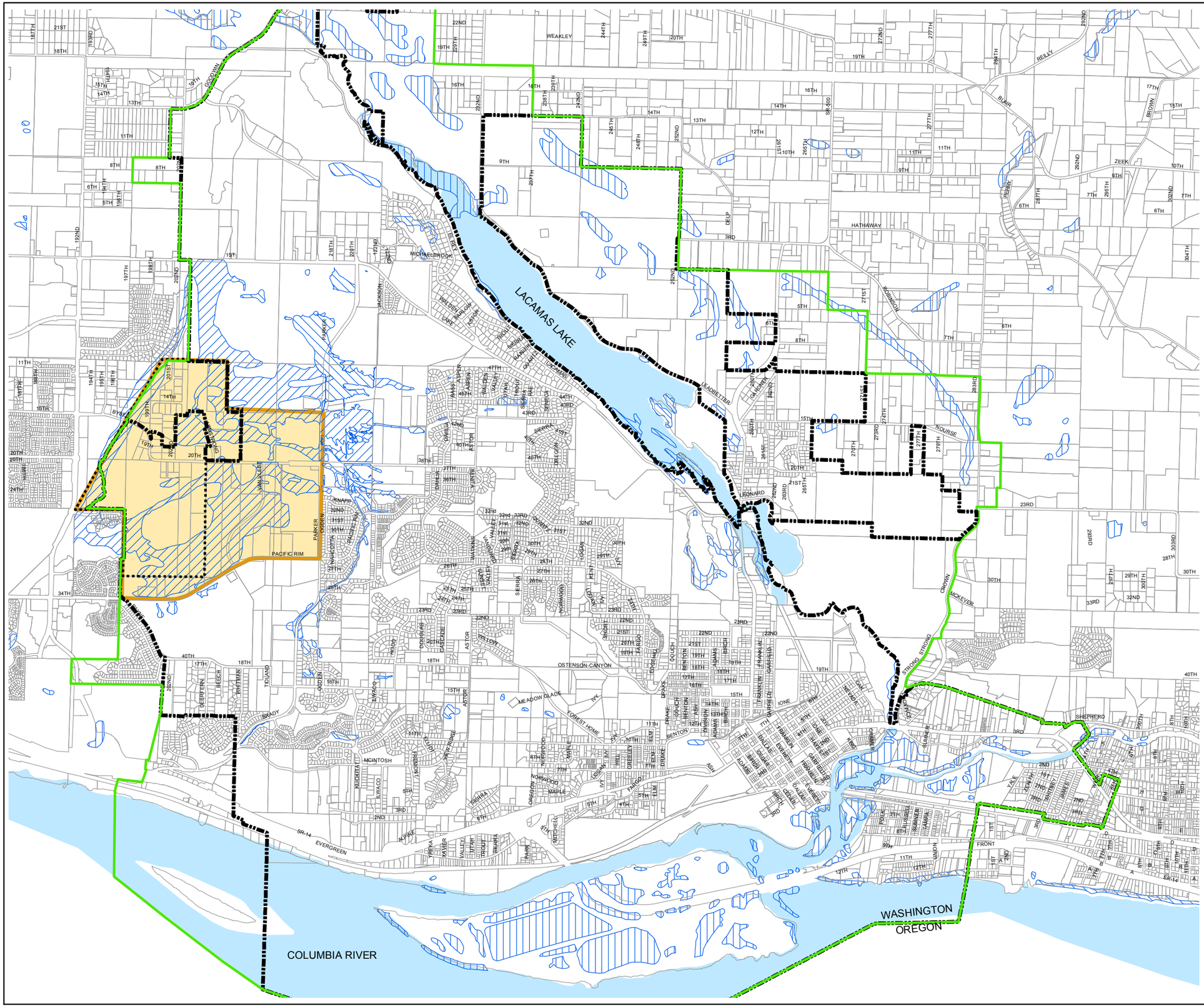
SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 1-3
LAND USE MAP

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\05471 WW FAC PLAN\GIS\FIG1-3.MXD



LEGEND:

- CITY LIMITS
- URBAN GROWTH BOUNDARY
- URBAN RESERVE
- PARCELS
- GRASS VALLEY AREA
- WATER

WETLANDS:

- 1988 NWI
- PMX
- Delineated

SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 1-4
GRASS VALLEY AREA AND CITY-WIDE
SURFACE WATERS / WETLANDS MAP

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\05471 WW FAC PLAN\GIS\WETLANDS.MXD

UGA. Transmission mains will need to be constructed with the Crown Road Booster Station. Approximately 5,400 feet of 24-inch transmission main is required from the discharge of the booster station to the intersection of SE 283rd Avenue and NE Norse Road. Additionally, transmission mains must be constructed within the NUGA to connect the Gregg NUGA and the Green Mountain NUGA. Approximately 24,800 feet of 24-inch transmission main is required to directly connect these portions of the NUGA. If this improvement is not made, then growth in the NUGA will be limited by the Lacamas Booster Station. In order to meet demands, the suction side transmission main to the Lacamas Booster Station must be upgraded to increase the capacity of the booster station. While Lacamas Booster Station has source capacity as currently configured, suction side improvements will be required to serve NUGA growth if the transmission main around the north side of the lake is not installed. Approximately 5,000 feet of 20-inch DI transmission main must be replaced if the NUGA transmission main is not constructed. The remaining portions of the NUGA will be served by approximately 32,500 feet of 16-inch DI transmission main. These improvements are dependent on growth within the NUGA and are placed in the 20-year planning period.

TABLE 1-1

Land Use Summary City of Camas

CAMAS LESS NORTH UGA	Total (acres)	Parks (acres)	Green Space (acres)	Schools (acres)	Municipal (acres)	Steep Slopes (acres)	Wetlands (acres)	Wetlands/ Parks Overlap (acres)	Steep Slope/ Parks Overlap (acres)	Net Developable (acres)	Less Streets and Utiltiies (acres)
COMMERCIAL	601.02	0.00	0.00	0.00	0.00	0.34				601.02	
INDUSTRIAL	978.51	0.00	0.00	0.00	0.00	6.76				978.51	
LI/BP	1473.09	0.00	0.00	0.00	0.00	33.24				1473.09	
MULTI FAMILY HIGH	153.80	0.00	0.00	0.00	36.24					117.56	
MULTI FAMILY LOW	240.14	0.00	0.00	0.00	0.00					240.14	
SINGLE FAMILY HIGH	98.00	0.00	0.00	0.00	0.00					98.00	
SINGLE FAMILY LOW	617.33	0.00	0.00	0.00	0.00	390.83				617.33	
SINGLE FAMILY MEDIUM	3360.89	146.34	415.61	233.18	0.00					2565.76	
TOTAL LESS NORTH UGA EXPANSION	7522.77									6691.40	
NORTH UGA EXPANSION											
COMMERCIAL	89.39	0.00	0.00	0.00	0.00	0.82				88.57	66.43
LI/BP	551.39	0.00	0.00	0.00	0.00	34.53	62.56			454.30	340.73
MULTI FAMILY LOW	97.10	0.00	0.00	0.00	0.00					97.10	70.39
SINGLE FAMILY HIGH	347.10	0.00	0.00	0.00	0.00		15.51			331.59	240.40
SINGLE FAMILY LOW	62.07	0.00	0.00	0.00	0.00		3.67			58.40	42.34
SINGLE FAMILY MEDIUM	1202.41	646.10	0.00	0.00	0.00	99.52	103.94	86.44	69.58	508.86	368.93
TOTAL NORTH UGA EXPANSION	2349.45									1538.82	1129.21
ENTIRE CAMAS LANDUSE											(% of Total)
COMMERCIAL	690.41	0.00	0.00	0.00	0.00					690.41	6.99
INDUSTRIAL	978.51	0.00	0.00	0.00	0.00					978.51	9.91
LI/BP	2024.48	0.00	0.00	0.00	0.00					2024.48	20.51
MULTI FAMILY HIGH	153.80	0.00	0.00	0.00	36.24					117.56	1.19
MULTI FAMILY LOW	337.23	0.00	0.00	0.00	0.00					337.23	3.42
SINGLE FAMILY HIGH	445.09	0.00	0.00	0.00	0.00					445.09	4.51
SINGLE FAMILY LOW	679.40	0.00	0.00	0.00	0.00					679.40	6.88
SINGLE FAMILY MEDIUM	4563.30	792.44	415.61	233.18	0.00					3122.07	31.62
TOTAL ENTIRE CAMAS LAND USE	9872.22	792.44	415.61	233.18	36.24					8394.75	85.03

N

0 4,000 8,000 Feet

WTP

BUTLER RESERVOIR

GREGG BPS

GREGG RESERVOIR

LACAMAS BPS

LACAMAS RESERVOIR

LACAMAS LAKE

WELL 9

WTP

ANGELO BPS

LOWER PRUNE HILL RESERVOIRS AND BPS

WELL 13

WASHOUGAL WELLFIELD WELLS 7, 8, 10, 11, 12

SR14

UPPER PRUNE HILL RESERVOIRS AND BPS

WELL 14

FRANCIS RD BPS

FOREST HOME BPS

WELL 6

WELL 5

WASHINGTON

OREGON

COLUMBIA RIVER

LEGEND:

- Reservoir
- Pump Station
- WTP Water Treatment
- W Wells
- Water Lines
- WATER SERVICE BOUNDARY
- URBAN GROWTH BOUNDARY
- URBAN RESERVE
- CITY LIMITS
- PARCELS

SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 1-5
WATER SYSTEM FACILITIES

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\05471\GIS\FIGURE3-3_new.MXD

CHAPTER 2

REVISED PLANNING DATA

INTRODUCTION

This chapter presents revised sewer flow projections based on the addition of the north urban growth area (NUGA) expansion to the sewer service area. Additionally, this chapter addresses additional sewer flows from the Grass Valley area due to higher commercial development in that area than what was projected in the May 2007 *General Sewer and Wastewater Facility Plan.*

WATER SYSTEM DEMANDS AND EQUIVALENT RESIDENTIAL UNITS

These flows have been derived based on water demands developed in the City's May 2009 draft *Water System Plan*. Table 2-1 provides a summary of projected water demands used to develop sewer flows for the non-NUGA area; these demands account for development in Grass Valley. Table 2-2 presents water demand projections for the NUGA expansion. Table 2-3 summarizes all water demand projections.

Tables 2-4 through 2-9 provide a breakdown of equivalent residential units (ERUs) for the water system as of 2007. These tables were prepared in order to develop a comparison between the water and sewer service ERUs later in this Chapter and assist the City's financial consultant perform a rate analysis for the two utilities, which is summarized in Chapter 6.

TABLE 2-1

Non-NUGA Demand Projections – Water

Year	Non-NUGA Population	Residential, Commercial, and City Demand[1] (gpd)	Industrial Demand[2] (gpd)	DSL @ 11%[3] (gpd)	Total ADD[4] (gpd)	MDD[5] (gpd)	PHD[6] (gpm)
2009	17,135	2,433,178	1,364,874	469,422	4,267,475	9,388,444	11,736
2015	19,994	2,839,153	1,948,762	591,765	5,379,679	11,835,295	14,794
2025	25,858	3,671,809	2,830,000	803,594	7,305,404	16,071,888	20,090
2028	27,932	3,966,318	2,830,000	839,994	7,636,312	16,799,887	21,000

(1) Non-NUGA Population * 142 gpcd, 142 gpcd is equal to the average of total production from 2005 to 2007 less industrial demand and DSL, divided by the population. Spread linearly based on buildout by 2025. Total of 710 acres, and 3,000 gallons per day per acre, plus 700,000 gpd for Wafertech.

(2) Spread linearly based on buildout by 2025. Total of 710 acres, and 3,000 gallons per day per acre, plus 700,000 for Wafertech.

(3) DSL = Distribution System Leakage = Total ADD * 0.11.

(4) ADD = Average Day Demand - Sum (Residential, Commercial, City, and Industrial Demand) ÷ 0.89.

(5) MDD = Maximum Day Demand = ADD * 2.2.

(6) PHD = = Peak Hour Demand = MDD * 1.8 / (24 * 60).

TABLE 2-2

NUGA Demand Projections – Water

Year	NUGA Population	Residential Demand[(1)] (gpd)	LI/BP Demand[(2)] (gpd)	Commercial Demand[(3)] (gpd)	DSL @ 11%[(4)] (gpd)	Total ADD[(5)] (gpd)	MDD[(6)] (gpd)	PHD[(7)] (gpm)
2009	-	-	-	-	-	-	-	-
2010	-	-	-	-	-	-	-	-
2011	777	90,186	4,286	2,923	12,038	109,433	240,753	301
2015	3,887	450,931	21,432	14,615	60,188	547,165	1,203,764	1,505
2025	11,662	1,352,792	64,296	43,844	180,565	1,641,496	3,611,292	4,514
2028	11,662	1,352,792	64,296	43,844	180,565	1,641,496	3,611,292	4,514

(1) Linearly distributed based on a total buildout population of 11,662 (see G&O memo of August 7, 2008) and 116 gpcd. 116 gpcd is equal to the average residential consumption from 2005 to 2007, divided by the population.

(2) Linearly distributed based on total employees on the developable acreage, 2,819 (determined from the *North UGA Expansion Water and Sewer Infrastructure Analysis* by Gray & Osborne in September 2007) and 18 gpd/employee from the *Washington DOH Water System Design Manual*.

(3) Linearly distributed based on the developable acreage, 66.4 (total commercial acreage determined from the G&O memo of July 23, 2008, and reduced by 25 percent to account for infrastructure as stated in the *North UGA Expansion Water and Sewer Infrastructure Analysis* by Gray & Osborne in September 2007) and 660 gpd/acre for commercial use. This value (660 gpd/acre was determined based on the average commercial water use in 2007, 150,000 gpd, over the existing 227 commercial acres in the City (150,000 / 227 = 660 gpd/acre).

(4) DSL = Total ADD * 0.11.

(5) NUGA Total ADD = Sum(Residential , LI/BP, and Commercial Consumption) / 0.89.

(6) NUGA MDD = NUGA ADD * 2.2.

(7) NUGA PHD = NUGA MDD * 1.8 / (24 * 60).

TABLE 2-3

Total Demand Projections[(1)] – Water

Year	Total Population	Total Residential, Commercial, LI, and BP Demand (gpd)	Total Industrial Demand (gpd)	Total DSL @ 11% (gpd)	Total ADD (gpd)	Total MDD (gpd)	Total PHD (gpm)
2009	17,135	2,433,178	1,364,874	469,422	4,267,475	9,388,444	11,736
2010	17,581	2,496,566	1,462,189	489,284	4,448,039	9,785,686	12,232
2011	18,817	2,659,001	1,559,503	521,388	4,739,892	10,187,386	253,487
2015	23,881	3,326,130	1,948,762	651,953	5,926,845	11,837,176	1,218,558
2025	37,520	5,132,741	2,830,000	984,159	8,946,900	16,077,531	3,631,382
2028	39,594	5,427,250	2,830,000	1,020,559	9,277,809	16,805,530	3,632,292

(1) The sum of Non-NUGA Demands from Table 2-1, and NUGA Demands from Table 2-2.

Tables 2-4 through 2-6 project ERUs for the City through the water system 20-year planning period. These projections are based on an average ERU value from 2004 to 2007, which was determined to be 296 gpd/ERU.

TABLE 2-4

Non-NUGA ERU Projections – Water

Year	Residential[(1)]	Commercial[(2)]	City[(3)]	Irrigation[(4)]	Industrial[(5)]	DSL @11%[(6)]	Total ERUs[(7)]
2009	6,823	575	82	740	4,611	1,586	14,417
2010	7,001	590	84	759	4,940	1,653	15,027
2011	7,183	606	87	779	5,269	1,721	15,643
2015	7,961	671	96	863	6,584	1,999	18,175
2025	10,296	868	124	1,116	9,561	2,715	24,680
2028	11,122	938	134	1,206	9,561	2,838	25,798

(1) Residential ERUs = SF + MF ERU percentage from Table 4 (0.83)* third column in Table 2-1.
(2) Commercial ERUs = Commercial ERU percentage from Table 4 (0.07) * third column in Table 2-1.
(3) City ERUs = City ERU percentage from Table 4 (0.01) * third column in Table 2-1.
(4) Irrigation ERUs = Irrigation ERU percentage from Table 4 (0.09) * third column in Table 2-1.
(5) Industrial ERUs = Industrial Demand from Table 2-1, Column 4 / 296 gpd per ERU.
(6) DSL ERUs = DSL Demand from Table 2-3, Column 5 / 296 gpd per ERU.
(7) Total ERUs = sum of Residential, Commercial, City, Irrigation, Industrial, and DSL ERUs.

TABLE 2-5

NUGA ERU Projections – Water

Year	Residential[(1)]	LI/BP[(2)]	Commercial[(3)]	DSL @ 11%[(4)]	Total ERUs[(5)]
2009	-	-	-		-
2010	-	-	-		-
2011	305	14	10	41	370
2015	1,523	72	49	203	1,849
2025	4,570	217	148	610	5,546
2028	4,570	217	148	610	5,546

(1) Residential ERUs = Residential Demand from Table 2, Column 3 / 296 gpd per ERU.
(2) LI/BP ERUs = LI/BP Demand from Table 2, Column 4 / 296 gpd per ERU.
(3) Commercial ERUs = Commercial Demand from Table 2, Column 5 / 296 gpd per ERU.
(4) DSL ERUs = DSL Demand from Table 2, Column 6 / 296 gpd per ERU.
(5) Total ERUs = Sum of Residential, LI/BP, Commercial, and DSL ERUs.

TABLE 2-6

Total ERU Projections[(1)] – Water

Year	Residential	Commercial	Industrial, LI, and BP	City	Irrigation	DSL	Total ERUs
2009	6,823	575	4,611	82	740	1,586	14,417
2010	7,001	590	4,940	84	759	1,653	15,027
2011	7,488	616	5,283	87	779	1,761	16,013
2015	9,485	721	6,656	96	863	2,203	20,023
2025	14,866	1,016	9,778	124	1,116	3,325	30,226
2028	15,692	1,086	9,778	134	1,206	3,448	31,344

(1) Sum of Non-NUGA ERU projection from Table 6 and NUGA ERU projections from Table 7.

WASTEWATER FLOWS, LOADINGS AND EQUIVALENT RESIDENTIAL UNITS

Table 2-7 was developed from Table 6-11 from the City of Camas May 2007 *General Sewer and Wastewater Facility Plan.* In the *2007 Plan*, the projected flows and ERUs are based on use of the growth assumptions applied to all customer classes except the industrial category. Projected future industrial flows were developed based on evaluation of each major industry's permitted capacity. In addition, a special industrial reserve of 0.7 mgd for 2015 and 1.4 mgd for 2025 was included for low strength wastewater (less than 8 mg/L BOD_5, 10 mg/L TSS, and 10 mg/L TKN). I/I was assumed to be constant for the non-NUGA area throughout the period. (In other words, increases in I/I due to the addition of new pipes and deterioration of old pipes are assumed to equal to decreases in I/I due to ongoing I/I reduction efforts.) Future WWTF flows were projected based on a dry weather flow of 149 gpd/ERU. To estimate future annual average, maximum month, and peak day flows, the I/I flow rates were added to the base level wastewater flows derived from the population projections to obtain the respective future WWTF influent flow rates.

A comparison of the current population and ERU projections for both the water and sewer utilities within the non-NUGA service area is shown in Table 2-8 for the years 2015 and 2025. For the NUGA portion of the service area, water demands in Table 2-2 were converted to sewer flows. As indicated in note (1) of Table 2-2, a per capita water demand of 116 gpcd was used for the NUGA area residential demand projects (does not include DSL).

The per capita sewer base flows (flows without I/I) can be estimated from information provided in the May 2007 *General Sewer and Wastewater Facility Plan*. The residential sewer flows are estimated from 2004-2005 winter water demands of 1,111,000 gpd from an estimated service population of 15,710 as 70.7 gpcd. Flows from non-residential sources are estimated in a similar manner used in the May 2007 *General Sewer and Wastewater Facility Plan* by assuming that on average 15 percent of the projected water

consumption is lost to irrigation, evaporation and spills. Table 2-9 summarizes NUGA flow and ERU projections for the sewer utility.

TABLE 2-7

Non-NUGA ERUs and Sewer Flows 2005 – 2025

Customer Type	Sewer ERUs			
	2005 (Actual)	**2015 (Projected)**	**2025 (Projected)**	**Buildout[(2)]**
Single-Family Residential	5,613	8,363	9,205	13,608
Multi-family Residential	729	1,086	1,196	7,546
Commercial	652	972	1,070	2,176
Industrial	6,224	9,857	12,556	25,537
City	52	77	85	173
TOTAL	13,270	20,356	24,112	49,039
Projected Flows (mgd)[(1)]				
Total Base Flow	1.98	3.03	3.59	7.31
Low-strength Industrial Reserve	0	0.70	1.40	Included in Industrial ERUs
Average Annual Flow	2.29	4.04	5.30	7.62
Maximum Month	3.09	4.84	6.10	8.42
Peak Day	7.03	8.78	10.04	12.36
Peak Hour	9.93[(3)]	11.47	13.44	17.06

(1) I/I assumed to remain constant during planning period. However, currently "constrained I/I" is projected to reach WWTP in future. See Note 3.

(2) Buildout ERUs and flows assume that commercial, industrial and City ERUs grow at the same rate as the overall population.

(3) Includes an estimated 1.1 mgd of "constrained I/I" that did not reach the WWTP during the peak hour storm event that would be expected to reach the WWTP after increasing pipe sizes.

TABLE 2-8

Comparison of Water and Sewer ERUs for Non-NUGA Service Area

Parameter	Year			
	2015		2025	
	Water	Sewer	Water	Sewer
Population	19,994	23,375	25,858	25,821
Residential ERUs	7,961	9,449	10,296	10,401
Commercial ERUs	671	972	868	1,070
Industrial ERUs	6,584	9,857	9,561	12,556
City ERUs	96	77	124	85
Irrigation ERUs	863	n/a	1,116	n/a
Distribution System Leakage ERUs	2.203	n/a	3.325	n/a
Grass Valley (Sewer Only)	(1)	1,206	(1)	2,413
Total ERUs	18,715	21,561	24,680	26,525

(1) Grass Valley Water Demands have been incorporated into residential and commercial demands.

TABLE 2-9

NUGA Flow and ERU Projections - Sewer

Year	NUGA Population	Residential Flow[(1)] (gpd)	LI/BP Flow[(2)] (gpd)	Commercial Flow[(2)] (gpd)	Total Base Flow (gpd)	Sewer ERUs[(3)]	Water ERUs[(4)]
2009	-	-	-		-	-	-
2010	-	-	-		-	-	-
2011	777	46,694	3,097	2,112	51,903	348	370
2012	1,555	93,448	6,194	4,224	103,865	697	739
2013	2,332	140,142	9,291	6,336	155,768	1,045	1,109
2014	3,110	186,895	12,388	8,447	207,731	1,394	1,479
2015	3,887	233,589	15,484	10,560	259,633	1,743	1,849
2016	4,665	280,343	18,581	12,671	311,595	2,091	2,218
2017	5,442	327,037	21,678	14,782	363,498	2,440	2,588
2018	6,220	373,791	24,775	16,895	415,460	2,788	2,958
2019	6,997	420,485	27,872	19,006	467,363	3,137	3,327
2020	7,775	467,239	30,969	21,118	519,326	3,485	3,697
2021	8,552	513,932	34,066	23,230	571,228	3,834	4,067
2022	9,330	560,686	37,163	25,342	623,191	4,182	4,436
2023	10,107	607,380	40,260	27,453	675,094	4,531	4,806
2024	10,885	654,134	43,358	29,566	727,057	4,880	5,176
2025	11,662	700,828	46,454	31,677	778,959	5,228	5,546
2026	11,662	700,828	46,454	31,677	778,959	5,228	5,546
2027	11,662	700,828	46,454	31,677	778,959	5,228	5,546
2028	11,662	700,828	46,454	31,677	778,959	5,228	5,546

(1) NUGA Population * 70.7 gpcd * 0.85.
(2) NUGA Water demand from Table 2-2 * 0.85.
(3) Total Average Annual Flow ÷ 149 gpd/ERU.
(4) Table 2-5 – Water, Fifth Column.

Table 2-10 shows average annual, maximum day and peak hour sewer flows for the NUGA in years 2015 and 2025 based on information in Table 2-9 as well as projections for Grass Valley that were not included in the May 2007 *General Sewer and Wastewater Facility Plan.* NUGA average annual, maximum month and maximum day sewer flows were calculated by multiplying areal I/I rates based on the 2007 Plan by the 2015 and 2025 NUGA developed areas, and adding the product to the base flow. For calculation of average annual and maximum month flows, the actual average areal I/I rates for the entire City (90 gpad and 270 gpad respectively) were used to calculate NUGA flows.

For calculation of peak hour NUGA flow, a diurnal peaking factor of 2.82, and the maximum peak hour areal I/I rate (500 gpad) for areas developed within the last 25 years were used. Peak day flows were calculated as the addition of base flow and peak day I/I, using the same ratio of peak day I/I to peak hour I/I as in the *May 2007 Plan.*

Peak hour flows for the Grass Valley area were calculated based on an assumption of 3,000 gpad base flow. This areal flow rate is a conservative buildout value used by King County and other jurisdictions in estimating flows from commercial development. Peak hour I/I was calculated using the assumption of 500 gpad as was used in the calculation of NUGA flows. Projected daily average base flows were calculated based on a peak hour to peak day peaking factor of 3.0 (assuming an 8-hour workday). Maximum month, peak day, annual average and peak hour flows were calculated using the same areal I/I rates as for the NUGA. It was assumed that 50 percent of the 2025 (buildout) flow was present by 2015.

Total projected sewer flows were calculated as the sum of the non-NUGA, NUGA and Grass Valley flows for each flow category (average annual, maximum month, peak hour and maximum day).

Table 2-11 provides projections of sewer loadings for organics, solids and nitrogen. Future WWTF maximum month BOD_5 and TSS loadings were estimated by multiplying the total projected number of ERUs (including non-NUGA, NUGA and Grass Valley) by the respective ERU-based loadings, and adding additional loading for a low-strength industrial reserve as indicated below. As in the *2007 Plan,* the future ERU-based annual average BOD_5 and TSS loadings are estimated using the ratio of the maximum month to annual average loadings of these parameters. The current maximum month BOD_5 and TSS loadings are 0.229 lb BOD_5/ERU/d and 0.327 lb TSS/ERU/d. The ratio of the maximum month to annual average BOD_5 is 1.37:1. The ratio of the maximum month to annual average TSS is 1.36:1.

As in the *2007 Plan,* the strength of the combined industrial wastewater with regard to BOD_5 and TSS *for the industrial ERUs* discharged to the City is assumed to be that of domestic wastewater for this analysis. The industrial ERUs include a reserve of 0.50 mgd of domestic strength industrial wastewater beyond the NPDES-permitted maximum flows. (It is likely that the combined industrial wastewater is more dilute than domestic, but due to a lack of information regarding BOD_5 and TSS concentrations for current and future industries, use of domestic concentrations is appropriate and conservative.) However, the *industrial low-strength reserve* of 0.7 mgd for 2015 and 2025 for 1.4 mgd is assumed to be low strength (e.g., pretreated) with concentrations not exceeding 8 mg/L BOD_5, 10 mg/L TSS, and 10 mg/L TKN.

Ammonia nitrogen concentrations and loadings are estimated based on the projected number of Wafertech and non-Wafertech ERUs. Non-Wafertech TKN loadings are estimated based on a ammonia/TKN ratio of 0.62, and industrial TKN loadings are estimated based on a ammonia/TKN ratio of 0.78, based on the composition of Wafertech's wastewater.

TABLE 2-10

Projected Flows 2015 and 2025 – Sewer

Category	Year			
	2005 (Actual)	2015 (Projected)	2025 (Projected)	Buildout[2]
Non-NUGA Projected Flows (mgd)[1]				
Total Base Flow	1.98	3.03	3.59	7.31
Low-strength Industrial Reserve	0	0.70	1.40	Included in Industrial ERUs
Average Annual Flow	2.29	4.04	5.30	7.62
Maximum Month	3.09	4.84	6.10	8.42
Peak Day	7.03	8.78	10.04	12.36
Peak Hour	9.93[3]	11.47	13.44	17.06
NUGA Projected Flows (mgd)[4]				
Total Base Flow	n/a	0.26	0.78	0.78
Average Annual Flow	n/a	0.29	0.88	0.88
Maximum Month	n/a	0.36	1.08	1.08
Peak Day	n/a	0.41	1.23	1.23
Peak Hour	n/a	1.04	2.76	2.76
Grass Valley Projected Flows (mgd)[5]				
Total Base Flow	n/a	0.17	0.35	0.35
Average Annual Flow	n/a	0.19	0.37	0.37
Maximum Month	n/a	0.20	0.39	0.39
Peak Day	n/a	0.25	0.50	0.50
Peak Hour	n/a	0.63	1.26	1.26
Total Projected Sewer Flows (mgd)				
Average Annual Flow	2.29	4.52	6.55	8.87
Maximum Month	3.09	5.40	7.57	9.89
Peak Day	7.03	9.44	11.77	14.09
Peak Hour	9.93[3]	13.14	17.46	21.08

(1) I/I assumed to remain constant during planning period. However, currently "constrained I/I" is projected to reach WWTP in future. See Note (3).

(2) Buildout ERUs and flows assume that commercial, industrial and City ERUs grow at the same rate as the overall population.

(3) Includes an estimated 1.1 mgd of "constrained I/I" that did not reach the WWTP during the peak hour storm event that would be expected to reach the WWTP after increasing pipe sizes.

(4) See discussion in text for methods of estimating.

(5) See discussion in text for methods of estimating.

TABLE 2-11

Projected Loadings 2015 and 2025 - Sewer

	Units	2005 (actual)	2015	2025
Total ERUs	--	13,270	23,304	31,754
Average Annual BOD_5	lb/d	2,218	3,929	5,376
Maximum Month BOD_5	lb/d	3,039	5,383	7,365
Average Annual TSS	lb/d	3,191	5,647	7,720
Maximum Month TSS	lb/d	4,339	7,679	10,500
Average Annual NH_3-N	lb/d	730	1,300	2,050
Maximum Month NH_3-N	lb/d	1,029	1,833	2,890
Average Annual TKN	lb/d	1,017	1,980	2,733
Maximum Month TKN	lb/d	1,367	2,792	3,853

BOD_5 = 5-day Biochemical Oxygen Demand
TSS = Total Suspended Solids
NH_3-N = Ammonia Nitrogen
TKN = Total Kjeldahl Nitrogen

Table 2-12 presents projections for sewer ERUs for the years 2015 and 2025 using information from Tables 2-7 and 2-9.

TABLE 2-12

Total ERUs – Sewer

	Year		
Service Classification	**2005**	**2015**	**2025**
Residential(1)	6,342	11,017	15,105
Commercial(2)	652	1,043	1,283
Industrial(3)	6,224	9,961	12,868
City(4)	52	77	85
Grass Valley(5)	-	1,206	2,413
TOTAL	13,270	23,304	31,754

(1) Table 2-7 (SFR + MFR) plus Table 2-9 - Sewer Residential Flows ÷ 149 gpd/ERU.
(2) Table 2-7 (Commercial) plus Table 2-9 - Sewer Commercial Flows ÷ 149 gpd/ERU.
(3) Table 2-7 (Industrial) plus Table 2-9 - Sewer LI/BP Flows ÷ 149 gpd/ERU.
(4) Table 2-7 (City) plus Table 2-9 - Sewer City Flows ÷ 149 gpd/ERU.
(5) ERUs will be residential and commercial, partitioning to be determined in the future

Table 2-13 summarizes ERU projections for the water and sewer utilities for years 2015 and 2025 using information from Tables 2-10 and 2-11.

TABLE 2-13

Comparison of Water and Sewer ERUs for Full Service Area

Parameter	Year			
	2015		2025	
	Water	Sewer	Water	Sewer
Population	23,882	27,262	37,520	37,483
Residential ERUs	9,485	11,017	14,866	15,105
Commercial ERUs	721	1,043	1,016	1,283
Industrial ERUs	6,656	9,961	9,778	12,868
City ERUs	96	77	124	85
Irrigation ERUs	863	n/a	1,116	n/a
Distribution System Leakage ERUs	2,203	n/a	3,325	n/a
Grass Valley (Sewer Only)	(1)	1,206	(1)	2,413
Total ERUs	20,024	23,304	30,225	31,754

(1) Grass Valley Water Demands have been incorporated into residential and commercial demands.

CHAPTER 3

REVISED COLLECTION SYSTEM ANALYSIS

This chapter presents revised sewer modeling results and additional conveyance needs based on the incorporation of the North Urban Growth Area (NUGA) expansion into the sewer service area, as discussed in Chapter 1. Additionally, the effects of the Grass Valley development to the City's septic tank effluent pump (STEP) and collection system are also addressed.

NUGA BASINS

For the purposes of this analysis, the NUGA was divided into six separate drainage basins based on topography, existing roads and parcel lines. The basins were developed to allow flows within each basin to drain via gravity to a proposed new pump station located near the low point within the basin. Figure 3-1 shows the six proposed basins and the proposed location of the six pump stations and force main routings. This analysis assumes that all flows generated within the NUGA travel in a generally southeasterly direction along the north side of Lacamas Lake and enter into the City's existing sewer system on Crown Road. As an interim stage, prior to full development, the possibility of temporarily partitioning off flows from developments within Basins I and II to the existing STEP system to the southwest is also addressed. Discharge to the STEP system should be temporary because flows from NUGA were not included in the original design of STEP conveyance, and high operation and maintenance costs and unfavorable downstream impacts to conveyance and WWTP facilities have led the City to conclude that further expansion of the STEP service is undesirable. Pump station and force main routing for the temporary discharges to the STEP system are shown on Figure 3-2.

NUGA FLOWS AND PUMP STATION REQUIREMENTS

Table 3-1 summarizes the estimated flows originating from each basin. Flows within the basins were developed from a weighted average of land use areas and estimated flows from each land use within the basins. The total flow of 2.76 mgd peak hour flow in 2025, developed in Chapter 2 (Table 2-12), was used as the basis of this projection of NUGA flows. Land uses within the NUGA are shown in Figure 1-3. Table 3-2 summarizes the proposed pump station requirements.

TABLE 3-1

Projected 2025 NUGA Basin Flows

Basin	Residential Annual Average Flow (gpd)	Light Industry Estimated (gpd)	Commercial Annual Average Flow (gpd)	Total Annual Average Flow (gpd)	Peak Hour Flow (gpd)
I	297,212	-	31,576	328,788	1,031,198
II	93,032	-	-	93,033	291,784
III	35,416	19,847	-	55,263	173,325
IV	87,245	32,633	4,199	124,078	389,153
V	157041	-	-	157,040	492,540
VI	121,798	-	-	121,798	382,000
Total	791,744	52,480	35,775	880,000	2,760,000

TABLE 3-2

Projected NUGA Basin Pump Station and Force Main Requirements

Basin/Pump Station	Peak Hour Flow from Basin (gpd)	Pump Station Capacity (gpd) (gpm)	Force Main Length (ft)	Force Main Diameter (inch)	Total Dynamic Head (ft)	Horsepower
I	1,031,198	1,031,198 (716)	8,200	10	87	20
II	291,784	291,784 (203)	3,000	6	56	5
III	173,325	1,496,307[(1)] (1,040)	4,700	12	310	100
IV	389,153	389,153 (270)	3,600	14	230	100
V	492,540	492,540 (342)	9,000	16	137	70
VI	382,000	382,000 (265)	400	6	114	10

(1) Summation of Peak Hour Flows from Basins I and III.

In addition to the series of pump stations and force mains shown above, gravity lines are also required to connect Basin I to Basin IV and to connect the NUGA to the City's existing sewer system on Crown Road. Assuming a minimum slope of 0.5 percent, the gravity line required to connect Basin I to Basin IV is approximately 9,000 linear feet of 12-inch-diameter pipe. The line connecting the NUGA to the existing system is approximately 5,000 linear feet of 16-inch-diameter pipe.

N

0 2,500 5,000 Feet

PROPOSED PUMP STATION

GREEN MOUNTAIN GOLF COURSE

I

II

CAMAS MEADOWS GOLF COURSE

PROPOSED PUMP STATION

CAMP CURRIE

TO TWO CREEKS P.S.

III

IV

PROPOSED PUMP STATION

PROPOSED PUMP STATION

V

PROPOSED PUMP STATION

VI

PROPOSED PUMP STATION

LARKSPUR P.S.

GRASS VALLEY P.S.

HILLSHIRE P.S.

STONE LEAF P.S.

PACIFIC RIM

LACAMAS PARK

LACAMAS LAKE

WEAKLEY HILL

HATHAWAY

OSTENSON-CANYON

THOMPSON

BRADFORD

IRELAND

WYLIE

CAVITT

COOPER

STAUFFER

REILLY

NOURSE

BLAIR

ZEEK

INGLE

GOODWIN

COUNTY

LEADBETTER

LEVEE

JACKSON

PARKER

VAN VLEET

ARMSTRONG

BYBEE

FAIRVIEW

CROWN

STRONG

ROBINSON

DELP

PERRY

BROWN

LIVINGSTON

LESSARD

MINNEAPOLIS

SR-500

LEGEND:

GRAVITY
- 12-INCH GRAVITY
- 16-INCH GRAVITY

FORCE MAIN
- 6-INCH FM
- 10-INCH FM
- 12-INCH FM
- 14-INCH FM
- 16-INCH FM

NUGA BOUNDARY

CITY LIMITS

PARCELS

I - 524 Acres

II - 417 Acres

III - 233 Acres

IV - 500 Acres

V - 192 Acres

VI - 397 Acres

SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 3-1
NUGA SEWER CONVEYANCE INFRASTRUCTURE

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\07201 UGA EXPANSION\GIS\FIGURE 3-1 FINAL.MXD

N

0 2,500 5,000 Feet

I

II

III

IV

V

VI

PROPOSED PUMP STATION

GREEN MOUNTAIN GOLF COURSE

CAMAS MEADOWS GOLF COURSE

PROPOSED PUMP STATION

CAMP CURRIE

PROPOSED PUMP STATION

PROPOSED PUMP STATION

PROPOSED PUMP STATION

PROPOSED PUMP STATION

LEGEND:

GRAVITY
- 12-INCH GRAVITY
- 16-INCH GRAVITY

FORCEMAIN
- 6-INCH FM
- 10-INCH FM
- 12-INCH FM
- 14-INCH FM
- 16-INCH FM
- SEWER PIPES
- CITY LIMITS
- PARCELS

PROPOSED SEWER BASINS
- I - 524 Acres
- II - 417 Acres
- III - 233 Acres
- IV - 500 Acres
- V - 192 Acres
- VI - 397 Acres

SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 3-2
NUGA TEMPORARY SEWER
CONVEYANCE INFRASTRUCTURE

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\07201 UGA EXPANSION\GIS\FIGURE 3-2 FINAL.MXD

EXISTING COLLECTION SYSTEM MODEL RESULTS

The City's Wastewater Collection System Hydraulic Model, developed by Gray & Osborne for the May 2007 *General Sewer/Wastewater Facilities Plan,* using DHI, Inc. Mouse modeling software, was revised and utilized to determine the impact of the proposed NUGA expansion on the existing sewer system. A more detailed description of the Mouse software is included in Appendix F of the May 2007 *General Sewer/Wastewater Facilities Plan.* Projected year 2025 flow from the NUGA, 2.76 million gallons per day (mgd) peak hour, was applied as input into the model at a location near the top of the existing system on Crown Road, Manhole 7-3-5. The Crown Road system gravity feeds into the existing Lacamas Creek Pump Station, which pumps to the gravity system at Manhole 6-1-9, from which wastewater ultimately flows by gravity to the Main Pump Station. Figure 3-3 shows the existing sewer collection system affected by the NUGA expansion. The model analysis assumed that future improvements have been constructed to route the existing 21-inch STEP system currently discharging to the gravity system at 6th Avenue and Joy Street to a new alignment on the recently constructed bridge over the Washougal River and conveyed to the Wastewater Treatment Facility, as recommended in the May 2007 *General Sewer/Wastewater Facilities Plan.*

The results of the existing collection system analysis downstream of the NUGA are summarized in Table 3-3. The model shows that the existing gravity system upstream of the Lacamas Creek Pump Station requires increased capacity. The diameter of the existing gravity sewer along Crown Road to the pump station will need to be increased to 15 inches. The gravity system downstream of the Lacamas Creek Pump station is currently at or near capacity as discussed in the May 2007 *General Sewer/Wastewater Facility Plan.* The model shows an acceptable level of surcharging (less than 6 inches) in this system with the current pipe sizes, assuming the STEP flow is rerouted, even with the inclusion of Grass Valley and Green Mountain flows. If the STEP system is not rerouted, an unacceptable amount of surcharging results in all pipes downstream of the confluence of the Lacamas Creek system and the STEP system at 2nd and Joy. (This level of surcharging presents the risk of sewage backups into residential basements.) Improvements to the downstream system would be required with or without the additional flow from the NUGA if the STEP system is not rerouted. Additional hydraulic data from the collection system analysis is included in Appendix B.

TABLE 3-3

Summary of Model Results for Existing Sewer Collection System Downstream of NUGA

Pipe ID	From Manhole	To Manhole	Length (ft)	Current Diameter (in)	Required Diameter (in)	Peak Hour (mgd)	Surcharge (in)
7-3-5l1	7-3-5	7-3-4	121	8	16	2.76	None
7-3-4l1	7-3-4	7-3-3	194	8	16	2.76	None
7-3-3l1	7-3-3	7-3-2	151	8	16	2.76	None
7-3-2l1	7-3-2	7-3-1	118	8	16	2.76	None
7-3-1l1	7-3-1	7-1-1	191	8	16	2.76	None
7-1-1l1	7-1-1	L C PS	328	10	16	3.53	None
6-1-9l1	6-1-9	6-1-8	277	18	18	3.53	None
6-1-8l1	6-1-8	6-1-7	269	18	18	3.53	4
6-1-7l1	6-1-7	6-1-6	256	18	18	3.53	4
6-1-6l1	6-1-6	6-1-5	280	18	18	3.53	4
6-1-5l1	6-1-5	6-1-4	279	18	18	3.65	None
6-1-4l1	6-1-4	6-1-3	265	18	18	3.65	3
6-1-3l1	6-1-3	6-1-2	269	18	18	3.65	None
6-1-2l1	6-1-2	6-1-1	251	18	18	3.65	None
6-1-1l1	6-1-1	5-2-3	266	21	21	3.65	None
5-2-3l1	5-2-3	5-2-2	75	18	18	3.65	None
5-2-2l1	5-2-2	5-2-1	80	18	18	3.65	None
5-2-1l1	5-2-1	5-1-1	76	18	18	3.65	4
5-1-1l1	5-1-1	Main PS	142	24	24	9.216	None

As discussed in the May 2007 *General Sewer/Wastewater Facilities Plan*, the Lacamas Creek pump station had capacity to accommodate approximately 235 additional homes in 2007. Pump station capacities are established based on one pump on standby, as required by the Department of Ecology. It is recommended that a new pump station be constructed to replace the existing Lacamas Creek pump station to accommodate the increase in peak hour flow to 3.53 mgd (2,451 gpm) due to the NUGA expansion. This new pump station could be built on property adjacent to the existing pump station, which the City would need to acquire.

Additionally, the Lacamas Creek Pump Station currently pumps via a 6-inch force main to Manhole 6-1-9. The increased flow, as a result of the NUGA expansion, will require an increase in the size of the force main to 15 inches. This sizing is based on a maximum design velocity of 5.0 fps through the force main.

Sewer system hydraulic data and calculations for the NUGA are summarized in Appendix B.

GREGG RESERVOIR ANNEXATION

VI

15

PROPOSED NEW FORCEMAIN

PROPOSED NEW BASIN VI PUMP STATION

PROPOSED NEW SEWER ON CROWN ROAD

INCREASE CAPACITY OF EXISTING CROWN ROAD SEWER

NEW STEP MAIN BYPASS REQUIRED FROM 6TH AND JOY (NOT SHOWN FOR CLARITY)

REPLACE FORCEMAIN

REPLACE LACAMAS CREEK L.S.

EXISTING GRAVITY LINE

EXISTING FORCEMAIN

EXISTING MAIN L.S.

2

3s

4

5

6

7

8

9

N

0 1,000 2,000 Feet

LEGEND:

- PROPOSED PUMP STATION
- NEW MANHOLES
- MANHOLES
- PUMP STATION

PIPE SIZES (DIA.)

- 1-INCH
- 2-INCH
- 3-INCH
- 4-INCH
- 6-INCH
- 8-INCH
- 10-INCH
- 12-INCH
- 15-INCH
- 18-INCH
- 21-INCH
- 24-INCH

PROPOSED NUGA SYSTEM

- SEWERLINE
- FORCEMAIN
- SEWER CONVEYANCE FOR NUGA THROUGH EXISTING SEWER SYSTEM
- GREGG RESERVOIR ANNEXATION
- URBAN RESERVE
- CITY LIMITS
- URBAN GROWTH BOUNDARY
- EXISTING SEWER BASINS
- PARCELS

PROPOSED NUGA SEWER BASIN:

- VI - 397 Acres

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 3-3
NEW CROWN ROAD SEWER AND EXISTING SEWER SYSTEM MODIFICATIONS TO SERVE NUGA

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\05471\GIS\FIGURE3-3_new.MXD

SEWER SYSTEM INFRASTRUCTURE COST ESTIMATES

Cost estimates in Tables 3-4 and 3-5 are based on unit construction costs for similar projects using the collection system configuration shown on Figure 3-1. More detailed cost estimates are included in Appendix C. All estimates presented in this chapter are for a main trunk conveyance system only and do not include neighborhood collector systems. Costs of property acquisition are not included in any cost estimates. Estimated costs include engineering, sales tax, and contingency.

TABLE 3-4

NUGA and Lacamas Creek Sewage Pump Station Preliminary Cost Estimates (2009 Dollars)

Item	Capacity (Peak Hour Flow) (gpm)	Estimated Cost
Basin I Pump Station	716	$ 1,550,000
Basin II Pump Station	203	$ 720,000
Basin III Pump Station	1040	$ 2,050,000
Basin IV Pump Station	270	$ 1,500,000
Basin V Pump Station	342	$ 1,330,000
Basin VI Pump Station	265	$ 830,000
Subtotal NUGA Pump Station Costs		**$ 7,980,000**
Lacamas Creek Pump Station and Force Main(1)	2,450	$ 2,870,000
Total NUGA and Lacamas Creek Pump Station Costs		**$ 10,850,000**

(1) This cost does not include the portion ($160,000) of the total projected cost that is required to serve areas currently within the City limits (e.g., Loyal Lands, Gregg Reservoir Annexation) per Appendix L of the May 2007 General Sewer/Wastewater Facilities Plan. The total project cost including this portion is $3,030,000.

TABLE 3-5

NUGA and Crown Road Sewer Transmission Main Preliminary Cost Estimates (2009 Dollars)

Item	Location	Estimated Cost
8,200 lf 10-inch Force Main	NUGA Basin I	$ 1,701,000
3,000 lf 6-inch Force Main	NUGA Basin II	$ 543,000
4,700 lf of 12-inch Force Main	NUGA Basins III, IV	$ 1,144,000
3,600 lf of 14-inch Force Main	NUGA Basin IV	$ 1,084,000
9,000 lf of 16-inch Force Main	NUGA Basins V, VI	$ 2,809,000
400 lf of 6-inch Force Main	NUGA Basin VI	$ 63,000
9,000 lf of 12-inch Gravity Sewer Main	NUGA Basins I,II, III	$ 2,398,000
5,000 lf of 16-inch Gravity Sewer Main	Crown Road	$ 1,703,000
1,100 lf of Existing Gravity Sewer Main Replaced with 16-inch Gravity Sewer Main	Crown Road to Lacamas Creek	$ 480,000
Sub-total Estimated NUGA Sewer Main Cost		**$11,925,000**

Table 3-6 summarizes costs for a conceptual sewer collection system needed to serve the projected growth in the NUGA.

TABLE 3-6

NUGA Sewer Infrastructure Preliminary Cost Estimate Summary (2009 Dollars)

Item	Estimated Cost
Pump Stations	$10,850,000
Sewer Lines	$11,925,000
Total Estimated NUGA Sewer Infrastructure Cost	**$22,775,000**

GRASS VALLEY

Wastewater flows from the proposed Grass Valley development will discharge into the existing STEP system. A hydraulic model of the STEP system was developed as part of the May 2007 *General Sewer/Wastewater Facility Plan*. For the current analysis, the model was revised to include the flows associated with the Grass Valley development, an additional 1.2 mgd peak hour as developed in Chapter 2. The existing STEP system has sufficient capacity to adequately convey the additional flow from the proposed development. Since the design details and the pump characteristics of the multiple, individual STEP pumps are not available, capacity of the STEP line was based on a maximum velocity on the STEP main of 4.0 ft/sec. The model shows that the maximum

velocity through the system does not exceed 3.2 ft/sec with the addition of the Grass Valley development. An additional factor considered to evaluate capacity was the pressure within the STEP line. The system is constructed of thin walled, 100-psi pipe which has numerous taps and has a history of maintenance problems. Due to concerns about the integrity and durability of the pipe, it was recommended in the May 2007 *General Sewer/Wastewater Facility Plan* for replacement in phases.

Impacts of the proposed Grass Valley flows on the existing downstream gravity system were not explicitly analyzed. As discussed previously, it is assumed that the STEP flow will be rerouted through new pipe on the new pedestrian bridge over the Washougal River and conveyed to the Wastewater Treatment Facility, as recommended in the May 2007 *General Sewer/Wastewater Facility Plan.* The existing gravity system downstream of the STEP discharge is currently at or over capacity as evidenced by surcharges in the Downtown area. Improvements to the downstream system would be required with or without the additional flow from the Grass Valley development if the STEP system is not rerouted.

CHAPTER 4

REVISED WASTEWATER TREATMENT FACILITY EVALUATION

The purpose of this chapter is to evaluate the wastewater treatment facility (WWTF) to determine its ability to meet its treatment objectives based on projected Camas flows and loadings for the year 2025, including flows and loadings from the NUGA and Grass Valley, and provide recommendations for improvements required to provide the necessary capacity and level of treatment.

DESIGN CRITERIA

Wastewater design flows and loads for the City, including the NUGA, for year 2025 are presented below in Table 4-1. This table also shows existing design criteria for the Phase II wastewater treatment facility, as indicated in the 1997 *Wastewater Facility Plan*. The treatment plant effluent quality must meet projected effluent limits in the City's NPDES permit for BOD_5, TSS, ammonia, fecal coliform and pH. These projected effluent quality criteria are presented below in Table 4-2.

TABLE 4-1

Current and Projected Future Flow and Loadings

Parameter	Existing (Phase II) Design Criteria[(1)]	Projected 2025 Criteria
Average Annual Flow (mgd)	5.30	6.55
Maximum Month Average Flow (mgd)	6.10	7.57
Peak Day Flow (mgd)	10.04	11.77
Peak Hour Flow (mgd)	13.44	17.46
Average Annual BOD_5 Loading (lb/day)	4,099	5,376
Maximum Month BOD_5 Loading (lb/day)	5,616	7,365
Average Annual TSS Loading (lb/day)	5,883	7,720
Maximum Month TSS Loading (lb/day)	8,001	10,500
Average Annual NH_3-N Loading (lb/day)	1,389	2,050
Maximum Month NH_3-N Loading (lb/day)	1,956	2,890
Average Annual TKN Loading (lb/day)	1,917	2,733
Maximum Month TKN Loading (lb/day)	2,573	3,853

(1) Phase II design criteria from 2007 *Wastewater Facility Plan.*

TABLE 4-2

Projected NPDES Permit Effluent Limits

Parameter	Average Monthly	Average Weekly
BOD_5	20 mg/L, 1,263 lb/d 70% removal of influent BOD_5	30 mg/L, 1,894 lb/d
TSS	20 mg/L, 1,263 lb/d 70% removal of influent TSS	30 mg/L, 1,894 lb/d
Ammonia	Summer: 20 mg/L, 1,263 lb/d Winter: 7 mg/L, 442 lb/d	No Limit
Fecal Coliform	200 FCU/100 ml	400 FCU /100 ml
pH	Daily minimum is equal to or greater than 6 and daily maximum is equal to or less than 9	

PHASE II WWTF IMPROVEMENTS

The existing WWTF is currently being upgraded by the Phase II construction project with construction lasting through 2011. This project will address the need for an increase in the solids treatment capacity, as originally identified in the 1997 *Wastewater Facility Plan*. The scope of the construction project is further described in the May 2007 *General Sewer/Wastewater Facility Plan* (as revised and approved in November 2009).

The Phase II WWTF project will construct the following improvements and modifications:

- New anaerobic digester facility including digester building.
- New sludge dryer to produce Class A biosolids, including remodel of existing sludge storage building to enclose new dryer.
- Additional odor control biofilter area and fan.
- New Waste Activated Sludge storage tank and rotary screen thickener.
- New centrifuge centrate storage tank.
- Additional septage storage tank volume.
- Additional (second) headworks mechanical fine screen.
- Additional (fourth) aeration blower.
- Additional (fourth) UV disinfection system bank of lamps.
- Modifications to aeration basin selector zones and baffle walls.
- Decommissioning and removal of existing aerobic digester.
- Modification of existing outfall diffuser to open eight plugged ports and to reorient 16 nozzles vertically.

Construction of these improvements to the existing WWTF should be completed in 2011. The evaluations and recommendations in this Amendment for design year 2025 improvements are based on the assumption that the Phase II upgrades listed above have been constructed.

NPDES WASTE DISCHARGE PERMIT

The Department of Ecology issued the current City of Camas NPDES operating permit effective December 1, 2004. The permit expires November 30, 2009. It is expected that the re-issued permit will include revisions to the existing effluent ammonia limits, based on recent mixing zone dilution modeling. Based on discussions between the City and Ecology, it is expected that the new permit will include monthly average effluent limits for ammonia of 20 mg/L in the summer and 7 mg/L in the winter, and no daily maximum limit. This Amendment is prepared with the assumption that future NPDES permits will include the same effluent concentration limits as in the present permit, except for the noted changes to the effluent ammonia limit.

LIQUID STREAM TREATMENT EVALUATION AT 2025 DESIGN CRITERIA

In this section, the capacities of major WWTF liquid stream treatment components (including Phase II components currently under construction) at 2025 projected flow and loadings (see Table 4-1) are evaluated. Where applicable these capacities are compared to accepted design criteria, such as published in the Ecology *Criteria for Sewage Works Design* (1998), WEF *Manual of Practice #8* and Metcalf and Eddy *Wastewater Engineering* (4th Edition, 2003). This evaluation is summarized in Table 4-3. Abbreviations used in this table include:

- AAF = Annual Average Flow
- MMF = Maximum Month (Average) Flow
- PDF = Peak Day (Average) Flow
- PHF = Peak Hour (Average) Flow

TABLE 4-3

Comparison of Liquid Stream Treatment Component Design Criteria and Projected Flow and Loadings

Component (Parameter)	Existing Qty.[1]	Capacity/Criteria	Reference[2]	2025 Operating Condition (meets criteria?)
Mechanical Fine Screen/Bypass Bar Screen (Capacity)	2 Mech. Screens 1 Bar Screen	Mech. Screen: 10.6 mgd Bypass Screen: 12.8 mgd Total PHF: 23.4 mgd (one screen out of service)	Manufacturer	17.46 mgd (yes)
Primary Clarifiers (Overflow Rate)	2	800 – 1,200 gpd/sf AAF	Ecology, 1998	1,158 gpd/sf (yes)
		2,000-3,000 gpd/sf PHF	Ecology, 1998	3,088 gpd/sf (yes)[3]
Primary Clarifiers (Weir Loading)	2	10,000 – 40,000 gpd/lf AAF	Ecology, 1998	17,420 gpd/lf (yes)
		MMF		20,133 gpd/lf (yes)
		PHF		46,436 gpd/lf (yes)[3]
Primary Clarifiers (Detention Time)	2	≤ 2.5 hr AAF	Ecology, 1998	1.5 hr (yes)
		MMF		1.3 hr (yes)
		PHF		0.6 hr (yes)
Biological Selector (Detention Time at max. mo. flow)	3/basin	10-45 min. design 5-25 min. design 20-60 min. design	Ecology, 1998 WEF, 1991 M&E, 2003	25 (yes)
Biological Selector (F/M Ratio) 1st Compartment	3/basin	3-8 lb BOD/ lb MLSS	M&E, 2003	7.9 (yes)
3 Compartments		2 lb BOD/lb MLSS	M&E, 2003	2.0 (yes)
Aeration Basin Aerobic Solids Retention Time (Aerobic SRT)	3 basins	9.5 days MMF	2007 Wastewater Facility Plan	6.5 days (no)
Aeration Capacity (TKN Capacity at Projected BOD load = 7,365 lb/d)	3 basins	3,853 lb/d TKN	2007 Wastewater Facility Plan	4,262 lb/d TKN (yes)

TABLE 4-3 – (continued)

Comparison of Liquid Stream Treatment Component Design Criteria and Projected Flow and Loadings

Component (Parameter)	Existing Qty[(1)]	Capacity/Criteria	Reference[(2)]	2025 Operating Condition (meets criteria?)
Secondary Clarifiers (Overflow Rate) Max. Month	2	<800 gpd/sf, MMF 300-1,000 gpd/sf, MMF	Ecology, 1998 WEF, 1991	857 gpd/sf (no; per Ecology criteria)
Peak Day		600-800 gpd/sf, design	M&E, 2003	1,332 gpd/sf (no)
Peak Hour		1000-1600 gpd/sf, design	WEF, 1991	1,976 gpd/sf (no)
Secondary Clarifiers[(4)] (Solids Loading Rate) Max. Month	2	4.8 – 24 lb/d/sf 20-30 lb/d/sf	M&E, 2003 WEF, 1991	26.8 lb/d/sf (yes)
Peak Day		34 lb/d/sf 50 lb/d/sf	M&E, 2003 WEF, 1991	41.7 lb/d/sf (yes)
Filtration System (Capacity)	2 shafts (12 disks)	6.0 mgd (max. mo.)	Manufacturer	7.57 mgd (yes, with 1.57 mgd bypass)[(5)]
UV Disinfection System (Capacity)	4 banks	12.2 mgd (peak day)	Manufacturer	11.77 mgd (yes)
		9.15 mgd (max. mo.)	Manufacturer	7.57 mgd (yes)
Effluent Pumps	3	12.2 mgd (peak hour)	Manufacturer	17.46 mgd (no)

(1) Quantity of component following Phase II WWTF Improvements Project construction.
(2) Sources of design criteria include Water Environment Federation (WEF), the Washington State Department of Ecology (Ecology) and Metcalf and Eddy (M&E).
(3) Design loading slightly exceeds equipment capacity, but performance of equipment is estimated to be satisfactory at this loading and overall treatment of WWTF will not be significantly impacted.
(4) Secondary clarifier solids loading based on return activated sludge flow of 50 percent of plant flow and MLSS = 2,500 mg/L.
(5) See discussion below on adequacy of effluent filter performance at design flow.

HEADWORKS

The headworks includes a 24-inch Parshall flume for influent flow measurement and two automatic, perforated-plate, mechanical fine screens with 1/4–inch-diameter perforations. (One of these new screens is being installed in the Phase II improvements project.) Each screen is equipped with a screenings washer/compactor. Combined, the two screens have an hydraulic capacity of 21.2 mgd, which is adequate to handle the projected year 2025 peak hour flow of 17.46 mgd. If one mechanical screen were temporarily out of service due to equipment malfunction, flows in excess of the capacity of the operational screen will overflow a weir plate and will pass through the existing manual bar rack screen.

The existing Parshall flume, with a capacity of 21.4 mgd, can accommodate 2025 flows.

PRIMARY CLARIFIERS

Two 60-foot-diameter circular primary clarifiers remove grit and other settleable solids from the screened wastewater. The grit-laden sludge is pumped to the grit removal facility by three 10-hp recessed impeller torque flow pumps with a capacity of 220 gpm at a TDH of 32 feet. Scum collected from the primary clarifiers is conveyed by gravity to the primary clarifier scum pump station.

As shown in Table 4-3, the existing two primary clarifiers have adequate capacity for year 2025 flows.

AERATION BASINS AND AERATION SYSTEM CAPACITY

The existing activated sludge process consists of three parallel, equal-sized aeration basins, which are each comprised of seven compartments to create biological selector zones, anoxic zones, and aerobic (oxic) zones. The configuration and equipment in the basins enables biological treatment to remove BOD_5, ammonia (nitrification), and nitrates (denitrification). The aerobic zones are supplied air from three existing centrifugal blowers through air piping and fine bubble, membrane diffusers installed on the floor of each basin. Primary effluent and recycle flows are split equally between the three basin trains in a splitter box located immediately upstream of the basins.

The Camas activated sludge system is designed to achieve nitrification and denitrification to meet projected effluent ammonia limits and to provide process control benefits, including energy recovery, alkalinity recovery, pH control, and process stability. Based on the design analysis presented in the 1997 *Wastewater Facility Plan*, the aerobic solids retention time (SRT) required for nitrification of the wastewater TKN load is 9.5 days, which provides a nitrification safety factor of 2.0. The aeration basin volume requirements are based on this design SRT and the criteria shown in Table 4-4 below. Mass loadings shown in the table are based on the mass balances included in Appendix D.

TABLE 4-4

Activated Sludge Process Design Criteria

Parameter	Value
Net Sludge Yield, Y_N (lb/lb BOD_5 In)	0.78
BOD_5 In (lb/d)	5,413
BOD_5 Out (lb/d)	190
Design MLSS (mg/L)	2,500
SRT (days)	9.5
Waste Activated Sludge Yield (lb/d)	4,220

The aeration basin aerobic volume required to provide an SRT of 9.5 days is calculated as follows:

Aerobic volume = (Aerobic SRT x Sludge Yield)/MLSS Concentration

= [(9.5 d)(4,220 lb/d)(10^6)]/[(2,500 mg/L)(8.34)]

= 1,923,000 gallons (257,060 ft^3)

Each existing aeration basin includes 58,670 ft^3 of aerobic volume, or a total of 176,000 ft^3 within the three existing basins. The additional aerobic volume required for year 2025 design loads is 257,060 – 176,000 = 81,060 ft^3. This required additional volume is 1.4 times the volume of one basin. Since it is recommended that all aeration basins have the same volume, two additional basins will be constructed. The new basins will be constructed adjacent to the existing basins using common wall construction, as shown on Figure 4-1.

Biological treatment of the wastewater is provided in the aeration basins. The activated sludge in the basins is mixed and supplied with oxygen by blowers through submerged air distribution piping and diffusers. Automatic control of aeration blower output is accomplished based on continuous measurement of the dissolved oxygen (D.O.) in the aeration basins by submerged D.O. probes. As shown in Table 4-1, year 2025 BOD_5 and TKN (which is predominantly converted sequentially to ammonia, nitrate, and finally nitrogen gas in the WWTF) exceed the existing design loads. Thus, the aeration basins must be evaluated for their ability to accommodate the increased BOD_5 and TKN.

The aeration basin oxygen demand is decreased by the process of denitrification and by the periodic wasting of biomass growth. In the *Wasteload Assessment Report - Aeration System Capacity Analysis* (G&O, May 2006), the recorded air flow delivered by the blowers in operation at the WWTF was correlated to the actual, approximate oxygen required to achieve BOD and ammonia removal. A correlation factor, *K*, was determined

to describe the correlation between the actual oxygen required (AOR) and the airflow (standard cubic feet per minute, SCFM) delivered:

$$SCFM = K \times AOR$$

The correlation factor, *K*, is an expression of the efficiency of the blowers and the air diffusion system to deliver oxygen. The AOR is defined by the following equation:

$$AOR = 1.3 \times BOD_{removed} + 4.57 \times TKN_{oxidized} - 2.86 \times DN - 1.42 \times P_{x,bio}$$

The $BOD_{removed}$ is the amount of BOD oxidized, and the $TKN_{oxidized}$ is the nitrogen oxidized to nitrate. DN is the amount of nitrogen denitrified, which results in a decrease in oxygen demand. $P_{x,bio}$ is the amount of biomass wasted. As described in both the 2006 *Wasteload Assessment Report* and the May 2007 *General Sewer / Wastewater Facility Plan* (2007 Plan), the AOR was determined using biological kinetic factors, stoichiometric factors, and actual plant conditions and performance for the time period from March 2006 through April 2006. Assumptions used in this analysis are presented in these previous reports.

For the current analysis, the correlation factor, K, was used to estimate the aeration system capacity for biological removal of both carbonaceous and nitrogenous loads, given the air available and delivered by a maximum of three blowers in service. The blowers at the Camas WWTF are each rated at 1,650 standard cubic feet per minute (SCFM) @ 9.5 psig. Assuming three existing blowers in service (4,950 SCFM total air available), 95 percent removal of BOD_5, and complete nitrification, the influent BOD_5 and TKN loads that can be treated are summarized in Table 4-5.

As shown in Table 5-5, the maximum TKN the WWTF can treat while treating the design loading of 7,365 lb/d BOD_5 is 4,262 lb/d, which is about 11 percent greater than the design load of 3,853 lb/d TKN. Thus, the analysis shows that the existing blowers can accommodate the projected 2025 design BOD_5 and TKN loads simultaneously. Therefore, an additional blower is not required. New air supply piping from the blowers to the aeration basins will be required to prevent excessive head loss and reduced blower capacity.

TABLE 4-5

Evaluation of Oxygen Demand with Three Existing Blowers in Service

BOD_{in} (lb/d)	BOD_r (lb/d)	TKN_{ox} (lb/d)	P_{xbio} (lb/d)	DN (lb/d)	AOR (lb/d)	Airflow (SCFM)	*K* (SCFM/lb/d)	$Ammonia_{in}$ Capacity (lb/d)
1,000	950	6,038	443	3,623	17,838	4,950	0.2775	4,264
1,500	1,425	5,898	597	3,539	17,838	4,950	0.2775	4,179
2,000	1,900	5,759	752	3,455	17,838	4,950	0.2775	4,094
2,500	2,375	5,619	907	3,372	17,838	4,950	0.2775	4,010
3,000	2,850	5,480	1,061	3,288	17,838	4,950	0.2775	3,925
3,500	3,325	5,340	1,216	3,204	17,838	4,950	0.2775	3,840
4,000	3,800	5,201	1,371	3,121	17,838	4,950	0.2775	3,756
4,500	4,275	5,061	1,525	3,037	17,838	4,950	0.2775	3,671
5,000	4,750	4,922	1,680	2,953	17,838	4,950	0.2775	3,586
5,500	5,225	4,782	1,834	2,869	17,838	4,950	0.2775	3,502
6,000	5,700	4,643	1,988	2,786	17,838	4,950	0.2775	3,417
6,500	6,175	4,503	2,143	2,702	17,838	4,950	0.2775	3,332
7,000	6,650	4,364	2,297	2,618	17,838	4,950	0.2775	3,248
7,365	6,997	4,262	2,410	2,557	17,838	4,950	0.2775	3,186

Since the recommended two new aeration basins will have the same configuration and anoxic zone volumes as the existing basins, it is expected that denitrification performance at the 2025 loads will be adequate.

Biological Selectors

The selectors at the inlet ends of the aeration basins provide compartmentalization to create an environment with a high food/mass (F/M) ratio to favor the growth of floc-forming (readily settling) organisms, and produce a low sludge volume index (SVI). The selector zones in the new aeration basins will be designed to have the same volumes as in the existing basins. The design F/M gradient will be 6:3:1.5 lb BOD/ lb MLSS in the three selector compartments. As in the existing basins, the new selector zones will be mixed with aeration air using coarse bubble diffusers in the selector compartments.

The aeration basin design criteria are shown below.

Design Criteria for Aeration Basins

Aeration Basin Influent Flow	7.90 mgd
Plant Recycle Flow	0.33 mgd
Return Activated Sludge Flow, mgd	
Internal Recirculation Flow, mgd	22.5 mgd

Influent BOD5, lb/d	5,413 lb/d
Influent TSS, lb/d	2,625 lb/d
Influent TKN, lb/d	3,853 lb/d
Quantity of Basins	5 (2 new; 3 existing)
Total Volume	509,300 cubic feet
Basin Width	40 feet
Side Water Depth	21 feet
Basin Length	150 feet
Selector Zone One Total Volume	54,980 gallons
Detention Time at AAF	12.1 min
Detention Time at MMF	10.5 min
Selector Zone Two Total Volume	54,980 gallons
Detention Time at AAF	12.1 min
Detention Time at MMF	10.5 min
Selector Zone Three Total Volume	109.960 gallons
Detention Time at AAF	24.2 min
Detention Time at MMF	20.9 min
Anoxic Zone Total Volume (2 compartments)	1,350,900 gallons
Detention Time at AAF	4.95 hr
Detention Time at MMF	4.28 hr
Aerobic Zone Total Volume (3 compartments)	2,224,050 gallons
Detention Time at AAF	8.15 hr
Detention Time at MMF	7.05 hr
MLSS Conc.	2,500 mg/L
Aerobic Mass	46,370 lb MLSS
Aerobic SRT	11.0 days
Aeration Blowers	
Quantity	4 (1 new; 3 existing)
Type	Multi-stage centrifugal
Capacity each blower	1,650 scfm
Discharge pressure	9.5 psig
Stages	8
Horsepower, each	150

ALKALINITY ADDITION SYSTEM

Liquid sodium hydroxide solution is currently added to the plant flow at the aeration basin splitter box to provide supplemental alkalinity, since nitrification of the high influent TKN load results in considerable loss of alkalinity and lowered pH. The alkalinity chemical is stored in two existing 10,000-gallon, fiberglass storage tanks and pumped to the splitter box by a peristaltic metering pump.

The sizing of the existing alkalinity storage system was based on 2-week nitrification requirements for a projected maximum month 2017 influent TKN loading of 2,227 lb/d, which is less than the projected 2025 loading of 3,853 lb/d. However, the WWTF could receive its alkalinity source once per week and have enough capacity for the 2025 influent TKN loading. Therefore, the system does not need to be expanded. However, it is projected that the WWTF will need to replace the fiberglass storage tanks once during the next 15 years due to eventual deterioration of the tank materials.

SECONDARY CLARIFIERS

The WWTF has two 75-foot-diameter secondary clarifiers; one with 13-foot side water depth (SWD) and the second at 17-ft. SWD. Though Clarifier No. 2 has a greater effective capacity than Clarifier No. 1 because of the greater SWD, for the purposes of this evaluation, it is assumed that each clarifier receives the same flow rate.

The factors that influence the performance of secondary clarifiers include the clarifier physical design, overflow rate, solids loading rate and mixed liquor solids settleability (SVI). Because it is not certain that the aeration basin selector and activated sludge process will control SVI below 150 mL/g, and since historically the plant has had episodes of moderate sludge bulking, the secondary clarifiers should not be designed and operated at the upper range of design overflow and solids loading rates.

Clarifier Overflow Rate

As shown in Table 4-3, at design flow, the 1998 Ecology Design Criteria lists 800 gallons per day per square foot (gpd/sf) as a recommended limit for secondary clarifiers settling mixed liquor from a conventional activated sludge process. WEF Manual of Practice #8 lists maximum month design ranges of 300 to 1,000 gpd/sf. At projected year 2025 maximum month flows, the clarifier overflow rate of 857 gpd/sf exceeds these criteria.

WEF Manual of Practice #8 and Metcalf and Eddy list peak flow design ranges of 1,000 to 1,600 gpd/sf and 600-800 gpd/sf, respectively. At projected year 2025 flows, the design peak clarifier overflow rate of 1,976 gpd/sf exceeds the WEF criteria. (The 1998 Ecology design criteria does not address this design parameter.)

Solids Loading Rate

As shown in Table 4-3, the maximum *design* solids loading rate recommended by Metcalf and Eddy and WEF are 24 and 30 lb/sf/d, respectively. At the design maximum month flow and loadings, the solids loading rate is 26.8 lb/sf/d. These estimated solids loading rates are based on a return activated sludge flow of 50 percent of plant flow and a design MLSS concentration of 2,500 mg/L.

The *peak* solids loading rate recommended by Metcalf and Eddy and WEF are 34 and 50 lb/sf/d, respectively. At projected year 2025 peak day flow and loadings, the design peak solids loading rate is 41.7 lb/sf/d.

Though the projected solids loading rates at 2025 flows do not exceed recommended design criteria, the design hydraulic overflow rate is greater than recommended. Consequently, the existing two secondary clarifiers will not reliably settle suspended solids to meet permit limits at design flows. Therefore, it is recommended that a third secondary clarifier, of equal diameter to the existing clarifiers (75-feet diameter) be constructed to handle the 2025 design flows. The additional clarifier will be equipped with return activated and waste activated sludge pumps and a new scum sump and pump. The new clarifier will be installed in the area occupied by the abandoned Aerobic Digester No. 1, which will be demolished.

Design Criteria for Secondary Clarifiers

Quantity	3 (1 new; 2 existing)
Diameter	75 feet
Effective Settling Area, each	4,418 sf
Effective Side Water Depth	
Clarifier No. 1	13 feet
Clarifier No. 2	17 feet
Clarifier No. 3 (new)	14 feet
Volume of each clarifier	
Clarifier No. 1	429,600 gallons
Clarifier No. 2	561,800 gallons
Clarifier No. 3 (new)	462,700 gallons
Surface overflow rate at AAF	494 gpd/sf
Surface overflow rate at MMF	571 gpd/sf
Surface overflow rate at PHF	1,317 gpd/sf
Detention time at AAF (Clar. 1/2/3)	4.7/6.2/5.4 hours
Detention time at MMF (Clar. 1/2/3)	4.1/5.3/4.7 hours
Detention time at PHF (Clar. 1/2/3)	1.8/2.3/2.0 hours
Solids loading rate at AAF	15.5 lb/d/sf*
Solids loading rate at MMF	17.9 lb/d/sf*
Weir length each clarifier	226 feet
Weir loading rate at AAF	9,660 gpd/lf
Weir loading rate at MMF	11,170 gpd/lf
Weir loading rate at PHF	25,750 gpd/lf
Motor size, each	1 hp

*Based on MLSS concentration of 2,500 mg/L and return activated sludge flow equal to 50 percent of plant flow.

EFFLUENT FILTERS

The filtration system consists of two parallel fabric media filters, located in the UV Disinfection Building. Each filter consists of a steel tank, 12 fabric media covered disks, backwash system, sludge removal system, high-pressure spray wash system and disk drive assembly. The capacity of each filter is 3.0 mgd (maximum month), providing a combined capacity of 6 mgd. The purpose of the use of this unit is to filter the secondary effluent to meet the permit requirement for 70 percent removal of influent BOD_5 and TSS.

At the 2025 maximum month average design flow of 7.57 mgd, the filters would need to bypass 1.57 mgd, or about 20 percent of the flow, to remain within the rated capacity. This bypass can be provided by setting the bypass channel overflow weirs at the required level. It is not expected that the bypass of 20 percent of secondary effluent will prevent compliance with the permit requirement for 70 percent influent BOD_5 and TSS removal. At the minimum expected influent BOD_5 (or TSS) concentration of 100 mg/L, the filters should produce an effluent BOD_5 (or TSS) concentration of 10 mg/L or less. If the bypass BOD_5 (or TSS) concentration is 30 mg/L or less, then the blended final effluent will have a BOD_5 (or TSS) concentration below 15 mg/L, resulting in an overall removal performance of 86 percent:

Effluent BOD5 (or TSS) = [(6.0 mgd)(10 mg/L) + (1.57 mgd)(30 mg/L)]/7.57 mgd
= 14 mg/L

Influent BOD5 (or TSS) removal = [(100 – 14 mg/L)/100 mg/L](100) = 86%

Therefore, the filters have sufficient capacity for projected year 2025 flows.

PLANT EFFLUENT FLOW METER

The existing 36-inch-diameter magnetic flow meter, with a capacity of 25 mgd, has capacity to measure 2025 flows.

ULTRAVIOLET DISINFECTION SYSTEM

Filtered effluent from the disk filters flows by gravity through the existing UV channel where disinfection occurs. After the Phase II upgrade, four banks of Trojan 3000 (low-pressure low-intensity) UV lamps will operate in series within the disinfection channel. The 4-bank system is rated for disinfection at a peak instantaneous flow of 9.15 mgd, since each bank has a capacity up to 3.05 mgd. The fourth bank provides redundancy; it will be automatically called in case of a major alarm on either in-use bank, and provides treatment for the peak day flow of 11.77 mgd. With the third bank on, the system capacity is 12.2 mgd. Therefore, the existing system has adequate capacity for the year 2025 design flows.

EFFLUENT PUMPS

The effluent pumps are vertical propeller, wet pit, mixed flow pumps rated at 4,300 gpm (6.2 mgd) each at 18-feet TDH. Three pumps are installed, with one of these units providing backup capacity. Transitions between gravity and pumped effluent flow are performed automatically when the pumps are placed in "auto" mode. Whenever the level of the Columbia River rises, gravity effluent discharge will be stopped by the closing of the flap gate in the Effluent Manhole

The operation of two of the existing three effluent pumps provides a maximum pumped flow of 12.2 mgd, which is not adequate to handle the year 2025 design peak hour flow of 17.46 mgd at 100-year flood elevation. Therefore, the installation of a fourth effluent pump, with a capacity of 4300 gpm, is recommended. The installation of the fourth pump will provide a total, confirmed capacity of 18.6 mgd. The design criteria for the effluent pumps is shown below.

Design Criteria for Effluent Pumps

Quantity	4 (1 new; 3 existing)
Type	Vertical Turbine
Capacity each pump	4,550 gpm
TDH	16 feet
Motor size, each	30 hp

OUTFALL

The existing 36-inch corrugated metal pipe (CMP) Camas WWTP outfall extends approximately 850 feet south into the Columbia River channel. The diffuser portion of the outfall is located along the outer 150 feet of the pipe. The existing outfall includes 16 vertical risers, each oriented vertically with rubber Tideflex, check valve-type nozzles. The risers discharge effluent perpendicular to the flow of the Columbia River.

Because the Phase II Camas outfall discharges perpendicular to the direction of the river flow, there is considerable turbulence and good dilution in the mixing zone. The change from the original horizontal discharge to a vertical discharge in the Phase II upgrade increases dilution significantly based on the UM3 model Ecology has used to model dilution in the Camas mixing zone (see Appendix E for mixing zone study). With the vertical orientation of the diffusers, there is no reasonable potential to exceed water quality standards for metals at the year 2025 design flows. Due to the industrial flows to the WWTF and Ecology regulations addressing prevention of "pass-through" of pollutants, there will be a permit limit for ammonia. The sixteen diffuser risers are fitted with Tideflex Valves on the ends of the risers to minimize entrainment of debris in the diffuser pipe.

SOLIDS STREAM TREATMENT EVALUATION AT 2025 DESIGN CRITERIA

As described and recommended in the May 2007 *General Sewer/Wastewater Facility Plan,* anaerobic digestion is the recommended option for solids treatment in the Phase II WWTF expansion. This plan is identified in the 2007 Plan as Alternative No. 1B - Anaerobic Digestion of Camas WWTF Biosolids Followed by Sludge Drying to Produce a Class A Biosolid. The new anaerobic digestion system will serve only the City of Camas and will not be designed to provide solids treatment of the load from another municipality. This Addendum is prepared based on the assumption that the new anaerobic digester system and sludge dryer described in Alternative 1B in the 2007 Plan will be constructed in the Phase II WWTF Improvements Project and is available to serve year 2025 design loads to the WWTF. Also, it is assumed that the existing Aerobic Digester No. 2 will be modified in the Phase II project to serve as a holding tank with three separate compartments for WAS, dewatering centrifuge centrate, and septage storage.

The solids treatment system design criteria for year 2025 are presented in Table 4-6. The maximum month and annual average influent wastewater BOD_5 and TSS loadings are based on the 2025 projected values. The influent TSS load includes the projected amount of solids delivered to the WWTF in septage hauled from the STEP system tanks in Camas. Estimated waste primary sludge and waste activated sludge production at the design influent loads are based on the same yields developed in the 2007 Plan.

TABLE 4-6

WWTF Design Criteria for Solids Treatment (Year 2025)

	Maximum Month	Annual Average
WWTF Influent BOD_5 (lb/d)	7,365	5,376
WWTF Influent TSS (lb/d)	10,500	7,720
Waste Primary Sludge (lb/d)	7,875	5,790
Waste Activated Sludge (lb/d)	4,220	3,086
Total Waste Sludge (lb/d)	12,095(1)	8,876(1)

(1) Load to digester estimated to be 5 percent greater due to additional solids in recycle flows.

The WWTF solids treatment system combines thickened waste primary sludge (WPS) and thickened waste activated sludge (WAS) and stabilizes the mixed solids in an anaerobic digester. The existing digester system consists of two primary digesters, one digested sludge holding tank, associated pumping and digester heating equipment, and a digester building. The digester system will produce a Class B biosolids, and produces a stabilized sludge for feeding to the existing dewatering centrifuge and the belt dryer. The dryer dries the sludge to at least 90 percent solids content and pasteurizes the sludge to generate a Class A biosolids product.

The capacities of major WWTF solids treatment components at 2025 projected flow and loadings (see Tables 4-1 and 4-6) are evaluated below, and, where applicable, compared to accepted design criteria, such as published in the Ecology *Criteria for Sewage Works Design* (1998), WEF *Manual of Practice #8* and Metcalf and Eddy *Wastewater Engineering* (4th Edition, 2003). This evaluation is summarized in Table 4-7.

TABLE 4-7

Comparison of Solids Treatment Component Design Criteria and Projected Flow and Loadings

Component (Parameter)	Existing Qty.[(1)]	Capacity/Criteria	Capacity or Criteria Reference[(2)]	2025 Operating Condition (meets criteria?)
WAS Holding Tank (Detention Time)	1	>3 days AAF MMF	2007 Wastewater Facility Plan	4.0 days (yes) 3.0 days (yes)
Centrate Holding Tank (Detention Time)	1	>1 day AAF MMF	2007 Wastewater Facility Plan	1.7 days (yes) 1.2 days (yes)
Grit Classifier	2	<220 gpm AAF MMF	Manufacturer	48 gpm (yes) 66 gpm (yes)
Gravity Thickener (Overflow Rate)	1	<500 gpd/sf AAF/MMF	WEF, 1991 M&E, 2003	450 gpd/sf (yes)
WAS Rotary Screen Thickener (Hours of operation per day)	1	6 hr/d operation maximum AAF MMF	2007 Wastewater Facility Plan	3.1 hr/d (yes) 4.2 (yes)
Anaerobic Digesters (Hydraulic Detention Time)	2	15 – 20 days AAF MMF	WEF, 1991 M&E, 2003	18 days (yes) 13.2 days (no)
Anaerobic Digesters (VS Loading Rate)	2	0.10 – 0.20 lb VS/d/ft^3 AAF MMF	WEF, 1991 M&E, 2003	0.16 lb VS/d/ft^3 (yes) 0.21 lb VS/d/ft^3 (no)

TABLE 4-7 – (continued)

Comparison of Solids Treatment Component Design Criteria and Projected Flow and Loadings

Component (Parameter)	Existing Qty.[(1)]	Capacity/Criteria	Capacity or Criteria Reference[(2)]	2025 Operating Condition (meets criteria?)
Anaerobic Digesters (VS Loading Rate)	2	0.10 – 0.20 lb VS/d/ft^3 AAF MMF	WEF, 1991 M&E, 2003	 0.16 lb VS/d/ft^3 (yes) 0.21 lb VS/d/ft^3 (no)
Digester boiler (Heating Capacity)	1	550,000 BTU/hr	2007 Wastewater Facility Plan	807,000 BTU/hr (no)
Sludge Holding Tank (Detention Time)	1	>5 days AAF MMF	2007 Wastewater Facility Plan	4.5 days (yes)[(3)] 3.3 days (yes)[(3)]
Centrifuge (Hours of operation per week day to fill dryer feed hopper)	1	6 hr/d operation maximum AAF MMF	Manufacturer	11 hr/d (no) 15 hr/d (no)
Dewatered Sludge Conveyor	1	100 ft^3/hr at 50% fill	Manufacturer	200 ft^3/hr (yes)
Sludge Dryer (Hours of operation per 5-day week)	1	<144 continuous hr/wk operation AAF	Manufacturer	134 hrs/wk (yes)
Biofilter (Detention Time)	2	90 seconds	Manufacturer	90 seconds (yes)

(1) Quantity of component(s) following Phase II WWTF Improvements Project construction.
(2) Sources include Water Environment Federation (WEF), the Washington State Department of Ecology (Ecology) and Metcalf and Eddy (M&E).
(3) Design criteria slightly exceeded but not significantly enough to require additional capacity.

WAS HOLDING TANK

The existing 150,000-gallon Waste Activated Sludge Holding Tank will provide three days of detention at design average annual WAS production in 2025. Since this detention time is adequate for process control, additional storage volume is not required.

CENTRATE HOLDING TANK

The 45,000-gallon Centrate Holding Tank will provide more than 24 hours of detention time of centrate drained from the dewatering centrifuge operation at design conditions. This detention is adequate since the tank should be emptied by recycling the centrate to the aeration basins each day during low flow periods. Therefore, additional storage volume is not required.

PRIMARY SLUDGE PUMPS, GRIT CLASSIFIER AND GRAVITY THICKENER

Primary sludge removed from the existing primary clarifiers is pumped by the recessed-impeller, primary sludge pumps at a rate of 220 gpm to each existing grit classifier. Degritted primary sludge is discharged by gravity from the grit classifiers to the existing 30-foot gravity thickener. At the design primary sludge underflow concentration of 1 percent, the primary sludge generation is 48 gpm at annual average flow and 66 gpm at maximum month flow in 2025. Therefore, the existing pumping rate of 220 gpm will remove the primary sludge from the clarifiers, and the existing grit classifiers and gravity thickener are adequately sized to handle the 2025 primary sludge flows. The pumped flow rate to the gravity thickener results in a surface overflow rate of 450 gpd/sf, which is acceptable, as indicated in Table 4-7.

WAS ROTARY SCREEN THICKENER

Waste activated sludge is thickened in the rotary screen thickener (RST) prior to pumping into the anaerobic digesters. The RST thickens 1 percent waste activated sludge to about 6 percent solids, thereby preserving digester capacity by reducing the volume of water entering the tanks. At 2025 maximum month design conditions, about 4,220 pounds per day of WAS will be pumped to the RST. Since the RST capacity is 200 gpm, the RST will need to operate for 4.2 hours to process the daily waste activated sludge production at design conditions. As shown in Table 4-7, this operating time per day is acceptable. Therefore, additional RST capacity is not required for year 2025.

The existing thickened WAS pumps will operate longer each day, but they have adequate capacity and will not need to be replaced.

ANAEROBIC DIGESTERS AND SLUDGE HOLDING TANK

The WWTF is equipped with two 180,000-gallon primary anaerobic digesters to stabilize waste primary, waste activated sludge and scum collected from the primary and secondary clarifiers. The digesters are each mixed by a top-mounted mechanical, turbine mixer, and they are heated by a system consisting of sludge recirculation pumps, spiral heat exchangers, a gas-fired boiler, and hot water circulation pumps. The estimated volatile solids reduction in the digesters is 40 percent. The methane gas generated in the digesters is used to provide fuel for the boiler and the burner for the sludge dryer. Auxiliary fuel for the boiler is natural gas.

At the 2025 design conditions, the volatile solids loading of the existing primary digester system will exceed 0.21 lb VS/d/ft^3, which is greater than recommended design loadings for the anaerobic digester process, as shown in Table 4-7. The volatile solids loading will be excessive and could lead to digester failure. Also, the hydraulic detention time of the existing digester system will not be adequate and would not reliably provide treatment to produce a Class B biosolid. Therefore, it is recommended that a third primary anaerobic digester be constructed to handle the year 2025 loads.

It is recommended that the third digester be sized the same as the existing digesters. As for the existing digesters, the new primary digester will be mixed with a top-mounted mechanical mixer. Heat for the primary digester will be provided by a hot water boiler capable of burning either digester gas or commercial natural gas. The new digester will be provided with one spiral heat exchanger for heating of thickened feed sludge. The existing three recirculation pumps will be supplemented by the installation of a fourth pump for the new digester. The new digester equipment will be housed within the exiting digester building. Digested sludge from the existing and new primary digesters will be conveyed by gravity to the existing sludge holding tank. As for the existing digesters, excess gas produced by the new digester will be burned at the existing waste gas burner.

The addition of a third anaerobic digester will require a larger boiler system to provide additional heating capacity. The scope of the upgrade of the boiler system will depend on the schedule for construction of the new third anaerobic digester. If the expansion occurs in the near future, then a small, second boiler may be the most cost effective alternative. However, if the expansion does not occur for ten to fifteen years, it is recommended that the existing boiler be replaced with a new, larger boiler that will heat all three digester tanks. For the purposes of estimating costs of construction of this project, as presented below, it is assumed that the existing Phase II boiler is replaced with a new, larger boiler to heat all three digesters.

The existing sludge holding tank will provide slightly less than 5-days detention time at 2025 average annual loads. This volume should provide adequate holding time in case of emergency shutdown and repair of the downstream dewatering centrifuges. Therefore, additional sludge holding tank volume is not required.

The existing 160-gpm digester sludge pumps are adequately sized to pump digested sludge to the dewatering centrifuges at design conditions.

CENTRIFUGE

The existing 130-gpm centrifuge dewaters anaerobically-digested sludge and discharges the cake to an auger conveyor that transports the material outside the equipment building and drops it into the dryer feed hopper in the adjacent dryer building. At the 2025 design average loading from the digester system, the centrifuge will need to operate about 4 hours per day (5.6 hours per weekday), including startup and shutdown, to dewater the

flow from the digested sludge pump. However, at this feed rate to the centrifuge, only about 3 to 4 yards of dewatered sludge cake will be produced per day. Preferably, the centrifuge would have enough capacity to fill the 25-cubic yard hopper with sludge cake in one day-shift's operation. Therefore, it is recommended that a second centrifuge, equal in capacity to the existing one, be installed. Since the existing centrifuge is almost ten years old, and there is no spare unit, a second, a new centrifuge would also provide needed backup service. The centrifuge room was originally designed to accommodate two centrifuges.

The existing dewatered sludge auger conveyor has a capacity of 200 ft^3 per hour, which is adequate for 2025 design loading and with two centrifuges operating. A second conveyor is not required.

SLUDGE DRYER

A new belt-type sludge dryer, to produce Class A dried biosolids, will be installed in the Phase II upgrade in the existing sludge storage building, which is being remodeled to enclose the dryer system. The dryer will receive dewatered, anaerobically-digested sludge and evaporate sufficient water from this material to produce a final solids concentration of at least 90 percent. The dryer is rated at 1,570 wet pounds (0.785 wet tons) of sludge per hour, or 1,100 pounds of water evaporated per hour. At the 2025 average design loading of 15.0 wet tons per day (at 20 percent solids in the dewatered sludge discharged from the centrifuge), the dryer will operate continuously for 6 days (134 hours) during each 7-day week, including startup and shutdown time. The dryer would be required to operate continuously to dry the amount of dewatered sludge produced per week, at maximum month loading. However, the long detention time provided in the three anaerobic digesters and sludge holding tank will provide capacity to store sludge during the design maximum sludge production period. Therefore, since the dryer operates most efficiently when running continuously, and the weekly operating time at average conditions allows over a day each week for shutdown, the existing dryer is adequate for 2025 design loading. Therefore, no expansion of the dryer facility is required.

ODOR CONTROL BIOFILTER AND FAN

Since the WWTF upgrade to treat the 2025 flows and loadings does not increase the volume of air collected and discharged to the existing biofilter system, no change to this odor control system is required.

SEPTAGE STORAGE TANK

The WWTF receives septage delivered by contract haulers from residential STEP tanks and the WaferTech septic tanks. Two 30,000-gallon, aerated septage storage tanks are installed at the WWTF to receive and store this waste. One tank was constructed in the Phase I secondary upgrade project in 2001 and the second tank will be installed in the

Phase II project. The two tanks were sized to handle the septage volumes produced through year 2025 by WaferTech and existing and future City residential STEP systems. As indicated in the 2007 *Wastewater Facility Plan*, the projected annual City STEP septage production for 2025, not including the NUGA, is 3.26 million gallons, or 8,900 gallons per day on average. The 2007 Plan also indicated that up to 30,000 gallons of City septage (up to 34,000 including Wafertech septage) will be sent to the City WWTF as a maximum day septage volume. The two 30,000-gallon tanks provide enough storage capacity to hold this maximum daily septage volume and meter it into the plant flow.

Since the majority of the NUGA will be served by gravity sewers, it is not expected that the STEP systems in this area will significantly increase the maximum daily septage volume delivered to the WWTF. Therefore, the two existing septage storage tanks should provide adequate storage capacity through year 2025, including service to the NUGA, and additional septage tank volume is not required.

The design criteria for the WWTF solids treatment system components are shown below.

Design Criteria for Solids Treatment System

Primary Anaerobic Digesters	
Quantity of Primary Digesters	3 (1 new; 2 existing)
Volume (each)	24,000 cubic feet
Diameter	35 feet
Side Water Depth	25 feet
Total Primary Digester Volume	72,000 cubic feet
Maximum Month Influent Sludge Feed Rate	27,200 gpd
Annual Average Influent Sludge Feed Rate	20,000 gpd
Maximum Month Hydraulic Retention Time	19.8 days
Influent Sludge Solids Concentration	5.6 percent
Maximum Month Total Solids Loading	12,700 lb/day
Maximum Month Volatile Solids Loading	10,160 lb/day
Volatile Solids Loading	0.14 lb VS/ft^3/d
Digester Operating Temperature	35°C to 38°C
Estimated Volatile Solids Reduction	40 percent
Maximum Month Digested Sludge Production	8,640 lb/d
Digested Sludge Solids Concentration	3.8 percent
Sludge Holding Tank (existing)	
Quantity	1
Volume	12,000 cubic feet
Diameter	35 feet
Side Water Depth	12.4 feet
Sludge Flow Rate	18,000 gpd
Effluent Sludge Solids Concentration	3.3 percent
Hydraulic Retention Time	5 days

Digester Mixing	
Type of Mixing	Mechanical
Quantity of Mixers per Digester	1
Mixer Pump Capacity	9,000 gpm
Turnover Time	20 minutes
Motor Size	10 hp
Heating	
Quantity of Boilers	1 (new)
Boiler Type	Fire Tube
Boiler Size	807,000 BTU/hr
Quantity of Spiral Heat Exchangers	3 (1 new; 2 existing)
Heat Exchanger Type	Spiral
Heat Exchanger Capacity	425,000 BTU/hr
Quantity of Boiler Water Pumps	2
Boiler Water Pump Type	Centrifugal
Boiler Water Pump Capacity	200 gpm
Boiler Water Pump TDH	23 feet
Boiler Water Pump Motor Size	7.5 hp
Recirculation Pumps	
Type	Rotary Lobe
Quantity of Pumps	4 (1 new; 3 existing)
TDH	23 feet
Pump Capacity	200 gpm
Motor Size	7.5 hp
Primary Sludge Gravity Thickener (existing)	
Quantity of Tanks	1
Volume	150,000 gallons
Diameter	30 feet
Effective Settling Area, each	707 sf
Effective Side Water Depth	10 feet
Volume	52,900 gallons
Surface overflow rate at design inlet flow (220 gpm)	450 gpd/sf
Solids loading rate at MMF (0.3% sludge feed conc.)	11.1 lb/d/sf
WAS Storage Tank (existing)	
Quantity of Tanks	1
Volume	150,000 gallons
Centrate Storage Tank (existing)	
Quantity of Tanks	1
Volume	45,000 gallons

Quantity of Centrate Pumps	2
Pump Type	Submersible Centrifugal
Septage Storage Tank (existing)	
Quantity of Tanks	2
Volume each	30,000 gallons
No. of Septage Pumps per tank	2
Pump Type	Submersible Centrifugal
WAS Thickener (existing)	
Quantity	1
Type	Rotary Screen Thickener
Flow Capacity	200 gpm
Feed Solids	1%
Thickened Solids	5-7%
Thickening Polymer Feed System (existing)	
Quantity	1
Type	2-Tank
Polymer Type	Liquid or Dry
Mixing Tank Volume	520 gallons
Holding Tank Volume	500 gallons
Solution Feed Pump Capacity	100 gph
Thickened WAS Pumps (existing)	
Quantity	2
Type	Progressing Cavity
Capacity	50 gpm
Pump Head	60 psi
Motor Size	10 hp
Digested Sludge Pumps (existing)	
Quantity	2
Type	Progressing Cavity
Capacity	160 gpm
Pump Head	60 psi
Motor Size	10 hp
Centrifuge	
Quantity	2 (1 new; 1 existing)
Type	Solid Bowl, VFD Back Drive
Capacity, each	130 gpm
Bowl speed	3,000 rpm
Motor Size	
Main Drive	100 hp

Back Drive	20 hp
Dewatered Cake Solids Concentration	20 percent
Dewatered Sludge Conveyor Capacity	200 ft^3/hr
Sludge Dryer (existing)	
Type	Belt
Capacity	1,570 wet lb/hr
	1,100 lb water evaporated/hr
Hours of Operation/Week	
Annual Average	134
Drying Energy Required	1,400 BTU/lb of water
Electricity Required	63 kW
Nonpotable Water Required	50 gpm
Plant Drain Pump Station No. 2 (existing)	
Quantity of Pumps	2
Type of Pumps	Submersible Centrifugal
Capacity	500 gpm
Pump Head	40 ft
Motor Size	10 hp
Odor Control System (existing)	
Type	Soil Biofilter
Quantity of Units	2
System Size	7,200 square feet
Media Depth	63 inches
Biofilter Fan (existing)	
Type	Centrifugal
Quantity of Units	2
Fan Capacity	3,600 scfm
Fan Motor Size	15 hp

ELECTRICAL AND SCADA SYSTEMS

Based on a review of electric utility billings, the available electrical capacity at the plant is sufficient for the loads associated with the new equipment discussed in this chapter. Additional electrical equipment to provide more power to the WWTF is not required. Since there is no additional essential equipment added other than the small motor loads of the new secondary clarifier, additional auxiliary generator capacity is not required.

The City's SCADA and PLC programming will need to be revised to incorporate the new equipment in the WWTF's monitoring and process control systems.

RECOMMENDED WWTF PLAN

The WWTF expansion to treat design year 2025 flows and loadings (including from NUGA) will require the following new improvements and modifications:

- Two additional aeration basins (#4 and #5) including associated basin equipment (air diffusers, air supply piping and valves, air flow meters, dissolved oxygen meters, internal recycle pump and pipe, submersible mixers), new air supply header pipe from blowers., and expansion of the aeration basin splitter influent box.

- One new effluent pump (#4).

- Two replacement alkalinity chemical storage tanks.

- One additional anaerobic digester (#3) and associated equipment (tank mixer, sludge recirculation pump and piping, sludge/water heat exchanger, instrumentation).

- One replacement digester boiler.

- One additional sludge dewatering centrifuge.

- Electrical and controls improvements associated with the new components listed above.

The recommended future site layout, process flow diagram, and hydraulic profile for the WWTF, showing recommended improvements described above, are presented in Figures 4-1, 4-2, and 4-3, respectively. A mass balance for the future WWTF process is included in Appendix D.

The estimated capital and O&M costs for the upgraded WWTF for year 2025 design flows and loadings are presented in Tables 4-8 and 4-9, respectively. Costs are estimated total project costs in 2009 dollars and include engineering, construction management, sales tax and contingency. The O&M cost includes the cost of contracted hauling of the dried, Class A biosolids off site for land application.

TABLE 4-8

Design Year 2025 WWTF Project Cost Estimate (2009 Dollars)

No.	Item	Quantity	Unit Price	Amount
1.	Mobilization/Demobilization	1 LS	$500,000	$500,000
2.	Demolition, incl. Aerobic Dig. #1	1 LS	$80,000	$80,000
3.	Aeration Basins (#4 and #5) incl. equipment	1 LS	$2,000,000	$2,000,000
4.	Alkalinity Chemical Storage Tanks	2 EA	$25,000	$100,000
5.	3rd Secondary Clarifier incl. equipment	1 LS	$1,200,000	$1,200,000
6.	Effluent Pump	1 EA	$60,000	$60,000
7.	Anaerobic Digester (#3) incl. equipment	1 LS	$750,000	$750,000
8.	Digester Boiler	1 LS	$300,000	$300,000
9.	Centrifuge (#2)	1 LS	$500,000	$500,000
10.	Dewatering	1 LS	$100,000	$100,000
11.	Earthwork	1 LS	$80,000	$80,000
12.	Miscellaneous Metals	1 LS	$100,000	$100,000
13.	Painting	1 LS	$75,000	$75,000
14.	Site Work	1 LS	$100,000	$100,000
15.	Mechanical/Yard Piping	1 LS	$1,000,000	$1,000,000
16.	Electrical	1 LS	$1,000,000	$1,000,000

Subtotal	$ 7,895,000
Construction Contingency (20%)	$ 1,579,000
Subtotal	$ 9,474,000
Washington State Sales Tax (7.9%)	$ 748,446
TOTAL ESTIMATED CONSTRUCTION COST	**$10,222,446**
Engineering, Administrative, and Legal Services (20%)	$ 2,044,489
TOTAL ESTIMATED PROJECT COST	**$12,266,935**

PROPERTY LINE

S70°31'17"W
471.37'

TRANSFORMER PAD

SUCTION/DISCHARGE DRAIN MANHOLE

EQUIPMENT BUILDING

SLUDGE DRYER BUILDING

BIOFILTER NO. 1

BIOFILTER NO. 2

N21°18'22"W
159.45'

WASTE GAS BURNER

DIGESTER BUILDING

DIGESTER No. 1

DIGESTER No. 2

DIGESTER No. 3

DIGESTED SLUDGE HOLDING TANK

PLANT DRAIN PUMP STATION NO. 2

GRAVITY THICKENER

SEPTAGE / CENTRATE / WAS STORAGE TANKS

SEPTAGE TRUCK UNLOADING PAD

SEPTAGE RECEIVING TANKS

SEPTAGE RECEIVING VALVE VAULT

VACTOR TRUCK UNLOADING PAD

HEADWORKS

PRIMARY CLARIFIER NO. 1

PRIMARY CLARIFIER NO. 2

PRIMARY CLARIFIER SCUM PUMP STATION

AERATION BASIN SPLITTER BOX

PLANT DRAIN PUMP STATION NO. 1

AERATION BASIN NO. 1

AERATION BASIN NO. 2

AERATION BASIN NO. 3

AERATION BASIN NO. 4

AERATION BASIN NO. 5

SECONDARY CLARIFIER NO. 3

STORAGE SHED

GARAGE

SECONDARY CLARIFIER NO. 1

CONTROL BUILDING NO. 1

CONTROL BUILDING NO. 2

SECONDARY CLARIFIER SPLITTER BOX

EFFLUENT FLOW METER VAULT

SECONDARY CLARIFIER NO. 2

U.V. DISINFECTION/ EFFLUENT PUMP STATION

TRANSFORMER PAD

EFFLUENT MANHOLE

BONNEVILLE POWER ADMINISTRATION LINE EASEMENT BOUNDARY

N09°20'07"E
525.39'

CHAIN LINK ROLLING GATE

N88°02'16"E
314.25'

N05°57'50"W
167.95'

N81°53'39"E
414.52'

STORMWATER TREATMENT POND

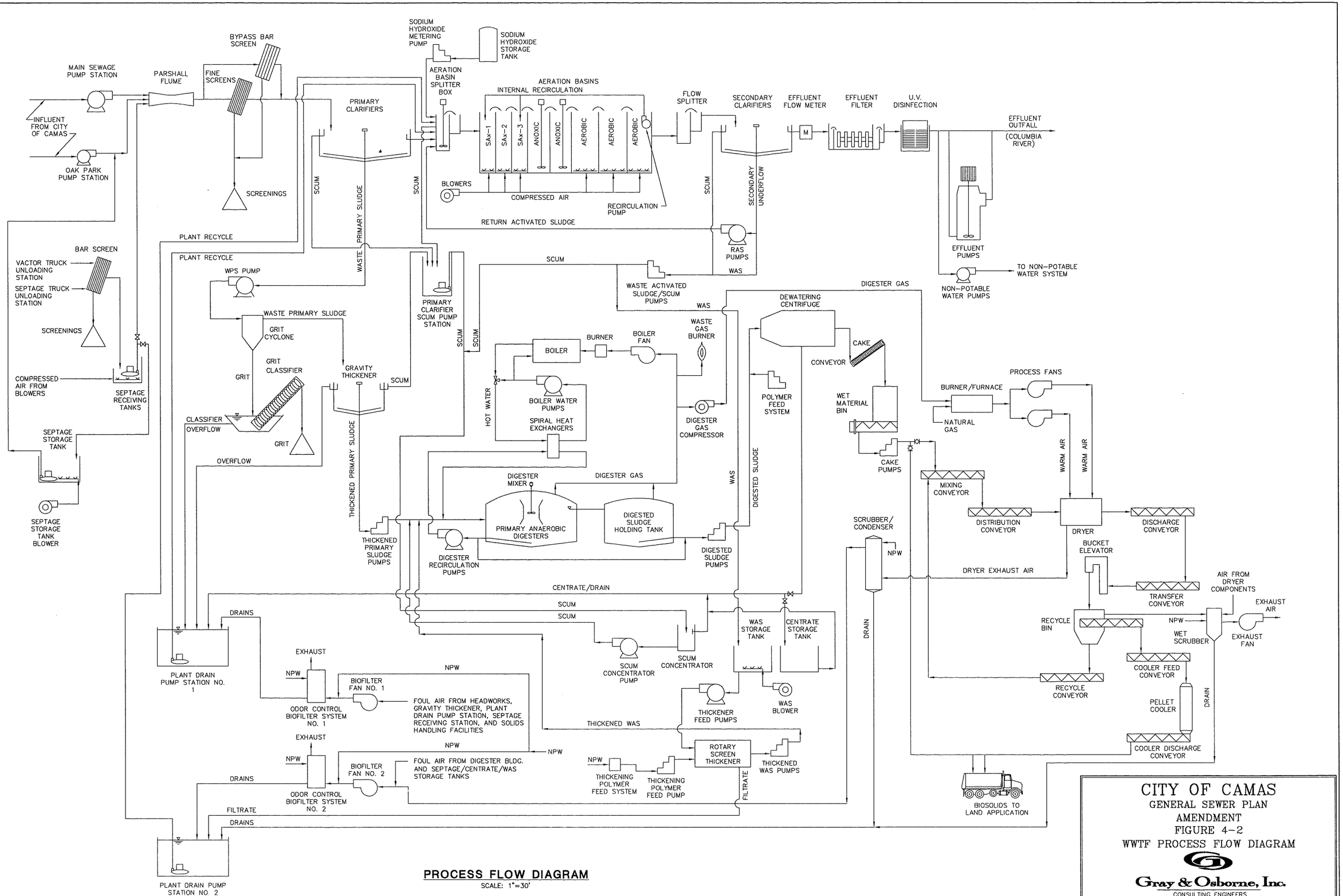
WWTF SITE PLAN

SCALE: 1"=30'

CITY OF CAMAS

GENERAL SEWER PLAN
AMENDMENT
FIGURE 4-1
WWTF SITE PLAN

Gray & Osborne, Inc.
CONSULTING ENGINEERS



PROCESS FLOW DIAGRAM

SCALE: 1"=30'

CITY OF CAMAS

GENERAL SEWER PLAN
AMENDMENT
FIGURE 4-2
WWTF PROCESS FLOW DIAGRAM

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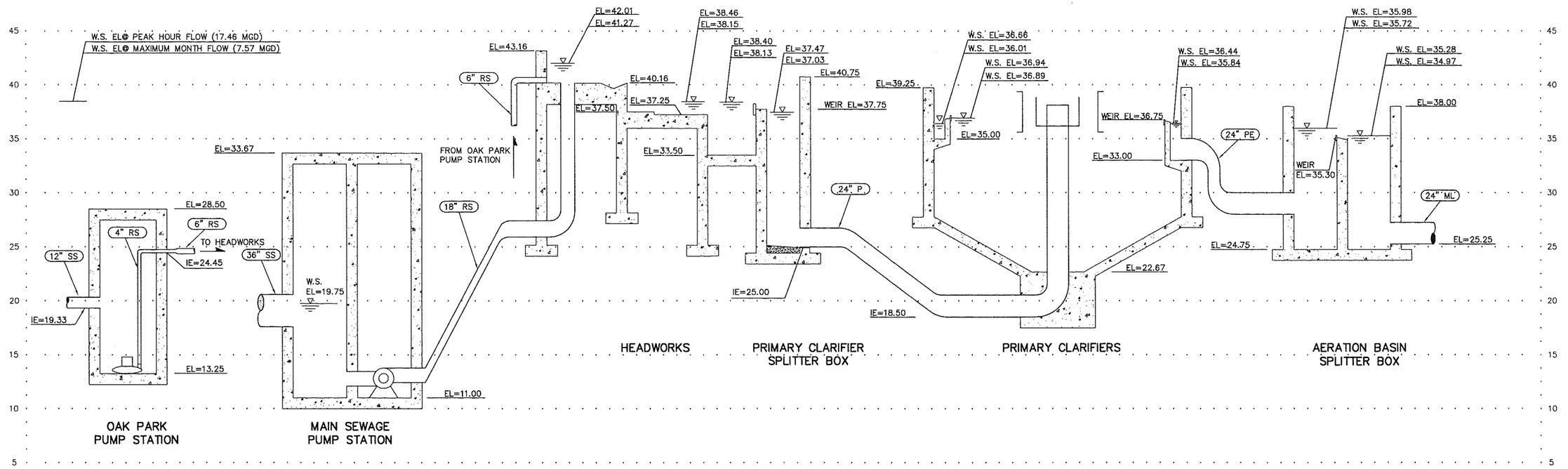
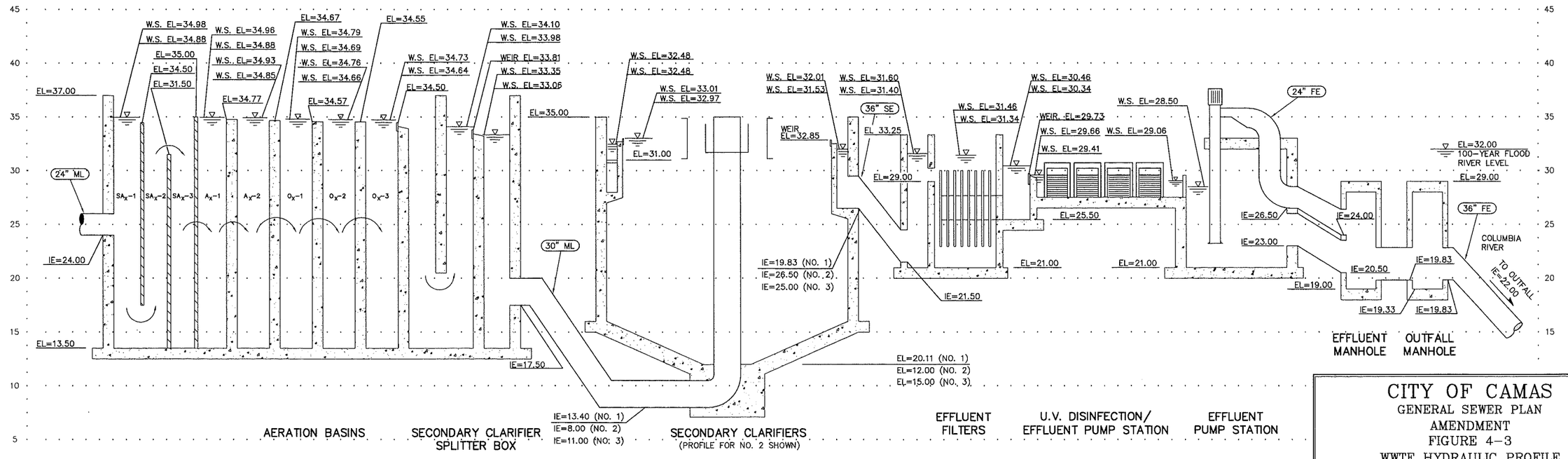




WWTF HYDRAULIC PROFILE

SCALE: VERT 1"=10', HORIZ NOT TO SCALE

CITY OF CAMAS

GENERAL SEWER PLAN
AMENDMENT
FIGURE 4-3
WWTF HYDRAULIC PROFILE

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\05471 WW Fac PLAN\2008 FP AMENDMENT\FIGURES\FIG4-3.DWG, LAYOUT1, 3/9/2010 11:17:13 AM, 0.5:1, BY: E SHOYMERMAN

TABLE 4-9

WWTF O&M Cost Estimate (Design Year 2025)

Item	Estimated Costs (2009 Dollars)
Labor ($38/hr)	$ 553,000
Power ($0.07/kWh)	$ 370,000
Polymer ($2.50/lb)	$ 67,000
Natural Gas ($1.15/therm)	$ 185,000
Equipment Maintenance and Repair	$ 150,000
Testing/Permitting/Misc.	$ 100,000
Contracted Hauling and Land Application ($60/wet TN)	$ 70,000
Total Annual Cost	**$1,495,000**

SOURCE CONTROL PROGRAM

Chapter 6 of the May 2007 *General Sewer/Wastewater Facilities Plan* included a detailed discussion of the characteristics of the major industrial dischargers, and Chapter 8 of the May 2007 Plan included an evaluation of the City's needs regarding managing its commercial and industrial dischargers and dischargers of FOG (Fats, Oil and Grease). In the May 2007 Plan, considering the large number of industries, apparent history of discharge of inhibitory materials, large number of restaurants/fast food establishments, automotive facilities, and potential problems from industrial and FOG disposal in the sewer, it was recommended that the City consider developing elements of a source control program including:

- A program to control Fats, Oils and Grease
- Development of local limits to control industrial discharges from Significant Industrial Users
- The purchase of a software program to manage information from industrial dischargers and FOG and staffing to manage the source control program

SIGNIFICANT INDUSTRIAL USERS

As required by its NPDES permit, the City completed an Industrial User Survey (IUS) in early 2005. The survey identified nine Significant Industrial Users (SIUs) and five Minor Industrial Users (MIUs). The SIUs identified included:

1. Bodycote, Inc.
2. Brown's Chevron
3. Columbia Litho, Inc.
4. Heraeus Shin-Etsu America

5. C-Tech
6. Linear Technology
7. Sharp Electronics Corporation
8. Shell Oil Products
9. Wafertech

The MIUs included:

1. Georgia Pacific (In addition to discharging some minor flows to the City's WWTF, Georgia Pacific discharges treated wastewater to the Columbia River from its own WWTF less than one mile west of the Camas outfall.)
2. Furuno USA Inc.
3. Lemon Aid Automotive
4. Post Record
5. Westlie Motors

Based on the information presented in Chapter 6 of the May 2007 Plan, industrial/commercial wastewater accounts for over half (56%) of the City's influent baseflow. Industrial wastewater (and wastewater from commercial enterprises that is industrial in nature) does not typically have the same concentrations of organics, solids and nutrients found in residential wastewater. Industrial wastewater can also contain higher concentrations of trace pollutants which are toxic to the biological treatment process used in the WWTF. Any industry siting in the sewer service area that has a discharge potentially deleterious to the wastewater collection or treatment systems must be required to provide adequate on-site industrial pretreatment, consistent with the City's pretreatment program, to prevent such impacts.

Considering the relatively large proportion of industrial flow, and relatively large number of industries in the City, it is recommended that the City consider developing local limits for the protection of its WWTF. Local limits are developed to implement site-specific prohibitions to protect against the discharge of pollutants at a quantity or rate that may cause pass-through or interference at (or otherwise detrimentally impact) a POTW.

The Department of Ecology has not delegated specific responsibilities for managing an industrial pretreatment program to the City. However, Ecology has asked the City to evaluate the impact of a specific wastestream (neutralized sulfuric acid discharged by Wafertech) on the City's wastewater collection and treatment systems. A report evaluating this impact and proposing Maximum Allowable Headworks Loadings (MAHLs) to the Camas WWTF for sulfate and Total Dissolved Solids will be submitted in Spring 2010. Per discussion with David Knight at the Department of Ecology, the City can expect a requirement to develop additional MAHLs and local limits, in accordance with EPA's 2004 *Local Limit Development Guidance,* to appear in its new NPDES permit, to be issued later in 2010.

INDUSTRIAL PRETREATMENT TRACKING PROGRAM

It is recommended that the City consider the purchase a computer program to track its industrial users. There are several options for pretreatment management database programs. Vendors include LINKO, Operator 10, PACS and PREWIN. All of these software programs offer similar functions to the user. In general, each program has the ability to:

- Store industrial user information
- Store sample and result information
- Make queries of stored information
- Store certain industry specific information (flow rates, pretreatment processes, etc.)
- Import and Export capabilities, also LIMS compatibility
- Generate reports and letters of violation
- Log notes, phone calls, track maintenance records, etc.

CHAPTER 5

REVISED EVALUATION OF WATER REUSE

INTRODUCTION

Wastewater reclamation can potentially be cost effective through reducing potable water costs, creating an additional new water supply, and generating revenue by selling reclaimed water to customers for irrigation and other non-potable water uses. The production and beneficial use of reclaimed water is the development of a new water supply. This chapter builds on the evaluation presented in Chapter 10 of the May 2007 *General Sewer/Wastewater Comprehensive Plan,* as modified and approved in November *2009* (May 2007 Plan*)*, and specifically provides an evaluation of the impact of the inclusion of NUGA flows on the feasibility of reusing effluent from the City of Camas WWTF or constructing a new water reclamation facility (WRF) to treat wastewater and produce water for reuse.

REGULATIONS CONCERNING REUSE

A detailed discussion of the regulations governing water reuse was provided in Chapter 10 of the May 2007 Plan. (See that chapter for more information.) The key regulations are the State of Washington Water Reclamation and Reuse Standards. The standards, developed jointly by the Washington Departments of Health and Ecology, were last published in September 1997; however, they are in the final stages of being revised, with new standards expected by 2010. As described in the May 2007 Plan, the current standards include Reclaimed Water Classification (Class A, B, C or D) by Type of Use, and requirements for uses such as:

- Groundwater Recharge
- Streamflow Augmentation
- Industrial Reuse

Additionally, the standards include treatment requirements, including:

- Reliability Criteria
- Alternative Disposal and Storage
- Redundant Process Units and Equipment

Finally, the standards, and other applicable regulations, include reuse area criteria, such as:

- Setbacks from Potable Water Systems
- Cross-Connection Control Requirements

- Residual Chlorine Requirements for Distribution System Protection

Also, depending on the use of the reclaimed water, groundwater and surface water regulations may apply.

WATER RIGHTS

The City currently has municipal water rights issued by the Washington State Department of Ecology (DOE) for two surface water sources and nine groundwater sources. The combined water right on instantaneous quantity basis (Q_i) from all of the City's sources is 10,545 gallons per minute (gpm). The annual withdrawal allocated to the City is 6,300 acre-feet. A summary of the City's water rights are presented below in Table 5-1 Four of the wells listed in Table 5-1 are no longer in use: Well 1, 2, 3, and 4. Water rights from these wells have been transferred to other sources as indicated.

The surface water diversions for Jones Creek and Boulder Creek (formerly known as the Little Washougal River) are situated in Section 3, Township 2 North, Range 4 East, W.M. All of the wells, with the exception of Well 9, are located in Section 12, Township 1 North, Range 3 East, W.M. Well 9 is located in Section 4, Township 1 North, Range 3 East. The "place of use" specified by DOE on all certificates, permits, and claims is either "within the City limits of the City of Camas" or the "area served by the City of Camas." The purpose or "type of use" for certificates, permits, and claims is "municipal supply," except for Certificate S 711 C (Jones Creek), which specifies a purpose of "domestic supplies." Ecology and the City have recently come to an agreement that eliminates the surface water withdrawals between May 15 and October 31, in exchange for additional groundwater rights.

TABLE 5-1

City of Camas Water Rights Summary

Source	ID Number	Priority Date	Instantaneous Qi (gpm)	Annual Qa (acre-ft/year)
Claims				
Well 1	121022	06/11/74	900	320[(1) (4)]
Well 2	121023	06/11/74	900	230[(1) (4)]
Well 10	Claims transferred from Wells 1 and 2[(5)]			
Well 12	Claims transferred from Wells 1 and 2[(5)]			
Certificates				
Boulder Creek[(6)]	S 712 C	08/22/23	1,120 (2.5 cfs)	1,820[(2)] (P)
Jones Creek[(6)]	S 711 C	09/05/30	450 (1.0 cfs)	730[(3)] (P)
Well 3	G 85-A C	07/21/45	1,200	118[(4)] (P)
Well 4	G 4072-A C	02/12/59	1,325	1,208[(4)] (P)
Well 5	G 6636-A C	03/22/68	600	920[(4)] (P)
Well 6	G 6635-A C	03/22/68	1,500	2,400[(4)] (P)
Well 7	G2-00501 C	03/22/71	1,000	530[(4)] (P)
Well 8	G2-24400 C	02/04/77	900	530[(4)] (P)
Well 11	Water Right transferred from Well 3[(5)]			
Well 13	Water Right transferred from Well 4[(5)]			
Permits				
Well 9	G4-27384 P	08/13/86	650	210 (S)
Anderson Site	G2-30145	08/21/03	1,000	880
Parkers Landing	G2-30146	08/21/03	1,000	880
Treatment Plant Well	G2-30147	08/21/03	1,000	880
Total			**14,045 gpm**	**11,090 (P) 210 (S) ac-ft**

(1) Claims are considered valid until proven otherwise through an adjudication process.

(2) This source was formerly known as the Little Washougal River. The certificate refers to an instantaneous quantity (Qi) and does not specify an annual withdrawal. A DOE Report of Examination for Well No. 7 (G2-00501 C) summarizes existing water rights, including 1,820 ac-ft/yr for Boulder Creek (S 712 C), based on continuous withdrawal at the instantaneous right specified.

(3) The certificate refers to an instantaneous quantity (Qi) and does not specify an annual withdrawal. A DOE Report of Examination for Well No. 7 (G2-00501 C) summarizes existing water rights, including 730 ac-ft/yr. for Jones Creek (S 711 C), based on continuous withdrawal at the instantaneous right specified.

(4) The Permit and Report of Examination preceding this certificate limited water rights to "the total quantity withdrawn or diverted from all sources is not to exceed 5,900 ac-ft/yr."

(5) Well 10, 11, and 12 were installed to replace Well 1, 2 and 3, which have failed due to collapsed well casings; see Pacific Groundwater Group report dated June 9, 2003. Well 13 replaced Well 4 after Well 4 was determined to be groundwater under the influence of surface water; see Pacific Groundwater Group report dated August 14, 2006.

(6) See Ecology agreement that limits withdrawal from May through October.

(P) Primary water right, additive to other rights.

(S) Supplemental water right, not additive or considered when summing a cumulative total of all rights.

CURRENT WATER SYSTEM

Based on the water rights analysis in the City's *2001 Water System Comprehensive Water System Plan*, the City of Camas does not have adequate water supply capacity to meet maximum day demand requirements through the year 2020. However, since the 2001 Plan, the City has secured water rights and made the source modifications listed below:

- In an effort to maximize capacities of existing sources and water rights the City has:

  - Replaced Wells 1, 2, and 3 with Wells 10, 11, and 12;
  - Replaced Well 4 with Well 13; and
  - Drilled Well 14 under a new water right to be equipped in 2009.

- The City is in the process of transferring existing water rights from Georgia Pacific to the City.

In 2008, Ecology issued three new water rights for the City, giving the City rights to receive 4.32 million gallons per day of new water to add to its current authorization of 15.9 million gallons per day. The combined total equals 17.96 million gallons per day because rights from Jones and Boulder Creek are not available for use during peak demand days. This combined total will meet the City's peak day demand projections through 2022. In addition to Well 14, the City intends to install two additional wells under the new rights over next few years as required by demand. Although the City does not have a need to develop additional water rights for the immediate future, the potential for reclaimed water is evaluated. There may be a need for reclaimed water in the future, depending on actual future residential and industrial growth.

POTENTIAL FOR REUSE

The potential applications for reclaimed water in the Camas area include industrial process water, irrigation, constructed wetlands for mitigation banking, and stream flow augmentation. Each reuse application is first discussed, and then the treatment alternatives are described. The advantages and disadvantages of the reuse application alternatives are highlighted in the discussion below.

INDUSTRIAL PROCESS WATER

Table 5-2 shows the City's highest water users. The majority of these users are from the industrial customer class that accounts for over 35 percent of the City's water usage. Note that Camas School District #117 has a number of different accounts, but is included as a single account.

Currently, WaferTech uses potable water for the industrial processes; the potable water is treated with reverse osmosis (RO) at the WaferTech facility. It is possible WaferTech could use a significant amount of reclaimed water for their industrial process.

The potential users of reclaimed water for industrial processes also include Underwriters Laboratories and Heraeus Shin-etsu. The industries listed in Table 5-2, Underwriters Laboratories, and Heraeus Shin-etsu could also potentially use reclaimed water for irrigation purposes. Most of the industrial facilities have significant sized lawns that require irrigation during the dry season.

TABLE 5-2

City of Camas Highest Water Users

Customer	2005 Average Daily Demand (gpd)	2006 Average Daily Demand (gpd)	2007 Average Daily Demand (gpd)
Wafertech Industries	570,385	625,521	597,593
Linear Technology	233,870	171,406	257,783
Georgia Pacific Mill	238,567	253,700	261,624
Camas School District #117	38,198	55,009	41,559
Sharp Electronics Corp	17,470	15,494	14,488
Hewlett-Packard	40,647	29,633	21,329
Green Mountain Golf Course	0	20,146	0
Heraeus Shin-estu	12,657	14,543	12,789
Underwriters Laboratory	20,222	24,751	22,558
Camas Washington Associates	8,499	8,641	9,143
Bodycote	7,030	6,640	8,122

Previous estimates from WaferTech indicate a potential projected daily water demand of 3.50 mgd and the remaining industrial customers have a combined projected daily water demand of 1.73 mgd by 2020 (estimates from the *2001 Water System Plan*). Some of this water demand will be for non-industrial, non-irrigation uses such as toilet flushing. The total reclaimed water potentially used by industrial processes and irrigation of the lawns at the industries is estimated at 4.73 mgd (approximately 90 percent of the total water demand). Although WaferTech still has the potential to expand to 3.50 mgd, the current *Water System Plan Draft* projects a 0.70 mgd demand for WafterTech, and a combined industrial demand total of 2.83 mgd by 2029. However, the analysis in this chapter will use the previous industrial demand projections developed in the approved *2001 Water System Plan.*

The advantage to using reclaimed water for an industrial process is that it is a potential application for year-round use of reclaimed water, near the NUGA area. The distribution system could be costly; however, most of the industries that will use reclaimed water are clustered near the northwest boundary of the City of Camas, and the City may be able to use a portion of the reclaimed water to provide spray irrigation at Camp Currie at the north end of the Lacamas Lake. The distribution system from a satellite water reclamation facility (WRF) situated at the north end of Lacamas Lake to the northwest corridor of the City and Camp Currie is presented on Figure 5-1. The proximity of a satellite WRF to the industrial corridor could allow the distribution system to be more cost effective. It may be an option to site a water reclamation facility on-site at the WaferTech facility since most of the reclaimed water produced will be used at the facility; however, this option is not evaluated at this time.

IRRIGATION

Reclaimed water could be used for irrigation and landscaping purposes during the summer months. The Camas region has an annual average rainfall of approximately 75 inches, but the summer rainfall can average as little as 0.56 inches per month (Chapter 2 in the May 2007 Plan). Due to the significant amount of rainfall during winter months, reclaimed water could only be used for irrigation during the summer months.

Distribution will be cost-prohibitive if all parks and public property throughout the City of Camas are considered. Additionally, treating to reuse standards at the existing WWTF site and conveying the reuse water to the north end will be cost-prohibitive. Therefore, in the May 2007 Plan, only the properties in the vicinity of the WWTF (i.e., southeast Camas) were considered for irrigation with reclaimed water, including some of the City's public parks, municipal property (including City Hall, the Community Center, and the Library) and, public schools, and the Camas Cemetery. In this plan, the possibility of irrigating areas in Northwest Camas was considered. It is understood that the area golf courses, Green Mountain and Camas Meadows, have sufficient water rights for their needs. However, spray irrigation could be provided for forested areas of Camp Currie at the northwest end of Lacamas Lake. Camp Currie includes approximately 260 acres of predominantly forested park land, owned by a trust as a wildlife and recreation preserve. It is projected that spray irrigation could be provided on as much as 25 percent of this area (65 acres) without disrupting existing uses.

Table 5-3 lists the estimated potential reclaimed water usage rates for irrigation purposes at both the southeast Camas and northwest Camas areas. The irrigation usage rates are based on an irrigation rate of 14 inches/year and an irrigation season of 3 months/year. The total potential peak day demand for irrigation for the southeast and northwest areas are 0.338 mgd and 0.550 mgd, respectively, applying a peaking factor of two to the average seasonal usage. In addition to the limitation of using reclaimed water for irrigation purposes is that irrigation is only necessary approximately 3 months per year.

ALTERNATIVE NO. 2
SATELLITE WATER RECLAMATION
FACILITY SITE

ALTERNATIVE NO. 1
EXISTING WASTEWATER
FACILITY SITE

LACAMAS LAKE

COLUMBIA RIVER

WASHINGTON

OREGON

N

0 2,500 5,000 Feet

SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 5-1
RECLAIMED WATER DISTRIBUTION
SYSTEM ALTERNATIVES

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\05471 WW FAC PLAN\GIS\FIGURE 5-1.MXD

TABLE 5-3

Potential Reclaimed Water Usage Rates[(1)]

Irrigation/Landscaping Use[(1)]	Irrigated Area (Acres)	Annual Average Usage (MG/year)	Peak Day (mgd)
Southeast Camas			
Public Schools	10	3.8	0.084
Other Municipal Property	3	1.1	0.025
Camas Cemetery	12	4.6	0.101
Public Parks	15	6	0.127
Total Potential Reclaimed Water Usage – Southeast Camas			**0.338**
Northwest Camas (Camp Currie)			
Camp Currie	65	25	0.550
Total Potential Reclaimed Water Usage – Northwest Camas			**0.550**

(1) Irrigation rate based on 14 inches per year over a 3-month irrigation season, and peak day to seasonal peaking factor of 2.0.

The irrigation sites and the distribution system from the existing WWTF are identified on Figure 5-1. The advantage of an irrigation system is the presence of several potential irrigation sites clustered including the southeast and northwest corridor of the City, near the existing treatment facility or proposed WRF site; therefore, distribution costs could be reasonable if the existing plant is modified to a water reclamation facility or a new facility is constructed. The disadvantage to irrigation as a reuse application is that irrigation is only necessary during summer months; during the remaining months the City would not need to reclaim water and would have to use the existing outfall.

MITIGATION WETLANDS BANK

The City of Camas has received funding to establish a mitigation wetlands bank in the Lacamas Watershed. A mitigation wetlands bank typically involves a larger mitigation wetlands site, providing more ecological value than several smaller mitigation wetlands. Furthermore, the potential for success of a mitigation wetland bank is greater than a smaller mitigation wetland. Mitigation wetland banks require the up-front compensation prior to impacting an existing wetland at a site undergoing development. With proper implementation and guidelines, mitigation wetland banks have the potential to increase ecological benefits, save money for project applicants, and improve efficiencies in application and permitting processes. Reclaimed water could be used to enhance the wetlands mitigation bank.

The mitigation wetlands bank in the Lacamas Watershed project will acquire 63 acres on Fifth Plain Creek, a tributary to Lacamas Creek. The property includes a 26-acre riparian

zone as well as connected wetlands and uplands. The City has received funding to restore/enhance 24 acres of the site, and the remaining 39 acres will be utilized for future restoration as banking revenues are received.

Hydrogeological studies will be required to determine the suitability of the site for the purpose of using reclaimed water. Furthermore, monitoring wells will be required if the site is developed for the use of reclaimed water. The disadvantage to using reclaimed water for the wetlands mitigation bank is that both the hydrogeological studies and the monitoring wells will be very costly. The advantage to using reclaimed water for the wetlands mitigation bank is the potential for year-round use.

STREAM FLOW AUGMENTATION

The reclaimed water could be used to augment stream flows in the Dwyer Creek basin. The habitat in the Dwyer Creek basin has been compromised due to increased development in the drainage basin. The City could augment stream flows in Dwyer Creek to enhance habitat in the drainage basin. The City would have to work with the Washington State Departments of Ecology and Fish and Wildlife to develop a stream flow augmentation system at Dwyer Creek using reclaimed water. Issues associated with this alternative that have to be addressed are as follows:

- Establish beneficial use for the additional stream flow.
- Direct discharge of reclaimed water into Dwyer Creek may not be allowed. Based on past experience, this may require the construction of an additional structure, a lined pond and a conveyance channel to reaerate, cool and polish the reclaimed water prior to its introduction to Dwyer Creek.
- Flow of reclaimed water into the creek may be required to be maintained at a constant rate 24-hours a day year round.
- The City will have to determine the quantity of water they are willing to permanently give up in order to use their reclaimed water for stream flow augmentation. Once the water begins flowing into the creek, any interruption of flow could have adverse impacts on the creek's habitat.
- Hydraulic capacity of the creek channel as well as in-stream flow goals must be established by the Department of Fish and Wildlife.
- Water quality impacts to the small stream must be established. These impacts include the effects of parameters such as dissolved oxygen, nutrients, toxics and coliform bacteria.

- WRF effluent limits for ammonia and other toxic pollutants (metals) may be more stringent due to the potential harm to aquatic life in the creek.

EVALUATION OF ALTERNATIVES

The City of Camas has several alternatives available for the production of reclaimed water. The reuse application varies with the treatment alternative based on the proximity of the reclaimed water production site. Alternatives available to the City include:

- Alternative No. 1 – Modify the Existing WWTF for Reclaimed Water Production and Application of Reclaimed Water for Irrigation and Industrial Process Water.

- Alternative No. 2 – Construct a Satellite Water Reclamation Facility for Reclaimed Water Production and Application of Reclaimed Water for Irrigation and Industrial Process Water.

- Alternative No. 3 – Construct a Satellite Water Reclamation Facility for a Reuse Application of Wetlands Banking Mitigation.

- Alternative No. 4 – Construct a Satellite Water Reclamation Facility for a Reuse Application of Stream flow Augmentation.

Alternatives No. 3 and No. 4 are not evaluated at this time since many of the total project costs will be very similar to the cost of Alternative No. 2. The treatment costs will be the same and the distribution costs may be similar; however, Alternatives No. 3 and No. 4 will require hydrogeological studies to determine if either of these sites is adequate for a reuse application. Furthermore, the cost of hydrological studies, permitting, and monitoring wells could be cost prohibitive. Alternatives No. 1 and No. 2 are evaluated in greater detail.

ALTERNATIVE NO. 1 – MODIFY THE EXISTING WWTF FOR A REUSE APPLICATION OF IRRIGATION AND INDUSTRIAL PROCESS WATER

The City could modify the existing WWTF to provide Class A water reclamation. The Class A reclaimed water treatment process will be designed for a peak hour flow of 4.73 mgd. This amount would be sufficient for industrial reuse (the predominant use approximately 9 months of the year); during the remaining 3 months, 0.338 mgd of irrigation reuse water would be provided, and the industries would use potable water if the peak hour supply was insufficient. The remaining effluent would likely be discharged out the outfall. The advantage to modifying the existing facility is that most of the infrastructure exists already at the treatment facility.

Additional electrical reliability components would be required for the Class A water reclamation facility. The generator capacity must also be upgraded to meet Reliability Class I and additional alarms and telemetry would be required. However, substantial additional equipment reliability components are not required since the City has an existing outfall as an alternative disposal method. The City would be required to provide a UV disinfection system designed to produce Class A reclaimed water. The newest edition of the Department of Ecology's *Criteria for Sewage Works Design* (*Orange Book*) requires the UV disinfection system for reuse applications to comply with the 2003 *Ultraviolet Disinfection Guidelines for Drinking Water and Reuse (NWRI Guidelines)* published by the National Water Research Institute (NWRI) in collaboration with the American Water Works Association Research Foundation (AWWARF).

Conceptual Design and Cost Estimate

Coagulation and Filtration

The City's existing Aqua-Aerobics AquaDisk fabric filter has been approved for Title 22 reuse applications. This filter utilizes a series of rotating disks, which can be continuously backwashed while the filter continues to operate. Periodically, flow to the filter must be stopped to allow for a more intense washing of the fabric as well as to clean out solids that deposit in the filter tank. The existing filters are designed to treat a peak hour flow of 6.1 mgd (24 disks with 0.25 mgd approximate capacity per disk). The system would be reconfigured so that an alarm will trigger when the peak hour flow is greater than 6.1 mgd, at that point, the flow will be diverted to the outfall.

The current State water reuse standards include a requirement for coagulation and flocculation upstream of filtration to destabilize and agglomerate finely divided particulate into larger particles to increase the capture rate of suspended solids in the filter. The reuse standards revision process currently underway may remove or relax this requirement; however, for the purposes of this cost estimate, it is assumed that the requirement remains. Typically, for such systems, the following equipment is required: chemical feed system (for feeding coagulants), flocculation tanks, and mixing system. An ongoing concern observed in other reuse systems using cloth media filters is blinding of the filters, which can be mitigated somewhat by providing adequate detention time in the flocculation tanks.

The chemical feed systems would be paced off the secondary effluent flow meter. Gentle mixing would be provided for flocculation with a velocity gradient in the range of 20/sec to 80/sec. Detention times for such flocculation systems are typically in the range of 15 min. to 20 min. If a typical detention time of 20 minutes at maximum month flow of year 2025 (7.57 mgd) is selected, a flocculation tank volume of 105,000 gallons is required. There are space and hydraulic limitations in accommodating a coagulation/filtration at Camas. For the purposes of this report, it is assumed concrete in-ground tanks are provided, along with lift (screw) pumps.

UV Disinfection

Following Phase II construction, the City's low pressure/low intensity UV disinfection system will be capable of treating a peak design flow of 10.04 mgd to meets its secondary fecal coliform limits. However, the design flow capacity of the UV system to disinfect to reuse standards will be lower, due to the higher dosage requirements for generating reclaimed water. The 2025 peak hour reuse water demand is estimated at 4.73 mgd. Presuming the UV dosage in the existing is insufficient to disinfect the 4.73 mgd to reuse levels, an inline UV disinfection system could provide the additional UV dose needed to meet the requirements for Class A reclaimed water. The additional UV disinfection system would be installed downstream of the existing UV disinfection system. The existing filters have sufficient capacity to treat a Class A reclaimed water peak hour flow of 6.1 mgd. Rather than limit the Class A reclaimed water production peak hour flow capacity to 4.73 mgd (the projected peak hour demand), it is only slightly more expensive to design the inline UV disinfection system to a peak hour flow of 6.1 mgd. The additional reclaimed water peak hour design flow capacity of 6.1 mgd allows for the potential to reuse a greater amount of treated effluent in the future should the beneficial reuse alternatives become more cost effective.

Meeting the disinfection requirements in the NWRI guidelines results in additional capital and operating cost for the UV system, due to several factors:

- Use of conservative design transmittance; the 10^{th} percentile of transmittance measured three times per day for 6 months or 55 percent, whichever is higher. The 10^{th} percentile design transmittance is projected to be 65 percent.

- Use of a *validated* (based on performance testing of seeded pathogens) design delivered dosage of 100 mJ/cm^2

- Use of conservative lamp fouling and end-of-life factors

- Requirements to continuously monitor flowrate, UV intensity and UV transmittance. Monitoring these three parameters will allow continuous monitoring of calculated operational dose, which is also required by the Guidelines. Additionally, turbidity must be monitored continuously.

- Requirements to calibrate UV intensity monitors at least monthly. UV transmittance monitors and turbidity monitors must be calibrated in accordance with manufacturer's recommendations. Laboratory measurements of UV transmittance must be used to verify the accuracy of on-line transmittance monitoring equipment on a weekly basis.

- Requirements to operate the UV system at the same velocity range and flow per lamp as used for performance validation, and with total headloss less than or equal to that measured in equipment validation testing.

Alarms and Telemetry

The use of reclaimed water in open access areas demands a higher level of quality control than normal WWTF operations. An alarm system would need to be installed so that if the coagulation, filtration, or disinfection systems fail, then reclaimed water production will cease, the operator will be notified, and effluent will be directed to the WWTF outfall. The system could utilize new reclaimed water pumps that convey the reclaimed water through the new inline UV system to provide the additional necessary dose required for reuse. If a critical condition occurs, the pumps would be turned off, allowing all of the flow to discharge to the river.

Storage

Industrial water users require water and produce wastewater at sporadic times of the day, irrigation water is often applied to open access areas at night from about 12:00 a.m. to 4:00 a.m., so that water has time to percolate into the ground before public contact. Reclaimed water will be generated in larger amounts during the diurnal peak hours and will be generated in smaller amounts throughout the night. To match reclaimed water production and reclaimed water demand, 200,000 gallons of equalizing storage onsite at the WWTF is recommended. In addition, the industrial users of reuse water may also opt to provide additional reuse water storage onsite at the industrial facility. The City would also have the option to discharge reclaimed water via the outfall during periods of peak reclaimed water production and low reclaimed water demand.

Distribution

A pump station will be required to maintain pressure in the reclaimed water distribution system and to convey the reclaimed water to the irrigation sites and the industries that will use reclaimed water. The preliminary cost of the pump station is estimated at $110,000. The distribution system totals 25,540 linear feet and is presented on Figure 5-1.

The capital costs to modify the existing facility and construct the irrigation distribution system are summarized in Tables 5-4 and 5-5. The O&M costs for Alternative No. 1 are the costs above the O&M costs already incurred by the City for operating the existing WWTF are minimal. An annual O&M cost estimate includes one additional full-time employee (FTE) and additional power costs to operate the UV disinfection system and the alarm system.

TABLE 5-4

Alternative No. 1 – Modify Existing WWTF for Production of Reclaimed Water Treatment Costs (2009 Dollars)

Item	Quantity	Unit	Unit Price	Total Price
Mobilization/Demobilization	1	LS	$437,000	$437,000
Polymer System	1	LS	$385,000	$385,000
Class A Inline UV Disinfection System	1	LS	$330,000	$330,000
Coagulation/Flocculation Tankage and Piping	1	LS	$1,000,000	$1,000,000
200,000 Gallon Storage Tank	200	CY	$825	$165,000
Reuse Pumps	2	EA	$66,000	$132,000
Standby Generator	1	LS	$84,000	$84,000

Subtotal	$2,530,000
Site Work (5% of subtotal)	$ 219,000
Piping (12% of subtotal)	$ 524,000
Alarms/electrical (20% of subtotal)	$ 874,000
Painting (3% of subtotal)	$ 131,000
Misc. metals (2% of subtotal)	$ 88,000
Subtotal	$4,366,000
Contingency (25%)	$1,092,000
Sales Tax (7.9%)	$ 432,000
Total Construction Cost	**$5,890,000**
Engineering and Administrative Costs (25%)	$1,473,000
Total Estimated Project Cost - WRF	**$7,363,000**

TABLE 5-5

Alternative No. 1 – Modify Existing WWTF Reclaimed Water Distribution Costs (2009 Dollars)

Item	Quantity	Unit	Unit Price	Total Price
Mobilization/Demobilization	1	LS	$560,000	$560,000
Booster Pump Station	1	LS	$550,000	$550,000
Irrigation Supply Piping	51,000	LF	$88	$4,488,000

Subtotal	$5,598,000
Contingency (25%)	$1,400,000
Sales Tax (7.9%)	$ 553,000
Total Construction Cost	**$7,551,000**
Engineering and Administrative Costs (25%)	$1,888,000
Total Estimated Project Cost	**$9,439,000**

ALTERNATIVE NO. 2 – CONSTRUCT A SATELLITE WATER RECLAMATION FACILITY FOR A REUSE APPLICATION OF INDUSTRIAL PROCESS AND IRRIGATION

For Alternative No. 2, the City would construct a satellite water reclamation facility sited at the north end of Lacamas Lake near Camp Currie. The location is in the vicinity of the customers that would use the reclaimed water produced at the facility, although the City would be required to negotiate with the County to locate the satellite WRF in the county park, and to use some of the park for spray irrigation. In addition to flows from the NUGA, the satellite WRF could treat commercial, industrial, and residential flows and loadings from Basin Nos. 11, 12, and 13, and about two-thirds of the total flows and loadings from Basin No. 1. The flows from these basins would be rerouted to the satellite WRF and no longer be treated at the existing WWTF site. The satellite water reclamation facility would serve as a scalping plant. Only the liquid stream would be treated at the satellite WRF, while solids would be pumped and conveyed through city sewers and treated at the existing treatment facility. (Some minor modifications would be needed to the STEP line to accommodate the conveyance of solids.) The existing WWTF would continue to treat the flows from the remaining basins. The existing outfall would continue to discharge the flows treated at the existing WWTF; furthermore, the existing outfall could serve as a backup to the WRF if needed. If sufficient demand for reclaimed water were available, the water reclamation facility could be sized for the 2025 peak hour flow of the NUGA, Basin Nos. 11, 12, and 13 (including Grass Valley), and about two-thirds of the flow from Basin No. 1. The total peak projected peak hour year 2025 flow for these areas is estimated to be 8.75 mgd. However, there is insufficient demand for reclaimed water to construct a WRF of this capacity. Thus, the WRF would be designed for 4.73 mgd peak hour flow. The maximum month design flow for the satellite WRF would be 2.1 mgd.

Conceptual Design and Cost Estimate

The reclaimed water system would require tertiary treatment, storage, and distribution. This section will briefly describe each component of the process and provide a cost estimate, based on costs for other water reclamation facilities in the State, including those at Sequim, Ephrata and Royal City.

The preferred alternative for construction of the satellite water reclamation facility is a membrane bioreactor (MBR) activated sludge process. The MBR process produces a very high quality effluent in a small footprint. In an MBR, secondary effluent is separated from the activated sludge solids by filtration through membranes submerged in the aeration basin, instead of separated by gravity in secondary clarifiers. The membrane filters produce a higher quality than typical tertiary filters, such as sand or cloth disc filters. Therefore, secondary clarifiers and tertiary filters are not required for MBR systems, and the facility footprint is smaller than for a reclaimed water facility using conventional activated sludge. Waste activated sludge is removed directly from the

aeration basin, and would be pumped to the existing treatment facility for further treatment.

Influent Pump Station

The Lacamas Shores Lift Station would be modified to serve as an influent pump station to the satellite WRF. Construction of a main sewer trunk to the satellite WRF will be required to convey influent from the influent pump station.

Headworks

The headworks would consist of an influent flow meter, sampler, mechanical fine screens, and a grit removal system. MBR processes require at least 3-mm fine screening to protect the membrane cassettes. Two mechanical fine screens (band screen or rotary drum) will be placed in two parallel channels, each sized for the maximum hydraulic flow of 4.73 mgd (one duty, one standby). A bypass bar screen will not be provided because its operation, even temporarily, could allow material into the MBR basin that may damage the membrane cassettes. The grit removal system would consist of an aerated grit chamber, a grit slurry pump, grit hydrocyclone, and classifier. Grit would be collected in a dumpster, while degritted slurry is returned to the grit chamber.

Membrane Bioreactor

In this particular process, solids in the aeration basin would be separated from the liquid by an in-basin membrane unit. The membrane microfilter system evaluated in this section is produced by Kubota, and marketed in the US by Enviroquip, Inc. Other membrane systems are available that may be used for the satellite WRF. In the Kubota system, membrane cassettes containing large numbers of flat-plate membranes (with nominal 0.4 μm pores) are placed directly into the aeration basin to provide clarification and filtration. Air is added through coarse-bubble diffusers mounted directly below the membrane cassettes to scour the membrane surfaces. The flow of air upward along the membranes promotes flow of mixed liquor upward across the membrane surfaces. Permeate (membrane effluent) passes through the membrane walls into the interior of the flat-plate membrane in a cross-flow pattern, with the driving force provided by either the elevation difference between the aeration basin water depth and the elevation of the downstream processes, or by permeate suction pumps.

In-place cleaning of the membranes with chlorine solution should be performed every 6 months, by injecting a chemical cleaning solution into the permeate lines and allowing the solution to soak in the interior of the membrane. Chemical solution tanks and feed pumps are provided. In addition, the manufacturer suggests periodically relaxing the membranes, by closing the permeate valves while continuing to scour the membranes with air, for 1 minute per 10 minutes of operation.

Operation of the aeration basin is not controlled by the gravity settling characteristics of the mixed liquor (as measured by the SVI). Therefore, the mixed liquor concentration can be maintained at three to four times the typical concentrations used in activated sludge processes. For this MBR, it is recommended to operate at a mixed liquor suspended solids (MLSS) concentration of 10,000 mg/L. Due to the high MLSS concentration, longer solids retention times (SRT) can be maintained in a tank with a short hydraulic retention time (HRT). The SRT is controlled by the rate that excess sludge is removed from the reactor. To remove excess sludge, the basins are equipped with waste activated sludge (WAS) pumps that transfer the sludge to the aerobic digestion system. Reducing the WAS removal rate will lengthen the SRT and increase the MLSS concentration. Membrane bioreactors have operated at concentrations up to 20,000 mg/L, without a negative long-term effect on membrane life.

Internal recycle pumps would transfer mixed liquor from the MBR tanks to the anoxic tanks and aeration basins, to transfer solids away from the membranes and to remove nitrogen from the wastewater through denitrification. Coarse bubble aeration diffusers would provide process air in the pre-aeration tanks. The MBR tanks are aerated by diffusers mounted to the bottom of the membrane cassettes. Two MBR tanks would be provided in parallel, allowing one tank to be taken off-line for maintenance or repair independently. In addition, redundant membrane cassettes would be provided in each tank to allow a cassette to be taken offline while providing treatment of the design flow.

Membrane permeate would flow by gravity or through permeate pumps to the UV disinfection facility. Permeate lines are equipped with pressure gauges and effluent magnetic flow meters.

Kubota membranes have a standard warranty of 5 years; replacement is recommended after 8 to 10 years. Extended warrantees are available, in which, for a fixed annual fee, the manufacturer will replace membranes as needed to maintain the design flux rate and performance.

The membrane bioreactor would be sized for a maximum month design flow of 2.1 mgd.

Coagulation and Filtration

The Class A reclaimed water standards require continuous oxidation, coagulation, filtration and disinfection of the wastewater. The MBR process will not produce higher quality effluent (in terms of BOD, TSS and turbidity) with the addition of coagulation or flocculation processes. Without coagulation, MBRs produce reclaimed water with higher quality than reclaimed water from conventional tertiary processes. The Washington State Departments of Ecology and Health have indicated that they would accept the MBR process without coagulation in a water reclamation application on a case-by-case basis. Therefore, coagulation facilities are not included in this evaluation.

Filtration is provided by the membrane microfilters in the MBR process.

UV Disinfection

Numerous UV disinfection systems that meet the Class A disinfection criteria have been installed in Washington State. Pilot testing has demonstrated that microfiltration membranes are capable of physically removing most bacteria, generally meeting the Class A disinfection standard (2.2 total coliform/100 mL) prior to disinfection. Pilot testing has demonstrated that virus removal is highly variable, and has been measured at less than 1-log (90 percent) removal in some pilot tests (City of San Diego, Point Loma Wastewater Treatment Plant). This is because viruses are generally smaller than the pore size of the microfilter.

The Washington State Department of Ecology's *Criteria for Sewage Works Design* has indicated that the future requirements of the UV disinfection must follow the NWRI guidelines. The implications of the NWRI guidelines on the design of the UV disinfection system are highlighted earlier in this chapter. However, MBR effluent requires a *validated* (based on performance testing of seeded pathogens) design delivered dosage of 80 mJ/cm^2. The UV disinfection system will be designed to disinfect the peak hour design flow of 4.73 with one bank out of service.

Alarms and Telemetry

An alarm system will be installed to notify staff if MBR or disinfection systems fail, or if the reclaimed water quality falls below an acceptable level. At this point, the reclaimed water production will cease and effluent will be pumped to the existing WWTF for further treatment and ultimately will be discharged via the City's existing outfall.

Storage

Industrial water users require water and produce wastewater at sporadic times of the day, Irrigation water is often applied to open access areas at night from about 12:00 a.m. to 4:00 a.m., so that water has time to percolate into the ground before public contact. Reclaimed water will be generated in larger amounts during the diurnal peak hours and will be generated in smaller amounts throughout the night. To match reclaimed water production and reclaimed water demand, 200,000 gallons of equalizing storage onsite at the WWTF is recommended. In addition, the industrial users of reuse water may also opt to provide additional reuse water storage onsite at the industrial facility. The City would also have the option to discharge reclaimed water via the outfall during periods of peak reclaimed water production and low reclaimed water demand.

Solids Handling

Mixed liquor must be wasted from the aeration basin to maintain a constant MLSS concentration and sludge age in the activated sludge system. The waste activated sludge (WAS) would be pumped to a city sewer for conveyance to the existing WWTF.

Distribution

A pump station would be required to maintain a pressure in the reclaimed water distribution system and to convey reclaimed water to the industrial corridor.

The capital costs to construct a satellite WRF and for the distribution system are summarized in Tables 5-6 and 5-7. The O&M costs for Alternative No. 2 are estimated based on experience from other existing water reclamation facilities throughout the State. It is estimated that the satellite WRF and distribution system will add 1 FTE to the City's labor requirement. Annual equipment maintenance costs are estimated as three percent of the initial equipment capital cost. In addition, UV lamps will need to be replaced, with an average replacement rate of 40 percent per year ($12,000) and the annual UV power requirements are estimated at $8,000. The membrane cartridges must be periodically replaced, with an average life of 8 to 10 years. The cost of an extended warranty, which includes replacement of membranes as needed, was quoted at $25,000 per year. The membranes would also require sodium hypochlorite, and possibly oxalic acid, as cleaning chemicals. The total annual O&M cost for Alternative No. 2 is estimated at $200,000.

TABLE 5-6

Alternative No. 2 – Construct a Satellite Water Reclamation Facility for Production of Reclaimed Water Treatment Costs (2009 Dollars)

Item	Quantity	Unit	Unit Price	Total Price
Mobilization/Demobilization	1	LS	$295,000	$295,000
Influent Pump Station and Distribution System	1	LS	$880,000	$880,000
Headworks (incl. fine screens, grit removal)	1	LS	$488,000	$488,000
MBR concrete tanks	1	LS	$669,000	$669,000
MBR equipment	1	LS	$5,720,000	$5,720,000
WAS Pump Station and Piping to Sewer	1	LS	$330,000	$330,000
Class "A" UV Disinfection System	1	LS	$386,000	$386,000
UV Disinfection System Channel	20	CY	$1,000	$20,000
Effluent flow meter and sampler	1	LS	$33,000	$33,000
Belt Filter Press	1	LS	$385,000	$385,000
Biosolids Hauling Truck	1	LS	$138,000	$138,000
200,000 Gallon Storage Tank	200	CY	$1,000	$200,000
Standby Generator	1	LS	$110,000	$110,000

Subtotal	$ 9,654,000
Site Work (5% of subtotal)	$ 483,000
Piping (12% of subtotal)	$ 1,159,000
Alarms/electrical (20% of subtotal)	$ 1,931,000
Painting (3% of subtotal)	$ 290,000
Misc. metals (2% of subtotal)	$ 194,000
Subtotal	$13,711,000
Contingency (25%)	$ 3,428,000
Sales Tax (7.9%)	$ 1,354,000
Total Construction Cost	**$18,493,000**
Engineering and Administrative Costs (25%)	$ 4,624,000
Total Estimated Project Cost	**$23,117,000**

TABLE 5-7

Alternative No. 2 – Construct a Satellite Water Reclamation Facility for Production of Reclaimed Water Distribution Costs (2009 Dollars)

Item	Quantity	Unit	Unit Price	Total Price
Mobilization/Demobilization	1	LS	$235,000	$235,000
Supply Pump Station	1	LS	$120,000	$120,000
Subtotal				$355,000
Site Work (5% of subtotal)				$18,000
Piping (15% of subtotal)				$54,000
Alarms/electrical (15% of subtotal)				$54,000
Painting (3% of subtotal)				$11,000
Misc. metals (2% of subtotal)				$8,000
Irrigation Supply Piping	21000	LF	$90	$1,890,000

Subtotal $2,390,000
Contingency (25%) .....$ 598,000
Sales Tax (7.9%) .....$ 237,000
Total Construction Cost $3,225,000
Engineering and Administrative Costs (25%) .....$ 807,000
Total Estimated Project Cost $4,032,000

FEASIBILITY OF REUSE

BENEFITS OF REUSE

The City and the surrounding community can benefit indirectly from the use of reclaimed water. The reuse application to augment streamflows in Dwyer Creek and for wetlands mitigation banking both will have potential environmental and social benefits to the City of Camas that are difficult to evaluate. For example, creating wetlands and enhancing Dwyer Creek can provide additional outdoor recreational uses for the community. The application to use reclaimed water for irrigation of parks and playfields can add value to the community as a whole, potentially increasing property values. In addition, reusing water for irrigation and industrial uses rather than using potable water supports a cultural value of conserving the quality and quantity of the City's water resources.

Industrial water customers can benefit from the production of reuse water by having a flexible and reliable alternative water source. Initially, industrial use of reclaimed water would likely require the industry to invest additional time and costs to adapt the existing system to the use of reclaimed water. However, the additional cost could potentially be minimal to retrofit the existing system since many of the industries currently have additional water treatment components that are applied to the potable water that they are currently purchasing.

ECONOMIC FEASIBILITY

Production of reclaimed water is considered economically feasible if the cost of producing reclaimed water is less than or equal to the cost of purchasing water or developing additional water rights. The 20-year present worth for Reuse Alternative No. 1 and Alternative No. 2 is presented in Table 5-7. The cost for Alternative No. 1, to modify the existing WWTF, is much less than the cost for Alternative No. 2, to construct a satellite WRF. However, at this time, production of reclaimed water is not economically feasible since adequate water rights are available at a relatively low cost. As mentioned above, the City has recently obtained substantial additional water rights, and if necessary, the City may be able to acquire additional water rights through a transfer. The cost to develop and acquire the additional water rights will not exceed a conservative estimate of $5 million. The cost to produce reclaimed water is significantly more expensive than the cost to develop and acquire additional water rights.

There would be some reduction in conveyance costs associated with the NUGA with the north end WRF. This reduction is not included in Table 5-8, but is estimated to be approximately 25 to 35 percent ($5 to $7 million) of the approximately $20 million in conveyance infrastructure (pump stations and trunk lines). However, there is insufficient demand to accommodate all of the 2025 peak hour flow of the NUGA, Basins No. 11, 12, and 13 (including Grass Valley), and about two-thirds of the flow from Basin No. 1. Without adequate demand or water quality drivers for reuse, given the higher cost of reuse relative to secondary treatment at the existing plant, it is recommended that water reuse not be implemented. The alternatives for reuse may be reevaluated in the future as treatment costs become more competitive.

TABLE 5-8

Comparison of Reuse Alternatives[(1)]
(2009 Dollars)

	Alternative No. 1 Modify Existing WWTF	Alternative No. 2 Construct a Satellite WRF
Peak Hour Reuse Water Production	6.1 mgd	4.73 mgd
Capital Cost – Treatment	$7,363,000	$23,117,000
Capital Cost – Distribution	$9,439,000	$4,032,000
Capital Cost – TOTAL	$16,802,000	$27,149,000
Annual O&M Cost	$108,000	$240,000
20-year Present Worth	$19,704,000	$33,598,000

(1) Inflation assumed at 3 percent.

CHAPTER 6

FINANCIAL ANALYSIS

This chapter addresses the financial impacts of the proposed improvements to the collection and treatment system to support the North Urban Growth Area (NUGA) expansion as well as additional development in the Grass Valley area identified since December 2007.

The 2007 General Sewer/Wastewater Facility Plan addressed the financial impacts of the proposed improvements to the City's wastewater collection and treatment system. The City commissioned a Utilities Rate Study by FCS Group resulting in a final report issued in January 2010. The FCS Group study incorporated the NUGA expansion Capital Improvement Program (CIP) from this General Sewer Plan amendment into its analysis. A copy of the FCS Group Sewer Utility Rate Study is located in Appendix F.

The FCS Group study assumed the following for the NUGA expansion:

- Collection system costs are spread out over a 10-year period (2014-2023), with 10 percent of the improvements constructed each year.
- The City funds one third of the collection system improvements, developers will fund two thirds.
- Treatment plant expansion needed to support the NUGA will not be made until 2021.

The FCS Group financial analysis also incorporated into their analysis the debt service for a $10 million Public Works Trust Fund (PWTF) loan that was acquired for the Phase 2 upgrades to the wastewater treatment facility now under construction. The City also received a $1 million PWTF loan for the Phase 2 design.

The FCS Group analysis assumes that a limited amount of revenue from system development charges (4 percent annually) will be used to fund the collection and treatment system capital improvements, while the majority of the improvements will be funded by the PWTF loan (41 percent) and revenue bonds (53 percent), with the remaining amount coming from existing fund balances (2 percent).

An 82 percent rate increase is needed to fund the total operating and capital needs of the sewer system through 2013. A phased rate transition strategy is proposed over the time period: 34 percent in 2009, 10.6 percent in both 2010 and 2011, 8 percent in 2012 and 3 percent in 2013. Monthly residential rates that incorporate the FCSG recommended rate increases are as follows:

2008 - $24.05
2009 - $32.23

2010 - $35.64
2011 - $39.42
2012 - $42.57
2013 - $43.85

The City intends to use a combination of rate increases, public financing, revenue bonds and developer funding for the sewer collection system improvements for the NUGA expansion. Because a significant amount of developer funding is required for these improvements, the City is considering the use of system development charge (SDC) credits when appropriate.

The FCSG analysis included system development charge recommendations for the NUGA that are higher than the non-NUGA. On an equivalent residential unit (ERU) basis, the non-NUGA SDC recommended by FCSG for an ERU is $3,334 and the NUGA SDC is $5,593.

The City is also considering the use of area-specific SDCs within the NUGA that would allow costs for capital improvements that only benefit a given area to be borne by the developers that build in that area. The development of area-specific SDCs will be contingent on the level and timing of development that occurs in a given area.

APPENDIX A

SEPA CHECKLIST

WAC 197-11-960 Environmental checklist.

ENVIRONMENTAL CHECKLIST

Purpose of checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply." Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of checklist for nonproject proposals:

Complete this checklist for nonproject proposals, even though questions may be answered "does not apply." IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D).

For nonproject actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

A. BACKGROUND

1. Name of proposed project, if applicable:

City of Camas General Sewer Plan Amendment (March 2010).

2. Name of applicant: **City of Camas**

3. Address and phone number of applicant and contact person:

James E. Carothers, P.E.
616 NE Fourth Avenue
Camas, Washington 98607
360 817-1561 ext. 4230
jcarothers@ci.camas.wa.us

4. Date checklist prepared: **April 2010**

5. Agency requesting checklist: **Washington Department of Ecology & City of Camas**

6. Proposed timing or schedule (including phasing, if applicable):

The General Sewer Plan Amendment was completed in April 2010. This document identifies potential improvements to the City Sewer System that will be completed in the year 2011 and beyond.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

The amendment to the City of Camas General Sewer & Wastewater Facilities Plan Amendment was prepared to address revisions to the City's north urban growth area (UGA) boundary as well as a new commercial development in the Grass Valley portion of the City's service area not identified in the City's existing General Sewer and Wastewater Facility Plan (May 2007/revised November 2009). These revisions will impact the sewer collection system, treatment facilities and potential strategies for wastewater reuse.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

- **A State Environmental Policy Act Determination of Non-Significance will be issued for this plan by the City of Camas.**
- **State Environmental Review Process/National Environmental Policy Act (SERP/NEPA) Environmental Assessment will be required if loans from the State Revolving Fund Program are utilized in the future for potential sewer system improvements identified in this Plan, but not for this General Sewer Plan Amendment.**

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

No other permit applications are likely to be required for adoption of the Facilities Plan Amendment.

10. List any government approvals or permits that will be needed for your proposal, if known.

Department of Ecology approval will be required for the General Sewer Plan Amendment and the City of Camas will issue a SEPA Determination of Non-Significance.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The North UGA expansion of residential development (1,700 acres) with more than 640 acres set aside for commercial and light industry/business park. Subtracting wetlands, parks streets and steep slopes, there would be 1,129 developable acres out of the total of 2,349 acres in the North UGA expansion, 652 acres for residential development, 66 acres for commercial and 340 acres for light industry/business park.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

- **The North UGA expansion extends north and east of Lacamas Lake.**

- **The proposed development in West Grass Valley is at the end of NW 38th Ave at the City of Camas/City of Vancouver border.**

B. ENVIRONMENTAL ELEMENTS

1. **Earth**

a. General description of the site (circle one): Flat**, rolling, hilly**, steep slopes, mountainous, other . . . . . .

b. What is the steepest slope on the site (approximate percent slope)?

Steep slopes are present in the North UGA.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

According to the *Soil Survey of Clark County, Washington (USDA SCS, November 1972)*, soils in the NORTH UGA north and east of Lacamas Lake are Cinebar-Yacolt association: Deep, dominantly gently sloping to very steep, medium-textured soils of the mountains and valleys. Soils in the West Grass Valley area are Hillsboro-Dollar-Cove association: Deep, dominantly nearly level to sloping, well drained to very poorly drained, medium-textured soils of the terraces.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

It is likely that there may be unstable soils in steep portions of the North UGA.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

None associated with this General Sewer Plan Amendment. Filling and grading quantities for associated construction projects will be addressed in future SEPA Checklists.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

No erosion would occur associated with the General Sewer Plan Amendment. Potential erosion issues associated with associated construction projects in the North UGA and West Grass Valley will be addressed in future SEPA Checklists.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

None associated with this General Sewer Plan Amendment: impervious surfaces associated with development of the North UGA will be addressed in future SEPA Checklists and other environmental documentation.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

None required for the General Sewer Plan Amendment. Construction BMPs for control of sedimentation and erosion will be implemented during construction of projects associated with the North UGA expansion and West Grass Valley development.

a. **Air**

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

There would be no air emissions associated with the General Sewer Plan Amendment. Air emissions associated with future construction projects in the North UGA and West Grass Valley will be addressed in future SEPA Checklists.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

None known.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

None required for the General Sewer Plan Amendment.

3. **Water**

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

The City of Camas North UGA is located to the north and east of Lacamas Lake. The lake is drained by Lacamas Creek. Fisher Creek is located on the boundary between Vancouver and the Camas city limits near West Grass Valley.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

No, the General Sewer Plan Amendment will not require work within 200 feet of Lacamas Lake. Future development in the North UGA will likely include work within 200 feet of Lacamas Lake.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

No fill or dredge material will be placed in surface waters or wetlands associated with the General Sewer Plan Amendment. Wetland impacts associated with future development in the North UGA and West Grass Valley will be addressed in separate SEPA documents.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

The General Sewer Plan Amendment will not require surface water withdrawals or diversions. Surface water impacts associated with future projects in the North UGA will be addressed in separate SEPA documents.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

According to Flood Insurance Rate Map (FIRM) Panel Number 530024 0425B portions of the North UGA in the vicinity of Lacamas Lake and Lacamas Creek are within the 100-year floodplain.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No. The General Sewer Plan Amendment addresses future wastewater collection and conveyance issues in the North UGA and West Grass Valley.

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

The General Sewer Plan Amendment will not impact groundwater. Implementation of some of the recommendations in the Amendment will likely improve/preserve groundwater quality in the area by eliminating septic systems.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

None associated with the General Sewer Plan Amendment.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

No modifications to surface water flow will occur associated with the General Sewer Plan Amendment.

2) Could waste materials enter ground or surface waters? If so, generally describe.

The General Sewer Plan Amendment will not directly impacts waste materials entering ground or surface water. Implementation of the recommendations of the Plan Amendment will likely reduce flows of wastewater from septic systems into groundwater in the North UGA.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

None required for the General Sewer Plan Amendment. Construction Best Management Practices (BMPs) for the control of sedimentation and erosion will be required for development within the North UGA and West Grass Valley.

4. **Plants**

a. Check or circle types of vegetation found on the site:

__X__ deciduous tree: alder, maple, aspen, cottonwood, Oregon ash other
___X____evergreen tree: fir, cedar, pine, other
__X__ shrubs

__X___ grass
___X___ pasture
___X___ crop or grain
___X___ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
_____ water plants: water lily, eelgrass, milfoil, other
_____ other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

No vegetation will be removed associated with the General Sewer Plan Amendment.

c. List threatened or endangered species known to be on or near the site.

Bradshaw's lomatium, *Lomatium bradshawii,* was listed as Endangered on September 30, 1988. It is thought to be endemic to the area around (within ten miles of) Salem, Oregon. According to Ron Klump of the US Army Corps of Engineers, it was recently discovered along Lacamas Creek near Camas, Washington.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

None associated with this General Sewer Plan Amendment.

5. **Animals**

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:

birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other:

b. List any threatened or endangered species known to be on or near the site.

Lower Columbia River Chinook salmon and Columbia River chum salmon (threatened) are present in the Washougal River. Lower Columbia River chinook, Lower Columbia River steelhead, Lower Columbia River coho and Columbia River chum, which are all listed as "threatened" pass the Camas WWTF outfall during their annual migrations. These fish spawn from mid summer through the winter, with a minimum number of smolts present during the month of August. The Washington Department of Fish & Wildlife Priority Habitat & Species Maps and Report indicated that purple martins nest in the vicinity of Camas.

c. Is the site part of a migration route? If so, explain.

Camas lies along the Pacific Flyway for migratory waterfowl. Approximately 14 Evolutionarily Significant Units and Distinct Population Segments of Columbia River salmon, trout and two species of sturgeon migrate up and down the Columbia River past the Camas WWTF.

d. Proposed measures to preserve or enhance wildlife, if any:

Implementation of the General Sewer Plan Amendment to address provisions for adequate wastewater treatment, conveyance and disposal for the North UGA and West Grass Valley will improve and preserve water quality for migratory salmonids and other fish and wildlife in and around Lacamas Lake and the Columbia River as the human population in Camas and the North UGA grows.

6. **Energy and natural resources**

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

The General Sewer Plan Amendment will require no significant use of energy.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

None required for the General Sewer Plan Amendment.

7. **Environmental health**

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste that could occur as a result of this proposal? If so, describe.

There are no environmental health hazards associated with adopting the General Sewer Plan Amendment.

1) Describe special emergency services that might be required.

None required for the General Sewer Plan Amendment.

2) Proposed measures to reduce or control environmental health hazards, if any:

None required for the General Sewer Plan Amendment.

b. **Noise**

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

No existing noises will affect the General Sewer Plan Amendment.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

No noise would be generated associated with adoption of the General Sewer Plan Amendment.

3) Proposed measures to reduce or control noise impacts, if any:

None required.

8. **Land and shoreline use**

a. What is the current use of the site and adjacent properties?

Land use in the recently designated North UGA is currently relatively sparse residential, light commercial and recreational centered around, east and north of Lacamas Lake. The West Grass Valley area consists mostly of open fields and sparse residential development.

b. Has the site been used for agriculture? If so, describe.

Open grass fields in West Grass Valley are harvested for livestock feed.

c. Describe any structures on the site.

There are several thousand structures in the city, including more than 6,400 dwelling units.

d. Will any structures be demolished? If so, what?

Adoption of the General Sewer Plan Amendment will not result in demolition of structures.

e. What is the current zoning classification of the site?

Zoning in the North UGA currently includes Park Land, School Properties and unzoned rural lands. The West Grass Valley area is designated Commercial and Residential.

f. What is the current comprehensive plan designation of the site?

The comprehensive plan designations or the North UGA area include single family, commercial, parks, school property and green space; the West Grass Valley area includes commercial and single family residential.

g. If applicable, what is the current shoreline master program designation of the site?

The Shoreline Master Program Designation along the west side of Lacamas Lake is largely "Conservancy."

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

A portion of the North UGA along the western shore of Lacamas Lake is designated as Shoreline Conservancy and there are steep slopes to the east of Lacamas Lake.

i. Approximately how many people would reside or work in the completed project?

The City of Camas has a current population of approximately 16,950 with a forecast population of approximately 22,000 in a 20-year planning horizon.

j. Approximately how many people would the completed project displace?

None.

k. Proposed measures to avoid or reduce displacement impacts, if any:

None.

Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

The General Sewer Plan Amendment addresses wastewater issues associated with the growth in the North UGA.

9. **Housing**

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

None.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

None.

c. Proposed measures to reduce or control housing impacts, if any:

The General Sewer Plan Amendment for the North UGA and West Grass Valley addresses wastewater collection, conveyance and treatment issues associated with residential and commercial development east and north of Camas.

10. **Aesthetics**

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Adoption of the General Sewer Plan Amendment will not result in construction of structures.

b. What views in the immediate vicinity would be altered or obstructed?

No views would change as a result of adopting the General Sewer Plan Amendment. Visual impacts associated with growth in the North UGA and Grass Valley will be addressed in future SEPA documents.

c. Proposed measures to reduce or control aesthetic impacts, if any:

Adoption of the General Sewer Plan Amendment for the North UGA will not have aesthetic impacts.

11. **Light and glare**

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

None.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

Adoption of the General Sewer Plan Amendment will not generate light or glare.

c. What existing off-site sources of light or glare may affect your proposal?

None.

d. Proposed measures to reduce or control light and glare impacts, if any:

None.

12. **Recreation**

a. What designated and informal recreational opportunities are in the immediate vicinity?

Boating, swimming, fishing occurs on Lacamas Lake, and windsurfing occurs along the Columbia River south of the North UGA.

b. Would the proposed project displace any existing recreational uses? If so, describe.

No.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

None.

13. **Historic and cultural preservation**

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

The Pittock-Leadbetter House is located in the North UGA.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

The Pittock-Leadbetter House and Lacamas Park are two culturally important resources in the North UGA.

c. Proposed measures to reduce or control impacts, if any:

None required for adoption of the General Sewer Plan Amendment for the North UGA.

14. **Transportation**

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

SR 14 provides access to the area surrounding the Camas WWTF, which is located at the intersection of SE Polk Street and SE 11th Avenue. The North UGA can be accessed from SR 14 via SR 500 and the roads around Lacamas Lake. Grass Valley is accessed from SR14 via SE 192nd Ave, Brady Rd and Parker St.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

C-Tran serves the City of Camas and a portion of the North UGA as well as West Grass Valley.

c. How many parking spaces would the completed project have? How many would the project eliminate?

None & None.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

Adoption of the General Sewer Plan Amendment will not require any new roads or streets. As development occurs in the North UGA, roads and streets will be built to serve the developed areas.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

The southern portion of the North UGA is approximately two miles from the Columbia River and its water transportation route.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

Adoption of the General Sewer Plan Amendment will not generate additional vehicular trips. However, traffic volumes in the North UGA and West Grass Valley will increase as a result of planned development in the next few years.

g. Proposed measures to reduce or control transportation impacts, if any:

None required for adoption of the General Sewer Plan Amendment.

15. **Public services**

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

Adoption of the General Sewer Plan Amendment for the North UGA would not directly result in a need for additional public services. This plan does, however, address provisions for wastewater collection, conveyance and treatment services to the North UGA.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Adoption of the General Sewer Plan Amendment for the North UGA and implementation of the recommendations for wastewater conveyance infrastructure will provide adequate service to the North UGA.

16. **Utilities**

a. Circle utilities currently available at the site: **electricity, natural gas, water, refuse service, telephone, sanitary sewer,** septic system, other.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity that might be needed.

The General Sewer Plan Amendment investigates measures to provide wastewater collection and conveyance infrastructure to serve the North UGA. Gas and electrical service in the area are provided by Northwest Natural Gas and Clark Public Utilities, respectively. Telephone service is provided by Verizon.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: Tina Daugherty

Date Submitted: 4-14-2010

D. SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

(Do not use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

Adoption of the General Sewer Plan Amendment for the North UGA provides a resource for development of sewer collection and conveyance structures to serve the area north and east of Camas and Lacamas Lake as well as the West Grass Valley area. Implementation of this General Sewer Amendment will provide for adequate wastewater conveyance and treatment to minimize adverse impacts to water quality associated with new development in the Camas North UGA and West Grass Valley through the planning period (2025).

Proposed measures to avoid or reduce such increases are:

Construction of new sewer pipelines and pump stations to serve the basins to the north and east of Lacamas Lake and to convey wastewater to the Camas WWTF will reduce/eliminate use of septic systems in the North UGA, allow for denser development, and provide for adequate wastewater treatment and conveyance through 2025.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

Adoption of the General Sewer Plan Amendment will have no impact on plants, animals, fish or marine life. Implementation of the sewer system improvements identified in the plan will improve and protect water quality and fish and wildlife in the vicinity of the WWTF Outfall through 2025.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

Construction best management practices (BMPs) for the control of sedimentation and erosion will be required during construction of proposed sewer system improvements. Proposed sewer system improvement projects will be reviewed via the SEPA and Shoreline Master Program regulations (associated with clearing and grading permits) for the City of Camas. Further, federally funded or permitted projects must be reviewed for their potential impacts to plant and animal species (and critical habitats) protected under the Endangered Species Act. Further, consultation with the National Marine Fisheries Service is required for projects that may impact commercially important species. Hydraulic Project Approval must be obtained from the Washington Department of Fish and Wildlife for projects with the potential to impact lakes, streams and fish habitat.

3. How would the proposal be likely to deplete energy or natural resources?

Adoption of the General Sewer Plan Amendment would not deplete energy or natural resources.

Proposed measures to protect or conserve energy and natural resources are:

Implementation of the sewer system improvements identified in the General Sewer Plan Amendment would help to provide adequate wastewater collection, conveyance and treatment infrastructure for the North UGA through 2025. Implementation of some of these projects is likely to increase energy consumption in the area slightly; i.e. sewering areas currently served by septic systems will necessarily require new pumping to convey wastewater to the Camas WWTF. New infrastructure will use modern, energy-efficient pumps, pipelines and equipment to minimize energy consumption. Once the new wastewater conveyance infrastructure is in place, water quality and fish habitat in the Columbia River near the WWTF outfall will be protected/preserved through 2025. Construction of wastewater conveyance and treatment infrastructure identified in the Facilities Plan Amendment will be subject to SEPA, Shoreline, Hydraulic Project review and Growth Management Act reviews in addition to the federal ESA consultation. Clean Water Act (CWA), Section 404 permitting from the Corps of Engineers and CWA, Section 401 Water Quality Certification from the Washington Department of Ecology.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

Adoption of the General Sewer Plan Amendment will not directly impact environmentally sensitive areas: i.e. there are no designated wilderness or Wild and Scenic Rivers in the project area, and potential impacts to listed species (and their critical habitats); cultural sites (to be avoided), wetlands, floodplains or prime farmlands will be minimal or positive.

Proposed measures to protect such resources or to avoid or reduce impacts are:

Implementation of the wastewater conveyance and treatment infrastructure improvements identified in the General Sewer Amendment will provide adequate wastewater conveyance and treatment infrastructure to serve the North UGA and General Sewer Plan Amendment through 2025. Infrastructure improvements will be subject to environmental reviews at the local, state and federal levels, as discussed above. Implementation of mitigation measures developed during the permitting processes and prudent land use decisions for the North UGA will help to minimize adverse impacts to fish and wildlife habitat associated with construction of the proposed sewer infrastructure improvements.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

Adoption of the General Sewer Plan Amendment will not affect land and shoreline use directly. Implementation of the infrastructure improvement projects identified in the amendment will support existing plans to develop the North UGA and Grass Valley commercial areas.

Proposed measures to avoid or reduce shoreline and land use impacts are:

Construction projects identified in the General Sewer Plan Amendment will be subject to review under the Camas Shoreline Master Program and the Growth Management Act in addition to the Washington Hydraulic Code (WDFW), Clean Water Act and Endangered Species Act reviews discussed above.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

Providing wastewater conveyance and treatment infrastructure identified in the General Sewer Plan Amendment would support planned development in West Grass Valley and North UGA, which would increase the demand for transportation, public services and water and electrical utilities in this area.

Proposed measures to reduce or respond to such demand(s) are:

Careful planning and permit review of proposed developments in the North UGA and West Grass Valley will assure that demands on transportation, public services and utilities are of an appropriate scale.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

Adoption of the General Sewer Plan Amendment for the Camas North UGA and West Grass Valley will provide the means for installation of wastewater conveyance and treatment infrastructure to serve this area, and to meet state and federal permitting requirements for the Camas WWTF discharge to the Columbia River. Adoption of the General Sewer Plan Amendment and implementation of the proposed infrastructure improvements will be consistent with local, state and federal laws to protect the environment, including:

- **Clean Water Act**
- **National Environmental Policy Act**
- **Endangered Species Act**
- **Washington Hydraulic Code**
- **Growth Management Act**
- **City of Camas Shoreline Master Program**
- **Washington State Environmental Policy Act**

APPENDIX B

CAMAS SEWER SYSTEM HYDRAULIC DATA

CITY OF CAMAS
GENERAL SEWER PLAN AMENDMENT
SANITARY SEWER HYDRAULIC DATA

This appendix includes the following sanitary sewer hydraulic data relevant to the General Sewer Plan Amendment:

1. Table 1, showing Sanitary Sewer Model Output, similar to that conducted for the 2007 *General Sewer / Wastewater Facility Plan*, revised to include Green Mountain and Grass Valley flows. For more information about the MOUSE modeling software parameters and modeling assumptions, see the 2007 *General Sewer / Wastewater Facility Plan.*

2. Data from flow monitoring conducted at the 6th and Joy discharge of the STEP Main in February 2010 for purposes of corroboration of the hydraulic model calibration. This data is plotted against WWTP daily flows and precipitation. In the 2007 *General Sewer/ Wastewater Facility Plan*, a current 2.72 MGD total peak hour flow (the sum of 2.27 MGD peak hour diurnal flow and 0.45 MGD estimated peak hour I/I) was modeled for this STEP line. This seems reasonably consistent with the data from this new monitoring, which shows 2.47 MGD peak hour flow for the STEP Main during the February monitoring period. The peak daily precipitation during this period was 0.71 inches.

   The flow levels appear to cycle ~7 - 11 times per day, consistent with a series of batch, or periodic, discharges. This pattern is due to the superposition of industrial flow patterns on top of residential flows. Industrial flows are expected to account for approximately half (0.75 MGD) of the daily STEP line flows observed. Of this 0.75 MGD industrial flow, 90% comes from Linear and Wafertech. Per discussion with Wafertech, this flow pattern is consistent with discharge. Wafertech's instantaneous pumping rate is approximately 770,000 gallon per day, with an average daily rate of 500,000 gallons per day. On Feb. 15, 2010, Wafertech discharged 9 pump cycles, with effluent pumps on for 1 ½ hours and off for about 1 hour for each cycle.

   The "4 per moving ave." is an Excel trendline showing the moving average of 4 consecutive points. As the flow is measured every 15 minutes, the smooth trendline represents hourly average flows. (It dampens out the variations seen in 15 min. flows a little.)

   The 0.45 MGD peak hour I/I estimated in the STEP line is a relatively small portion of the 6.57 mgd peak hour I/I associated with the ~9 MGD WWTP peak hour influent flow. The fact that the WWTP flow on Feb. 14, 2010 increased to 3.06 MGD in response to 0.71 in. precip., but the STEP flow apparently did not increase on that day, supports this view that most of the I/I comes from the rest of the system (the gravity system). If we had a bigger storm, I would expect to see some increase in the STEP flows.

3. A memo, dated February 8, 2010, regarding the potential of surcharging in the sanitary sewer system unless STEP flows are rerouted through a new STEP Main Bypass after the introduction of NUGA flows. Figure 1 in the memo shows the locations of manholes surveyed in support of this evaluation.

TABLE 1
SANITARY SEWER MODELING RESULTS
WITH GRASS VALLEY AND GREEN MOUNTAIN FLOWS INCLUDED

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[(1)]	Qmax (cfs)	Hmax/D[(2)]	Surcharge (ft)[(3)]
1-3-14l1	1-3-14	1-3-13	330.43	313	152.87	8	330.43	0.457	0.487	
1-3-13l1	1-3-13	1-3-12	313	289.73	262.09	8	313.16	0.457	0.244	
1-3-12l1	1-3-12	1-3-11	289.48	262	201.31	8	289.63	0.457	0.492	
1-3-11l1	1-3-11	1-3-10	262	235.54	308.84	8	262.16	0.457	0.246	
1-3-10l1	1-3-10	1-3-9	235.34	226	146.25	8	235.52	0.457	0.56	
1-3-9l1	1-3-9	1-3-8	226	217.87	157.97	8	226.19	0.457	0.28	
1-3-8l1	1-3-8	1-3-7	217.57	206	209.07	8	217.75	0.457	0.581	
1-3-7l1	1-3-7	1-3-6	206	199.67	141.42	8	206.19	0.457	0.325	
1-3-6l1	1-3-6	1-3-5	199.52	192	132.65	8	199.7	0.457	0.557	
1-3-5l1	1-3-5	1-3-4	192	185.33	123.75	8	192.19	0.457	0.524	
1-3-4l1	1-3-4	1-3-3	185.23	182.7	89.04	8	185.45	0.457	0.773	
1-3-3l1	1-3-3	1-3-2	182.7	179.47	214.38	8	182.96	0.457	0.386	
1-3-2l1	1-3-2	1-3-1	179.22	161.8	221.38	8	179.39	0.457	1.02	0.01
1-3-1l1	1-3-1	1-1-10	161.9	161.33	221.38	8	162.42	0.457	1.163	0.11
1-1-10l1	1-1-10	1-1-9	161.05	154.6	110.72	12	161.62	2.954	4.318	3.32
1-1-9l1	1-1-9	1-1-8	154.6	153.35	111.55	12	158.65	2.911	4.62	3.62
1-1-8l1	1-1-8	1-1-7	153.35	149.17	88.49	12	157.78	2.909	8.28	7.28
1-1-7l1	1-1-7	1-1-6	149.17	148.49	425.2	12	157.33	1.994	8.159	7.16
1-1-6l1	1-1-6	1-1-5	148.49	148.44	56.87	12	155.72	1.993	7.233	6.23
1-1-5l1	1-1-5	1-1-4	148.44	147.9	463.05	12	155.33	1.993	6.887	5.89
1-1-4l1	1-1-4	1-1-3	147.9	147.6	204.27	12	153.67	2.256	5.774	4.77

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[(1)]	Qmax (cfs)	Hmax/D[(2)]	Surcharge (ft)[(3)]
1-1-3l1	1-1-3	1-1-2	147.6	147.33	141.95	12	152.97	2.261	5.371	4.37
1-1-2l1	1-1-2	1-1-1	147.33	147.3	48.85	12	152.33	2.541	4.996	4.00
1-1-1l1	1-1-1	2-1-11	147	145.77	372.51	12	151.72	2.541	4.722	3.72
9-1-5l1	9-1-5	9-1-4	33.75	32.91	226.74	8	34.04	0.276	0.432	
9-1-4l1	9-1-4	9-1-3	26.95	25.22	436.41	8	27.23	0.276	0.696	
9-1-3l1	9-1-3	9-1-2	25.22	24.95	337.85	8	25.66	0.276	0.653	
9-1-2l1	9-1-2	9-1-1	23.85	23.61	65.8	8	24.16	0.331	0.459	
9-1-1l1	9-1-1	One Stp LS	23.51	22.5	32.81	12	23.66	0.331	0.149	
8-1-9l1	8-1-9	8-1-8	30.84	29.83	441.23	10	31.17	0.331	0.451	
8-1-8l1	8-1-8	8-1-7	29.83	28.67	335.14	10	30.12	0.331	0.452	
8-1-7l1	8-1-7	8-1-6	28.67	27.14	281.54	10	28.93	0.331	0.464	
8-1-6l1	8-1-6	8-1-5	27.14	25.16	266.48	10	27.38	0.331	0.619	
8-1-5l1	8-1-5	8-1-4	25.16	24.22	272.21	12	25.55	0.667	0.535	
8-1-4l1	8-1-4	8-1-3	24.22	21.83	304.05	12	24.54	0.667	0.524	
8-1-3l1	8-1-3	8-1-2	21.83	21.07	310.28	12	22.26	0.667	0.561	
8-1-2l1	8-1-2	8-1-1	21.07	20.95	41.2	12	21.45	0.667	0.382	
8-1-1l1	8-1-1	Oaks LS	20.7	17	250	12	20.95	0.667	0.252	
7-3-5l1	7-3-5	7-3-4	71.5	64.31	121.17	8	71.56	0.055	0.096	
7-3-4l1	7-3-4	7-3-3	64.26	41.81	193.99	8	64.31	0.055	0.193	
7-3-3l1	7-3-3	7-3-2	41.76	39.51	150.63	8	41.85	0.055	0.134	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[1]	Qmax (cfs)	Hmax/D[2]	Surcharge (ft)[3]
7-3-2l1	7-3-2	7-3-1	39.46	26.94	118.27	8	39.52	0.055	0.125	
7-3-1l1	7-3-1	7-1-1	26.89	16.91	190.47	8	26.96	0.055	0.569	
3-16-6l1	3-16-6	3-16-4	625.42	594.25	396.42	8	625.61	0.605	0.557	
3-16-4l1	3-16-4	3-16-3	594.25	581	141.91	8	594.44	0.605	0.61	
3-16-3l1	3-16-3	3-16-2	581	563.08	277.87	8	581.2	0.605	0.688	
3-16-2l1	3-16-2	3-16-1	563.08	554.01	222.76	8	563.31	0.605	0.714	
3-16-1l1	3-16-1	3-1-27	554.01	543.48	297.16	8	554.25	0.605	1.068	0.05
3-1-39l1	3-1-39	3-1-38	548.87	530	167.36	8	549.06	0.704	0.285	
3-1-38l1	3-1-38	3-1-37	527.99	521	215.05	8	528.26	0.704	0.546	
3-1-37l1	3-1-37	Crown LS	521	519	32.81	12	521.18	0.704	0.182	
3-19A-1l1	3-19A-1	3-19B-1	690.67	685	467.84	8	690.79	0.096	0.354	
3-19B-1l1	3-19B-1	3-19-6	685	678.77	467.84	8	685.12	0.096	0.18	
3-19-6l1	3-19-6	3-19-5	678.57	675.28	361.39	8	678.7	0.096	0.198	
3-19-5l1	3-19-5	3-19-4	675.16	671.11	334.48	8	675.28	0.096	0.345	
3-19-4l1	3-19-4	3-19-3	671.11	667.05	255.81	8	671.22	0.096	0.253	
3-19-3l1	3-19-3	3-19-2	667.05	664	51.5	8	667.13	0.096	0.267	
3-19-2l1	3-19-2	3-19-1	664	645.19	415.02	8	664.09	0.096	0.134	
3-19-1l1	3-19-1	3-1-36	645.09	627.12	269.24	8	645.17	0.096	0.771	
3-1-36l1	3-1-36	3-1-35	627.12	620.08	150.2	8	627.38	0.8	0.494	
3-1-35l1	3-1-35	3-1-34	619.88	605.44	345.62	8	620.14	0.8	0.423	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[1]	Qmax (cfs)	Hmax/D[2]	Surcharge (ft)[3]
3-1-34l1	3-1-34	3-1-33	605.24	589.5	267	8	605.48	0.8	0.781	
3-1-33l1	3-1-33	3-1-32	589.5	573.8	354.48	8	589.76	0.8	0.391	
3-1-32l1	3-1-32	3-1-31	572.42	561.9	126.18	8	572.64	0.817	0.98	
3-1-31l1	3-1-31	3-1-30	561.9	558.52	154.4	8	562.23	0.817	0.783	
3-1-30l1	3-1-30	3-1-29	558.52	554.39	83.71	8	558.78	0.817	0.818	
3-1-29l1	3-1-29	3-1-28	554.39	548.82	116.48	8	554.66	0.882	0.803	
3-1-28l1	3-1-28	3-1-27	548.82	543.48	100.57	8	549.09	0.882	1.068	0.05
3-1-27l1	3-1-27	3-1-26	543.48	533.98	143.24	8	543.84	1.486	3.797	1.86
3-1-26l1	3-1-26	3-1-25	533.98	530.74	150.68	8	536.12	1.486	4.477	2.32
3-1-25l1	3-1-25	3-1-24	530.74	527.7	296.49	8	533.35	1.486	3.911	1.94
3-1-24l1	3-1-24	3-1-23	527.7	517.67	297	8	528.16	1.772	1.5	0.33
3-1-23l1	3-1-23	3-1-22	517.67	510.51	263.25	8	518.17	1.772	0.75	
3-1-22l1	3-1-22	3-1-21	510.29	488.8	285.69	8	510.64	1.772	1.271	0.18
3-1-21l1	3-1-21	3-1-20B	488.8	480.5	191.92	8	489.22	1.772	0.927	
3-1-20Bl1	3-1-20B	3-1-20	480.5	464	137.81	8	480.81	1.772	0.911	
3-1-20l1	3-1-20	3-1-19	464	451	101.75	8	464.3	1.772	0.913	
3-1-19l1	3-1-19	3-1-18	451	422	234.31	8	451.3	1.772	1.206	0.14
3-1-18l1	3-1-18	3-1-17	422	413.73	117.92	8	422.4	2.111	0.603	
3-1-17l1	3-1-17	3-1-16	412.3	395.63	285.81	8	412.73	2.111	1.112	0.07
3-1-16l1	3-1-16	3-1-15	395.63	371	272.7	8	396	2.111	0.556	
3-1-15l1	3-1-15	3-1-14	370	361	109.1	8	370.39	2.111	0.992	
3-1-14l1	3-1-14	3-1-13	361	324.63	246.6	8	361.33	2.23	1.299	0.20
3-1-13l1	3-1-13	3-1-12	324.63	304.37	323	8	325.06	2.23	0.998	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[(1)]	Qmax (cfs)	Hmax/D[(2)]	Surcharge (ft)[(3)]
3-1-12l1	3-1-12	3-1-11	304.27	282	244.65	8	304.65	2.23	1.472	0.31
3-1-11l1	3-1-11	3-1-10	282	262.19	287.26	8	282.49	2.23	13.529	8.35
3-1-10l1	3-1-10	3-1-9	261.79	259.99	230.46	8	269.73	2.328	11.915	7.28
3-1-9l1	3-1-9	3-1-8	259.89	255.71	35.63	8	260.27	2.328	1.631	0.42
3-1-8l1	3-1-8	3-1-7	255.71	247.51	206.38	8	256.25	2.327	0.94	
3-1-7l1	3-1-7	3-1-6	246.66	231.4	242.11	8	247.4	2.325	9.921	5.95
3-1-6l1	3-1-6	3-1-5	231.4	226.54	256.56	8	237.18	2.325	8.668	5.11
3-1-5l1	3-1-5	3-1-4	226.24	210	262.89	8	226.69	2.325	1.371	0.25
3-1-4l1	3-1-4	3-1-3	210	194.73	259.92	8	210.46	2.325	1.076	0.05
3-1-3l1	3-1-3	3-1-2	194.63	173.42	262.16	8	195.04	2.325	0.613	
3-1-2l1	3-1-2	3-1-1	172.82	169.05	276.02	15	173.32	2.51	0.403	
3-1-1l1	3-1-1	5-8-1	168.9	83.11	442.05	18	169.19	3.815	0.197	
5-8-1l1	5-8-1	5-1-12	82.76	52.47	259.11	21	83.08	3.815	0.714	
4-2A-2l1	4-2A-2	4-2A-Q	213.76	209	281.8	8	213.88	0.107	0.325	
4-2A-Ql1	4-2A-Q	4-2A-1	209	206	115	8	209.11	0.107	0.37	
4-2A-1l1	4-2A-1	4-2-3	206	200.12	462.56	8	206.13	0.107	0.338	
4-2-3l1	4-2-3	4-2-2	200.12	198.99	374.83	8	200.3	0.107	0.275	
4-2-2l1	4-2-2	4-2-1	198.89	190.96	358.22	8	199	0.107	0.386	
4-2-1l1	4-2-1	4-1-2	190.96	190.15	256.41	8	191.13	0.107	0.972	
4-8-2l1	4-8-2	4-8-1	203.25	201.98	172.2	10	203.25	0	0.008	
4-8-1l1	4-8-1	4-1-8	201.98	200.95	441.72	10	201.99	0.001	0.498	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[1]	Qmax (cfs)	Hmax/D[2]	Surcharge (ft)[3]
4-1-8l1	4-1-8	4-1-7	200.95	199.6	468.84	10	201.28	0.382	0.679	
4-1-7l1	4-1-7	4-1-6	199.6	199.3	88.8	12	200.08	0.718	0.613	
4-1-6l1	4-1-6	4-1-5	199.3	199	70.52	12	199.74	0.718	0.54	
4-1-5l1	4-1-5	4-1-4	199	198.2	289.47	12	199.44	0.718	0.742	
4-1-4l1	4-1-4	4-1-3	198.2	197.37	315.9	12	198.74	1.011	0.64	
4-1-3l1	4-1-3	4-1-2	197.37	190.15	418.58	12	197.69	1.011	0.648	
4-1-2l1	4-1-2	4-1-1	190.15	189.6	246.78	15	190.69	1.117	0.504	
4-1-1l1	4-1-1	3-2-6	189.6	189.02	158.24	15	190.11	1.117	0.548	
3-2-6l1	3-2-6	3-2-5	189.02	188.29	224.99	15	189.54	1.117	0.549	
3-2-5l1	3-2-5	3-2-4	188.29	188.06	122.43	15	188.88	1.117	0.511	
3-2-4l1	3-2-4	3-2-3	188.06	184	261.61	15	188.38	1.117	0.509	
3-2-3l1	3-2-3	3-2-2	184	181.71	123.56	15	184.32	1.117	0.538	
3-2-2l1	3-2-2	3-2-1	181.71	175.84	342.51	15	182.05	1.306	0.306	
3-2-1l1	3-2-1	3-1-1	175.59	168.9	304.81	15	175.91	1.306	0.472	
6-5-2l1	6-5-2	6-5-1	59.47	58.27	380.57	8	59.47	0	0.007	
6-5-1l1	6-5-1	6-1-6	58.27	49.84	421.07	8	58.27	0.029	5.74	3.16
6-7-8l1	6-7-8	6-7-7	129.5	120.8	267.66	8	129.68	0.352	0.462	
6-7-7l1	6-7-7	6-7-6	120.8	100	319	8	120.95	0.352	0.552	
6-7-6l1	6-7-6	6-7-5	100	90.21	303.36	8	100.18	0.352	0.611	
6-7-5l1	6-7-5	6-7-4	90.21	82.72	344.71	8	90.41	0.352	0.535	
6-7-4l1	6-7-4	6-7-3	82.72	80.3	103.15	12	82.9	0.352	0.396	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[(1)]	Qmax (cfs)	Hmax/D[(2)]	Surcharge (ft)[(3)]
6-7-3l1	6-7-3	6-7-2	80.3	77.76	267.1	12	80.52	0.352	0.393	
6-7-2l1	6-7-2	6-7-1	77.76	73.87	417.65	12	77.98	0.352	0.385	
6-7-1l1	6-7-1	6-1-10	73.87	71.35	189.34	12	74.1	0.352	1.289	0.29
6-7-9l1	6-7-9	6-1-17	158.05	149.01	334.17	8	158.05	0	0.007	
6-1-17l1	6-1-17	6-1-16	149.01	141.48	280.07	8	149.01	0	0.008	
6-1-16l1	6-1-16	6-1-15	141.48	135.98	144.02	8	141.48	0	0.009	
6-1-15l1	6-1-15	6-1-14	135.98	133.05	301.36	8	135.98	0	0.007	
6-1-14l1	6-1-14	6-1-13	132.83	131.59	95.32	12	132.83	0	0.01	
6-1-13l1	6-1-13	6-1-13B	131.59	127.94	32.81	12	131.59	0	1.1	0.10
6-1-13Bl1	6-1-13B	6-1-12	127.94	115.03	136.35	15	128.49	7.52	1.058	0.07
6-1-12l1	6-1-12	6-1-11	115.03	95	256.6	12	115.69	7.52	1.233	0.23
6-1-11l1	6-1-11	6-1-10	95	71.35	247.14	12	95.62	7.52	1.289	0.29
6-1-10l1	6-1-10	6-1-9	71.35	59.76	284.88	18	71.99	7.872	1.815	1.22
6-1-9l1	6-1-9	6-1-8	59.76	57.85	276.65	18	61.68	8.491	1.285	0.43
6-1-8l1	6-1-8	6-1-7	57.85	52.04	269.02	18	58.81	8.491	2.805	2.71
6-1-7l1	6-1-7	6-1-6	52.04	49.84	256.12	18	55.43	8.491	2.551	2.33
6-1-6l1	6-1-6	6-1-5	49.84	47.68	279.68	18	52.85	8.491	2.168	1.75
6-1-5l1	6-1-5	6-1-4	47.68	45.48	278.91	18	50.07	8.702	1.716	1.07
6-1-4l1	6-1-4	6-1-3	45.48	43.32	265.09	18	47.55	8.702	1.547	0.82
6-1-3l1	6-1-3	6-1-2	43.32	41.16	268.64	18	44.48	8.702	0.773	
6-1-2l1	6-1-2	6-1-1	37.5	35.44	251.4	18	39.11	8.702	1.238	0.36
6-1-1l1	6-1-1	5-2-3	35.44	32.47	265.6	21	36.37	8.702	0.87	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[(1)]	Qmax (cfs)	Hmax/D[(2)]	Surcharge (ft)[(3)]
5-2-3l1	5-2-3	5-2-2	32.47	29.6	75.16	18	33.23	8.702	1.044	0.07
5-2-2l1	5-2-2	5-2-1	29.5	27.1	79.87	18	30.33	8.702	1.069	0.10
5-2-1l1	5-2-1	5-1-1	27	24.41	75.8	18	27.85	8.702	1.335	0.50
1-2-8l1	1-2-8	1-2-7	226.12	204.5	303.65	8	226.27	0.369	0.473	
1-2-7l1	1-2-7	1-2-6	204.5	181.39	354.81	8	204.66	0.369	0.492	
1-2-6l1	1-2-6	1-2-5	181.34	175.5	175.43	8	181.53	0.369	0.649	
1-2-5l1	1-2-5	1-2-4	175.45	170	80.81	8	175.69	0.835	0.769	
1-2-4l1	1-2-4	1-2-3	170	166.39	68.18	8	170.26	0.835	0.569	
1-2-3l1	1-2-3	1-2-2	166.24	160	130.65	8	166.5	0.835	0.837	
1-2-2l1	1-2-2	1-2-1	160	155.3	117.35	8	160.28	0.835	0.864	
1-2-1l1	1-2-1	1-1-2	155.2	147.33	152.69	8	155.54	0.844	7.937	4.62
2-1-11l1	2-1-11	2-1-10	145.77	144.56	413.58	12	149.52	2.958	3.753	2.75
2-1-10l1	2-1-10	2-1-9	144.56	144	178.13	12	146.19	2.958	1.629	0.63
2-1-9l1	2-1-9	2-1-8	144	128.5	366.34	12	144.45	2.958	1.38	0.38
2-1-8l1	2-1-8	2-1-7B	128.5	126.5	305.36	12	129.58	2.958	1.077	0.08
2-1-7Bl1	2-1-7B	2-1-7	126.14	124.99	64.67	12	126.75	2.958	0.767	
2-1-7l1	2-1-7	2-1-6	124.85	114.84	246.23	12	125.3	2.958	0.614	
2-3-1l1	2-3-1	2-1-6	124.49	114.84	156.08	10	124.66	0.456	0.737	
2-1-6l1	2-1-6	2-1-5	114.64	106.81	92.85	12	115.05	3.412	0.823	
2-1-5l1	2-1-5	2-1-4	106.61	101.76	131	12	107.12	3.412	0.677	
2-1-4l1	2-1-4	2-1-3	101.56	73.34	461.91	12	102	3.412	0.915	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[1]	Qmax (cfs)	Hmax/D[2]	Surcharge (ft)[3]
2-1-3l1	2-1-3	2-1-2B	73.14	66.45	246.84	12	73.7	3.412	0.897	
2-1-2Bl1	2-1-2B	2-1-2A	66.31	64.36	49	12	66.83	3.412	0.796	
2-1-2Al1	2-1-2A	2-1-2	64.2	62.25	32.81	12	64.68	3.412	0.95	
2-1-2l1	2-1-2	2-1-1	62.12	60.16	465.18	18	62.88	3.412	0.508	
2-1-1l1	2-1-1	5-1-12	56.78	52.47	401	12	57.59	3.412	1.25	0.25
10-1-23l1	10-1-23	10-1-24	586.24	582.57	246.52	8	586.37	0.119	0.392	
10-1-24l1	10-1-24	10-1-25	582.57	578.65	271.62	8	582.7	0.119	0.196	
10-1-25l1	10-1-25	10-1-26	578.46	573.76	73.84	8	578.55	0.119	0.136	
10-1-26l1	10-1-26	10-10B-1	573.52	565	71.95	8	573.6	0.119	0.118	
10-10-12l1	10-10-12	10-10-11	729.37	719.72	316.82	8	729.62	0.618	0.756	
10-10-11l1	10-10-11	10-10-10	719.72	713.46	209.66	8	719.97	0.618	0.396	
10-10-10l1	10-10-10	10-10-9	713.35	700	141.84	8	713.54	0.618	0.538	
10-10-9l1	10-10-9	10-10-9A	700	690.71	83	8	700.18	0.618	0.519	
10-10-9Al1	10-10-9A	10-10-8	690.71	673.37	136.92	8	690.88	0.618	0.259	
10-10-8l1	10-10-8	10-10-7	672.92	665.34	144.41	8	673.14	0.618	0.325	
10-10-7l1	10-10-7	10-10-6	664.94	650.23	168.4	8	665.13	0.618	0.285	
10-10-6l1	10-10-6	10-10-5	649.67	645.94	62.14	8	649.88	0.618	0.314	
10-10-5l1	10-10-5	10-10-4	645.64	617	347.43	8	645.83	0.618	0.289	
10-10-4l1	10-10-4	10-10-3	615.26	611.74	127.96	8	615.52	0.618	0.386	
10-10-3l1	10-10-3	10-10-2	611.07	595	101.85	8	611.23	0.618	0.449	
10-10-2l1	10-10-2	10-10-1	595	579.91	67.04	8	595.15	0.618	0.225	

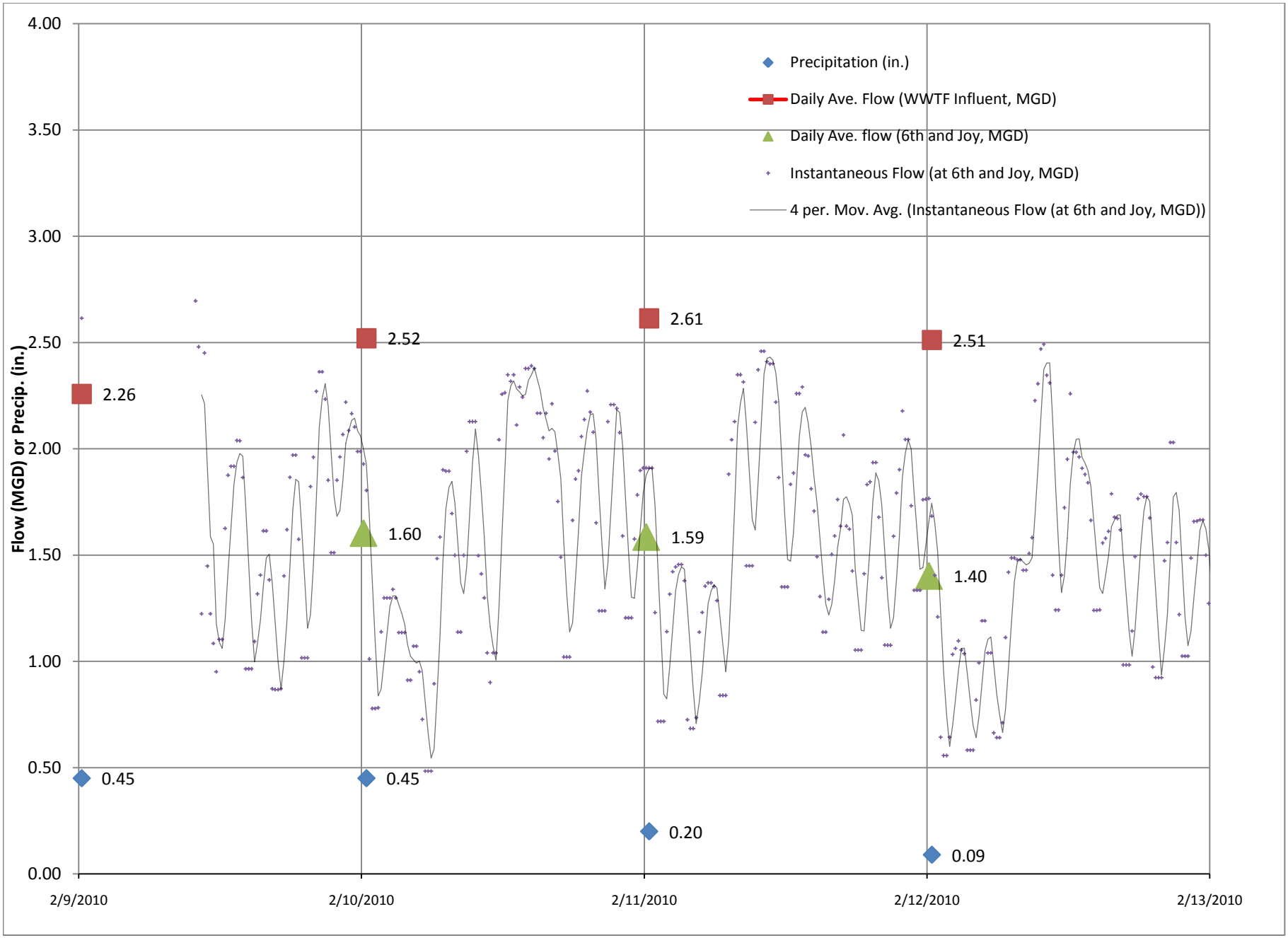
Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[1]	Qmax (cfs)	Hmax/D[2]	Surcharge (ft)[3]
10-10-1l1	10-10-1	10-10B-1	579.48	552.57	204.62	8	579.65	0.618	0.257	
10-10B-1l1	10-10B-1	10-11-8	552.32	529.58	113.51	8	552.51	0.898	0.279	
10-11-8I1	10-11-8	10-11-7	529.03	512.56	172.89	8	529.26	0.898	0.755	
10-11-7I1	10-11-7	10-11-6	512.51	504.76	172.89	8	512.79	0.898	0.415	
10-11-6I1	10-11-6	10-11-5	504.29	496.36	122.58	8	504.54	0.898	0.744	
10-11-5I1	10-11-5	10-11-4	496.36	489.35	99.68	8	496.61	0.898	0.869	
10-11-4I1	10-11-4	10-11-3	489.35	486.23	79.73	8	489.64	0.898	0.566	
10-11-3I1	10-11-3	10-11-2	485.94	481.23	202.93	8	486.27	0.898	0.5	
10-11-2I1	10-11-2	10-11-1	480.56	456.89	276.46	8	480.79	0.898	0.348	
10-11-1I1	10-11-1	10-4-4	456.17	437.78	149.06	8	456.38	0.898	0.317	
10-4-4l1	10-4-4	10-4-3	437.47	431.39	77.5	8	437.71	0.898	0.427	
10-4-3l1	10-4-3	10-4-2	431.2	422.61	105.27	8	431.44	0.898	0.774	
10-4-2l1	10-4-2	10-4-1	422.31	421.65	63.07	8	422.74	0.898	0.644	
10-4-1l1	10-4-1	10-1-10	421.53	377.51	189.32	8	421.71	0.898	0.269	
10-1-20l1	10-1-20	10-1-19	560.33	558.74	222.19	10	560.47	0.107	0.218	
10-1-19l1	10-1-19	10-1-18	558.7	557.34	180	10	558.83	0.107	0.165	
10-1-18l1	10-1-18	10-1-17	557.34	528.08	178.24	8	557.41	0.107	0.103	
10-1-17l1	10-1-17	10-1-16	527.27	510.29	82.16	8	527.34	0.107	0.098	
10-1-16l1	10-1-16	10-1-15	509.25	487.05	64.52	8	509.31	0.107	0.087	
10-1-15l1	10-1-15	10-1-14	486.88	461.89	227.99	8	486.96	0.107	0.376	
10-1-14l1	10-1-14	10-1-13	461.89	461.44	33	8	462.02	0.107	0.188	
10-1-13l1	10-1-13	10-1-12	461.44	411.61	153.23	8	461.5	0.107	0.088	

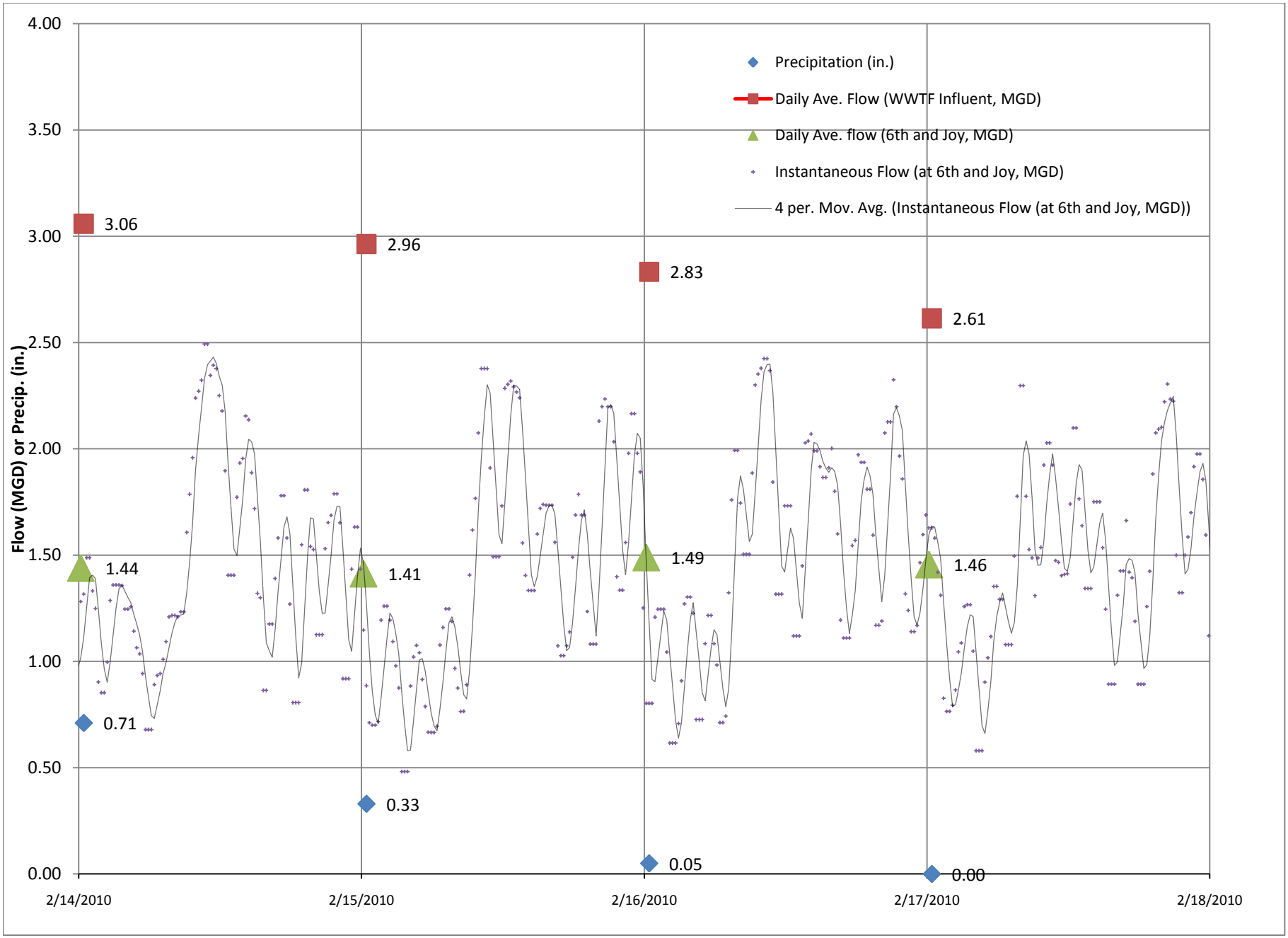
Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[1]	Qmax (cfs)	Hmax/D[2]	Surcharge (ft)[3]
10-1-12l1	10-1-12	10-1-11	410.71	388	158.82	8	410.88	0.625	0.253	
10-1-11l1	10-1-11	10-1-10	382.41	380.71	187.51	8	382.77	0.625	0.533	
10-1-10l1	10-1-10	10-1-9	375.1	170.58	281.66	8	375.28	1.523	1.9	0.60
10-1-9l1	10-1-9	10-1-8	171.3	159.26	89.57	8	171.57	1.523	0.41	
10-1-8l1	10-1-8	10-1-7	154.04	151.99	186.15	8	155.65	1.523	2.414	0.94
10-1-7l1	10-1-7	10-1-6	151.69	145.35	182.68	8	152.1	1.523	1.02	0.01
10-1-6l1	10-1-6	10-1-5	145.15	138.94	215.3	8	145.59	1.523	0.932	
10-1-5l1	10-1-5	S P Hill LS	138.94	137.5	32.81	12	139.25	1.523	0.311	
10-1-3l1	10-1-3	10-1-2	146.7	132	255.96	8	147.1	1.913	1.259	0.17
10-1-2l1	10-1-2	10-1-1	132	122.59	300	10	132.42	1.913	0.848	
10-1-1l1	10-1-1	W C LS	122.59	121	32.81	12	122.94	2.044	0.353	
10-6-4l1	10-6-4	10-6-3	475.28	471.48	200.3	8	475.54	0.518	0.551	
10-6-3l1	10-6-3	10-6-2	471.48	445.39	371.61	8	471.66	0.518	0.539	
10-6-2l1	10-6-2	10-6-1	445.39	424.43	273.95	8	445.57	0.518	0.688	
10-6-1l1	10-6-1	10-1A-12	424.43	417.32	238.32	8	424.66	0.518	0.344	
10-1A-12l1	10-1A-12	10-1-12	417.18	411.61	32.81	8	417.33	0.518	0.221	
7-1-6l1	7-1-6	7-1-5	23.7	22.21	286.97	8	24.05	0.468	0.757	
7-1-5l1	7-1-5	7-1-4	22.21	21.45	213.44	8	22.62	0.468	0.683	
7-1-4l1	7-1-4	7-1-3	21.45	19.75	57.12	8	21.68	0.468	0.743	
7-1-3l1	7-1-3	7-1-2	19.75	17.5	455.94	8	20.11	0.468	0.753	

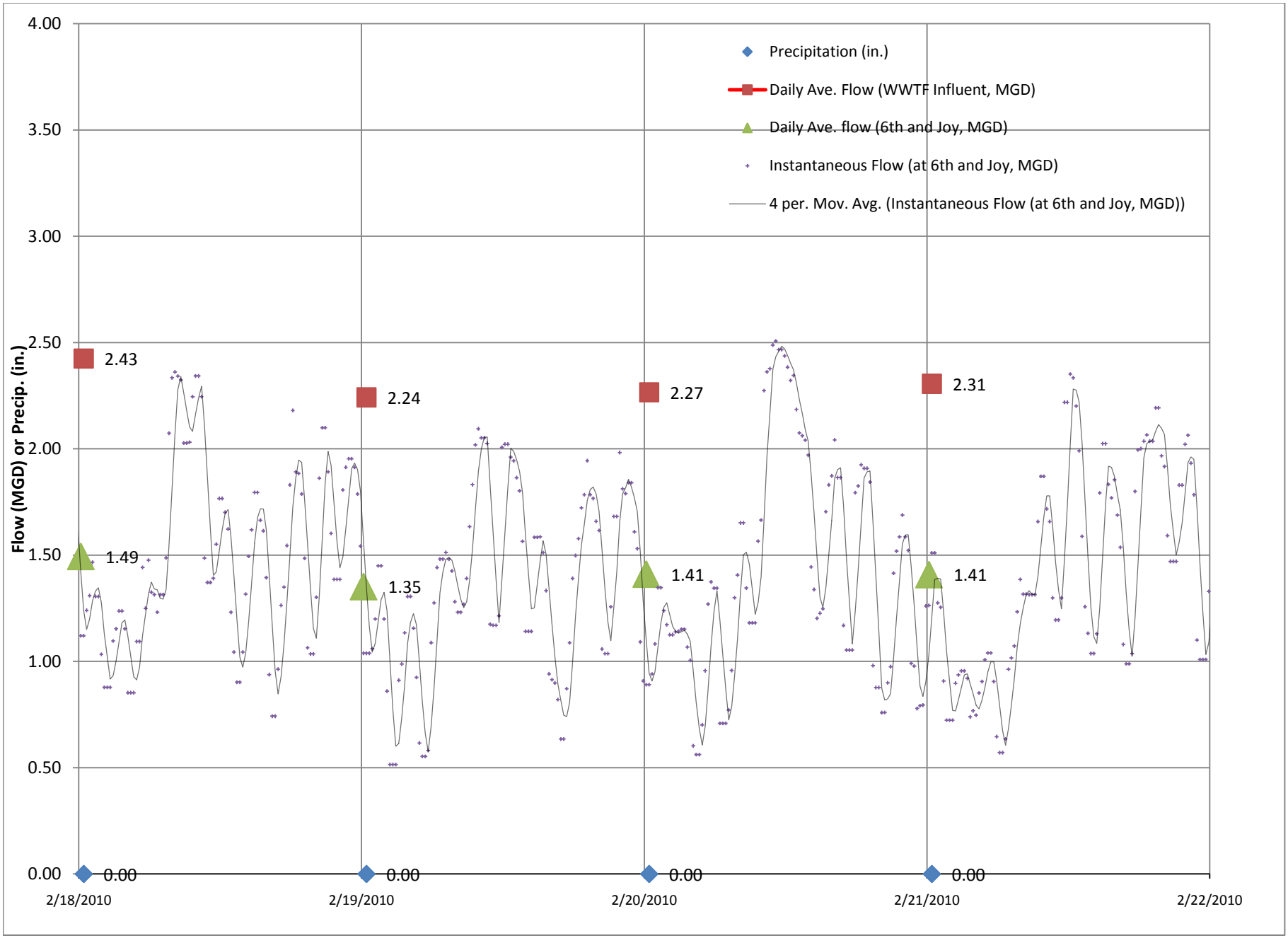
Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[(1)]	Qmax (cfs)	Hmax/D[(2)]	Surcharge (ft)[(3)]
7-1-2l1	7-1-2	7-1-1	17.5	16.86	163.94	8	17.89	0.468	0.644	
7-1-1l1	7-1-1	L C LS	16.86	9.62	328.36	10	17.07	0.523	0.258	
7-2-1l1	7-2-1	L C LS	12	9.62	101	12	12.09	0.096	0.093	
5-1-25l1	5-1-25	5-1-24	179.15	175.8	170.03	8	179.15	0	0.01	
5-1-24l1	5-1-24	5-1-23	175.8	158.25	97.27	8	175.8	0	0.011	
5-1-23l1	5-1-23	5-1-22	158.25	146.53	112.21	8	158.25	0	0.396	
5-1-22l1	5-1-22	5-1-21	146.53	135	271.78	8	146.66	0.208	0.41	
5-1-21l1	5-1-21	5-1-20	135	125	272.09	8	135.14	0.208	0.386	
5-1-20l1	5-1-20	5-1-19	125	112.43	268.1	8	125.13	0.208	0.23	
5-1-19l1	5-1-19	5-1-18	112.33	100	246.71	8	112.46	0.208	0.41	
5-1-18l1	5-1-18	5-1-17	100	90	271.63	8	100.14	0.208	0.408	
5-1-17l1	5-1-17	5-1-16	90	79.7	272.88	8	90.14	0.208	0.274	
5-1-16l1	5-1-16	5-1-15	79.6	71	267.08	8	79.74	0.208	0.421	
5-1-15l1	5-1-15	5-1-14	71	66.21	143.92	8	71.14	0.208	0.242	
5-1-14l1	5-1-14	5-1-13	66.11	60.5	122.75	8	66.24	0.208	0.437	
5-1-13l1	5-1-13	5-1-12	60.5	52.47	280.67	8	60.65	0.208	1.874	0.58
5-1-12l1	5-1-12	5-1-11	52.47	43.93	272	21	53.09	7.435	0.902	
5-1-11l1	5-1-11	5-1-10	43.93	40.07	274.19	21	44.72	7.613	0.611	
5-1-10l1	5-1-10	5-1-9	39.62	37.5	245.69	24	40.56	7.613	0.796	
5-1-9l1	5-1-9	5-1-8	37.5	36.52	551.39	24	38.9	7.613	0.759	
5-1-8l1	5-1-8	5-1-7	36.52	35	130.28	24	37.45	7.613	0.819	
5-1-7l1	5-1-7	5-1-6	35	33	226.78	21	35.95	7.613	0.724	

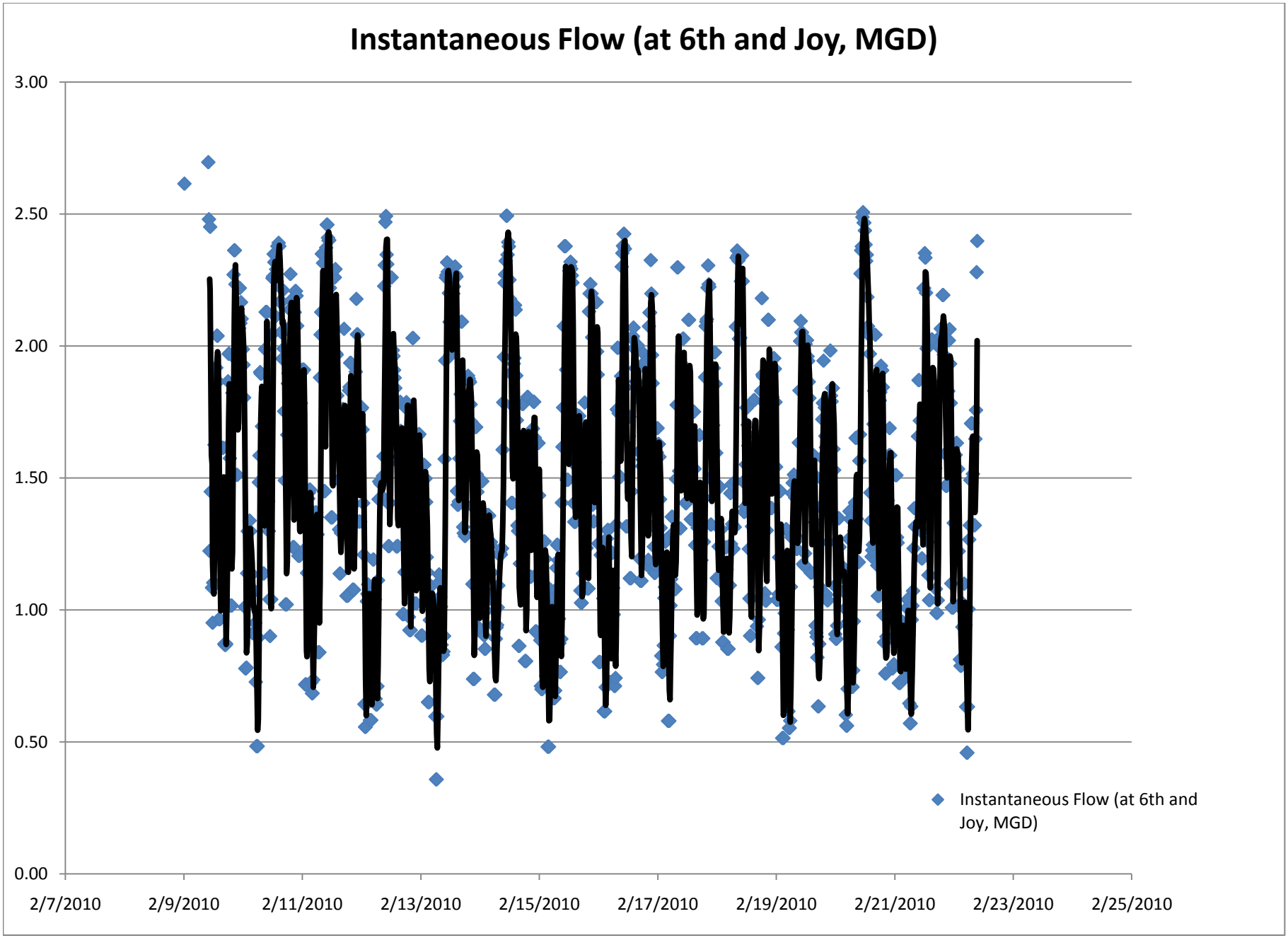
Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[(1)]	Qmax (cfs)	Hmax/D[(2)]	Surcharge (ft)[(3)]
5-1-6l1	5-1-6	5-1-5	33	28	121.91	21	33.63	7.613	1.066	0.12
5-1-5l1	5-1-5	5-1-4	28	26.22	240	21	29.25	7.613	1.287	0.50
5-1-4l1	5-1-4	5-1-3	26.22	25.93	289.28	21	28.28	7.613	1.176	0.31
5-1-3l1	5-1-3	5-1-2	25.93	24.9	240	21	27.29	7.614	1.002	0.00
5-1-2l1	5-1-2	5-1-1	24.9	24.41	34	24	26.46	7.615	1.001	0.00
5-1-1l1	5-1-1	Main_LS	24.41	22	142	24	25.41	16.309	0.501	

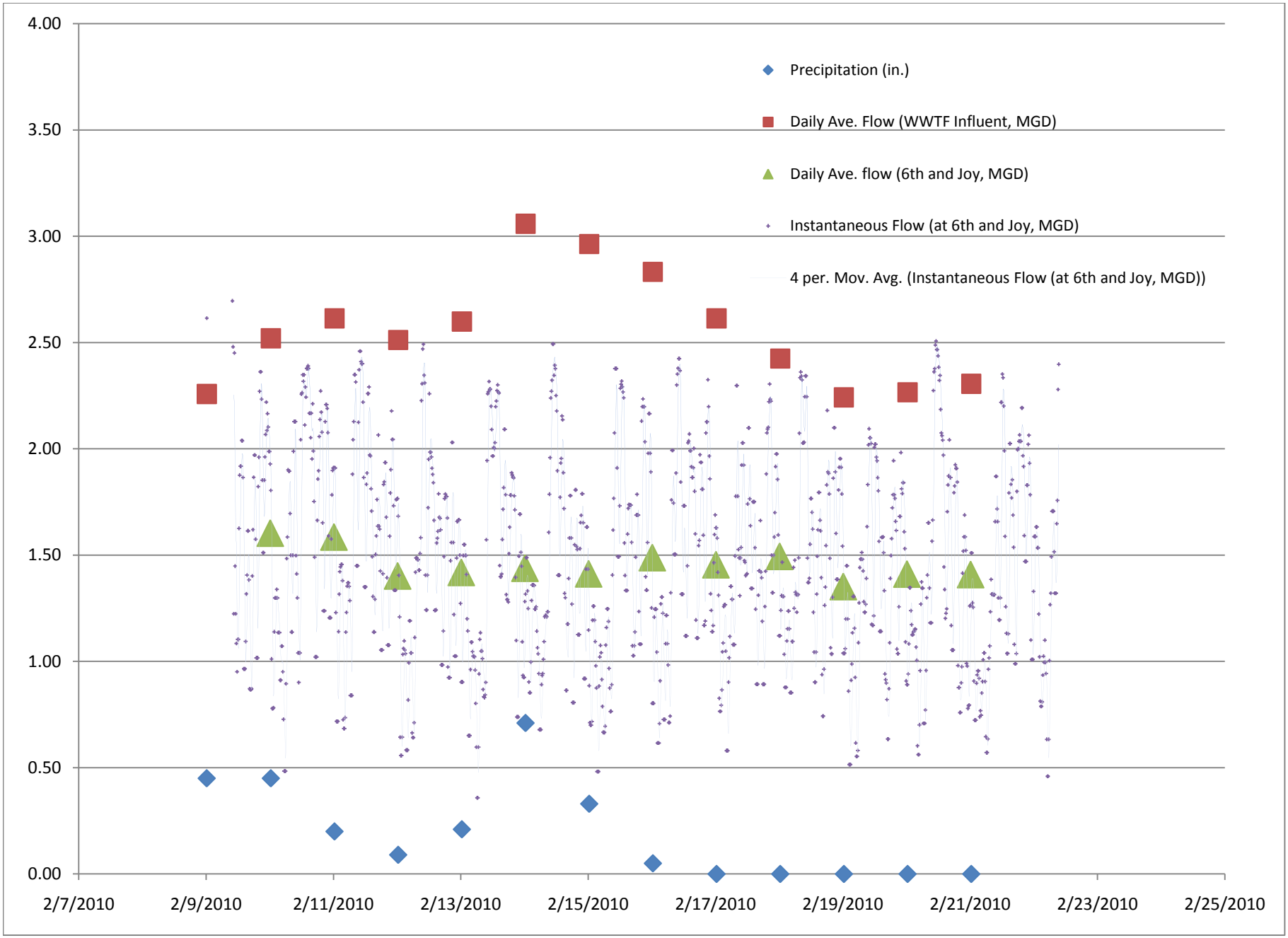
1) Hmax represents the hydraulic grid line; summation of elevation head, velocity head and pressure head.
2) Hmax/D represents the percent the of the pipe diameter used to convey the flow.
3) Surcharge represents the depth of water above the crown of the pipe in the manholes.


Precipitation (in.)
Daily Ave. Flow (WWTF Influent, MGD)
Daily Ave. flow (6th and Joy, MGD)
Instantaneous Flow (at 6th and Joy, MGD)
4 per. Mov. Avg. (Instantaneous Flow (at 6th and Joy, MGD))
Flow (MGD) or Precip. (in.)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2/9/2010
2/10/2010
2/11/2010
2/12/2010
2/13/2010
2.26
2.52
2.61
2.51
1.60
1.59
1.40
0.45
0.45
0.20
0.09


Precipitation (in.)
Daily Ave. Flow (WWTF Influent, MGD)
Daily Ave. flow (6th and Joy, MGD)
Instantaneous Flow (at 6th and Joy, MGD)
4 per. Mov. Avg. (Instantaneous Flow (at 6th and Joy, MGD))
Flow (MGD) or Precip. (in.)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2/14/2010
2/15/2010
2/16/2010
2/17/2010
2/18/2010
3.06
2.96
2.83
2.61
1.44
1.41
1.49
1.46
0.71
0.33
0.05
0.00


Precipitation (in.)
Daily Ave. Flow (WWTF Influent, MGD)
Daily Ave. flow (6th and Joy, MGD)
Instantaneous Flow (at 6th and Joy, MGD)
4 per. Mov. Avg. (Instantaneous Flow (at 6th and Joy, MGD))
Flow (MGD) or Precip. (in.)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2.43
2.24
2.27
2.31
1.49
1.35
1.41
1.41
0.00
0.00
0.00
0.00
2/18/2010
2/19/2010
2/20/2010
2/21/2010
2/22/2010


Instantaneous Flow (at 6th and Joy, MGD)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2/7/2010
2/9/2010
2/11/2010
2/13/2010
2/15/2010
2/17/2010
2/19/2010
2/21/2010
2/23/2010
2/25/2010
Instantaneous Flow (at 6th and Joy, MGD)


4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2/7/2010
2/9/2010
2/11/2010
2/13/2010
2/15/2010
2/17/2010
2/19/2010
2/21/2010
2/23/2010
2/25/2010
Precipitation (in.)
Daily Ave. Flow (WWTF Influent, MGD)
Daily Ave. flow (6th and Joy, MGD)
Instantaneous Flow (at 6th and Joy, MGD)
4 per. Mov. Avg. (Instantaneous Flow (at 6th and Joy, MGD))

MEMORANDUM

TO: MONTE BRACHMANN, PUBLIC WORKS DIRECTOR
FROM: KEN ALEXANDER, P.E.
DATE: FEBRUARY 8, 2010
SUBJECT: COLLECTION SYSTEM CAPACITY FOR NORTH UGA EXPANSION
CITY OF CAMAS, CLARK COUNTY, WASHINGTON
G&O #05471.01

Gray & Osborne recently received projected sewage flows from WG Cardno for the Green Mountain development (see attached) that is potentially to be part of the North Urban Growth Area (NUGA) expansion.

We have also received flow projections for the Fischer Investments facility in Grass Valley. The additional Grass Valley projections are based on 3,000 gallons per acre-day (gpad) base flow, a peaking factor of 3, and I/I of 500 gpad.

Because previous modeling of flows in the collection system during development of the Wastewater Facility Plan showed surcharging of portions of the system during high-flow events, we performed additional modeling to determine the potential impact of both the Green Mountain and Grass Valley developments.

Our modeling indicates that these additional flows, when added to existing flows, will increase surcharging of the system. While the modeling shows that projected flows do not cause the manholes to flood and release sewage to the street, in some manholes surcharging is significant enough to be of concern.

Because of this concern, we performed field measurements of selected manholes to measure the elevation difference between the manhole rim and the invert of the sewer line in the manhole. Results of field measurements and modeling are presented in Table 1. A figure showing locations of manholes measured in the field follows the table.

The modeling and fieldwork indicate that surcharging will potentially cause the liquid level in the manholes to approach 3 feet from the manhole rim in Manhole 6-1-4 when future Grass Valley and Green Mountain flows are added to existing flows. Modeling

and field measurements indicate other manholes will see liquid levels between 3.8 feet and 15 feet from the rim.

Gray & Osborne would like to discuss the implications of this analysis with the City prior to completing the Wastewater Facility Plan amendment that addresses the NUGA expansion.

TABLE 1

Collection System Modeling Results and Field Survey for the City of Camas

Manhole Number	Manhole Rim (ft)	Pipe Invert (ft)	Rim to Invert Height		Pipe Diameter (ft)	Surcharge (ft)			Rim to Surcharge Elevation (ft)		
			Model (ft)	Measured (ft)		GV + GM	GM only	GV Only	GV + GM	GM only	GV Only
6-1-13B	136.8	127.94			1.5	0.087	0	0			
6-1-12	123.3	115.03			1.5	0.3495	0	0.213			
6-1-11	104.13	95			1.5	0.4335	0.1665	0.3135			
6-1-10	78.68	71.35			1.5	1.2225	0.486	0.6255			
6-1-9	67.04	59.76			1.5	0.4275	0	0			
6-1-8	70	57.85			1.5	2.7075	0.5235	0.6315			
6-1-7	65	52.04			1.5	2.3265	0.441	0.7125			
6-1-6	59.84	49.84	10	7.08	1.5	1.752	0.528	0.669	3.8	5.1	4.9
6-1-5	64	47.68			1	1.074	0.1125	0.4335			
6-1-4	55.48	45.48	10	5.00	1	0.8205	0.4305	0.636	3.2	3.6	3.4
6-1-3	53.32	43.32	10		1.25	0	0	0			
6-1-2	47.5	37.5	10	11.17	1.5	0.357	0.102	0.2415	9.3	9.6	9.4
6-1-1	45.44	35.44	10		1.5	0	0	0			
5-2-3	42.47	32.47	10		1.75	0	0	0			
5-2-2	38.5	29.5	9	7.67	1.5	0.1035	0	0	6.1	6.2	6.2
5-2-1	38	27	11	17.00	1.5	0.5025	0.366	0.441	15.0	15.1	15.1
5-1-1	32	24.1			1	0	0	0			

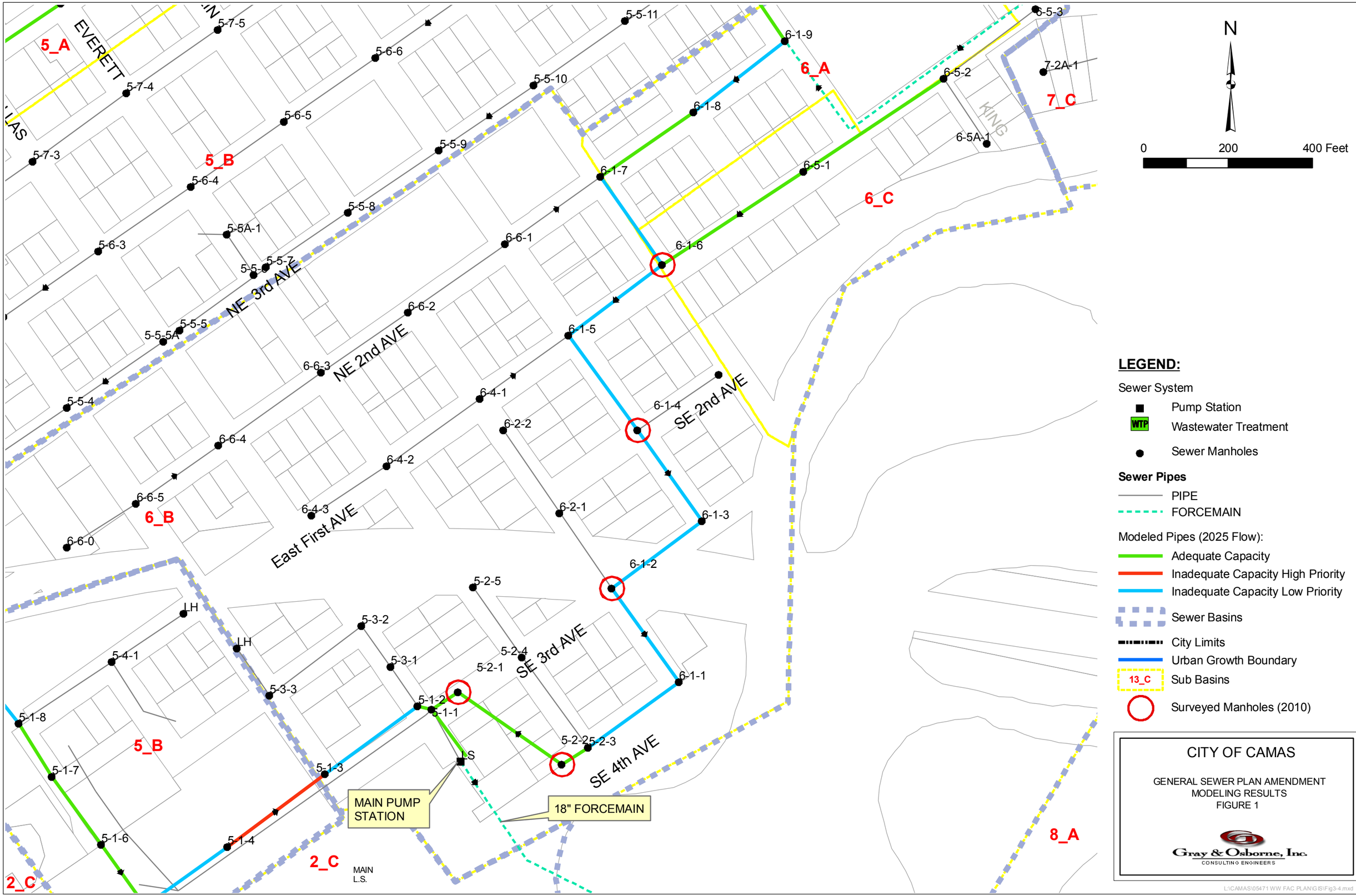
(1) Existing flows assumed to be 2.41 cfs (from 2007 Wastewater Facility Plan), with peaking factor of 2 applied in modeling.

(2) GM = Green Mountain flows assumed to be 0.54 cfs (0.059 cfs existing plus 0.481 cfs), with peaking factor of 2 applied in model.

(3) GV = Additional Grass Valley flows assumed to be 0.93 cfs, with peaking factor of 2 applied in model.

(4) Surcharge is measured as distance from crown of pipe to water surface.

KCA/hhj


N
0
200
400 Feet
5_A
5_B
6_A
6_B
6_C
7_C
2_C
8_A
EVERETT
NE 3rd AVE
NE 2nd AVE
East First AVE
SE 2nd AVE
SE 3rd AVE
SE 4th AVE
KING
5-7-5
5-7-4
5-7-3
5-6-6
5-6-5
5-6-4
5-6-3
5-6-2
5-6-1
5-6-0
5-5-11
5-5-10
5-5-9
5-5-8
5-5A-1
5-5-7
5-5-6
5-5-5A
5-5-5
5-5-4
6-6-3
6-6-4
6-6-5
6-4-3
6-4-2
6-4-1
6-2-2
6-2-1
6-1-9
6-1-8
6-1-7
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6-1-5
6-1-4
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7-2A-1
5-4-1
5-3-3
5-3-2
5-3-1
5-2-5
5-2-4
5-2-1
5-2-2
5-2-3
5-1-8
5-1-7
5-1-6
5-1-4
5-1-3
5-1-2
5-1-1
LH
LH
LS
MAIN PUMP STATION
18" FORCEMAIN
MAIN L.S.
LEGEND:
Sewer System
Pump Station
WTP
Wastewater Treatment
Sewer Manholes
Sewer Pipes
PIPE
FORCEMAIN
Modeled Pipes (2025 Flow):
Adequate Capacity
Inadequate Capacity High Priority
Inadequate Capacity Low Priority
Sewer Basins
City Limits
Urban Growth Boundary
13_C
Sub Basins
Surveyed Manholes (2010)
CITY OF CAMAS
GENERAL SEWER PLAN AMENDMENT
MODELING RESULTS
FIGURE 1
Gray & Osborne, Inc.
CONSULTING ENGINEERS
L:\CAMAS\05471 WW FAC PLAN\GIS\Fig3-4.mxd

APPENDIX C

COST ESTIMATES

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
BASIN I LIFT STATION (720 gpm peak flow)

NO.	ITEM	QUANTITY		UNIT PRICE	TOTAL
1	Mobilization/Demobilization	1	LS	$ 97,000	$ 97,000
2	Clearing & Grubbing	1	LS	$ 7,000	$ 7,000
3	Dewatering	1	LS	$ 20,000	$ 20,000
4	Erosion Control	1	LS	$ 7,000	$ 7,000
5	Temporary Shoring & Bracing	1	LS	$ 31,100	$ 31,100
6	Trench Excavation Safety Systems	1	LS	$ 3,000	$ 3,000
7	Concrete Slabs and Foundations	1	LS	$ 37,300	$ 37,300
8	Gravel Base	250	TN	$ 20	$ 5,000
9	Grading and Paving	1	LS	$ 20,000	$ 20,000
10	Fencing	250	FT	$ 50	$ 12,500
11	Utilities & Misc. Site Improvements	1	LS	$ 8,000	$ 8,000
12	Electrical Shelter	1	LS	$ 31,100	$ 31,100
13	Painting & Dampproofing	1	LS	$ 50,000	$ 50,000
14	Pumps and Level Control	1	LS	$ 155,200	$ 155,200
15	Piping, Valves and Accessories	1	LS	$ 99,400	$ 99,400
16	Generator System	1	LS	$ 99,400	$ 99,400
17	Electrical	1	LS	$ 149,000	$ 149,000
18	Instrumentation & Telemetry	1	LS	$ 40,000	$ 40,000
19	Utility Service (PUD)	1	LS	$ 12,000	$ 12,000
20	Programming, Startup, SCADA, Documentation	1	LS	$ 20,000	$ 20,000
			Subtotal		$ 904,000
			Sales Tax (8.9%)		$ 80,456
			Subtotal		$ 984,456
			Contingency (25%)		$ 246,114
			TOTAL ESTIMATED CONSTRUCTION COST		$ 1,240,000
			Engineering and Adminitrative Costs (25%)		$ 310,000
			Total Project Cost (Rounded)		$ 1,550,000

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
BASIN II LIFT STATION (205 gpm peak flow)

NO.	ITEM	QUANTITY		UNIT PRICE	TOTAL
1	Mobilization/Demobilization	1	LS	$ 45,000	$ 45,000
2	Clearing & Grubbing	1	LS	$ 7,000	$ 7,000
3	Dewatering	1	LS	$ 20,000	$ 20,000
4	Erosion Control	1	LS	$ 7,000	$ 7,000
5	Temporary Shoring & Bracing	1	LS	$ 8,900	$ 8,900
6	Trench Excavation Safety Systems	1	LS	$ 3,000	$ 3,000
7	Concrete Slabs and Foundations	1	LS	$ 10,700	$ 10,700
8	Gravel Base	200	TN	$ 20	$ 4,000
9	Grading and Paving	1	LS	$ 20,000	$ 20,000
10	Fencing	200	FT	$ 50	$ 10,000
11	Utilities & Misc. Site Improvements	1	LS	$ 8,000	$ 8,000
12	Electrical Shelter	1	LS	$ 8,900	$ 8,900
13	Painting & Dampproofing	1	LS	$ 50,000	$ 50,000
14	Pumps and Level Control	1	LS	$ 44,200	$ 44,200
15	Piping, Valves and Accessories	1	LS	$ 28,300	$ 28,300
16	Generator System	1	LS	$ 28,300	$ 28,300
17	Electrical	1	LS	$ 42,500	$ 42,500
18	Instrumentation & Telemetry	1	LS	$ 40,000	$ 40,000
19	Utility Service (PUD)	1	LS	$ 12,000	$ 12,000
20	Programming, Startup, SCADA, Documentation	1	LS	$ 20,000	$ 20,000
			Subtotal		$ 417,800
			Sales Tax (8.9%)		$ 37,184
			Subtotal		$ 454,984
			Contingency (25%)		$ 113,746
			TOTAL ESTIMATED CONSTRUCTION COST		$ 570,000
			Engineering and Adminitrative Costs (25%)		$ 150,000
			Total Project Cost (Rounded)		$ 720,000

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
BASIN III LIFT STATION (1040 gpm peak flow)

NO.	ITEM	QUANTITY		UNIT PRICE	TOTAL
1	Mobilization/Demobilization	1	LS	$ 129,000	$ 129,000
2	Clearing & Grubbing	1	LS	$ 7,000	$ 7,000
3	Dewatering	1	LS	$ 20,000	$ 20,000
4	Erosion Control	1	LS	$ 7,000	$ 7,000
5	Temporary Shoring & Bracing	1	LS	$ 44,900	$ 44,900
6	Trench Excavation Safety Systems	1	LS	$ 3,000	$ 3,000
7	Concrete Slabs and Foundations	1	LS	$ 53,800	$ 53,800
8	Gravel Base	250	TN	$ 20	$ 5,000
9	Grading and Paving	1	LS	$ 20,000	$ 20,000
10	Fencing	250	FT	$ 50	$ 12,500
11	Utilities & Misc. Site Improvements	1	LS	$ 8,000	$ 8,000
12	Electrical Shelter	1	LS	$ 44,900	$ 44,900
13	Painting & Dampproofing	1	LS	$ 50,000	$ 50,000
14	Pumps and Level Control	1	LS	$ 224,200	$ 224,200
15	Piping, Valves and Accessories	1	LS	$ 143,500	$ 143,500
16	Generator System	1	LS	$ 143,500	$ 143,500
17	Electrical	1	LS	$ 215,200	$ 215,200
18	Instrumentation & Telemetry	1	LS	$ 40,000	$ 40,000
19	Utility Service (PUD)	1	LS	$ 12,000	$ 12,000
20	Programming, Startup, SCADA, Documentation	1	LS	$ 20,000	$ 20,000
			Subtotal		$ 1,203,500
			Sales Tax (8.9%)		$ 107,112
			Subtotal		$ 1,310,612
			Contingency (25%)		$ 327,653
			TOTAL ESTIMATED CONSTRUCTION COST		$ 1,640,000
			Engineering and Adminitrative Costs (25%)		$ 410,000
			Total Project Cost (Rounded)		$ 2,050,000

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
BASIN IV LIFT STATION (270 gpm peak flow)

NO.	ITEM	QUANTITY		UNIT PRICE	TOTAL
1	Mobilization/Demobilization	1	LS	$ 95,000	$ 95,000
2	Clearing & Grubbing	1	LS	$ 7,000	$ 7,000
3	Dewatering	1	LS	$ 20,000	$ 20,000
4	Erosion Control	1	LS	$ 7,000	$ 7,000
5	Temporary Shoring & Bracing	1	LS	$ 30,000	$ 30,000
6	Trench Excavation Safety Systems	1	LS	$ 3,000	$ 3,000
7	Concrete Slabs and Foundations	1	LS	$ 36,000	$ 36,000
8	Gravel Base	250	TN	$ 20	$ 5,000
9	Grading and Paving	1	LS	$ 20,000	$ 20,000
10	Fencing	250	FT	$ 50	$ 12,500
11	Utilities & Misc. Site Improvements	1	LS	$ 8,000	$ 8,000
12	Electrical Shelter	1	LS	$ 30,000	$ 30,000
13	Painting & Dampproofing	1	LS	$ 50,000	$ 50,000
14	Pumps and Level Control	1	LS	$ 150,000	$ 150,000
15	Piping, Valves and Accessories	1	LS	$ 96,000	$ 96,000
16	Generator System	1	LS	$ 96,000	$ 96,000
17	Electrical	1	LS	$ 144,000	$ 144,000
18	Instrumentation & Telemetry	1	LS	$ 40,000	$ 40,000
19	Utility Service (PUD)	1	LS	$ 12,000	$ 12,000
20	Programming, Startup, SCADA, Documentation	1	LS	$ 20,000	$ 20,000
			Subtotal		$ 881,500
			Sales Tax (8.9%)		$ 78,454
			Subtotal		$ 959,954
			Contingency (25%)		$ 239,989
			TOTAL ESTIMATED CONSTRUCTION COST		$ 1,200,000
			Engineering and Adminitrative Costs (25%)		$ 300,000
			Total Project Cost (Rounded)		$ 1,500,000

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
BASIN V LIFT STATION (345 gpm peak flow)

NO.	ITEM	QUANTITY		UNIT PRICE	TOTAL
1	Mobilization/Demobilization	1	LS	$ 83,000	$ 83,000
2	Clearing & Grubbing	1	LS	$ 7,000	$ 7,000
3	Dewatering	1	LS	$ 20,000	$ 20,000
4	Erosion Control	1	LS	$ 7,000	$ 7,000
5	Temporary Shoring & Bracing	1	LS	$ 25,000	$ 25,000
6	Trench Excavation Safety Systems	1	LS	$ 3,000	$ 3,000
7	Concrete Slabs and Foundations	1	LS	$ 30,000	$ 30,000
8	Gravel Base	250	TN	$ 20	$ 5,000
9	Grading and Paving	1	LS	$ 20,000	$ 20,000
10	Fencing	250	FT	$ 50	$ 12,500
11	Utilities & Misc. Site Improvements	1	LS	$ 8,000	$ 8,000
12	Electrical Shelter	1	LS	$ 25,000	$ 25,000
13	Painting & Dampproofing	1	LS	$ 50,000	$ 50,000
14	Pumps and Level Control	1	LS	$ 125,000	$ 125,000
15	Piping, Valves and Accessories	1	LS	$ 80,000	$ 80,000
16	Generator System	1	LS	$ 80,000	$ 80,000
17	Electrical	1	LS	$ 120,000	$ 120,000
18	Instrumentation & Telemetry	1	LS	$ 40,000	$ 40,000
19	Utility Service (PUD)	1	LS	$ 12,000	$ 12,000
20	Programming, Startup, SCADA, Documentation	1	LS	$ 20,000	$ 20,000
			Subtotal		$ 772,500
			Sales Tax (8.9%)		$ 68,753
			Subtotal		$ 841,253
			Contingency (25%)		$ 210,313
			TOTAL ESTIMATED CONSTRUCTION COST		$ 1,060,000
			Engineering and Adminitrative Costs (25%)		$ 270,000
			Total Project Cost (Rounded)		$ 1,330,000

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
BASIN VI LIFT STATION (265 gpm peak flow)

NO.	ITEM	QUANTITY		UNIT PRICE	TOTAL
1	Mobilization/Demobilization	1	LS	$ 52,000	$ 52,000
2	Clearing & Grubbing	1	LS	$ 7,000	$ 7,000
3	Dewatering	1	LS	$ 20,000	$ 20,000
4	Erosion Control	1	LS	$ 7,000	$ 7,000
5	Temporary Shoring & Bracing	1	LS	$ 11,500	$ 11,500
6	Trench Excavation Safety Systems	1	LS	$ 3,000	$ 3,000
7	Concrete Slabs and Foundations	1	LS	$ 13,800	$ 13,800
8	Gravel Base	250	TN	$ 20	$ 5,000
9	Grading and Paving	1	LS	$ 20,000	$ 20,000
10	Fencing	250	FT	$ 50	$ 12,500
11	Utilities & Misc. Site Improvements	1	LS	$ 8,000	$ 8,000
12	Electrical Shelter	1	LS	$ 11,500	$ 11,500
13	Painting & Dampproofing	1	LS	$ 50,000	$ 50,000
14	Pumps and Level Control	1	LS	$ 57,200	$ 57,200
15	Piping, Valves and Accessories	1	LS	$ 36,600	$ 36,600
16	Generator System	1	LS	$ 36,600	$ 36,600
17	Electrical	1	LS	$ 54,900	$ 54,900
18	Instrumentation & Telemetry	1	LS	$ 40,000	$ 40,000
19	Utility Service (PUD)	1	LS	$ 12,000	$ 12,000
20	Programming, Startup, SCADA, Documentation	1	LS	$ 20,000	$ 20,000
			Subtotal		$ 478,600
			Sales Tax (8.9%)		$ 42,595
			Subtotal		$ 521,195
			Contingency (25%)		$ 130,299
			TOTAL ESTIMATED CONSTRUCTION COST		$ 660,000
			Engineering and Adminitrative Costs (25%)		$ 170,000
			Total Project Cost (Rounded)		$ 830,000

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 8,200 LF of 10-inch Force Main

NO.	ITEM	QUANTITY		UNIT PRICE		AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$	61,000.00	$	61,000.00
2	10-inch FM Sewer Pipe	8200 LF	$	75.00	$	615,000.00
3	Locate Existing Utilities	LUMP SUM	$	18,000.00	$	18,000.00
4	Traffic Control	LUMP SUM	$	3,500.00	$	3,500.00
5	Erosion Control	LUMP SUM	$	18,000.00	$	18,000.00
6	Trench Safety Systems	LUMP SUM	$	8,200.00	$	8,200.00
7	Gravel Backfill	3610 TN	$	15.00	$	54,150.00
8	Connections to Existing	1 EA	$	2,500.00	$	2,500.00
9	Foundation Gravel	450 TN	$	25.00	$	11,250.00
10	Crushed Surfacing, Top Course	100 TN	$	25.00	$	2,500.00
11	Cold Mix Asphalt	360 TN	$	85.00	$	30,600.00
12	Asphalt Pavement Repair	5470 SY	$	20.00	$	109,400.00
13	Sawcutting	16400 LF	$	4.00	$	65,600.00

Subtotal:	$	999,700.00
Sales Tax (8.9%):	$	88,973.30
Subtotal:	$	1,088,673.30
Contingency (25%):	$	272,126.70
TOTAL ESTIMATED CONSTRUCTION COST:	$	1,360,800.00
Engineering and Administrative Costs (25%):	$	340,200.00
TOTAL ESTIMATED PROJECT COST:	$	1,701,000.00

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 3,000 LF of 6-inch Force Main

NO.	ITEM	QUANTITY		UNIT PRICE		AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$	24,000.00	$	24,000.00
2	6-inch FM Sewer Pipe	3000 LF	$	60.00	$	180,000.00
3	Locate Existing Utilities	LUMP SUM	$	6,000.00	$	6,000.00
4	Traffic Control	LUMP SUM	$	1,200.00	$	1,200.00
5	Erosion Control	LUMP SUM	$	6,000.00	$	6,000.00
6	Trench Safety Systems	LUMP SUM	$	3,000.00	$	3,000.00
7	Gravel Backfill	1100 TN	$	15.00	$	16,500.00
8	Connections to Existing	1 EA	$	2,500.00	$	2,500.00
9	Foundation Gravel	140 TN	$	25.00	$	3,500.00
10	Crushed Surfacing, Top Course	50 TN	$	25.00	$	1,250.00
11	Cold Mix Asphalt	130 TN	$	85.00	$	11,050.00
12	Asphalt Pavement Repair	2000 SY	$	20.00	$	40,000.00
13	Sawcutting	6000 LF	$	4.00	$	24,000.00

Subtotal:	$	319,000.00
Sales Tax (8.9%):	$	28,391.00
Subtotal:	$	347,391.00
Contingency (25%):	$	86,809.00
TOTAL ESTIMATED CONSTRUCTION COST:	$	434,200.00
Engineering and Administrative Costs (25%):	$	108,600.00
TOTAL ESTIMATED PROJECT COST:	$	543,000.00

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 4,700 LF of 12-inch Force Main

NO.	ITEM	QUANTITY		UNIT PRICE		AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$	50,000.00	$	50,000.00
2	12-inch FM Sewer Pipe	4700 LF	$	90.00	$	423,000.00
3	Locate Existing Utilities	LUMP SUM	$	12,000.00	$	12,000.00
4	Traffic Control	LUMP SUM	$	1,200.00	$	1,200.00
5	Erosion Control	LUMP SUM	$	12,000.00	$	12,000.00
6	Trench Safety Systems	LUMP SUM	$	4,700.00	$	4,700.00
7	Gravel Backfill	2410 TN	$	15.00	$	36,150.00
8	Connections to Existing	2 EA	$	2,500.00	$	5,000.00
9	Foundation Gravel	300 TN	$	25.00	$	7,500.00
10	Crushed Surfacing, Top Course	120 TN	$	25.00	$	3,000.00
11	Cold Mix Asphalt	200 TN	$	85.00	$	17,000.00
12	Asphalt Pavement Repair	3140 SY	$	20.00	$	62,800.00
13	Sawcutting	9400 LF	$	4.00	$	37,600.00

Subtotal:	$	671,950.00
Sales Tax (8.9%):	$	59,803.55
Subtotal:	$	731,753.55
Contingency (25%):	$	182,946.45
TOTAL ESTIMATED CONSTRUCTION COST:	$	914,700.00
Engineering and Administrative Costs (25%):	$	228,700.00
TOTAL ESTIMATED PROJECT COST:	$	1,144,000.00

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 3,600 LF of 14-inch Force Main

NO.	ITEM	QUANTITY		UNIT PRICE		AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$	47,000.00	$	47,000.00
2	14-inch FM Sewer Pipe	3600 LF	$	120.00	$	432,000.00
3	Locate Existing Utilities	LUMP SUM	$	11,000.00	$	11,000.00
4	Traffic Control	LUMP SUM	$	1,200.00	$	1,200.00
5	Erosion Control	LUMP SUM	$	11,000.00	$	11,000.00
6	Trench Safety Systems	LUMP SUM	$	3,600.00	$	3,600.00
7	Gravel Backfill	1850 TN	$	15.00	$	27,750.00
8	Connections to Existing	2 EA	$	2,500.00	$	5,000.00
9	Foundation Gravel	230 TN	$	25.00	$	5,750.00
10	Crushed Surfacing, Top Course	75 TN	$	25.00	$	1,875.00
11	Cold Mix Asphalt	160 TN	$	85.00	$	13,600.00
12	Asphalt Pavement Repair	2400 SY	$	20.00	$	48,000.00
13	Sawcutting	7200 LF	$	4.00	$	28,800.00

Subtotal:	$	636,575.00
Sales Tax (8.9%):	$	56,655.18
Subtotal:	$	693,230.18
Contingency (25%):	$	173,269.83
TOTAL ESTIMATED CONSTRUCTION COST:	$	866,500.00
Engineering and Administrative Costs (25%):	$	216,600.00
TOTAL ESTIMATED PROJECT COST:	$	1,084,000.00

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 9,000 LF of 16-inch Force Main

NO.	ITEM	QUANTITY		UNIT PRICE		AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$	122,000.00	$	122,000.00
2	16-inch FM Sewer Pipe	9000 LF	$	125.00	$	1,125,000.00
3	Locate Existing Utilities	LUMP SUM	$	29,000.00	$	29,000.00
4	Traffic Control	LUMP SUM	$	3,500.00	$	3,500.00
5	Erosion Control	LUMP SUM	$	29,000.00	$	29,000.00
6	Trench Safety Systems	LUMP SUM	$	9,000.00	$	9,000.00
7	Gravel Backfill	5280 TN	$	15.00	$	79,200.00
8	Connections to Existing	2 EA	$	2,500.00	$	5,000.00
9	Foundation Gravel	660 TN	$	25.00	$	16,500.00
10	Crushed Surfacing, Top Course	300 TN	$	25.00	$	7,500.00
11	Cold Mix Asphalt	390 TN	$	85.00	$	33,150.00
12	Asphalt Pavement Repair	6000 SY	$	20.00	$	120,000.00
13	Sawcutting	18000 LF	$	4.00	$	72,000.00

Subtotal:	$	1,650,850.00
Sales Tax (8.9%):	$	146,925.65
Subtotal:	$	1,797,775.65
Contingency (25%):	$	449,424.35
TOTAL ESTIMATED CONSTRUCTION COST:	$	2,247,200.00
Engineering and Administrative Costs (25%):	$	561,800.00
TOTAL ESTIMATED PROJECT COST:	$	2,809,000.00

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 400 LF of 6-inch Force Main

NO.	ITEM	QUANTITY		UNIT PRICE		AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$	3,000.00	$	3,000.00
2	6-inch FM Sewer Pipe	400 LF	$	60.00	$	24,000.00
3	Locate Existing Utilities	LUMP SUM	$	1,000.00	$	1,000.00
4	Traffic Control	LUMP SUM	$	500.00	$	500.00
4	Erosion Control	LUMP SUM	$	1,000.00	$	1,000.00
6	Trench Safety Systems	LUMP SUM	$	400.00	$	400.00
9	Gravel Backfill	150 TN	$	15.00	$	2,250.00
11	Connections to Existing	1 EA	$	2,500.00	$	2,500.00
13	Foundation Gravel	20 TN	$	25.00	$	500.00
14	Crushed Surfacing, Top Course	5 TN	$	25.00	$	125.00
15	Cold Mix Asphalt	20 TN	$	85.00	$	1,700.00
16	Asphalt Pavement Repair	270 SY	$	20.00	$	5,400.00
17	Sawcutting	800 LF	$	4.00	$	3,200.00

Subtotal:	$	36,975.00
Sales Tax (8.9%):	$	3,290.78
Subtotal:	$	40,265.78
Contingency (25%):	$	10,034.23
TOTAL ESTIMATED CONSTRUCTION COST:	$	50,300.00
Engineering and Administrative Costs (25%):	$	12,600.00
TOTAL ESTIMATED PROJECT COST:	$	63,000.00

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 5,000 LF of 16-inch Sewer Main

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 74,000.00	$ 74,000.00
2	16-inch PVC Gravity Sewer Pipe	5000 LF	$ 130.00	$ 650,000.00
3	Precast Manhole 48"	17 EA	$ 4,000.00	$ 68,000.00
4	Locate Existing Utilities	LUMP SUM	$ 5,000.00	$ 5,000.00
5	Traffic Control	LUMP SUM	$ 500.00	$ 500.00
6	Erosion Control	LUMP SUM	$ 17,000.00	$ 17,000.00
7	Trench Safety Systems	LUMP SUM	$ 5,000.00	$ 5,000.00
8	Gravel Backfill	2930 TN	$ 15.00	$ 43,950.00
9	Connections to Existing	1 EA	$ 2,500.00	$ 2,500.00
10	Foundation Gravel	370 TN	$ 25.00	$ 9,250.00
11	Crushed Surfacing, Top Course	5 TN	$ 25.00	$ 125.00
12	Cold Mix Asphalt	220 TN	$ 85.00	$ 18,700.00
13	Asphalt Pavement Repair	3340 SY	$ 20.00	$ 66,800.00
14	Sawcutting	10000 LF	$ 4.00	$ 40,000.00

Subtotal:	$ 1,000,825.00
Sales Tax (8.9%):	$ 89,073.43
Subtotal:	$ 1,089,898.43
Contingency (25%):	$ 272,501.58
TOTAL ESTIMATED CONSTRUCTION COST:	$ 1,362,400.00
Engineering and Administrative Costs (25%):	$ 340,600.00
TOTAL ESTIMATED PROJECT COST:	$ 1,703,000.00

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 9,000 LF of 12-inch Sewer Main

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 104,000.00	$ 104,000.00
2	12-inch PVC Gravity Sewer Pipe	9000 LF	$ 90.00	$ 810,000.00
3	Precast Manhole 48"	30 EA	$ 4,000.00	$ 120,000.00
4	Locate Existing Utilities	LUMP SUM	$ 26,000.00	$ 26,000.00
5	Traffic Control	LUMP SUM	$ 3,500.00	$ 3,500.00
4	Erosion Control	LUMP SUM	$ 25,000.00	$ 25,000.00
6	Trench Safety Systems	LUMP SUM	$ 9,000.00	$ 9,000.00
9	Gravel Backfill	4620 TN	$ 15.00	$ 69,300.00
11	Connections to Existing	1 EA	$ 2,500.00	$ 2,500.00
13	Foundation Gravel	580 TN	$ 25.00	$ 14,500.00
14	Crushed Surfacing, Top Course	5 TN	$ 25.00	$ 125.00
15	Cold Mix Asphalt	390 TN	$ 85.00	$ 33,150.00
16	Asphalt Pavement Repair	6000 SY	$ 20.00	$ 120,000.00
17	Sawcutting	18000 LF	$ 4.00	$ 72,000.00

Subtotal:	$ 1,409,075.00
Sales Tax (8.9%):	$ 125,407.68
Subtotal:	$ 1,534,482.68
Contingency (25%):	$ 383,617.33
TOTAL ESTIMATED CONSTRUCTION COST:	$ 1,918,100.00
Engineering and Administrative Costs (25%):	$ 479,500.00
TOTAL ESTIMATED PROJECT COST:	$ 2,398,000.00

City of Camas
Preliminary Cost Estimate
Lacamas Creek Pump Station and Force Main - Upgrade to 2,450 gpm

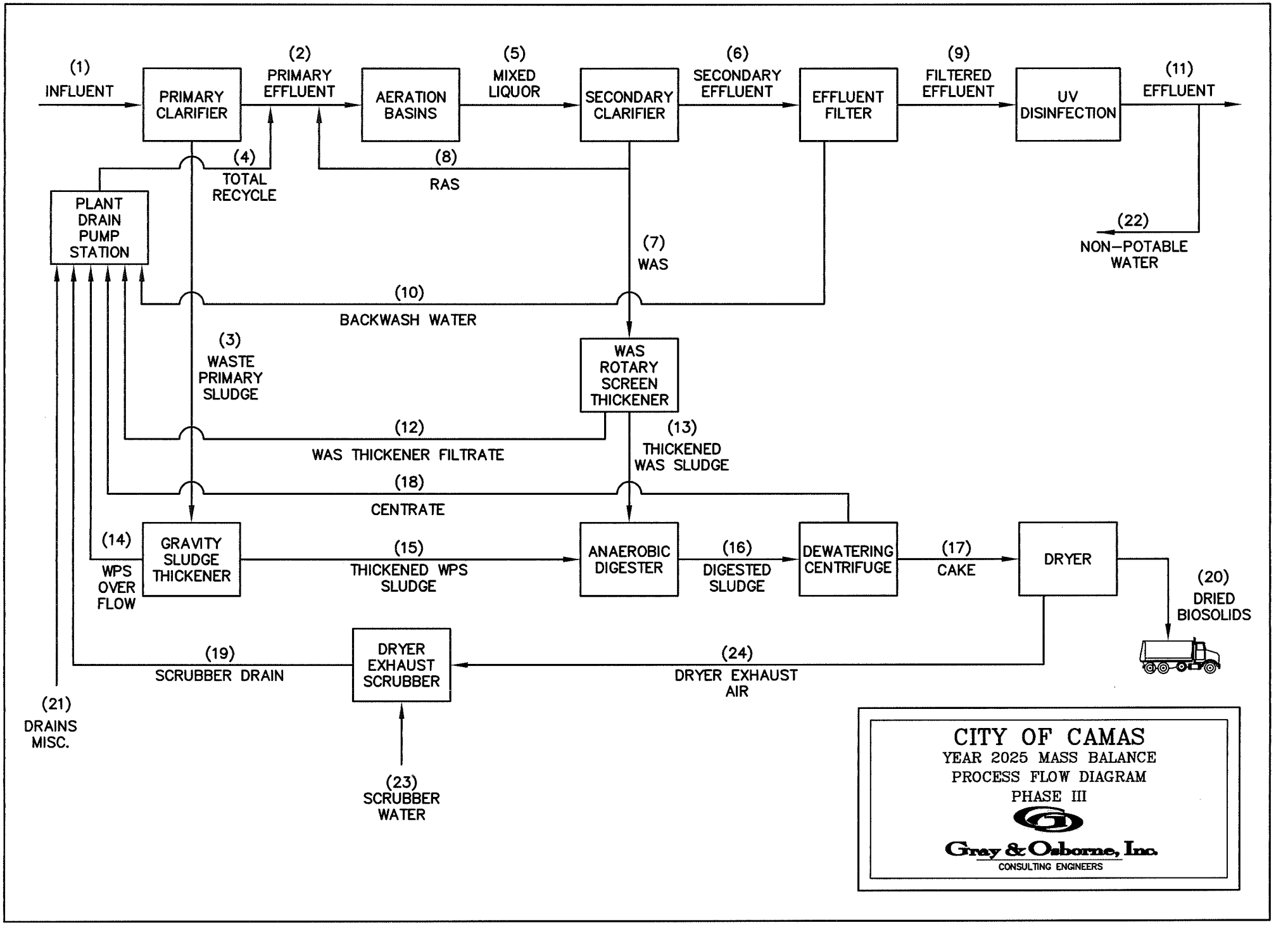
	Item	Quantity		Unit Cost	Total
1	Mobil. & Demobil.	1	LS	$ 159,300	$ 159,300
2	16" PVC Force Main	1600	LF	$ 100	$ 160,000
3	Locate Existing Utility	1	LS	$ 30,100	$ 30,100
4	Trench Safety Systems	1	LS	$ 3,200	$ 3,200
5	Trench Excavation, Backfill	1	LS	$ 32,500	$ 32,500
6	Traffic Control	1	LS	$ 6,500	$ 6,500
7	Erosion Control	1	LS	$ 30,100	$ 30,100
8	Foundation Gravel	120	TN	$ 35	$ 4,200
9	Gravel Base	1050	TN	$ 15	$ 15,750
10	Crushed Top Course	80	TN	$ 25	$ 2,000
11	Asphalt Pavement Repair	100	TN	$ 130	$ 13,000
12	Sawcutting	2000	LF	$ 3	$ 6,500
13	Dry Pit Submersible pumps	3	EA	$ 48,000	$ 144,000
14	Electrical & Control	1	LS	$ 300,000	$ 300,000
15	Generator	1	LS	$ 50,000	$ 50,000
16	HVAC	1	LS	$ 26,000	$ 26,000
17	Pump Station Excavation	1	LS	$ 150,000	$ 150,000
18	CMU Building	1	LS	$ 500,000	$ 500,000
19	Piping at Pump Station	1	LS	$ 50,000	$ 50,000
20	Shoring and Dewatering	1	LS	$ 26,000	$ 26,000
21	Demolition	1	LS	$ 13,000	$ 13,000
22	Landscaping	1	LS	$ 15,000	$ 15,000
23	Fencing	1	LS	$ 15,000	$ 15,000
24	Painting	1	LS	$ 10,000	$ 10,000
25	Bypass Pumping	1	LS	$ 50,000	$ 50,000
26	Land Acquisition	1	LS	$ 50,000	$ 50,000
	Subtotal				$ 1,862,150
	Contigency (20%)				$ 372,430
	Subtotal				$ 2,234,580
	Sales Tax (8.2%)				$ 183,236
	Total Construction Cost				$ 2,417,816
	Engineering and Administration(25%)				$604,454
	Total Project Cost (Rounded)				$ 3,030,000

City of Camas
Evaluation of Sewer Service for the Gregg Reservoir Annexation
Preliminary Cost Estimate
Replace Sewer Upstream of Lacamas Lift Station (w/16" Sewer)

	Item	Quantity			Unit Cost		Total
1	Mobilization/Demobilization	1	LS	$	25,100	$	25,100
2	Clearing and Grubbing	1	LS	$	22,000	$	22,000
3	Environmental Controls	1	LS	$	3,000	$	3,000
4	Trench Excavation Safety Systems	1	LS	$	3,000	$	3,000
5	Dewatering	1	LS	$	4,000	$	4,000
6	Locate Existing Utilities	1	LS	$	2,000	$	2,000
7	Removal of Structures and Obstructions	1	LS	$	2,000	$	2,000
8	Traffic Control	1	LS	$	2,000	$	2,000
9	16" PVC Sewer Pipe (Including bedding)	1,100	LF	$	130	$	143,000
10	48" Precast Manhole (Basic to 8')	6	EA	$	3,900	$	23,400
11	48" Precast Manhole (Height over 8')	0	LF	$	200	$	-
12	Connection to Existing Manhole	1	EA	$	1,000	$	1,000
13	6" PVC Side Sewer Pipe (including bedding ar	0	EA	$	1,000	$	-
14	Special Excavation of Unsuitable Material	10	CY	$	35	$	350
15	Foundation Gravel	10	TN	$	35	$	350
16	Gravel Base	1,660	TN	$	15	$	24,900
17	Crushed Surfacing Top Course	210	TN	$	25	$	5,250
18	Cold Mix Asphalt (temp repair)	170	TN	$	75	$	12,750
19	Asphalt Pavement Repair	730	SY	$	20	$	14,600
20	Hydroseeding		SY	$	2	$	-
21	Saw Cutting	4,400	LF	$	2	$	8,800
			Subtotal			$	297,500
			Contingency (20%)			$	59,500
			Subtotal			$	357,000
			Sales Tax (8.2%)			$	29,274
			Total			$	386,274
			Total Construction Cost (Rounded)			**$**	**386,000**
			Engineering and Construction Administration (25%)			$	97,000
			Total Project Cost (Rounded)			**$**	**480,000**

APPENDIX D

WWTF MASS BALANCE



CITY OF CAMAS

YEAR 2025 MASS BALANCE
PROCESS FLOW DIAGRAM
PHASE III

Gray & Osborne, Inc.
CONSULTING ENGINEERS

City of Camas
Wastewater Treatment Plant
Year 2025 Mass Balance (End of Phase III)

2025 Characteristic	Units	1 Influent	2 Primary Effluent	3 WPS	4 Total Recycle	5 Mixed Liquor	6 Secondary Effluent	7 WAS	8 RAS	9 Filtered Effluent	10 Backwash Water	11 Effluent	12 WAS Thickener Filtrate
Flow	MGD	7.57	7.49	0.08	0.68	10.44	8.10	0.07	2.27	7.85	0.24	7.66	0.06
COD	lb/day	16203	6375	9828	1797	8172	2971	-----	-----	2882	89	2811	-----
BOD	lb/day	7365	5156	2210	817	5972	1350	-----	-----	1310	41	1278	-----
TSS	lb/day	10500	3675	6825	2392	195530	1350	5683	189403	655	695	639	568
VSS	lb/day	8925	3124	5801	1880	166201	1148	4173	139056	557	591	543	417
TKN	lb/day	3853	3638	215	601	14922	675	321	10683	655	118	639	32
NH4-N	lb/day	2890	2890	-----	457	3347	135	-----	-----	65	70	64	-----

2025 Characteristic	Units	13 Thickened WAS Sludge	14 WPS Overflow	15 Thickened WPS Sludge	16 Digested Sludge	17 Cake	18 Centrate	19 Scrubber Drain	20 Dried Cake	21 Drains Misc	22 Non-Potable Water	23 Scrubber Water	24 Dryer Exhaust Air
Flow	MGD	0.01	0.07	0.01	0.025	0.0039	0.021	0.1889	0.0015	0.098	0.192	0.192	0.0057
COD	lb/day	-----	786	9042	-----	-----	-----	-----	-----	-----	-----	-----	-----
BOD	lb/day	-----	177	2033	-----	-----	123	-----	-----	-----	-----	-----	-----
TSS	lb/day	5115	546	6279	6914	6568	346	236	6332	-----	24	24	-----
VSS	lb/day	3755	464	5337	4843	4601	242	166	4435	-----	20	20	-----
TKN	lb/day	288	16	197	230	218	11	166	53	-----	-----	-----	-----
NH4-N	lb/day	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

APPENDIX E

MIXING ZONE STUDY

Technical Memorandum

PO Box 1678 • Tacoma, WA 98401-1678
711 Pacific Avenue • Tacoma, WA 98402
Phone (253) 272-7220 • Fax (253) 272-7250
BFox@cosmopolitaneng.com

TM TITLE: **City of Camas Mixing Zone Study – 16-Port Diffuser Updated Effluent Flows**

DATE: September 21, 2009

TO: Jay Swift, PE, Gray & Osborne

PREPARED BY: Nick Whitaker, Cosmopolitan Engineering Group

REVIEWED BY: Bill Fox, PE, Cosmopolitan Engineering Group

PROJECT #: G&O016

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LIST OF ATTACHMENTS

INTRODUCTION

Cosmopolitan Engineering Group completed an update to the *Mixing Zone Analysis* for the City of Camas in a Technical Memorandum (TM) dated February 19, 2009. That TM evaluated mixing for a proposed 16-port diffuser modification in which the discharge ports were oriented vertically with the addition of Tideflex elastomeric check valves. This TM evaluates the dilution and Reasonable Potential Analysis (RPA) for the proposed extended 16-port diffuser, with updated effluent flows.

EFFLUENT FLOW RATES

The updated effluent flow design criteria for facility planning are presented in Table 1.

Table 1 Effluent Flow Design Criteria for Facility Planning

Planning Year	Winter Flow Criteria		Summer Flow Criteria	
	Max. Month (mgd)	Max. Day (mgd)	Max. Month (mgd)	Max. Day (mgd)
2025	7.57	11.77	6.26	7.96

POTENTIAL DIFFUSER MODIFICATION

The potential diffuser extension would consist of 16 ports oriented to discharge vertically. Each port would be fitted with a 6-inch Tideflex elastomeric check valve. Port spacing would remain at 10 feet, effectively doubling the diffuser length. Revised performance data for the 16-port arrangement are provided in Table 2.

Table 2 Diffuser Port Velocities for Tideflex Diffuser Valves

Design Year	Season	Max Flow Period	Effluent Flow (mgd)	Flow per Port (gpm)	Discharge Velocity (fps)	Effective Area (sq. in.)	Effective Diameter (in.)
2025	Winter	30-day	7.57	3.29	10.8	9.78	3.53
2025	Winter	24-hr	11.77	511	13.88	11.81	3.88
2025	Summer	30-day	6.26	372	9.7	8.99	3.38
2025	Summer	24-hr	7.96	346	11.1	10.00	3.57

DILUTION MODELING

UM3 MODEL

The UM3 models runs were carried out through the Visual Plumes interface. A default aspiration entrainment coefficient (AEC) of 0.1 was used in all the model runs. Additional default values included the diffuser port contraction coefficient of 1. The model configuration also applied the Brooks farfield solution with the default dispersion coefficients.

The centerline dilution concentration in previous studies (CEG, 2007) was determined by dividing the calculated dilution factor by a peak-to-mean ratio of 2.3. This evaluation used a more conservative centerline dilution factor, which is calculated using the algorithms embedded in UM3.

MODEL RESULTS

A series of UM3 model runs from the Visual Plumes interface, with the Brooks farfield algorithm, are provided in Attachment 1. All model runs are based on the vertical port orientation with Tideflex valves. The basis of the model runs and the results are described below:

G-1	This chronic model run is for near-flood ambient conditions modeled by Ecology in the NPDES permit, the 90th percentile river discharge of 522 kcfs. This run is equivalent to Ecology run NC22B except for the maximum month effluent flow rate for 2025.
G-2	This acute model run is for the same near-flood ambient conditions modeled by Ecology, equivalent to Ecology run NC24 except the maximum day effluent flow rate for 2025.
G-3	This chronic model run corresponds to the 2025 winter maximum month flow rate and winter effluent temperature. Ambient current speed is tidally-averaged current profile during the low river flow condition.
G-4	This acute model run corresponds to 2025 maximum day winter flow rate and winter effluent temperature. Ambient current speed is the one-hour minimum velocity profile from the current meter deployment, which is caused by the tidal influence that occurs during low to normal Columbia River flows.
G-5	This chronic model run corresponds to 2025 summer maximum month flow rate and summer effluent temperature. Ambient current speed is tidally-averaged current profile during the low river flow condition (same as G-3).
G-6	This acute model run corresponds to 2025 maximum day summer flow rate and summer effluent temperature. Ambient current speed is the one-hour minimum velocity profile from the current meter deployment (same as G-4).

The results of the modeling are presented in Table 3. The results demonstrate that critical conditions occur during the 90th percentile high river discharge conditions (Runs G-1 and G-2). Critical acute and chronic dilution factors for the reasonable potential assessment are 23 and 124, respectively.

Table 3 Dilution Model Results for 2025 Effluent Flows

Model Run #	Ambient Condition	Discharge Depth (ft)	Avg Current Speed (m/sec)	Ambient Temp (°C)	Effluent Flow (mgd)	Effluent Temp (°C)	Acute Dilution	Chronic Dilution
G-1	[1]Winter High Flow	26.6	1.0	12.6	7.57	16.0		124
G-2	[1]Winter High Flow	26.6	1.0	12.6	11.77	16.0	23	
G-3	[2]Winter Average	21.0	0.7	12.6	7.57	16.0		233
G-4	[3]Winter 10%	21.0	0.25	12.6	11.77	16.0	31	
G-5	[2]Summer Average	21.0	0.7	21.5	6.26	22.0		194
G-6	[3]Summer 10%	21.0	0.25	21.5	7.96	22.0	27	

[1] Ambient conditions for 522 kcfs river flow (90th percentile) per Ecology NPDES permit (runs NC22 and NC24).

[2] Ambient condition for non-flood river flow based on tidally-averaged current profile from October 2004 current meter deployment.

[3] Ambient condition for acute model runs based on lowest tidally-influenced current profile (duration = 1 hr±) from October 2004 current meter deployment.

REASONABLE POTENTIAL ASSESSMENT

EPA and Ecology use a statistical test to determine a discharge's "reasonable potential" to exceed water quality standards, which is based on effluent and ambient data and acute and chronic dilution factors. If a discharge exhibits a reasonable potential to exceed water quality standards for any parameter, Ecology issues an effluent limitation for that parameter in the NPDES permit. If a parameter does not exhibit a reasonable potential to exceed water quality standards, no NPDES permit limit is required.

EFFLUENT DATA

Water quality-based effluent limits are assessed for ammonia and selected metals (cadmium, copper, lead, nickel, silver, zinc, and mercury). The critical effluent concentrations used in determination of reasonable potential are based on 12 effluent metals scans in 2005, 2006, and 2008, and over 400 effluent ammonia samples in 2005 and 2006.

The metals data are provided in Table 4. The values in red are detected concentrations, and the values in black are the detection levels for non-detected results. High concentrations of cadmium and nickel were measured on June 2, 2006. These values may be anomalous, or if realistic should be evaluated in future sampling efforts. The 95th percentile values were used in the RPA.

Table 4 Camas Effluent Metals Data (µg/L)

Date	Cd	Cu	Pb	Ni	Ag	An	Hg
5/13/2005	3	8	5	20	10	18	0.056
7/21/2005	10	31	5	20	10	19	0.05
9/30/2005	3	5	5	20	10	16	0.056
12/7/2005	3	5	5	20	10	15	0.05
3/31/2006	3	5	5	20	10	25	0.07
6/2/2006	87	12	5	373	70	20	0.05
9/12/2006	3	7	5	20	10	31	
12/18/2006	3	5	5	29	10	30	0.05
3/14/2008	5	20	10	50	10	50	
7/2/2008	5	20	5	20	10	50	0.04
9/22/2008	5	20	5	20	10	50	0.16
11/25/2008	5	20	10	20	10	50	0.2
Count	12	12	12	12	12	12	10
# Detects	2	4	0	2	0	8	3
95th percentile	44.65	24.95	10	195.35	10	50	0.182

Detected Values in Red Detection Limit in Black

AMBIENT DATA AND WATER QUALITY STANDARDS

No ambient sampling has been conducted in this mixing zone study for ammonia or metals or the parameters that affect their water quality standards (pH, temperature, and hardness). The criteria for ambient concentrations, and ambient-depended water quality criteria, are the same as Ecology cited in Appendix C of the NPDES permit.

REASONABLE POTENTIAL RESULTS

The reasonable potential to exceed water quality standards for ammonia and metals is presented in Table 5 for the recommended diffuser modifications. Ammonia is the only analyte considered seasonally due to its dependence on ambient pH and temperature. Cadmium was the only analyte with a reasonable potential to exceed water quality standards.

A comparison of the 8-port and 16-port diffusers RPA results in Table 5 shows a decrease in the maximum concentration at the edge of the acute and chronic mixing zone boundaries (except for mercury at the chronic mixing zone boundary). Based on the Visual Plumes modeling, the outfall extension would decrease the concentrations of cadmium at the acute mixing zone boundaries, but will not lower concentrations enough to meet the State Water Quality Standards. However, this finding is based on only one high detected value, and thus should be sampled more frequently in the future to determine if the reasonable potential is realistic.

Table 5 Reasonable Potential Calculation Table

8-PORT DIFFUSER

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-

				State Water Quality Standard		Max concentration at edge of...									
Parameter	Metal Criteria Translator as decimal Acute	Metal Criteria Translator as decimal Chronic	Ambient Concentration (metals as dissolved) ug/L	Acute ug/L	Chronic ug/L	Acute Mixing Zone ug/L	Chronic Mixing Zone ug/L	LIMIT REQ'D?	Max effluent conc. measured (metals as total recoverable) ug/L	Coeff Variation CV	s	# of samples n	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor
Modified Diffuser (Vertical Discharge)															
2025															
Ammonia-N (summer)	1.00	1.00	27.00	5100.00	830.000	939.52	239.40	NO	35200	0.60	0.55	268	0.70	27.0	116.0
Ammonia-N (winter)	1.00	1.00	19.00	2100.00	470.000	1468.77	289.84	NO	35200	0.60	0.55	268	0.70	17.0	91.0
Cadmium	0.940	0.940	0.53	1.70	0.61	4.54	1.28	YES	45.00	0.60	0.55	12	1.63	17.0	91.0
Copper	1.000	1.000	0.86	8.65	6.14	3.20	1.30	NO	25.00	0.60	0.55	12	1.63	17.0	91.0
Lead	0.470	0.470	0.06	29.3	1.14	0.51	0.14	NO	10.0	0.60	0.55	12	1.63	17.0	91.0
Nickel	1.000	1.000	0.56	770.7	85.60	19.17	4.04	NO	195.00	0.60	0.55	12	1.63	17.0	91.0
Silver	0.850	0.850	0.10	1.00	100.00	0.91	0.25	NO	10.00	0.60	0.55	12	1.63	17.0	91.0
Zinc	1.000	1.000	2.00	62.3	56.9	4.85	2.53	NO	31.000	0.60	0.55	12	1.63	17.0	91.0
Mercury	1.000	1.000		2.1	0.012	0.02	0.003	NO	0.182	0.60	0.55	10	1.74	17.0	91.0

16-PORT DIFFUSER

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-

				State Water Quality Standard		Max concentration at edge of...									
Parameter	Metal Criteria Translator as decimal Acute	Metal Criteria Translator as decimal Chronic	Ambient Concentration (metals as dissolved) ug/L	Acute ug/L	Chronic ug/L	Acute Mixing Zone ug/L	Chronic Mixing Zone ug/L	LIMIT REQ'D?	Max effluent conc. measured (metals as total recoverable) ug/L	Coeff Variation CV	s	# of samples n	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor
Modified Diffuser (Vertical Discharge)															
2025															
Ammonia-N (summer)	1.00	1.00	27.00	5100.00	830.000	939.52	154.00	NO	35200	0.60	0.55	268	0.70	27.0	194.0
Ammonia-N (winter)	1.00	1.00	19.00	2100.00	470.000	1090.57	217.76	NO	35200	0.60	0.55	268	0.70	23.0	124.0
Cadmium	0.940	0.940	0.53	1.70	0.61	3.50	1.08	YES	45.00	0.60	0.55	12	1.63	23.0	124.0
Copper	1.000	1.000	0.86	8.65	6.14	2.59	1.18	NO	25.00	0.60	0.55	12	1.63	23.0	124.0
Lead	0.470	0.470	0.06	29.3	1.14	0.39	0.12	NO	10.0	0.60	0.55	12	1.63	23.0	124.0
Nickel	1.000	1.000	0.56	770.7	85.60	14.32	3.11	NO	195.00	0.60	0.55	12	1.63	23.0	124.0
Silver	0.850	0.850	0.10	1.00	100.00	0.70	0.21	NO	10.00	0.60	0.55	12	1.63	23.0	124.0
Zinc	1.000	1.000	2.00	62.3	56.9	4.10	2.39	NO	31.000	0.60	0.55	12	1.63	23.0	124.0
Mercury	1.000	1.000		2.1	0.012	0.01	0.003	NO	0.182	0.60	0.55	10	1.74	23.0	124.0

ENGINEERING GROUP

Attachment 1

UM3 Model Runs

Civil, Environmental, and Recreational Consulting

G-1

/ Windows UM3. 7/8/2009 11:47:28 AM
Case 1; ambient file U:\Nick\Camas\VP plumeF1.002.db; Diffuser table record 1: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0.0	1.03	180.0	0.0	12.6	0.0	0.0	1.03	180.0	0.0003
1.0	1.09	180.0	0.0	12.6	0.0	0.0	1.09	180.0	0.0003
2.0	1.09	180.0	0.0	12.6	0.0	0.0	1.09	180.0	0.0003
3.0	1.07	180.0	0.0	12.6	0.0	0.0	1.07	180.0	0.0003
4.0	1.06	180.0	0.0	12.6	0.0	0.0	1.06	180.0	0.0003
5.0	1.03	180.0	0.0	12.6	0.0	0.0	1.03	180.0	0.0003
6.0	1.0	180.0	0.0	12.6	0.0	0.0	1.0	180.0	0.0003
7.0	0.98	180.0	0.0	12.6	0.0	0.0	0.98	180.0	0.0003
8.0	0.95	180.0	0.0	12.6	0.0	0.0	0.95	180.0	0.0003
9.0	0.92	180.0	0.0	12.6	0.0	0.0	0.92	180.0	0.0003
10.0	0.91	180.0	0.0	12.6	0.0	0.0	0.91	180.0	0.0003
11.0	0.89	180.0	0.0	12.6	0.0	0.0	0.89	180.0	0.0003
12.0	0.85	180.0	0.0	12.6	0.0	0.0	0.85	180.0	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(ft)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(kg/kg)
3.53	1.0	90.0	180.0	16.0	10.0	32.0	321.0	26.6	7.57	0.0	16.0	100.0

Froude number: 159.0

Step	Depth (ft)	Amb-cur (m/s)	P-dia (in)	Polutnt (kg/kg)	Dilutn ()	CL-diln ()	x-posn (ft)	y-posn (ft)	
0	26.6	0.947	3.53	100.0	1.0	1.0	0.0	0.0;	
74	25.88	0.953	11.6	26.88	3.72	1.419	-0.222	0.0;	begin overlap,
92	25.75	0.954	14.01	20.48	4.88	1.633	-0.352	0.0;	end overlap,
100	25.68	0.955	15.19	18.02	5.548	1.751	-0.431	0.0;	
200	24.13	0.969	41.19	2.562	39.01	9.766	-8.985	0.0;	
243	22.84	0.981	62.43	1.094	91.4	23.0	-32.53	0.0;	acute zone,
300	20.21	0.996	108.7	0.354	282.6	71.39	-166.3	0.0;	
311	19.56	1.001	120.9	0.284	351.4	89.03	-223.6	0.0;	merging,
324	18.64	1.009	141.7	0.22	454.5	124.1	-325.5	0.0;	chronic zone,
375	13.56	1.055	330.5	0.0801	1247.8	549.8	-1296.6	0.0;	surfa

G-2

/ Windows UM3. 7/8/2009 11:53:00 AM
Case 1; ambient file U:\Nick\Camas\VP plumeF2.003.db; Diffuser table record 1: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0.0	1.03	180.0	0.0	12.6	0.0	0.0	1.03	180.0	0.0003
1.0	1.09	180.0	0.0	12.6	0.0	0.0	1.09	180.0	0.0003
2.0	1.09	180.0	0.0	12.6	0.0	0.0	1.09	180.0	0.0003
3.0	1.07	180.0	0.0	12.6	0.0	0.0	1.07	180.0	0.0003
4.0	1.06	180.0	0.0	12.6	0.0	0.0	1.06	180.0	0.0003
5.0	1.03	180.0	0.0	12.6	0.0	0.0	1.03	180.0	0.0003
6.0	1.0	180.0	0.0	12.6	0.0	0.0	1.0	180.0	0.0003
7.0	0.98	180.0	0.0	12.6	0.0	0.0	0.98	180.0	0.0003
8.0	0.95	180.0	0.0	12.6	0.0	0.0	0.95	180.0	0.0003
9.0	0.92	180.0	0.0	12.6	0.0	0.0	0.92	180.0	0.0003
10.0	0.91	180.0	0.0	12.6	0.0	0.0	0.91	180.0	0.0003
11.0	0.89	180.0	0.0	12.6	0.0	0.0	0.89	180.0	0.0003
12.0	0.85	180.0	0.0	12.6	0.0	0.0	0.85	180.0	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(ft)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(kg/kg)
3.88	1.0	90.0	180.0	16.0	10.0	32.0	321.0	26.6	11.77	0.0	16.0	100.0

Froude number: 195.1

Step	Depth (ft)	Amb-cur (m/s)	P-dia (in)	Polutnt (kg/kg)	Dilutn ()	CL-diln ()	x-posn (ft)	y-posn (ft)	
0	26.6	0.947	3.88	100.0	1.0	1.0	0.0	0.0;	
100	25.26	0.959	19.12	16.37	6.105	2.072	-0.553	0.0;	
200	23.22	0.977	53.32	2.354	42.46	10.66	-10.13	0.0;	
239	21.73	0.987	77.79	1.088	91.9	23.14	-32.38	0.0;	acute zone,
284	19.23	1.004	120.4	0.446	224.0	56.5	-119.2	0.0;	merging,
300	17.97	1.015	146.8	0.325	307.6	85.38	-194.3	0.0;	
316	16.39	1.029	187.5	0.237	422.2	139.5	-321.1	0.0;	chronic zone,
345	12.72								

G-3

```
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      Depth    Amb-cur    Amb-dir    Amb-sal    Amb-tem    Amb-pol      Decay    Far-spd    Far-dir    Disprsn
          m        m/s        deg        psu          C      kg/kg        s-1        m/s        deg   m0.67/s2
        0.0       0.79      180.0        0.0       12.6        0.0        0.0       0.79      180.0     0.0003
        1.0       0.77      180.0        0.0       12.6        0.0        0.0       0.77      180.0     0.0003
        2.0       0.74      180.0        0.0       12.6        0.0        0.0       0.74      180.0     0.0003
        3.0        0.7      180.0        0.0       12.6        0.0        0.0        0.7      180.0     0.0003
        4.0       0.65      180.0        0.0       12.6        0.0        0.0       0.65      180.0     0.0003
        5.0       0.61      180.0        0.0       12.6        0.0        0.0       0.61      180.0     0.0003
        6.0       0.54      180.0        0.0       12.6        0.0        0.0       0.54      180.0     0.0003
        7.0       0.46      180.0        0.0       12.6        0.0        0.0       0.46      180.0     0.0003
        8.0       0.46      180.0        0.0       12.6        0.0        0.0       0.46      180.0     0.0003
        9.0       0.46      180.0        0.0       12.6        0.0        0.0       0.46      180.0     0.0003
       10.0       0.46      180.0        0.0       12.6        0.0        0.0       0.46      180.0     0.0003
       11.0       0.46      180.0        0.0       12.6        0.0        0.0       0.46      180.0     0.0003
       12.0       0.46      180.0        0.0       12.6        0.0        0.0       0.46      180.0     0.0003
   P-dia  P-elev V-angle H-angle   Ports Spacing AcuteMZ ChrncMZ P-depth Ttl-flo Eff-sal    Temp Polutnt
    (in)    (ft)   (deg)   (deg)      ()    (ft)    (ft)    (ft)    (ft)   (MGD)   (psu)     (C) (kg/kg)
    3.53     1.0    90.0   180.0    16.0    10.0    32.0   321.0    21.0    7.57     0.0    16.0   100.0
Froude number:      159.0
        Depth  Amb-cur    P-dia  Polutnt   Dilutn  CL-diln   x-posn   y-posn
Step     (ft)    (m/s)     (in)  (kg/kg)       ()       ()     (ft)     (ft)
   0      21.0    0.508     3.53    100.0      1.0      1.0      0.0      0.0;
 100      19.3    0.548    20.07    15.03     6.65    2.489   -0.566      0.0;
 200     17.11    0.594    57.16     2.23    44.83    10.96   -8.541      0.0;
 246     15.31    0.623    87.94    0.897    111.5     27.1    -32.2      0.0; acute zone,
 280     13.56    0.644    121.0    0.457    218.5    53.36   -82.66      0.0; merging,
 300     12.16    0.664    155.2    0.308    324.8    90.03   -149.6      0.0;
 327     9.778      0.7    236.4     0.18    554.3    232.8   -325.9      0.0; chronic zone, surface,
Outside chronic zone
 ;
12:02:30 PM. amb fills: 2
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G-4

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      Depth    Amb-cur    Amb-dir    Amb-sal    Amb-tem    Amb-pol      Decay    Far-spd    Far-dir    Disprsn
          m        m/s        deg        psu          C      kg/kg        s-1        m/s        deg   m0.67/s2
        0.0      0.264      180.0        0.0       12.6        0.0        0.0      0.264      180.0     0.0003
        1.0      0.264      180.0        0.0       12.6        0.0        0.0      0.264      180.0     0.0003
        2.0      0.256      180.0        0.0       12.6        0.0        0.0      0.256      180.0     0.0003
        3.0      0.247      180.0        0.0       12.6        0.0        0.0      0.247      180.0     0.0003
        4.0      0.228      180.0        0.0       12.6        0.0        0.0      0.228      180.0     0.0003
        5.0       0.21      180.0        0.0       12.6        0.0        0.0       0.21      180.0     0.0003
        6.0      0.187      180.0        0.0       12.6        0.0        0.0      0.187      180.0     0.0003
        7.0      0.163      180.0        0.0       12.6        0.0        0.0      0.163      180.0     0.0003
        8.0      0.163      180.0        0.0       12.6        0.0        0.0      0.163      180.0     0.0003
        9.0      0.163      180.0        0.0       12.6        0.0        0.0      0.163      180.0     0.0003
       10.0      0.163      180.0        0.0       12.6        0.0        0.0      0.163      180.0     0.0003
       11.0      0.163      180.0        0.0       12.6        0.0        0.0      0.163      180.0     0.0003
       12.0      0.163      180.0        0.0       12.6        0.0        0.0      0.163      180.0     0.0003
   P-dia  P-elev V-angle H-angle   Ports Spacing AcuteMZ ChrncMZ P-depth Ttl-flo Eff-sal    Temp Polutnt
    (in)    (ft)   (deg)   (deg)      ()    (ft)    (ft)    (ft)    (ft)   (MGD)   (psu)     (C) (kg/kg)
    3.88     1.0    90.0   180.0    16.0    10.0    32.0   321.0    21.0   11.77     0.0    16.0   100.0
Froude number:      195.1
        Depth  Amb-cur    P-dia  Polutnt   Dilutn  CL-diln   x-posn   y-posn
Step     (ft)    (m/s)     (in)  (kg/kg)       ()       ()     (ft)     (ft)
   0      21.0    0.177     3.88    100.0      1.0      1.0      0.0      0.0;
 100     16.85    0.206     27.3     13.8    7.242    3.583   -0.525      0.0;
 200     10.74    0.241    114.0    2.063    48.44    13.14   -6.894      0.0;
 205     10.39    0.243    120.1    1.869    53.48    14.16   -7.836      0.0; merging,
 235     7.409    0.253    181.5    1.032    96.88    30.73   -19.84      0.0; surface,
Const Eddy Diffusivity.  Farfield dispersion based on wastefield width of      50.33 m
    conc  dilutn   width distnce    time
 (kg/kg)            (m)     (m)    (hrs) (kg/kg)   (s-1)   (m/s)(m0.67/s2)
 1.03009   97.03   57.33   97.84   0.156     0.0     0.0   0.163 3.00E-4
count: 1
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G-5

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Case 1; ambient file U:\Nick\Camas\VP plumeF5.006.db; Diffuser table record 1: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0.0	0.79	180.0	0.0	21.5	0.0	0.0	0.79	180.0	0.0003
1.0	0.77	180.0	0.0	21.5	0.0	0.0	0.77	180.0	0.0003
2.0	0.74	180.0	0.0	21.5	0.0	0.0	0.74	180.0	0.0003
3.0	0.7	180.0	0.0	21.5	0.0	0.0	0.7	180.0	0.0003
4.0	0.65	180.0	0.0	21.5	0.0	0.0	0.65	180.0	0.0003
5.0	0.61	180.0	0.0	21.5	0.0	0.0	0.61	180.0	0.0003
6.0	0.54	180.0	0.0	21.5	0.0	0.0	0.54	180.0	0.0003
7.0	0.46	180.0	0.0	21.5	0.0	0.0	0.46	180.0	0.0003
8.0	0.46	180.0	0.0	21.5	0.0	0.0	0.46	180.0	0.0003
9.0	0.46	180.0	0.0	21.5	0.0	0.0	0.46	180.0	0.0003
10.0	0.46	180.0	0.0	21.5	0.0	0.0	0.46	180.0	0.0003
11.0	0.46	180.0	0.0	21.5	0.0	0.0	0.46	180.0	0.0003
12.0	0.46	180.0	0.0	21.5	0.0	0.0	0.46	180.0	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(ft)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(kg/kg)
3.38	1.0	90.0	180.0	16.0	10.0	32.0	321.0	21.0	6.26	0.0	22.0	100.0

Froude number: 304.2

Step	Depth (ft)	Amb-cur (m/s)	P-dia (in)	Polutnt (kg/kg)	Dilutn ()	CL-diln ()	x-posn (ft)	y-posn (ft)	
0	21.0	0.508	3.38	100.0	1.0	1.0	0.0	0.0;	
100	19.52	0.543	18.47	15.4	6.494	2.358	-0.524	0.0;	
200	17.55	0.585	51.92	2.267	44.11	10.79	-8.325	0.0;	
247	15.88	0.616	80.63	0.894	111.9	27.15	-32.33	0.0;	acute zone,
290	13.85	0.641	120.7	0.381	262.2	64.07	-105.8	0.0;	merging,
300	13.25	0.648	135.2	0.313	319.6	82.42	-141.5	0.0;	
328	11.21	0.678	203.9	0.18	556.4	193.9	-321.6	0.0;	chronic zone,
340	10.24								

G-6

```
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Case 1; ambient file U:\Nick\Camas\VP plumeF6.007.db; Diffuser table record 1: ---------------------------------
      Depth    Amb-cur    Amb-dir    Amb-sal    Amb-tem    Amb-pol      Decay    Far-spd    Far-dir    Disprsn
          m        m/s        deg        psu          C      kg/kg        s-1        m/s        deg   m0.67/s2
        0.0       0.79      180.0        0.0       21.5        0.0        0.0       0.79      180.0     0.0003
        1.0       0.77      180.0        0.0       21.5        0.0        0.0       0.77      180.0     0.0003
        2.0       0.74      180.0        0.0       21.5        0.0        0.0       0.74      180.0     0.0003
        3.0        0.7      180.0        0.0       21.5        0.0        0.0        0.7      180.0     0.0003
        4.0       0.65      180.0        0.0       21.5        0.0        0.0       0.65      180.0     0.0003
        5.0       0.61      180.0        0.0       21.5        0.0        0.0       0.61      180.0     0.0003
        6.0       0.54      180.0        0.0       21.5        0.0        0.0       0.54      180.0     0.0003
        7.0       0.46      180.0        0.0       21.5        0.0        0.0       0.46      180.0     0.0003
        8.0       0.46      180.0        0.0       21.5        0.0        0.0       0.46      180.0     0.0003
        9.0       0.46      180.0        0.0       21.5        0.0        0.0       0.46      180.0     0.0003
       10.0       0.46      180.0        0.0       21.5        0.0        0.0       0.46      180.0     0.0003
       11.0       0.46      180.0        0.0       21.5        0.0        0.0       0.46      180.0     0.0003
       12.0       0.46      180.0        0.0       21.5        0.0        0.0       0.46      180.0     0.0003
   P-dia  P-elev V-angle H-angle   Ports Spacing AcuteMZ ChrncMZ P-depth Ttl-flo Eff-sal    Temp Polutnt
    (in)    (ft)   (deg)   (deg)      ()    (ft)    (ft)    (ft)    (ft)   (MGD)   (psu)     (C) (kg/kg)
    3.57     1.0    90.0   180.0    16.0    10.0    32.0   321.0    21.0    7.96     0.0    22.0   100.0
Froude number:      337.3
       Depth  Amb-cur    P-dia  Polutnt   Dilutn  CL-diln   x-posn   y-posn
Step     (ft)    (m/s)     (in)  (kg/kg)       ()       ()     (ft)     (ft)
   0      21.0    0.508     3.57    100.0      1.0      1.0      0.0      0.0;
 100     19.24    0.549    20.51    14.94    6.691    2.525   -0.577      0.0;
 200     16.99    0.597    58.61    2.223    44.99    10.99   -8.606      0.0;
 246     15.15    0.625    90.18    0.894    111.9     27.2   -32.64      0.0; acute zone,
 277     13.52    0.644    120.6    0.484    206.7    50.38   -77.94      0.0; merging,
 300     11.89    0.668    161.3    0.307    325.9    92.59   -156.5      0.0;
 324     9.785    0.699    235.1    0.191    524.2    218.4   -319.1      0.0; surface,
Const Eddy Diffusivity.  Farfield dispersion based on wastefield width of      51.69 m
    conc  dilutn   width distnce    time
 (kg/kg)            (m)     (m)    (hrs) (kg/kg)   (s-1)   (m/s)(m0.67/s2)
 0.18983   526.7   51.71   97.84 3.41E-4     0.0     0.0    0.46 3.00E-
```

APPENDIX F

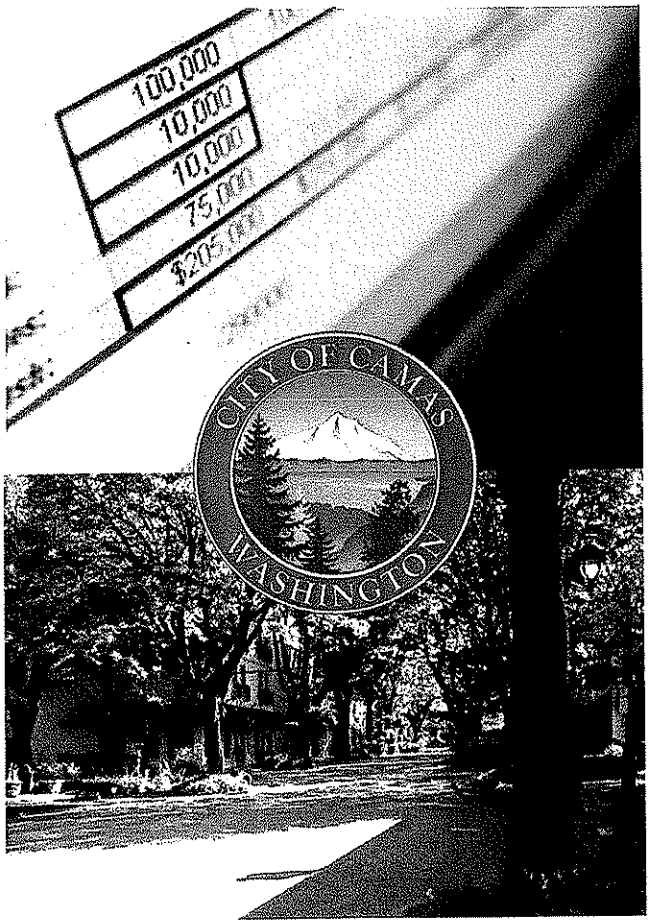
UTILITIES RATE STUDY

City of Camas, Washington

Final Report for

UTILITIES RATE STUDY

January 2010



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Solutions-Oriented Consulting

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ANGIE 230

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Report Contents

SECTION 1: INTRODUCTION

INTRODUCTION

In 2008, the City of Camas authorized FCS GROUP to complete a utilities rate study for the water, sewer, storm and sanitation utilities. Included as part of the rate study was an update of the System Development Charges (SDC) for water and sewer and establishing a new SDC for the storm utility. The results of the study aim to establishing a blueprint for achieving strong financial performance in the future and sustaining efficient and effective services to the City's customers. The scope of the project included the following elements:

- Assess revenue needs for a multi-year period that include adequate funding for operations and maintenance, capital projects, debt service, and other program activities.
- Project long-term capital needs and incorporate these needs into a long-term funding forecast that includes rates, debt, system development charges and existing reserves.
- Develop and recommend rate structures that:
  - ✓ Generate sufficient revenue to meet each utility's financial obligations on a stand along basis;
  - ✓ Promote water conservation;
- Update system development charges imposed on new development to mitigate the impact of such development on the capital facilities of the water, sewer and storm systems.

The methodology, key factors, conclusions and recommendations for each of the key task areas of the study are summarized in this executive level report.

A. NORTH ANNEXATION AREA

In 2008, the City annexed 1,100 acres of land located in the North Urban Growth Area (NUGA) located north of Lacamas Lake. This area is mostly undeveloped with minimal utility infrastructure. The City is in discussions with major land owners on development agreements and is preparing facility plans to address future growth.

The revenue requirement portion of this study does not address the additional operating and maintenance or capital costs associated with this area since that these costs are assumed to go into effect after the study period. The system development charge section takes a look at capital expenditures for a 20-year period, and therefore, does incorporate capital costs associated to the annexed area. The proposed charges in the following sections have developed system development charges for both the existing and annexed area.

SECTION 2: RATE STUDY METHODOLOGY

A. UTILITY RATE SETTING PRINCIPLES AND METHODOLOGY

The methods used to establish utility rates are based on principles that are generally accepted and widely followed throughout the industry. These principles are designed to produce rates that equitably recover costs from each class of customer by setting the appropriate level of revenue to be collected from ratepayers, and establishing a rate structure to equitably collect those revenues.

The primary tasks of the rate study are listed below:

- Revenue Requirements Analysis. This analysis identified the total revenue requirement to fully fund each utility on a standalone basis, considering operating and maintenance expenditures, capital funding needs, debt requirements and policy objectives.
- Rate Design Analysis. This analysis includes the development of rates that generate sufficient revenue to meet each system's revenue requirement forecast and continue to address the City's pricing objectives (e.g. conservation).

B. REVENUE REQUIREMENT ANALYSIS

A revenue requirement analysis forms the basis for a long-range financial plan and multi-year rate management strategy for each utility. It also enables the City to set utility rate structures, which fully recover the total costs of operating each utility: capital improvement and replacement, operations, maintenance, general administration, fiscal policy attainment, cash reserve management, and debt repayment. Linking utility rate levels to a financial plan such as this helps to enable not only sound financial performance for the City's utility enterprise funds, but also a clear and reasonable relationship between the costs imposed on utility customers and the costs incurred to provide them the service.

When FCS GROUP conducts a revenue requirements analysis, it includes the following core elements to form a complete portrayal of the utility's financial obligations:

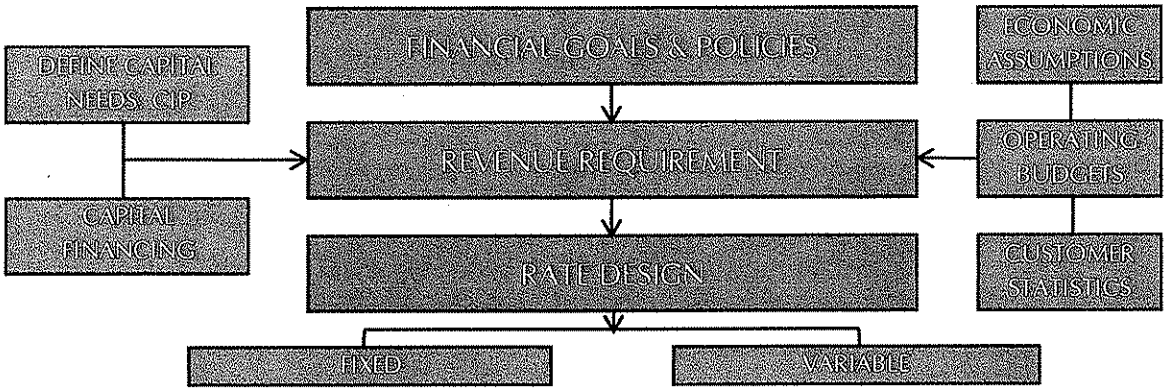
- ***Fiscal Policy Analysis*** – Identifies formal and informal fiscal policies of the City to ensure that current policies are maintained, including reserve levels, capital/system replacement funding and debt service coverage targets.
- ***Capital Funding Plan*** – Defines a strategy for funding the City's capital improvement/equipment program, including an analysis of available resources from rate revenues, system development charges, debt financing, and any special resources that may be readily available (e.g., grants, developer participation, etc.).
- ***Operating Forecast*** – Identifies future annual non-capital costs associated with the operation, maintenance, and administration of the utility systems.
- ***Reserve Analysis*** – Forecasts cash flow and fund balance activity in the City's utility reserves. Tests for satisfaction of actual or recommended minimum fund balance policies, including working capital/operating reserves and capital contingency/emergency reserves.
- ***Sufficiency Testing*** – Evaluates the sufficiency of utility revenues in meeting all obligations, including cash uses such as operating expenses, debt service, capital outlays, and reserve contributions, as well as any coverage requirements associated with long-term debt.
- ***Strategy Development*** – Designs a forward-looking strategy for adjusting utility resources to fully fund all utility obligations on a periodic or annual basis over the projection period.

From this foundation, utility rate structures can be adjusted to meet the defined annual and long-term funding targets as well the City's pricing objectives.

C. RATE DESIGN

The focus of rate design is the design of the pricing structures and is largely dictated by the objectives of the utility. The principal consideration is for the rate structure to generate sufficient revenues for the system which are reasonably commensurate with the cost of providing service. Most rate designs consist of fixed and variable charges. Fixed costs typically attempt to cover costs of the system that do not vary while variable costs vary with a change in user demand. Although majority of costs are fixed in nature, in general customers prefer more costs tied to the variable charge since changes in behavior have a direct correlation with a change in their bill. **Exhibit 2.1** provides an overview of the rate study process.

Exhibit 2.1: Overview of Rate Study Process



SECTION 3: WATER UTILITY

INTRODUCTION

The Camas Water Utility provides water to its customers for domestic, irrigation, commercial, industrial process and fire protection use. The Camas water utility has approximately 6,500 customers both within and outside the current City Limits. The system has 9,330 acre/feet of annual water rights from both surface and groundwater sources. The Jones/Boulder surface source is limited to winter time use to help protect stream flows for endangered fish. The infrastructure includes 9 wells, water filtration plant, 6 reservoir sites, 8 booster stations and over 110 miles of water main. In 2008 the average daily consumption was 3.7 million gallons per day (MGD) with a peak day of 7.8 MGD. In 2009 the Utility will complete the Water Facility Plan update that will provide guidance for system improvements needed for the next twenty years. The main capital focus of the next 6 years will be improving distribution and planning for the annexed area north of the lake.

A. REVENUE REQUIREMENT

A revenue requirement analysis forms the basis for a long-range financial plan and multi-year rate management strategy. The analysis is developed by completion of an operating forecast that identifies future annual non-operating costs and a capital funding plan that defines a strategy for funding the capital improvement needs of the City.

A.1 REVENUE REQUIREMENTS ANALYSIS

The purpose of the operating forecast is to determine whether the existing rates and charges are sufficient to recover the costs the City incurs to operate and maintain the water system. A combination of 2008 budget revenues and expenses and 2008 actual information formed the baseline for this forecast. The operating income forecast was developed for the 2009 through 2013 time period. The following list highlights some of the key assumptions used in the development of the water utility revenue requirement:

Reserves

- Operating Reserves: minimum 90 days of O&M expenses (per discussion with City staff).
- Capital Contingency Reserves: $200 thousand (per discussion with City staff).

Operating Revenue

- Customer Growth Rate Revenue: 1.5 percent (per discussion with City staff).
- Interest Earnings Rate: 3.13 percent per year (per discussion with City staff using the five-year average for the Washington State Local Government Investment Pool).

Operating & Maintenance (O&M) Expenses

- General Cost Inflation: 3.15 percent per year (based on analysis of historical Consumer Price Index data and discussion with City staff).
- Construction Cost Inflation: 6.0 percent per year (to date of anticipated construction, based on the discussion with City staff).
- Labor Cost Inflation: 5.0 percent per year (based on discussion with City staff).
- Local/State Excise Taxes: Public utility excise tax rate is 5.029 percent on all water rate revenues.
- State B&O Tax: 1.50 percent on all non-rate revenues.

Debt Service

- Three (3) existing debt obligations totaling $401 to $403 thousand: a revenue bond loan, a community economic revitalization board loan (CERB) and a public works trust fund loan (PWTF) starting in 2009.
  - ✓ The revenue bond loan is a Water and Sewer loan with 74 percent of it allocated to the water utility.
  - ✓ The CERB loan is paid off in 2016, outside the time frame covered in this study.
  - ✓ The PWTF loan is a five year loan, which starts in 2009 and is paid off in 2013.
- Two (2) new debt service obligations totaling $23 - $172 thousand per year: The first debt issue is anticipated in 2009 for an amount $240 thousand and the second in 2010 for an amount of $1.6 million. Both issues assume a 20-year term and a 5.6 percent interest rate. These debt issues will help fund numerous main installation/replacement projects.

System Reinvestment

- System reinvestment funding is to ensure system integrity through reinvestment in the system. Ideally, the minimum funding would be an amount equal to or greater than depreciation expense. If the annual depreciation expense is not available, it can be estimated based on the current water utility asset listing. The City's water utility depreciation expense is currently approximately $839 thousand (water's portion of the combined water and sewer plant).
- Historically, this rate funded component has had minimal dedicated funding; instead it depends on the availability of funds.
- This study assumes no annual funding in 2009. To avoid adding additional pressure on the rate payers, system reinvestment will not be funded through 2010 and will be incorporated at $200 thousand per year starting in 2011 through 2013.

A.2 CAPITAL FUNDING PLAN

The water utility is anticipating $7.6 million in capital costs in 2009 through 2013 (2008 dollars), $8.9 million inflated at 6 percent per year to date of construction. The annual average capital funding need is approximately $1.8 million inflated, with 2010 being the highest capital outlay year at $4.0 million inflated. **Exhibit 3.1** provides a summary of the water utility capital funding.

Exhibit 3.1: Water Utility Capital Funding Summary

Summary of Expenditures	2009	2010	2011	2012	2013	Total
CAPITAL PROJECTS						
Improvement Upgrade & Expansions	$ 1,433,650	$ 3,957,881	$ 467,871	$ 28,406	$ 2,706,561	$ 8,594,369
Repairs and Replacements	55,650	58,989	62,528	66,280	70,257	313,704
TOTAL CAPITAL EXPENDITURES	$ 1,489,300	$ 4,016,870	$ 530,399	$ 94,686	$ 2,776,818	$ 8,908,073
FUNDING SOURCES						
Grants / Developer Donations	$ 1,249,300	$ 2,232,968	$ 363,657	$ -	$ 2,676,451	$ 6,522,376
System Reinvestment	-	-	166,742	94,686	100,367	361,795
System Development Charge Revenue	-	189,104				189,104
New Debt Proceeds	240,000	1,581,200	-	-	-	1,821,200
Capital Fund Balance	-	13,598	-	-	-	13,598
TOTAL CAPITAL RESOURCES	$ 1,489,300	$ 4,016,870	$ 530,399	$ 94,686	$ 2,776,818	$ 8,908,073

Notes: Does not include Capital Fund reserve funding.

Approximately 75 percent of the capital projects will be funded through grants or developer donations and the remaining 25 percent will be funded through a combination of system development charges, annual rate funded system reinvestment, existing capital fund balances and new revenue bond debt issues.

A.3 SUMMARY OF REVENUE REQUIREMENT

The operating forecast components of O&M expenses, debt service and system reinvestment funding come together to form the multi-year revenue requirement. The revenue requirement compares the overall revenue available to the water utility to the expenses to evaluate the sufficiency of rates. **Exhibit 3.2** provides a summary of the water utility revenue requirement findings.

Exhibit 3.2: Water Utility Revenue Requirement Summary

Revenue Requirement	2009	2010	2011	2012	2013
Revenues					
Rate Revenues Under Existing Rates	$ 2,751,397	$ 2,792,668	$ 2,834,558	$ 2,877,076	$ 2,920,233
Non-Rate Revenue	222,103	238,466	254,297	264,885	280,629
Total Revenue	**$ 2,973,500**	**$ 3,031,134**	**$ 3,088,855**	**$ 3,141,961**	**$ 3,200,861**
Expenses					
Cash O&M Expenses	$ 2,502,332	$ 2,600,866	$ 2,703,549	$ 2,810,491	$ 2,922,049
Existing Debt Service	402,641	403,908	401,061	401,757	400,917
New Debt Service	22,610	171,571	171,571	171,571	171,571
Rate Funded System Reinvestment	-	-	200,000	200,000	200,000
Total Expenses	**$ 2,927,583**	**$ 3,176,346**	**$ 3,476,181**	**$ 3,583,819**	**$ 3,694,538**
Surplus (Deficiency)	$ 45,917	$ (145,211)	$ (387,326)	$ (441,858)	$ (493,676)
Additions to Meet Coverage	$ (80,813)	$ (111,885)	$ -	$ -	$ -
Total Surplus (Deficiency)	$ (34,896)	$ (257,097)	$ (387,326)	$ (441,858)	$ (493,676)
% of Rate Revenue	1.27%	9.21%	13.66%	15.36%	16.91%
Annual Rate Adjustment	**5.00%**	**5.00%**	**4.25%**	**4.00%**	**4.00%**
Rate Revenues After Rate Increase	$ 2,854,574	$ 3,078,916	$ 3,257,917	$ 3,439,057	$ 3,630,269
Net Cash Flow After Rate Increase	**$ 143,906**	**$ 126,642**	**$ 14,742**	**$ 91,861**	**$ 180,652**
Coverage After Rate Increase	1.41	1.28	1.44	1.59	1.77

Notes: 2009 Rate increase assumes partial year implementation.

Summary of Revenue Requirements:

- The revenue requirement analysis indicates a rate deficiency in each year of the study ranging from 1.27 percent in 2009 increasing to 16.91 percent by 2013.
- In order to fund the upcoming capital projects and to meet annual operating and maintenance requirements we recommend a 5.00 percent rate increase in 2009 and 2010 followed by a 4.25 percent increase in 2011 and 4.00 percent increases in 2012 and 2013.
- Operating fund target of 90 days is met by the end of the study period.

- Emergency construction fund of $200 thousand is met or exceeded every year of the study period.
- Debt service coverage of 1.25 minimum requirements is met after increases.
- Implementation of the new rate increases took effect March 30, 2009.

Since the City decided to adopt rates on an annual basis, we recommend that the City revisit and update economic and capital assumptions on an annual basis to make sure assumptions used have not changed significantly.

B. RATE DESIGN

The principal objective of the rate design stage of this rate study was to implement water rate structures that collect the appropriate level of revenue.

Establishing rates is a blend of "Art" and "Science" and especially so when it comes to the rate levels and structures. Several variables must be balanced to arrive at optimal rates. A cost-of-service analysis, which evaluates the rate equity by customer class, was not performed during the current study. The new rate increases were passed through to each class with a uniform across the board approach as requested by the City. In essence, each rate component (fixed and variable charge) will be increased by the same percentage. There was no greater weight put on either charge.

B.1 EXISTING WATER RATES

The existing water rates are composed of a fixed monthly charge by meter size and a variable charge per hundred cubic feet (ccf) for all water use. There are currently two separate fixed charge structures (including fire and cemetery classes) and five variable charge structures. The monthly fixed charges increase by meter size for all classes. There is a 1.5 multiplier on both the fixed and variable charges for all customers outside the City limits. **Exhibit 3.3** provides a summary of the current water utility rate structure.

Exhibit 3.3 – Current Water Rates

Existing Rates		
Meter	Monthly Fixed	Fire Line Monthly Fixed
5/8"	$ 6.43	
3/4"	6.97	
1"	8.60	
1.25"	9.68	
1.5"	10.77	
2"	16.73	
3"	60.65	
4"	76.92	$ 16.76
6"	114.88	23.53
8"		30.27
10"		44.00
Variable Charge (ccf)		
Residential	Commercial	City
$ 1.24	$ 1.50	$ 1.50
Industrial	Irrigation	Cemetery
$ 1.25	$ 1.40	$ 0.56

Notes: Outside City customers have a 1.5 multiplier on the fixed and variable charges.

B.2 PROPOSED WATER RATES

As previously mentioned the rate increases were passed along across-the-board to each individual class. **Exhibit 3.4** provides a summary of the proposed rates for 2009.

Exhibit 3.4: 2009 Proposed Water Rates

Proposed Rates		
Meter	Monthly Fixed	Fire Line Monthly Fixed
5/8"	$ 6.75	
3/4"	7.32	
1"	9.03	
1.25"	10.16	
1.5"	11.31	
2"	17.57	
3"	63.68	
4"	80.77	$ 17.60
6"	120.62	24.71
8"		31.79
10"		46.20
Variable Charge (ccf)		
Residential	Commercial	City
$ 1.30	$ 1.58	$ 1.58
Industrial	Irrigation	Cemetery
$ 1.31	$ 1.47	$ 0.59

Notes: Outside City customers have a 1.5 multiplier on the fixed and variable charges.

C. CONSERVATION RATE STRUCTURE

C.1 INTRODUCTION TO CONSERVATION

Part of the rate study scope of services was the development of a conservation based inverted block rate structure.

The conservation rate structure was developed in part based on the regulatory requirements of the 2003 Municipal Water Supply Efficiency Requirement Act (Municipal Water Law), which applies to municipal water suppliers to use water more efficiently in exchange for certainty and flexibility in exercising in water rights. House Bill 1338 Section 7 outlines several requirements pertaining to financials and rates. The requirements outlined are as follows:

- Ensure the efficient use of water while maintaining water system financial viability:
- Improve affordability of supplies;
- Evaluate the feasibility of adopting and implementing water delivery rate structures that encourage water conservation; and
- Identify water use patterns among utility customer classes.

An inverted block water rate structure for the residential customer class can help the City meet regulatory requirements, and achieve its conservation goals, all intended to save its precious water resources.

C.2 CONSERVATION RATE

When developing a conservation rate structure a detailed customer statistics analysis is completed separating customer usage by class and month. Understanding the class' usage profile provides useful information regarding at what level to establish usage block sizes.

The residential class was chosen for the conservation rate structure since this class is generally the largest class on the system. In addition, it tends to have the most discretionary use with the greatest peak usage during the most constrained time of the year when water supply is at the lowest.

Since the City has not had a conservation rate structure for the residential class before, a basic 3-block inverted block structure was developed. The block sizes and charges were based on residential annual, winter, summer and peak statistics. Block one was based on an expanded winter average month usage, block two was based on double the winter usage, and block three was based on any usage above block two threshold. The block two price was based on the summer to winter average month ratio and block three was based on peak to winter average month ratio; total revenue generated from the blocks had to meet the annual revenue requirement. To account for the fact that the inverted block structure would induce water conservation and to preserve revenue stability, a 5 percent consumption reduction factor was applied to the third block. **Exhibit 3.5** provides a summary of the proposed conservation rates for 2009 for the residential class.

Exhibit 3.5: 2009 Proposed Residential Conservation Water Rates

Proposed Conservation Rates	
Meter	Monthly Fixed
5/8"	$ 6.75
3/4"	7.32
1"	9.03
1.25"	10.16
1.5"	11.31
2"	17.57
Variable Charge (ccf)	
Block 1 (0-10)	$1.04
Block 2 (11-20)	$1.66
Block 3 (21+)	$2.43

Notes: Outside City customers have a 1.5 multiplier on the fixed and variable charges.

Under the proposed block structure approximately 65 percent of customers fall into block one, 22 percent into block two and the remaining 13 percent into block three. Approximately 62 percent of the usage is in block one, 20 percent is in block two and 18 percent is in block three.

The City did not implement the proposed rate provided for the residential class.

D. FIRE COST ALLOCATION

In Lane v. Seattle, 164 Wn.2d 875 (2008), the Washington Supreme Court ruled that municipalities may not charge utility customers a monthly fire hydrant fee, and that the cost of fire hydrants must be borne by the general fund. Camas should consult with its attorney to insure that it is in compliance with Lane v. Seattle.

E. SUMMARY

The analysis described above concludes the rate study for the water utility. After performing a rate revenue analysis, it was shown that the revenues at current level are not sufficient to fund ongoing water system obligations. As a result a 5.0 percent increase is proposed in 2009 effective March 30th, 2009. Although the rate study has provided a financial forecast and rate transition plan through 2013, the City is not proposing a multi-year rate increase at this time. Staff will review rates annually and bring recommendations back for council consideration.

Furthermore, we recommend that the City update the cost-of-service rate study (last performed in 2003) to update the rate structure for changes in utility customer class demands. A cost-of-service analysis will also identify the fire related costs and help the City comply with the requirements stemming from the Lane versus Seattle court case.

The detailed technical exhibits developed as part of the water rate study can be found at the end of this report in the Technical Appendices.

SECTION 4: SEWER UTILITY

INTRODUCTION

The Camas Sewer system provides sewer service for 6,300 residential, commercial and industrial customers in areas within the Urban Growth Boundary (UGB). The system is comprised of a main sewer treatment plant rated at 6.1 MGD average daily flow, and a collection system that includes gravity main lines, pump stations, force mains and a large number of Septic Tank Effluent Systems (STE). The utility has submitted a General Sewer Wastewater Facility Plan in 2009 to the Department of Ecology (DOE) for approval that will guide system improvements for the next twenty years. The Utility has also submitted to DOE an amendment to the above mentioned plan that will specifically address the annexation area north of the lake. The main capital focus over the next six years is a major improvement to the Waste Water Treatment Plant that will convert to anaerobic digestion and produce class A solids, and planning for the annexed area north of the lake.

A. REVENUE REQUIREMENTS

Similar to the water utility a revenue requirement was completed for the sewer utility and forms the basis for a long-range financial plan and multi-year rate management strategy.

A.1 OPERATING FORECAST

The purpose of the operating forecast is to determine whether the currently adopted rates and charges are sufficient to recover the costs the City incurs to operate and maintain the sewer system. A combination of 2008 budget revenues and expenses and 2008 actual figures form the baseline for this forecast. The operating income forecast was developed for the 2009 through 2013 time period. The following list highlights some of the key assumptions used in the development of the sewer utility revenue requirement:

Reserves

- Operating Reserves: minimum 60 days of O&M expenses (per discussion with City staff).
- Capital Contingency Reserves: $200 thousand (per discussion with City staff).

Operating Revenue

- Customer Growth Rate Revenue: 1.50 percent per year (per discussion with City staff).
- Interest Earnings Rate: 3.13 percent per year (per discussion with City staff using the five-year average for the Washington State Local Government Investment Pool).

Operating & Maintenance (O&M) Expenses

- General Cost Inflation: 3.15 percent per year (based on analysis of historical Consumer Price Index data and discussion with City staff).
- Construction Cost Inflation: 6.00 percent per year (to year of anticipated construction, based on the discussion with City staff).
- Labor Cost Inflation: 5.00 percent per year (based on discussion with City staff).
- Local/State Excise Taxes: Public utility excise tax rate is 3.852 percent on collection revenue and 1.50 percent on the treatment revenue. According to City's tax records, collection makes up 29 percent of rate revenue and treatment makes up 71 percent of rate revenue.
- State B&O Tax: 1.50 percent on all non-rate revenues.

Debt Service

- Seven (7) existing debt service obligations totaling approximately $1.57 million: two (2) revenue bond loans, three (3) public works trust fund loans (PWTF) and two (2) Department of Ecology loans (DOE).
  - ✓ One of the revenue bond loans is a Water and Sewer loan with 26 percent of it allocated to the sewer utility. The other revenue bond loan is a refunding of the 1998 bonds.
  - ✓ The PWTF loans consist of; a five year loan, which starts in 2009 and gets paid off in 2013, a 5-year pre construction loan for the WWF Improvements Phase II which is going to be converted into a 20-year loan starting in 2009 and a Sewer Treatment Plant Upgrade loan.
  - ✓ Two DOE loans one of which is related to the Sewer Treatment Plant (STP) Clarifier.
- Four (4) new debt service obligations totaling $10,000 to $1.7 million per year: the City has acquired $10 million in PWTF money to help pay for upcoming (STP) Upgrade related projects, which will be completed between 2009 and 2012. The PWTF money will be used for projects in 2009 and 2010. The second debt issue is anticipated in 2011 for an amount of $7.55 million, which will also be used to help pay for the STP Upgrade projects. The third debt issues is anticipated in 2012 for an amount of $4.72 million and will also be used to help finish the STP related projects and a main improvement/replacement project. The last debt issues is anticipated in 2013 for an amount of $520 thousand to help pay for pump station upgrades and STP update.

System Reinvestment

- The purpose of system reinvestment funding is to ensure system integrity through reinvestment in the system. Ideally, the minimum funding would be an amount equal to or greater than depreciation expense. If the annual depreciation expense is not available, it can be estimated based on the current sewer system asset listing. The City's sewer utility depreciation expense is currently approximately $970 thousand (sewer's portion of the combined water and sewer plant).
- Historically, this rate funded component has had minimal dedicated funding, instead funding depends on availability.
- Currently, the City is not assuming any funding for system reinvestment due to the significant level of capital which the City is undertaking during the planning period. This will avoid adding additional pressure on rate payers.

A.2 CAPITAL FUNDING PLAN

The sewer utility is anticipating $23.2 million in capital costs in 2009 through 2013 (2008 dollars) and $24.2 million inflated (6 percent per year to date of construction). The annual average capital funding need is approximately $4.84 million inflated, with 2010 being the highest capital outlay year at $8.12 million inflated. **Exhibit 4.1** below provides a summary of the sewer utility capital funding.

Exhibit 4.1: Sewer Utility Capital Fund Summary

Summary of Expenditures	2009	2010	2011	2012	2013	Total
CAPITAL PROJECTS						
Improvement Upgrade & Expansions	$ 421,200	$ 4,370,790	$ 3,029,775	$ 2,464,048	$ 301,101	$ 10,586,914
Repairs and Replacements	1,790,800	3,752,810	5,054,503	2,464,048	568,746	13,630,907
TOTAL CAPITAL EXPENDITURES	$ 2,212,000	$ 8,123,600	$ 8,084,278	$ 4,928,096	$ 869,847	$ 24,217,821
FUNDING SOURCES						
Public Works Trust Fund Loans	$ 2,020,000	$ 7,980,000				$ 10,000,000
System Development Charge Revenue	186,163	143,600	186,163	186,163	186,163	888,253
New Debt Proceeds	-	-	7,550,000	4,720,000	520,000	12,790,000
Capital Fund Balance	5,837	-	348,115	21,933	163,683	539,568
TOTAL CAPITAL RESOURCES	$ 2,212,000	$ 8,123,600	$ 8,084,278	$ 4,928,096	$ 869,847	$ 24,217,821

Notes: Does not include Capital Fund reserve funding.

The projects will be funded through a combination of system development charges 4 percent, PWTF loans 41percent, revenue bond loans 53 percent and the remainder from existing fund balances 2 percent.

A.3 SUMMARY OF REVENUE REQUIREMENT

The operating forecast components of O&M expenses, debt service and system reinvestment funding come together to form the multi-year revenue requirement. The revenue requirement compares the overall revenue available to the utility to the expenses to evaluate the sufficiency of rates. **Exhibit 4.2** below provides a summary of the sewer utility revenue requirement findings.

Exhibit 4.2: Sewer Utility Revenue Requirement Summary

Revenue Requirement	2009	2010	2011	2012	2013
Revenues					
Rate Revenues Under Existing Rates	$ 3,431,364	$ 3,482,834	$ 3,535,077	$ 3,588,103	$ 3,641,924
Non-Rate Revenue	136,992	141,419	154,924	180,689	199,286
Total Revenue	**$ 3,568,356**	**$ 3,624,253**	**$ 3,690,001**	**$ 3,768,792**	**$ 3,841,211**
Expenses					
Cash O&M Expenses	$ 2,808,285	$ 2,914,495	$ 3,025,097	$ 3,140,399	$ 3,260,227
Existing Debt Service	1,582,175	1,581,721	1,579,057	1,576,928	1,573,447
New Debt Service	10,100	156,316	1,249,112	1,667,422	1,711,165
Total Expenses	**$ 4,400,561**	**$ 4,652,532**	**$ 5,853,266**	**$ 6,384,749**	**$ 6,544,840**
Surplus (Deficiency)	**$ (832,204)**	**$ (1,028,279)**	**$ (2,163,265)**	**$ (2,615,957)**	**$ (2,703,629)**
% of Rate Revenue	24.25%	29.52%	61.19%	72.91%	74.24%
Annual Rate Adjustment	**34.00%**	**10.60%**	**10.60%**	**8.00%**	**3.00%**
Rate Revenues After Rate Increase	$ 4,306,362	$ 5,161,700	$ 5,794,472	$ 6,351,901	$ 6,640,595
Net Cash Flow After Rate Increase	**$ 9,088**	**$ 585,917**	**$ 9,099**	**$ 41,379**	**$ 179,532**
Coverage After Rate Increase	2.80	4.05	2.29	1.97	2.02

Notes: 2009 Rate increase assumes partial year implementation.

Summary of Revenue Requirement:

- The revenue requirement analysis indicates a rate deficiency starting in 2009 and ranging from 24.25 percent in 2009 increasing to 74.24 percent by 2013.
- In order to fund the ongoing operating needs we recommend a 34 percent rate increases in 2009 followed by two 10.60 percent increases in 2010 and 2011, an 8.00 percent increase in 2012 and a 3.00 percent in 2013.
- Operating fund target of 60 days is met every year except 2009 and 2011 with 2011 being off only by 1 day. In order to meet operating targets of 60 days in 2009 a higher increase would be required.
- Emergency construction fund of $200 thousand is met every year.
- Implementation of the new rate increases took effect March 30th, 2009.
- Debt service coverage is above the 1.25 minimum requirement after rate increases.
- No system reinvestment funding due to debt burden.

Similar to the water utility, the City Council decided to adopt rate increases on an annual basis. The City should revisit economic and capital assumptions used in the study and make sure these assumptions have not changed significantly to ensure rates remain sufficient and the fund level is adequate to meet cash flow needs and target fund balances.

B. RATE DESIGN

As discussed in the water utility section, the principal objective of the rate design stage is to implement sewer rate structures that collect the appropriate level of revenue as outlined by the revenue requirement. Since a cost-of-service analysis was not performed, the increase is passed through to each class with an across the board approach as requested by the City.

B.1 EXISTING SEWER RATES

The existing sewer rates are composed of two separate structures. The residential structure consists of a fixed monthly charge, while the commercial/industrial structure consists of a fixed monthly charge and an additional volume charge per 100 cubic feet of use. There is a 1.5 multiplier on both the fixed and variable charges for all customers outside the City limits.

Exhibit 4.3 below provides a summary of the current sewer rate structure.

Exhibit 4.3: Existing Sewer Rates

Existing Rates		
Class	Monthly Fixed	Variable Charge (ccf)
Residential	$ 24.05	
Commercial / Industrial	5.75	$ 2.45

Notes: Outside City customers have a 1.5 multiplier on the fixed and variable charges.

B.2 PROPOSED SEWER RATES

The proposed Sewer rate schedule contains no structural changes and applies the rate increase across the board (or equally to each rate component). **Exhibit 4.4** on the following page provides a summary of the proposed 2009 sewer rate schedule.

Exhibit 4.4: Proposed Sewer

Proposed Rates		
Class	Monthly Fixed	Variable Charge (ccf)
Residential	$ 32.23	
Commercial / Industrial	7.71	$ 3.28

Notes: Outside City customers have a 1.5 multiplier on the fixed and variable charges.

C. SUMMARY

The analysis described above concludes the rate study for the sewer utility. After performing a rate revenue analysis, it was shown that the revenues at current level are not sufficient to fund ongoing sewer system obligations. As a result a 34.00 percent increase is proposed in 2009 for sewer rates effective March 30th, 2009. Although the rate study has provided a financial forecast and rate transition plan through 2013, the City is not proposing a multi-year rate increase at this time. Staff will review rates annually and bring recommendations back for council consideration.

Similar with the water analysis, we recommend that the City update the cost-of-service rate study (last performed in 2003) to update the rate structure for changes in customer class demands.

The detailed technical exhibits developed as part of the sewer rate study can be found at the end of this report in the Technical Appendices.

SECTION 5: STORM WATER UTILITY

INTRODUCTION

The Camas Storm utility was formed to provide a funding source to comply with the National Pollution Discharge Elimination System (NPDES) Phase 2 permit issued by the Department of Ecology on January 17th, 2007. The utility maintains the public storm system that includes gravity main lines, manholes, catch basins and storm treatment/detention ponds. The utility is also responsible for street sweeping to reduce sediment entering streams. Some treatment facilities and private storm collection systems are the responsibility of private business and homeowner associations (HOAs).

A. REVENUE REQUIREMENT

The stormwater utility revenue requirement was established similar to the other utilities; it is developed by completion of an operating forecast that identifies future annual operating costs and a capital funding plan that defines a strategy for funding capital improvement needs of the stormwater system on a standalone basis.

A.1 OPERATING FORECAST

The purpose of the operating forecast is to determine whether the currently adopted rates and charges are sufficient to recover the costs the City incurs to operate and maintain the stormwater utility. The City provided a 6-year stormwater plan that was used as the basis for this forecast. The forecast was developed for the 2009 through 2013 time period. The following list highlights some of the key assumptions used in the development of the stormwater utility revenue requirement:

Key Assumptions

- Operating Reserves: minimum 30 days of O&M expenses (per discussion with City staff).
- Capital Contingency Reserves: currently not funded.
- Fisher Basin Reserve/Cash Balance: Used for Fisher Basin capital projects only until it is depleted.

Operating Revenue

- Customer Growth Rate Revenue: 2.00 percent per year (per discussion with City staff and stormwater 6-year plan).
- Interest Earnings Rate: 3.13 percent per year (per discussion with City staff using the five-year average for the Washington State Local Government Investment Pool).

Operating & Maintenance (O&M) Expenses

- All expenses were provided by the City from the stormwater 6-year plan.
- State B&O Tax: 1.50 percent.

Debt Service

- The stormwater utility currently does not hold any debt.
- New Debt Service: There are no new debt issues assumed for the study period.

System Reinvestment

- As with the water and sewer utilities it is important to fund annual system reinvestment to ensure system integrity. Ideally, the minimum funding would be an amount equal to or greater than depreciation expense. If the annual depreciation expense is not available, it can be estimated based on the current

stormwater system asset listing. The City's stormwater utility depreciation expense is currently approximately $397 thousand.

- Historically, the City has been funding all of its capital expenses through reserves and direct rate funding, thereby capturing depreciation funding through rates. The City's current annual average CIP for the storm utility is $327,000 inflated.

A.2 CAPITAL FUNDING PLAN

The stormwater utility is anticipating $1.32 million (2008 dollars) in total capital costs in 2009 through 2013, $1.64 million inflated (6 percent per year to year of construction). Approximately $996 thousand inflated of the total costs are related to Fisher Basin projects and the remaining $640 thousand inflated are for the Non Fisher Basin projects. The annual average total capital funding need is approximately $327 thousand inflated, with 2013 being the highest capital outlay year at $596 thousand inflated. **Exhibit 5.1** below provides a summary of the stormwater utility capital funding.

Exhibit 5.1: Stormwater Utility Capital Funding Summary

Summary of Expenditures	2009	2010	2011	2012	2013	Total
CAPITAL PROJECTS						
Improvement Upgrade & Expansions	$ 37,100	$ 103,933	$ 199,495	$ 211,465	$ 297,755	$ 849,748
Repairs and Replacements	37,100	103,933	199,495	148,341	297,755	786,624
TOTAL CAPITAL EXPENDITURES	$ 74,200	$ 207,866	$ 398,990	$ 359,806	$ 595,510	$ 1,636,373
FUNDING SOURCES						
Fisher Basin Capital Fund Transfers	$ 68,900	$ 95,506	$ 279,889	$ 170,434	$ 247,961	$ 862,690
Non Fisher Basin Capital Fund Balance	5,300	112,360	119,102	189,372	347,550	773,683
TOTAL CAPITAL RESOURCES	$ 74,200	$ 207,866	$ 398,990	$ 359,806	$ 595,510	$ 1,636,373

Notes: Does not include Capital Fund reserve funding.

The projects related to Fisher Basin will be funded through Fisher Basin funds only until the fund is depleted; once the fund is depleted (in 2013) the projects will be funded through rate revenue. The Non Fisher Basin projects are currently funded through rates.

A.3 SUMMARY OF REVENUE REQUIREMENT

The operating forecast components of O&M expenses and capital funded through rates join together to form the multi-year revenue requirement. The revenue requirement compares the overall available utility revenue to the expenses to evaluate the sufficiency of rates. **Exhibit 5.2** below provides a summary of the stormwater utility revenue requirement findings.

Exhibit 5.2: Stormwater Utility Revenue Requirement Summary

Revenue Requirement	2009	2010	2011	2012	2013
Revenues					
Rate Revenues Under Existing Rates	$ 527,485	$ 538,034	$ 548,795	$ 559,771	$ 570,966
Non-Rate Revenue	-	-	-	1,057	2,237
Total Revenue	$ 527,485	$ 538,034	$ 548,795	$ 560,828	$ 573,203
Expenses					
Cash Operating Expenses	$ 473,761	$ 571,805	$ 586,028	$ 600,678	$ 615,767
Street Cleaning	138,831	138,391	142,338	146,405	150,593
Administration / Taxes	97,754	136,407	119,519	122,583	125,739
Rate Funded System Reinvestment	30,300	112,360	119,102	189,372	347,550
Total Expenses	$ 740,646	$ 958,963	$ 966,987	$ 1,059,038	$ 1,239,649
Surplus (Deficiency)	$ (213,161)	$ (420,928)	$ (418,192)	$ (498,209)	$ (666,446)
% of Rate Revenue	40.41%	78.23%	76.20%	89.00%	116.72%
Annual Rate Adjustment	55.00%	20.00%	20.00%	3.00%	3.00%
Rate Revenues After Rate Increase	$ 745,072	$ 1,000,744	$ 1,224,911	$ 1,286,891	$ 1,352,008
Net Cash Flow After Rate Increase	$ 1,162	$ 34,841	$ 247,782	$ 218,004	$ 102,880

Notes: 2009 Rate increase assumes partial year implementation.

Summary of Revenue Requirement:

- The revenue requirement analysis indicates a rate deficiency starting in 2009 and ranging from 40.41 percent in 2009 increasing to 116.72 percent by 2013.
- In order to fund the ongoing operating needs and upcoming capital projects we recommend a 55.00 percent increase in 2009 followed by two 20.00 percent increases in 2010 and 2011 and 3.00 percent increases in 2012 and 2013.
- Operating fund target of 30 days is not met until 2012 with the current rate increases. In order to reach the 30 day reserve target larger rate increases are required.
- From an independent utility stand point, the stormwater utility had negative fund balances in the beginning of the study (not taking into account Fisher Basin funds). With the proposed increase the stormwater utility starts to carry positive balances in 2011.
- Implementation of the new rate increases took effect March 30, 2009.

Similar to the recommended approach for the water and sewer utilities, the City should revisit economic and capital assumptions on an annual basis to make sure significant changes have not occurred and that rates remain sufficient to meet cash flow needs and target fund balances.

B. RATE DESIGN

As discussed in the previous sections, the principal objective of the rate design stage is to implement stormwater rate structures that collect the appropriate level of revenue as outlined by the revenue requirement.

B.1 EXISTING STORMWATER RATES

The existing stormwater rate is made up of two components an O&M component and a capital component. The current residential O&M component is $3.76 per month and the capital component is $0.95 per month.

Existing Fisher Basin customers are paying for the O&M component only since Fisher Basin related capital is being paid for from the Fisher Basin fund, while the Non Fisher Basin customers are paying both the O&M and Capital components of the charge for a total of $4.71 per month. The charges are based on equivalent dwelling unit (EDU) which is defined as 3,218 square feet per dwelling unit. Each residential customer is considered to have one EDU, while all other classes are calculated based on their impervious surface area and are charged for each EDU. **Exhibit 5.3** below provides a summary of the current stormwater rate structure.

Exhibit 5.3: Existing Stormwater Rates

Existing Rates		
Monthly Charge per EDU		
O&M	Capital	Total
$3.76	$0.95	$4.71

Notes: Fisher Basin pays the O&M fee only

B.2 PROPOSED STORMWATER RATES

Under the existing rate structure Fisher Basin customers only pay the O&M component of the total charge due to the fact that Fisher Basin capital gets paid out of the Fisher Basin fund balance. Once the fund balance is depleted, Fisher Basin customers will have to pay for capital out of rates. Since there are significantly less Fisher Basin customers than Non Fisher Basin customers the Fisher Basin capital portion of the charge could be substantial. We propose changing the existing charge into a uniform charge, which covers the entire rate revenue requirement for Fisher Basin and Non Fisher Basin customers. The proposed charge contains no other structural changes and applies the rate increases across the board. **Exhibit 5.4** provides a summary of the proposed 2009 stormwater rate schedule.

Exhibit 5.4: Proposed Stormwater Rates

Proposed Rates
Total Monthly Charge per EDU
$6.89

Notes: Includes both O&M and Capital

C. SUMMARY

The analysis described above concludes the rate study for the stormwater utility. After performing a rate revenue analysis, it was shown that the revenues at current level are not sufficient to fund ongoing stormwater obligation. As a result a 55.00 percent increase is proposed in 2009 for stormwater rates effective March 30th, 2009. Although the rate study has provided a financial forecast and rate transition plan through 2013, the City is not proposing a multi-year rate increase at this time. Staff will review rates annually and bring recommendations back for council consideration.

The detailed technical exhibits developed as part of the stormwater rate study can be found at the end of this report in the Technical Appendices.

SECTION 6: SANITATION UTILITY

INTRODUCTION

The Sanitation Utility collects solid waste from all residential, commercial, and industrial accounts using containers 2 yards and smaller. The City has entered into a non-exclusive franchise agreement with Waste Connects Inc. for solid waste collection for containers larger than 2 yards. Solid waste collection is mandatory in Camas. The utility owns four refuse trucks and has four FTE. The utility also collects mandatory recycle fees from the residential customers and has entered into a contract with Waste Connections Inc. to collect and dispose of residential recycle material. Commercial recycling is provided by a variety of purveyors. The City begins servicing newly annexed areas seven years after the annexation occurs in accordance with State law.

A. REVENUE REQUIREMENTS

The sanitation utility revenue requirement was established similar to the other utilities; it is developed by completion of an operating forecast that identifies future annual operating costs and a capital funding plan that defines a strategy for funding capital improvement needs of the sanitation system on a standalone basis.

A.1 OPERATING FORECAST

The purpose of the operating forecast is to determine whether the currently adopted rates and charges are sufficient to recover the costs the City incurs to operate and maintain the sanitation utility. The City provided a 6-year sanitation plan that was used as the basis for this forecast. The forecast was developed for the 2009 through 2013 time period. The following list highlights some of the key assumptions used in the development of the sanitation utility revenue requirement:

Key Assumptions

- Operating Reserve: minimum 30 days of O&M expenses (per discussion with City staff).

Operating Revenue

- Customer Growth Rate Revenue: 2.00 percent per year (per discussion with City staff and sanitation 6-year plan).
- Interest Earnings Rate: 3.13 percent per year (per discussion with City staff using the five-year average for the Washington State Local Government Investment Pool).

Operating & Maintenance (O&M) Expenses

- All expenses were provided by the City from the sanitation 6-year plan,

Equipment Reinvestment

- The City currently funds equipment replacement (consisting of truck rental and operations center lease) in the amount of approximately $320-$380 thousand annually.

A.2 SUMMARY OF REVENUE REQUIREMENT

The detailed operating forecast joins the anticipated O&M expenses with any equipment replacement costs to form the multi-year revenue requirement. The revenue requirement compares the overall available utility revenue to the expenses to evaluate the sufficiency of rates. **Exhibit 6.1** below provides a summary of the sanitation utility revenue requirement findings.

Exhibit 6.1: Sanitation Revenue Requirement Summary

Revenue Requirement	2009	2010	2011	2012	2013
Revenues					
Rate Revenues Under Existing Rates	$ 1,851,300	$ 1,888,326	$ 1,926,093	$ 2,014,174	$ 2,054,457
Non-Rate Revenue	35,401	26,492	27,390	28,402	29,301
Total Revenue	**$ 1,886,701**	**$ 1,914,818**	**$ 1,953,483**	**$ 2,042,576**	**$ 2,083,758**
Expenses					
Disposal	$ 565,020	$ 595,219	$ 643,205	$ 677,621	$ 713,836
Recycling	314,647	345,329	372,799	389,727	407,583
Collection	701,461	721,536	757,213	763,510	785,447
Customer Accounts / A&G / Taxes	238,217	239,574	246,268	253,902	261,006
Total Expenses	**$ 1,819,345**	**$ 1,901,657**	**$ 2,019,486**	**$ 2,084,760**	**$ 2,167,872**
Surplus (Deficiency)	**$ 67,356**	**$ 13,160**	**$ (66,003)**	**$ (42,185)**	**$ (84,114)**
% of Rate Revenue	0.00%	0.00%	3.43%	2.09%	4.09%
Annual Rate Adjustment	**0.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**
Rate Revenues After Rate Increase	$ 1,851,300	$ 1,926,093	$ 2,003,907	$ 2,135,415	$ 2,221,686
Net Cash Flow After Rate Increase	**$ 67,356**	**$ 50,360**	**$ 10,644**	**$ 77,238**	**$ 80,606**

Notes: Includes revenue assumptions for additional connections at Lacamas Heights in 2012.

Summary of Revenue Requirement:

- The analysis assumes that there will be new connections coming online at Lacamas Heights starting in 2011/2012 generating additional rate revenue starting in 2012 (approximately $50 thousand). New connections are made up of 268 residential customers, ranging in sizes of can pickup, and 6 commercial customers.
- The revenue requirement analysis indicates a rate deficiency of 3.43 percent beginning in 2011 increasing to 4.09 percent by 2013.
- In order to fund the ongoing operating needs we recommend a 2.00 percent rate increase beginning in 2010 through 2013. The increases begin in 2010 instead of 2011 in order to minimize customer impacts by phasing in the adjustments over time.
- Operating fund target of 30 days of working capital met throughout the 2009 – 2013 time period. Revenue in excess of 30 days of working capital is assumed to be transferred to the equipment fund.

B. RATE DESIGN

The sanitation rate design is fairly straightforward. Unlike other operations that charge a combination of fixed and variable charges, all charges are recovered by container size and frequency of pickup.

B.1 EXISTING SANITATION RATES

As previously mentioned the existing sanitation rate structure is composed of a charge by container size and frequency of pickup. **Exhibit 6.2** provides a summary of the existing sanitation rates.

Exhibit 6.2: Existing Sanitation Rates

Existing Rates	
Regular Monthly Service	
Service	Monthly Charge
35 gallon (EOW)	$ 9.25
35 gallon weekly	14.12
65 gallon weekly	18.95
95 gallon weekly	25.70

Existing Rates				
# of Empties	Regular Dumpster		Compacted	
	1.5 Yards	2 Yards	1.5 Yards	2 Yards
1	$ 64.35	$ 89.27	$ 135.31	$ 178.54
2	135.31	178.54	282.89	357.08
3	209.10	267.81	430.46	535.62
4	282.89	357.08	578.04	714.16
5	356.67	446.35	725.62	892.70

B.2 PROPOSED SANITATION RATES

The proposed sanitation rate schedule contains no structural changes and applies the rate increase across the board (or equal to each rate component). Since the first rate increase is proposed for 2010 for the sanitation utility, **Exhibit 6.3** below provides a summary of the proposed 2010 sanitation rate schedule.

Exhibit 6.3: Proposed 2010 Sanitation Rates

Proposed Rates 2010	
Regular Monthly Service	
Service	Monthly Charge
35 gallon (EOW)	$ 9.44
35 gallon weekly	14.40
65 gallon weekly	19.33
95 gallon weekly	26.21

Proposed Rates 2010				
# of Empties	Regular Dumpster		Compacted	
	1.5 Yards	2 Yards	1.5 Yards	2 Yards
1	$ 65.64	$ 91.06	$ 138.02	$ 182.11
2	138.02	182.11	288.55	364.22
3	213.28	273.17	439.07	546.33
4	288.55	364.22	589.60	728.44
5	363.80	455.28	740.13	910.55

C. SUMMARY

The analysis described above concludes the rate study for the sanitation utility. After performing a rate revenue analysis, it was shown that the revenues at current level are not sufficient to fund ongoing sanitation system obligations starting in 2011. As a result a 2.00 percent increase is proposed in 2010 for sanitation rates effective January 1st, 2010. Although the rate study has provided a financial forecast and rate transition plan through 2013, the City is not proposing a multi-year rate increase at this time. Staff will review rates annually and bring recommendations back for council consideration.

We recommend that the City update the cost-of-service rate study (last performed in 2003) to update the rate structure for changes in utility costs and customer class demands.

The detailed technical exhibits developed as part of the sanitation rate study can be found at the end of this report in the Technical Appendix.

SECTION 7: SYSTEM DEVELOPMENT CHARGES

INTRODUCTION

As part of the utility rate study the City of Camas requested the study include an update to the water and sewer system development charges (SDCs) and to create a new SDC for the storm drainage utility. This section will provide a general overview of SDCs, summarize the methodology used, outline key factors and present the recommended charges.

A. OVERVIEW

"System Development Charge (or connection) charge" is a generic term referring to charges imposed as a condition of connecting to the utility system. SDCs differ from installation fees in that they are intended as a means of ensuring that new customers bear their equitable share of the cost of the system assets that serve all customers, and are not direct reimbursement for out-of-pocket costs to physically connect the new customer to the system. It is assumed that SDCs are imposed in addition to meter charges, labor and material charges, tap fees, inspection fees, or other non-capital charges related to the immediate expense of connecting a new service.

B. METHODOLOGY

The purpose of the SDC is two-fold: 1) to provide a source for capital financing and 2) to equitably recover the proportionate share of utility plant-in-service from new customers. In the absence of SDCs, growth-related costs would be borne in large part by existing customers. The cost of the system to be recovered by SDCs can be defined in two parts: an existing cost basis portion, which recover existing costs, and a future cost basis portion, which recover future costs.

Revenues generated from the SDCs can be used to fund capital projects or to pay debt service incurred to finance capital projects, but cannot be used to pay operating and maintenance costs.

There are several documented approaches used in the industry to establish a SDC that is legally defensible if designed properly. Within the range of legally defensible approaches, the choice of the costs the City targets is a matter of policy. It is important that the City follow a methodical and rational approach to consistently determine and implement cost-based SDCs.

Since the calculated charges represent the maximum allowable charge, the City may choose to implement a charge at any level up to the calculated charge. Revenues generated from the charge will vary depending upon whether or not the full charge is implemented (e.g., phase-in strategies). The lower the charge and longer the phase-in period, the less revenue will be collected and available to help pay the cost of these facilities. This loss in revenue could result in delays in completing the capital improvement program and/or result in increased costs to the City's existing ratepayers through rates for service.

B.1 EXISTING COST BASIS

The existing cost basis portion of the charge developed in this study is based on facilities of general benefit, such as storage reservoirs, transmission mains, interceptor trunk lines, etc. It is intended to recognize the current ratepayers' net investment in estimated original cost of the non-donated system assets and the accumulated interest on that investment. For Washington cities and towns, State statute (RCW 35.92.025) and subsequent legal interpretations provide a guideline for connection charges which suggest that such charges should reflect the actual original cost of the utility system, and can include interest on that cost at the rate applicable at the time of construction. Interest can be accumulate for a maximum of ten years from the

date of construction, and cannot exceed the original cost of the asset. In addition, outstanding debt principal (less any cash available to buy down debt) is deducted from plant-in-service because new customers will pay their share of debt service through user rates. For this study, the existing cost basis for each utility is based on the City's record of system assets as of December 31, 2007, incorporating the adjustments noted above.

B.2 FUTURE COST BASIS

The statue enabling connection charges for cities and towns does not specifically address a charge based on planned future improvements. Common practice and legal opinion suggest that future facilities needed to serve growth, as well as to provide for regulatory system improvement, can be included in the connection charge. It is common practice for Cities and Towns to include up to twenty (20) years of future costs consistent with the planning period used in the City's comprehensive planning process. The future cost basis can include utility capital projects planned for construction and identified in comprehensive system planning documents.

It is important to note that current-year dollars are used when calculating the SDC and not inflated dollars. This approach assumes that the SDC will be updated annually to track construction cost inflation. Projects directly funded by developers, grants, or special property assessments are not included in the calculation. Replacement projects are most often excluded from the calculation unless they are needed to increase the size of the system. The capital improvement program has been allocated between existing and future customers based on engineering and planning criteria.

A separate future cost basis charge is calculated for the non-NUGAE customers and NUGAE customers. The NUGAE customers require an extensive amount of capital to allow the City to incorporate them into the water, sewer and stormwater utilities. The analysis has developed separate SDC rates for both NUGAE and non-NUGAE areas. The resulting rate differential of the NUGAE only costs being spread over a much smaller customer base.

C. WATER SYSTEM DEVELOPMENT CHARGE

The City currently uses a cost of service allocation basis approach when calculating the SDC and establishes an individual charge for each customer class based on the results of the cost-of-service functional allocation which includes assignment of costs based on individual customer flow statistics, meter equivalents and number of accounts.

After assessing the current structure and individual class charges it seemed that most class specific SDCs resulted in similar charges with the exception of the industrial class, which demonstrated a significantly higher disproportionate demand on the system based on its size and usage.

From these observations a "general" approach is proposed, which changes the class specific SDC and instead calculates the value of one meter customer equivalent (MCE) and assesses all new system connections based on this equivalent unit buy-in value. This recommended approach is applicable to all customer classes with the exception of the industrial class due to the disproportionate demand placed on the system by these customers. A separate charge is recommended specifically for the industrial class.

DETERMINATION OF THE WATER SYSTEM DEVELOPMENT CHARGE

C.1 EXISTING COST BASIS

As of 2007, water utility total fixed assets equal $37.75 million. Of this amount, approximately $4.83 million was contributed and, therefore, excluded from the cost basis. Calculating 10 years of interest on each allocable asset adds $15.62 million to the total asset value. The water utility's existing cash reserves were less than outstanding debt, and thus a reduction of $5.72 million was made to account for principal outstanding. After

adjusting the utility's total assets for capital contributions and principal outstanding, the total existing cost basis is approximately $42.82 million.

C.2 FUTURE COST BASIS

According to the 2008 Draft Water System Plan the City has planned for approximately $69.80 million of capital projects in the water utility between 2008 and 2027. Recognizing the fact that some of the projects will provide capacity beyond the 20-year period, with the help of the City and the consulting engineer working on the Water System Plan, the project costs were reduced based on the capacity they will provide by the end of the 20-year period (this reduction in costs only applies to the non-NUGAE customers since NUGAE customers build out by 2025). The resulting 20-year project capital total was $66.12 million.

From the $66.12 million, $34.12 million are considered to be contributed/donated, reducing the future cost basis portion for NUGAE and non-NUGAE customers. In addition to the contributions/donations any project or portion of the project designated as repair and replacement (R&R) ($1.10 million) was also deducted. The resulting allocable future cost basis was $30.90 million, which was made up of $20.72 million project costs related to NUGAE, $6.10 million of project costs related to non-NUGAE and $4.08 million of project costs related to both customer bases.

C.3 CUSTOMER BASE

Using the detailed customer statistics provided by the City, the water utility had approximately 9,446 Non NUGAE meter customer equivalents (MCEs) in 2008 – MCEs relate to flow factor assumptions that vary by meter size and are established by the American Water Works Association. The consulting engineer working on the Water System Plan provided a growth forecast, by class, for the 20-year study period using flow based equivalent residential units (ERUs). Since a different unit of measure was used in estimating the future demand ERUs than in the calculation of the charge (MCEs), a growth rate was calculated from the demand projection ERUs (percentage growth from current ERUs to 20-year future ERUs) and applied to the MCEs to calculate the 20-year MCEs. Using this approach the City will add 6,780 non-NUGAE MCEs over the next twenty-year period – reaching a total non-NUGAE customer base of 16,226 MCEs.

NUGAE customers are new and in addition to the current customer base. The method used to estimate the 20-year NUGAE customer base in MCEs consisted of using the flow based demand ERUs provided by class and developing a ratio between the 20-year non-NUGAE ERUs and MCEs. These ratios were then applied to the NUGAE flow based demand ERUs and converted to MCEs for the 20-year period; 5,581 MCEs. The total customer base, NUGAE and non-NUGAE, for the 20-year period is calculated to be 21,807 MCEs.

C.4 CALCULATION OF THE GENERAL WATER SYSTEM DEVELOPMENT CHARGE

Exhibit 6.1 shows the calculation of the water system development charge by calculating the existing and the future cost bases.

Exhibit 6.1: Calculation of Water System Development Charge

Water System Development Charge Calculation			
	Non-NUGAE	NUGAE	Notes
Existing Allocable Cost	$ 42,818,181	$ 42,818,181	
Allocable Customer Base	21,807	21,807	Total customer base (existing & future)
Existing Portion	**$ 1,964**	**$ 1,964**	
Future Cumulative Cost*	$ 4,082,100	$ 4,082,100	Capital allocable to NUGAE & non-NUGAE
Allocable Customer Base	12,361	12,361	Total future customers
Future Cumulative Portion	**$ 330**	**$ 330**	
Future Cost	$ 6,095,575	$ 20,720,667	Capital allocable to NUGAE & non-NUGAE
Allocable Customer Base	6,780	5,581	Total future customers
Future Portion	**$ 899**	**$ 3,713**	
TOTAL SDC	$ 3,193	$ 6,007	per MCE

*Notes: Cumulative costs apply to both NUGAE & non-NUGAE, the remaining future costs apply to each area on an individual basis.

Exhibit 6.2 shows the proposed non-NUGAE and the NUGAE system development charges by meter size using the MCEs to differentiate the demands each meter size place on the system.

Exhibit 6.2: Proposed Non-NUGAE and NUGAE System Development Charges

Meter	MCEs	Proposed	
		Non-NUGAE	NUGAE
5/8"	1	$ 3,193	$ 6,007
3/4"	1.5	4,790	9,011
1"	2.5	7,983	15,018
1.5"	5	15,965	30,035
2"	8	25,544	48,056
3"	16	51,088	96,112
4"	25	79,825	150,175
6"	50	159,650	300,350
8"	80	255,440	480,560

As previously mentioned the proposed charges are a calculated ceiling, the City can implement a charge of any level up to the indicated amount.

D. SEPARATE INDUSTRIAL WATER SYSTEM DEVELOPMENT CHARGE ALTERNATIVES

As previously mentioned the industrial class exhibited high disproportionate demands on the system based on its size and usage compared to other classes. To avoid the remaining classes subsidizing the industrial class a separate industrial system development charge is proposed.

A charge based on MCEs represents the peaking (maximum instantaneous) requirements placed on the system by a customer. The increase in the charge from one meter to the next represents the maximum peaking requirement for that meter size and the relationship between each different size meter to the base 5/8" meter. If every customer class uses water on an equitable basis (usage per MCE) the peaking approach is appropriate.

If there are customers who use disproportionate amounts of water on an average daily basis whereby the average usage exceeds the standard MCE factor, the peaking methodology alone may not be appropriate. This is because the system is sized not only based on peak demand of the individual customer, but is sized based on the total system requirements of "all" individual customer demands. A large user places a disproportionate demand on other parts of the system such as storage requirements and source of supply and should be charged commensurate with these increased demands. The SDC options proposed address this issue.

Two options are proposed to the City for the Industrial SDC. The first option keeps the City's current methodology and simply updates the industrial charge based on the functional allocation of updated costs. The second approach uses a similar functional allocation approach as the existing methodology, but spreads the "base" costs by ERUs instead of MCEs.

D.1 INDUSTRIAL OPTION 1 – CURRENT METHODOLOGY

The water system costs were spread based on a functional allocation (base, peak, fire, etc.). The previous study was used since a cost-of-service analysis was not performed during the 2008 update. Similar to the general approach existing and future infrastructure costs were calculated, however instead of dividing through by the applicable total customer base, the costs were spread through by the industrial customer class statistics representing accounts, meter customer equivalents (MCEs) and meter service equivalents (MSEs – related to actual cost of the meter/hardware) depending on the function.

Exhibit 6.3 summarizes the Industrial charge for the base 5/8" meter.

Exhibit 6.3: Industrial Charge for 5/8" Base Meter

Industrial Option 1						
Industrial	Customer / Account	Meters & Services/MSE	Base/MCE	Peak/MCE	Fire/Account	SDC
Non-NUGAE	$ -	$ 393	$ 14,725	$ 2,134	$ 2,567	**$ 19,819**
NUGAE	$ -	$ 393	$ 29,551	$ 4,326	$ 4,206	**$ 38,476**

Exhibit 6.4 escalates the SDC based on each function and an appropriate factor by meter size.

Exhibit 6.4: SDC Escalation Based on Function and Meter Size

Meter	MCEs	MSEs	Proposed	
			Non NUGAE	NUGAE
5/8"	1	1	$ 19,819	$ 38,476
3/4"	1.5	1.1	28,288	55,454
1"	2.5	1.4	45,265	89,449
1.5"	5	1.8	87,569	174,298
2"	8	2.9	138,579	276,362
3"	16	11	276,634	550,561
4"	25	14	429,544	856,633
6"	50	21	853,770	1,706,309
8"	80	29	1,362,684	2,725,763

D.2 INDUSTRIAL OPTION 2 – SYSTEM UNIT COST

Similar to the first option the costs were spread based on a functional allocation. In this scenario the costs were based on the customer statistics for the system as a whole to determine unit costs instead of allocating costs based on individual customer statistics first. This approach also spreads "base" costs or total average water flow based on the ERU for the system (283.6 gpd/ERU) instead of MCEs.

Exhibit 6.5 summarizes the Industrial charge for the base 5/8" meter and one (1) ERU. When comparing the two options it is important to remember that each industrial class will be multiple ERUs.

Exhibit 6.5: Industrial Charge for 5/8" Base Meter

Industrial Option 2						
Industrial	Customer / Account	Meters & Services/MSE	Base/ERU	Peak/MCE	Fire/Account	SDC
Non-NUGAE	$ -	$ 393	$ 988	$ 1,147	$ 518	$ 3,046
NUGAE	$ -	$ 393	$ 2,704	$ 2,324	$ 845	$ 6,266

The calculation of system development charges by meter size will depend on the size of meter factors associated with that meters size (as with option 1). In addition, the projected demand will be needed to estimate the number of ERUs.

As an example, two existing accounts are used to calculate an SDC using both options and compare the outcomes:

- The first account (6346) is on a two inch meter and its usage for 2008 was 2,076 ccf.
- The second account (6344) is on a six inch meter and its usage for 2008 was 296,967 ccf

OPTION 1 CALCULATION: 2" METER, NON-NUGAE CUSTOMER

Step 1: $0 is added for the customer/account portion of the charge.

Step 2: $393 per MSE representing the Meters & Services portion is multiplied by 2.9 to represent the fact that the meter size is two inches = [$393*2.9 = $1,139.70].

Step 3: $14,725/MCE representing the "Base" portion is escalated by 8 to represent the meter size = [8 * $14,752 = $117,800]

Step 4: $2,134/MCE representing the "Peak" portion is escalated by 8 to represent the meter size = [8 * $2,134 = $17,072]

Step 5: $2,567/account is added representing the Fire portion

Total charge = $138,579 [$0 + $1,139.70 + $117,800 + $17,072 + 2,567]

Similarly, the calculation for the six inch meter would be as follows: Customer ($0) + Meters & Services ($393*21= $8,253) + Base ($14,725*50 = $736,250) + Peak ($2,134*50 = $106,700) + Fire ($2,567) for a combined charge of $853,770.

OPTION 2 CALCULATION: 2" METER, NON-NUGAE CUSTOMER

Step 1: $0 is added for the customer/account portion of the charge.

Step 2: $393 per MSE representing the Meters & Services portion is multiplied by 2.9 to represent the fact that the meter size is two inches = [$393*2.9 = $1,139.70].

Step 3: $988/ERU (this is the change between the options). Determine the number of ERUs for the customer by dividing the projected annual use of 2,076 ccf by 283.6 gpd (represents 1 ERU). First you must convert ccf to gallons per day (2,076 ccf *748(g/ccf)/365(days/year) = 4,254 gpd. Calculate ERUs = 4,254 gpd/283.6(gpd/ERU) = 15. Calculate base allocation $988 * 15 = $14,821

Step 4: $1,147/MCE representing the "Peak" portion is escalated by 8 to represent the meter size = [8 * $1,147 = $9,176]

Step 5: $518/account is added representing the Fire portion

Total charge = $25,655 [$0 + $1,139.70 + $14,821 + $9,176 + 518]

Similarly, the calculation for the six inch meter would be as follows: Customer ($0) + Meters & Services ($393*21= $8,253) + Base (296,967ccf*748(g/ccf)/365(days/year) = 608,579 gpd, 608,579 gpd/283.6(gpd/ERU) = 2,146 ERUs), 2,146 ERUs * $988 = $2,120,248) + Peak ($1,147*50 = $57,350) + Fire ($518), results in a charge of $2,186,369.

Comparing the resulting charges for the two and six inch meters side by side shows that option two results in lower charges if consumption is lower (two inch meter option one: $138,579; two inch meter option two: $25,655), while the opposite is true if the customers consumption is on the higher side (six inch meter option one: $853,770; six inch meter option two: $2,186,369).

E. SEWER SYSTEM DEVELOPMENT CHARGE

The sewer utility follows the same methodology currently in place where Residential and Commercial I customers are charged a fixed system development charge for the base meter size of 5/8" (Commercial I customers charge increases based on meter size by AWWA flow factors). Commercial II charge is calculated based on functionally allocated costs and established unit costs for flow and strength (Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS).

DETERMINATION OF THE SEWER SYSTEM DEVELOPMENT CHARGE

E.1 EXISTING COST BASIS

As of 2007, sewer utility total fixed assets equal $43.60 million. Of this amount approximately $6.24 million was contributed and, therefore, excluded from the cost basis. Calculating 10 years of interest on each allocable asset adds $15.62 million. The sewer utility's existing cash reserves were less than outstanding debt, and thus a reduction of $16.48 million was made to account for principal outstanding. After adjusting the utility's total assets for capital contributions and principal outstanding, the total existing cost basis is approximately $39.77 million.

E.2 FUTURE COST BASIS

According to the 2008 Draft Sewer System Plan the City has planned for approximately $102.62 million of capital projects in the sewer utility between 2008 and 2027. Similar to the water utility, recognizing the fact that some of the projects will provide capacity beyond the 20-year period, with the help of the City and the consulting Engineer working on the Sewer System Plan, the project costs were reduced based on the capacity they will provide by the end of the 20-year period (this reduction in costs only applies to the non-NUGAE customers since NUGAE customers build out by 2025). The resulting 20-year project capital total was $79.31 million.

From the $79.31 million $13.70 million are considered to be contributed/donated, reducing the future cost basis portion for NUGAE and non-NUGAE customers. In addition to the contributions/donations any project or portion of the project designated as repair and replacement (R&R) was deducted as well; total R&R deduction was $24.37 million. The resulting allocable future cost basis was $41.27 million, which was made up of $22.06 million project costs related to NUGAE, $18.36 million of project costs related to non-NUGAE and $850 thousand of project costs related to both customer bases.

E.3 CUSTOMER BASE

The consulting Engineer working on the Sewer System Plan provided a growth forecast, which listed 2005 actual ERUs and estimates for 2015 and 2025. An annual compounding interest rate was calculated based on the 2005 and 2015 ERUs and applied to the 2005 ERU counts for three years to estimate the number of existing ERUs in 2008, which is 15,086. Since the non-NUGAE city build out is outside the 20-year study period an annual compounding growth rate was calculated from 2015 to 2025 and applied to the 2025 year for two years to estimate the total ERUs in the 20-year study period. The total non-NUGAE ERUs assumed in 2027 was 24,959. From the information provided by the consulting Engineer NUGAE customers reached build out by 2025 at 5,228 ERUs.

E.4 CALCULATION OF THE SEWER SYSTEM DEVELOPMENT CHARGE RESIDENTIAL/COMMERCIAL I

Exhibit 6.6 shows the calculation of the sewer system development charge by calculating the existing and future cost bases.

Exhibit 6.6: Sewer System Development Charge Calculation – Existing and Future Cost Bases

Sewer System Development Charge Calculation			
	Non-NUGAE	NUGAE	Notes
Existing Allocable Cost	$ 39,767,590	$ 39,767,590	
Allocable Customer Base	30,187	30,187	Total customer base (existing & future)
Existing Portion	**$ 1,317**	**$ 1,317**	
Future Cumulative Cost*	$ 850,000	$ 850,000	Capital allocable to NUGAE & non-NUGAE
Allocable Customer Base	15,101	15,101	Total future customers
Future Cumulative Portion	**$ 56**	**$ 56**	
Future Cost	$ 7,724,178	$ 22,060,325	Capital allocable to NUGAE & non-NUGAE
Allocable Customer Base	9,873	5,228	Total future customers
Future Portion	**$ 782**	**$ 4,220**	
Future Cost - non NUGAE**	$ 10,634,955		Capital allocable to non-NUGAE Phase III portion
Allocable Customer Base	9,026		Future through 2025 (Phase III capacity)
Future Portion	**$ 1,178**		
TOTAL SDC	**$ 3,334**	**$ 5,593**	per ERU

Notes:

*Cumulative costs apply to both NUGAE & non-NUGAE, the remaining future costs apply to each area on an individual basis.

**Phase III treatment plant upgrade will only provide enough capacity for ERUs through 2025

NUGAEs portion is included in the NUGAE Future Cost section since all NUGAE builds out in 2025.

Exhibit 6.7 shows the non-NUGAE and the NUGAE system development charges and how they vary by meter size for Commercial I customers.

Exhibit 6.7: Non-NUGAE and NUGAE System Development Charges for Commercial I Customers

Flow Factors	Meter	Proposed	
		Non-NUGAE	NUGAE
1	5/8"	$ 3,334	$ 5,593
1.5	3/4"	5,001	8,390
2.5	1"	8,335	13,983
5	1.5"	16,670	27,965
8	2"	26,672	44,744
16	3"	53,344	89,488
25	4"	83,350	139,825
50	6"	166,700	279,650
80	8"	266,720	447,440

COMMERCIAL II

For Commercial II customers the costs were spread based on a functional allocation from the previous study since a cost-of-service analysis was not performed during the 2008 update. Once the costs were functionalized, unit costs were developed for each function for each portion of the charge (existing and future). **Exhibit 6.8** summarizes the Commercial II charge.

Exhibit 6.8: Non-NUGAE and NUGAE System Development Charges for Commercial II Customers

Commercial II	Proposed	
	Non-NUGAE	NUGAE
Flow (gallons)	$ 16.94	$ 28.78
BOD (lbs / day)	$ 3,149	$ 5,071
TSS (lbs / day)	$ 1,192	$ 1,921

As with the water system development charge, the proposed charges are a calculated ceiling, the City can implement a charge of any level up to the indicated amount.

F. STORM SYSTEM DEVELOPMENT CHARGE

Currently the City does not have a system development charge for its storm water utility. To stay consistent with the water and sewer utilities the same methodology was used in the development of the stormwater utility's system development charges.

DETERMINATION OF THE STORM SYSTEM DEVELOPMENT CHARGE

F.1 EXISTING COST BASIS

As of 2007, storm water utility total fixed assets equal $10.77 million. Of this amount approximately $8.08 million was contributed and, therefore, excluded from the cost basis. Calculating 10 years of interest on each allocable asset adds $489 thousand. Currently the storm water utility holds no debt. After adjusting the utility's total assets for capital contributions the total existing cost basis is approximately $3.18 million.

F.2 FUTURE COST BASIS

According to the City's six year Capital Improvement Program (CIP) the City has planned for approximately $1.89 million in projects. In addition to the six year CIP 20 percent of all street fund 20-year projects are assumed to be allocated to the storm water utility with 15 percent of the storm water utility's portion being contributed/donated. The total combined 20-year plan is $41.03 million. The City split projects between non-NUGAE, NUGAE and projects which benefit both customer groups. The NUGAE portion of total projects was $30.67 million, non-NUGAE portion was $10.25 million and the cumulative portion was $104 thousand.

From the $41.03 million $5.78 million are considered to be contributed/donated, reducing the future cost basis portion for NUGAE and non-NUGAE customers. In addition to the contributions/donations any project or portion of the project designated as repair and replacement was also deducted. The resulting allocable future cost basis was $34.36 million, which is made up of $26.07 million related to NUGAE, $8.18 million related to non-NUGAE and $104 thousand of project costs related to both customer bases.

F.3 CUSTOMER BASE

According to the City's billing records, in 2008 there were approximately 9,692 non-NUGAE Equivalent Domestic Units (EDUs). After a discussion with City staff the same growth rate was assumed for the storm water utility 20-year period as for the sewer utility. Using the appropriate growth rate the total non-NUGAE 20-year period EDUs are 16,023. The NUGAE EDUs assume to tie sewer utility's ERUs directly at 5,225.

F.4 CALCULATION OF THE STORM SYSTEM DEVELOPMENT CHARGE

Exhibit 6.9 shows the calculation of the sewer system development charge by calculating the existing and future cost bases.

Storm

Exhibit 6.9: Sewer System Development Charge by Existing and Future Cost Bases

Storm Water System Development Charge Calculation					
	Non-NUGAE		NUGAE		Notes
Existing Allocable Cost	$	3,178,410	$	3,178,410	
Allocable Customer Base		21,251		21,251	Total customer base (existing & future)
Existing Portion	**$**	**150**	**$**	**150**	
Future Cumulative Cost*	$	104,375	$	104,375	Capital allocable to NUGAE & non-NUGAE
Allocable Customer Base		11,559		11,559	Total future customers
Future Cumulative Portion	**$**	**9**	**$**	**9**	
Future Cost	$	8,181,558	$	26,071,200	Capital allocable to NUGAE & non-NUGAE
Allocable Customer Base		6,331		5,228	Total future customers
Future Portion	**$**	**1,292**	**$**	**4,987**	
TOTAL SDC	**$**	**1,451**	**$**	**5,145**	per EDU

*Notes: Cumulative costs apply to both NUGAE & non-NUGAE, the remaining future costs apply to each area on an individual basis

As with water and sewer system development charges, the proposed charges are a calculated maximum, the City can implement a charge of any level up to the indicated amount.

TECHNICAL APPENDICES

WATER SYSTEM

City of Camas
Water Utility Rate Study
Summary

Revenue Requirements	2008	2009	2010	2011	2012	2013
Revenues						
Rate Revenues Under Existing Rates	$ 2,710,736	$ 2,751,397	$ 2,792,668	$ 2,834,558	$ 2,877,076	$ 2,920,233
Non-Rate Revenues	330,300	222,103	238,466	254,297	264,885	280,629
Total Revenues	**$ 3,041,036**	**$ 2,973,500**	**$ 3,031,134**	**$ 3,088,855**	**$ 3,141,961**	**$ 3,200,861**
Expenses						
Cash Operating Expenses	$ 2,405,137	$ 2,502,332	$ 2,600,866	$ 2,703,549	$ 2,810,491	$ 2,922,049
Existing Debt Service	380,659	402,641	403,908	401,061	401,757	400,917
New Debt Service	-	22,610	171,571	171,571	171,571	171,571
Rate Funded System Reinvestment	-	-	-	200,000	200,000	200,000
Total Expenses	**$ 2,785,796**	**$ 2,927,583**	**$ 3,176,346**	**$ 3,476,181**	**$ 3,583,819**	**$ 3,694,538**
Net Surplus (Deficiency)	**$ 255,240**	**$ 45,917**	**$ (145,211)**	**$ (387,326)**	**$ (441,858)**	**$ (493,676)**
% of Rate Revenue	0.00%	0.00%	5.20%	13.66%	15.36%	16.91%
Additions To Meet Coverage	$ (95,165)	$ (80,813)	$ (111,885)	$ -	$ -	$ -
Total Surplus (Deficiency)	**$ 160,075**	**$ (34,896)**	**$ (257,097)**	**$ (387,326)**	**$ (441,858)**	**$ (493,676)**
% of Rate Revenue	0.00%	1.27%	9.21%	13.66%	15.36%	16.91%
Annual Rate Adjustment	**0.00%**	**5.00%**	**5.00%**	**4.25%**	**4.00%**	**4.00%**
Rate Revenues After Rate Increase	$ 2,710,736	$ 2,854,574	$ 3,078,916	$ 3,257,917	$ 3,439,057	$ 3,630,269
Additional Taxes from Rate Increase	$ -	$ 5,189	$ 14,395	$ 21,291	$ 28,262	$ 35,708
Net Cash Flow After Rate Increase	**255,240**	**143,906**	**126,642**	**14,742**	**91,861**	**180,652**
Coverage After Rate Increases	1.67	1.41	1.28	1.44	1.59	1.77
Sample Monthly Bill (5/8" 11ccf)	$ 20.07	$ 21.07	$ 22.13	$ 23.07	$ 23.99	$ 24.95
Monthly Increase	$ -	$ 1.00	$ 1.05	$ 0.94	$ 0.92	$ 0.96

Notes:

If growth accelerates in NUGAE than need to revisit study. Current study assumes that NUGAE growth begins after 2013

2009 increase is in effect for 9 month (effective April)

City of Camas
Water Utility Rate Study
Summary

Fund Balance	2008	2009	2010	2011	2012	2013
Operating:						
Beginning Balance	**$ 479,154**	**$ 175,000**	**$ 318,906**	**$ 445,547**	**$ 460,290**	**$ 552,151**
Net Cash Flow after Rate Increase	255,240	143,906	126,642	14,742	91,861	180,652
Transfer of Surplus to Capital Fund	(141,346)	-	-	-	-	(12,297)
Ending Balance	$ 593,047	$ 318,906	$ 445,547	$ 460,290	$ 552,151	$ 720,505
Minimum Target Balance	*$ 593,047*	*$ 617,013*	*$ 641,309*	*$ 666,628*	*$ 692,998*	*$ 720,505*
90 Day Target	90	47	63	62	72	90
Capital						
Beginning Balance	**$ 181,256**	**$ (100,000)**	**$ 207,204**	**$ 200,090**	**$ 428,714**	**$ 736,549**
plus: Rate Funded System Reinvestment	-	-	-	200,000	200,000	200,000
plus: Grants / Developer Donations / Other Outside Sources	-	1,367,400	2,232,968	363,657	-	2,676,451
plus: Transfer from REET	500,000	-	-	-	-	-
plus: Existing Bond Proceeds	4,084,800	-	-	-	-	-
plus: System Development Charges	189,104	189,104	189,104	189,104	189,104	189,104
plus: Net Debt Proceeds Available for Projects	-	240,000	1,581,200	-	-	-
plus: Interest Earnings	5,673	-	6,485	6,262	13,417	23,051
plus: Transfer of Surplus from Operating Fund	141,346	-	-	-	-	12,297
plus: Direct Rate Funding	-	-	-	-	-	-
Total Capital Funding Sources	5,102,178	1,696,504	4,216,960	959,113	831,235	3,837,453
less: Capital Expenditures (inflated)	(5,030,000)	(1,489,300)	(4,016,870)	(530,399)	(94,686)	(2,776,818)
Ending Balance	**72,178**	**207,204**	**200,090**	**428,714**	**736,549**	**1,060,635**
Minimum Capital Contingency Target	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*

City of Camas
Water Utility Rate Study
Assumptions

Economic & Financial Factors		2008	2009	2010	2011	2012	2013
1	General Cost Inflation	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%
2	Construction Cost Inflation	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
3	Labor Cost Inflation	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
4	Customer Growth	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
5	General Inflation plus Growth	4.70%	4.70%	4.70%	4.70%	4.70%	4.70%
6	Taxes on Connection Charges	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
8	No Escalation	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Fund Earnings (5-year average of the LWGSIP)	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%
	Local / State Excise Tax	5.03%	5.03%	5.03%	5.03%	5.03%	5.03%
	State B&O Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%

Accounting Assumptions	2008	2009	2010	2011	2012	2013
FISCAL POLICY RESTRICTIONS						
Min. Op. Fund Balance Target (days of O&M expense)	90	90	90	60	60	60
Max. Op. Fund Balance (days of O&M expense)	90	90	90	90	90	90
Minimum Capital Fund Balance Target						
Select Minimum Capital Fund Balance Target: 2	**User Input**					
1 - Defined as % of Plant						
Plant-in-Service in 2008: $ 37,749,068						
Minimum Capital Fund Balance - % of plant assets	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
2 - Amount at Right ==>	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
RATE FUNDED SYSTEM REINVESTMENT						
Select Reinvestment Funding Strategy: 3	**User Input**					
Amount of Annual Cash Funding from Rates						
1 - Equal to Annual Depreciation Expense						
2 - Equal to Annual Depreciation Expense less Annual Debt Principal Payments						
3 - Equal to Amount at Right ==>	$ -	$ -	$ -	$ 200,000	$ 200,000	$ 200,000
4 - Do Not Fund System Reinvestment						

City of Camas
Water Utility Rate Study
Assumptions

Capital Financing Assumptions

		2008	2009	2010	2011	2012	2013
System Development Charges							
Select SDC Alternative	1	**Current Charge is in use**					
1 - User Input (Current Charge)	$ -						
2 - Calculated Charge	$ -						
Total Customer Equivalents (Estimate)							
SDC Revenue		$ 189,104	$ 189,104	$ 189,104	$ 189,104	$ 189,104	$ 189,104
REVENUE BONDS							
Term (years)		20	20	20	20	20	20
Interest Cost		5.00%	5.60%	5.60%	5.00%	5.00%	5.00%
Issuance Cost		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Revenue Bond Coverage Requirement	1.25						
PWTF LOAN							
Term (years; 10 year minimum and no more than 20 years)		20	20	20	20	20	20
Interest Cost		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
OTHER LOANS & REVENUE-SUPPORTED GENERAL OBLIGATION BONDS [a]							
Term (years)		20	20	20	20	20	20
Interest Cost		4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
Issuance Cost		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

[a] Tax-supported general obligation bonds are assumed to be accounted for in the General Fund; terms and annual obligations of such bonds are not factors in this analysis.

City of Camas
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

Revenues		FORECAST BASIS	Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
Rate revenues								
Residential	4	Customer Growth	$ 1,662,561	$ 1,687,499	$ 1,712,811	$ 1,738,504	$ 1,764,581	$ 1,791,050
Commercial	4	Customer Growth	178,585	181,264	183,983	186,743	189,544	192,387
Industrial	4	Customer Growth	706,592	717,191	727,949	738,868	749,951	761,200
Irrigation	4	Customer Growth	162,998	165,443	167,925	170,444	173,001	175,596
Total Rate revenue			**$ 2,710,736**	**$ 2,751,397**	**$ 2,792,668**	**$ 2,834,558**	**$ 2,877,076**	**$ 2,920,233**
Non-rate revenues [a]								
Public Fire Protection	1	General Cost Inflation	$ 2,000	$ 2,063	$ 2,128	$ 2,195	$ 2,264	$ 2,335
Private Fire Protection	1	General Cost Inflation	14,000	14,441	14,896	15,365	15,849	16,348
Other - Public Author/Hydrants	1	General Cost Inflation	10,800	11,140	11,491	11,853	12,226	12,611
Water Hook-up Fees (physical connect)	4	Customer Growth	70,000	71,050	72,116	73,197	74,295	75,410
Interest Income	1	Calculated	125,000	5,477	10,688	19,314	19,775	22,650
Water Turn off Fees (100% Water)	1	General Cost Inflation	1,000	1,031	1,064	1,097	1,132	1,168
Penalties (50% Water)	1	General Cost Inflation	60,000	61,890	63,839	65,849	67,923	70,063
Space & Facilities Leases (50% Water)	1	General Cost Inflation	10,000	10,315	10,640	10,975	11,321	11,677
Other Rents & Use Charges (50% Water)	1	General Cost Inflation	37,500	38,681	39,899	41,156	42,452	43,789
	1	General Cost Inflation	-	-	-	-	-	-
	1	General Cost Inflation	-	-	-	-	-	-
Total Non-rate revenues			**$ 339,494**	**$ 222,103**	**$ 238,466**	**$ 254,297**	**$ 264,885**	**$ 280,629**
TOTAL REVENUES			**$ 3,050,230**	**$ 2,973,500**	**$ 3,031,134**	**$ 3,088,855**	**$ 3,141,961**	**$ 3,200,861**

City of Camas
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
Expenditures		FORECAST BASIS						
100 **Excise Tax State Tax**		*Excise and B&O Tax Rate*	$ 116,000	$ 136,216	$ 138,412	$ 140,629	$ 142,798	$ 145,074
810 **WTR S.O.S**								
Regular Salaries	3	Labor Cost Inflation	$ 39,955	$ 41,953	$ 44,050	$ 46,253	$ 48,566	$ 50,994
Overtime	3	Labor Cost Inflation	1,000	1,050	1,103	1,158	1,216	1,276
Personnel Benefits	3	Labor Cost Inflation	14,474	15,198	15,958	16,755	17,593	18,473
Uniforms & Clothing	1	General Cost Inflation	-	-	-	-	-	-
Office and Operating Supplies	1	General Cost Inflation	8,000	8,252	8,512	8,780	9,056	9,342
Fuel Consumed	1	General Cost Inflation	400	413	426	439	453	467
Small Tools and Minor Equip	1	General Cost Inflation	5,000	5,157	5,320	5,487	5,660	5,839
Professional Ser	3	Labor Cost Inflation	75,000	78,750	82,688	86,822	91,163	95,721
Communication	1	General Cost Inflation	2,000	2,063	2,128	2,195	2,264	2,335
Advertising	1	General Cost Inflation	-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation	5,000	5,157	5,320	5,487	5,660	5,839
Public Utility	1	General Cost Inflation	200	206	213	219	226	234
Repairs & Maintenance	3	Labor Cost Inflation	50,000	52,500	55,125	57,881	60,775	63,814
Miscellaneous	1	General Cost Inflation	8,000	8,252	8,512	8,780	9,056	9,342
Interfund Oper. Rentals & Lease	1	General Cost Inflation	5,000	5,157	5,320	5,487	5,660	5,839
Total WTR S.O.S			**$ 214,029**	**$ 224,109**	**$ 234,673**	**$ 245,745**	**$ 257,350**	**$ 269,513**
820 **WTR Pumping**								
Reg Salaries	3	Labor Cost Inflation	$ 39,955	$ 41,953	$ 44,050	$ 46,253	$ 48,566	$ 50,994
Overtime	3	Labor Cost Inflation	3,000	3,150	3,308	3,473	3,647	3,829
Personnel Benefits	3	Labor Cost Inflation	14,654	15,387	16,156	16,964	17,812	18,703
Office and Operating Supplies	1	General Cost Inflation	10,000	10,315	10,640	10,975	11,321	11,677
Fuel Consumed	1	General Cost Inflation	-	-	-	-	-	-
Small Tools and Minor Equipment	1	General Cost Inflation	3,000	3,094	3,192	3,292	3,396	3,503
Professional Ser	3	Labor Cost Inflation	22,000	23,100	24,255	25,468	26,741	28,078
Communication	1	General Cost Inflation	-	-	-	-	-	-
Travel	1	General Cost Inflation	-	-	-	-	-	-
Operating Rentals	1	General Cost Inflation	-	-	-	-	-	-
Public Utility	1	General Cost Inflation	195,000	201,141	207,476	214,011	220,751	227,703
Repairs & Maintenance	3	Labor Cost Inflation	58,000	60,900	63,945	67,142	70,499	74,024
Miscellaneous	1	General Cost Inflation	-	-	-	-	-	-
Infund Oper. Rentals & Lease	1	General Cost Inflation	5,000	5,157	5,320	5,487	5,660	5,839
Total WTR Pumping			**$ 350,609**	**$ 364,198**	**$ 378,342**	**$ 393,065**	**$ 408,393**	**$ 424,350**

City of Camas
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
830 **WTR Treatment**								
Reg Salaries	3	Labor Cost Inflation	$ 41,166	$ 43,224	$ 45,386	$ 47,655	$ 50,038	$ 52,539
Overtime	3	Labor Cost Inflation	6,000	6,300	6,615	6,946	7,293	7,658
Personnel Benefits	3	Labor Cost Inflation	15,360	16,128	16,934	17,781	18,670	19,604
Office and Operating Supplies	1	General Cost Inflation	7,500	7,736	7,980	8,231	8,490	8,758
Fuel Consumed	1	General Cost Inflation	-	-	-	-	-	-
Supplies - Chemicals	1	General Cost Inflation	10,000	180,000	185,669	191,517	197,548	203,770
Small Tools and Minor Equipment	1	General Cost Inflation	120,000	123,779	127,678	131,699	135,847	140,125
Professional Ser	3	Labor Cost Inflation	8,000	8,400	8,820	9,261	9,724	10,210
Communication	1	General Cost Inflation	2,000	2,063	2,128	2,195	2,264	2,335
Travel	1	General Cost Inflation	-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation	500	516	532	549	566	584
Insurance	3	Labor Cost Inflation	42,000	44,100	46,305	48,620	51,051	53,604
Public Utility	1	General Cost Inflation	15,000	15,472	15,960	16,462	16,981	17,516
Repairs & Maintenance	3	Labor Cost Inflation	10,000	10,500	11,025	11,576	12,155	12,763
Miscellaneous	1	General Cost Inflation	8,000	8,252	8,512	8,780	9,056	9,342
Intgovt Profess Services	1	General Cost Inflation	-	-	-	-	-	-
Interfund Oper. Rentals & Lease	1	General Cost Inflation	5,000	5,157	5,320	5,487	5,660	5,839
Total WTR Treatment			**$ 290,526**	**$ 471,628**	**$ 488,863**	**$ 506,759**	**$ 525,344**	**$ 544,646**

City of Camas
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
850 **WTR Trans/Distrr**								
Reg Salaries	3	Labor Cost Inflation	$ 131,854	138,447	145,369	152,637	160,269	168,283
Overtime	3	Labor Cost Inflation	15,000	15,750	16,538	17,364	18,233	19,144
Personnel Benefits	3	Labor Cost Inflation	47,652	50,035	52,536	55,163	57,921	60,817
Uniforms and Clothing	1	General Cost Inflation	-	-	-	-	-	-
Office and Operating Supplies	1	General Cost Inflation	16,000	16,504	17,024	17,560	18,113	18,683
Fuel Consumed	1	General Cost Inflation	-	-	-	-	-	-
Small Tools and Minor Equip	1	General Cost Inflation	6,000	6,189	6,384	6,585	6,792	7,006
Professional Ser	3	Labor Cost Inflation	18,000	18,900	19,845	20,837	21,879	22,973
Communication	1	General Cost Inflation	1,000	1,031	1,064	1,097	1,132	1,168
Travel	1	General Cost Inflation	-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation	1,000	1,031	1,064	1,097	1,132	1,168
Public Utility	1	General Cost Inflation	-	-	-	-	-	-
Repairs & Maintenance	3	Labor Cost Inflation	37,500	7,875	8,269	8,682	9,116	9,572
Miscellaneous	1	General Cost Inflation	1,000	1,031	1,064	1,097	1,132	1,168
Intfund Oper. Rentals & Lease	1	General Cost Inflation	60,000	61,890	63,839	65,849	67,923	70,063
Intfund Repairs & Maint	1	General Cost Inflation	-	-	-	-	-	-
Total WTR Trans/Distrr			**$ 335,006**	**$ 318,683**	**$ 332,995**	**$ 347,971**	**$ 363,643**	**$ 380,045**
860 **WTR Services**								
Reg Salaries	3	Labor Cost Inflation	43,082	45,236	47,498	49,873	52,366	54,985
Overtime	3	Labor Cost Inflation	-	-	-	-	-	-
Personnel Benefits	3	Labor Cost Inflation	15,509	16,284	17,099	17,954	18,851	19,794
Office and Operating Supplies	1	General Cost Inflation	7,000	7,220	7,448	7,682	7,924	8,174
Professional Ser	1	General Cost Inflation	-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation	1,500	1,547	1,596	1,646	1,698	1,752
Repairs & Maintenance	3	Labor Cost Inflation	1,000	1,050	1,103	1,158	1,216	1,276
Miscellaneous	1	General Cost Inflation	200	206	213	219	226	234
Intfund Oper. Rentals & Leases	1	General Cost Inflation	10,000	10,315	10,640	10,975	11,321	11,677
Total Total WTR Trans/Distrr			**78,291**	**81,860**	**85,596**	**89,507**	**93,603**	**97,891**

City of Camas
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
870 **WTR Meters**								
Regular Salaries	3	Labor Cost Inflation	126,299	132,614	139,245	146,207	153,517	161,193
Overtime	3	Labor Cost Inflation	500	525	551	579	608	638
Personnel Benefits	3	Labor Cost Inflation	45,513	47,789	50,178	52,687	55,321	58,087
Uniforms & Clothing	1	General Cost Inflation	-	-	-	-	-	-
Office and Operating Supplies	1	General Cost Inflation	2,500	2,579	2,660	2,744	2,830	2,919
Small Tools and Minor Equip	1	General Cost Inflation	190,000	41,260	42,559	43,900	45,282	46,708
Professional Services	3	Labor Cost Inflation	-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation	-	-	-	-	-	-
Repairs & Maintenance	3	Labor Cost Inflation	1,000	1,050	1,103	1,158	1,216	1,276
Miscellaneous	1	General Cost Inflation	-	-	-	-	-	-
Intfund Oper. Rentals and Leases	1	General Cost Inflation	10,000	10,315	10,640	10,975	11,321	11,677
Total WTR Meters			**375,812**	**236,131**	**246,936**	**258,249**	**270,095**	**282,500**
100 **Admin/Gen**		50% to water 50% to Sewer						
Regular Salaries	3	Labor Cost Inflation	78,369	82,287	86,402	90,722	95,258	100,021
Overtime	3	Labor Cost Inflation	-	-	-	-	-	-
Personnel Benefits	3	Labor Cost Inflation	27,284	28,648	30,080	31,584	33,163	34,821
Uniforms & Clothing	1	General Cost Inflation	-	-	-	-	-	-
OPEB Expense	1	General Cost Inflation	-	-	-	-	-	-
Office and Operating Supplies	1	General Cost Inflation	2,500	2,579	2,660	2,744	2,830	2,919
Fuel Consumed	1	General Cost Inflation	-	-	-	-	-	-
Small Tools and Minor Equip	1	General Cost Inflation	4,750	4,900	5,054	5,213	5,377	5,547
Professional Ser	3	Labor Cost Inflation	76,500	80,325	84,341	88,558	92,986	97,636
Communication	1	General Cost Inflation	4,500	4,642	4,788	4,939	5,094	5,255
Travel	1	General Cost Inflation	250	258	266	274	283	292
Operating Rentals and Leases	1	General Cost Inflation	-	-	-	-	-	-
Insurance	3	Labor Cost Inflation	-	-	-	-	-	-
Public Utility	1	General Cost Inflation	-	-	-	-	-	-
Repairs & Maintenance	3	Labor Cost Inflation	-	-	-	-	-	-
Miscellaneous	1	General Cost Inflation	10,750	11,089	11,438	11,798	12,170	12,553
Interfund Profess. Serv.	1	General Cost Inflation	274,981	283,641	292,574	301,789	311,293	321,098
Intfund Oper. Rentals & Lease	1	General Cost Inflation	43,165	44,524	45,927	47,373	48,865	50,404
Total Admin/Gen			**523,048**	**542,892**	**563,530**	**584,994**	**607,320**	**630,545**

City of Camas
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
170 **Customer Services**								
Regular Salaries	3	Labor Cost Inflation	-	-	-	-	-	-
Overtime	3	Labor Cost Inflation	-	-	-	-	-	-
Personnel Benefits	3	Labor Cost Inflation	-	-	-	-	-	-
Office and Operating Supplies	1	General Cost Inflation	3,000	3,094	3,192	3,292	3,396	3,503
Small Tools and Minor Equip	1	General Cost Inflation	-	-	-	-	-	-
Professional Ser	3	Labor Cost Inflation	12,500	13,125	13,781	14,470	15,194	15,954
Communication	1	General Cost Inflation	375	387	399	412	425	438
Travel	1	General Cost Inflation	-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation	-	-	-	-	-	-
Repairs & Maintenance	3	Labor Cost Inflation	1,000	1,050	1,103	1,158	1,216	1,276
Miscellaneous	1	General Cost Inflation	-	-	-	-	-	-
Interfund Profess. Serv.	1	General Cost Inflation	-	-	-	-	-	-
Intfund Oper. Rentals & Lease	1	General Cost Inflation	-	-	-	-	-	-
Total Customer Services			**16,875**	**17,656**	**18,475**	**19,332**	**20,230**	**21,171**
Additional Expenses								
Conservation Program (C:1-6)	1	General Cost Inflation	25,000	25,787	26,600	27,437	28,301	29,193
Total Additional Expenses			**25,000**	**25,787**	**26,600**	**27,437**	**28,301**	**29,193**
Add'l O&M from CIP		*From CIP*	-	-	-	-	-	-
Total Cash O&M Expenditures			**$ 2,405,137**	**$ 2,502,332**	**$ 2,600,866**	**$ 2,703,549**	**$ 2,810,491**	**$ 2,922,049**

Depreciation Expense in	2007	$ 839,932	Water and Sewer Annual Depreciation Allocated Based on Fixed Assets					
Depreciation Expense [b]	*Last year's plus annual additions from CIP*		$ 959,598	$ 990,020	$ 1,070,358	$ 1,080,966	$ 1,082,859	$ 1,138,396
TOTAL EXPENSES			**$ 3,364,735**	**$ 3,492,352**	**$ 3,671,224**	**$ 3,784,514**	**$ 3,893,351**	**$ 4,060,445**

City of Camas
Water Utility Rate Study
Existing Debt Input

Existing Debt Service - Revenue Bonds		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Water & Sewer Revenue Bonds	74%										
Annual Interest Payment		$ 184,998	$ 179,180	$ 173,047	$ 166,600	$ 159,995	$ 151,855	$ 143,345	$ 134,465	$ 125,030	$ 115,225
Annual Principal Payment		136,900	144,300	151,700	155,400	162,800	170,200	177,600	188,700	196,100	207,200
Total Annual Payment		$ 321,898	$ 323,480	$ 324,747	$ 322,000	$ 322,795	$ 322,055	$ 320,945	$ 323,165	$ 321,130	$ 322,425
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
CERB Loan											
Annual Interest Payment		$ 23,534	$ 21,474	$ 19,292	$ 16,983	$ 14,539	$ 11,952	$ 9,214	$ 6,316	$ 3,248	$ -
Annual Principal Payment		35,227	37,288	39,469	41,778	44,222	46,809	49,547	52,446	55,514	-
Total Annual Payment		$ 58,761	$ 58,761	$ 58,761	$ 58,761	$ 58,761	$ 58,761	$ 58,761	$ 58,761	$ 58,761	$ -
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
REVENUE BOND 3											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
REVENUE BOND 4											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
REVENUE BOND 5											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Use of Debt Reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
TOTAL REVENUE BONDS											
Annual Interest Payment		$ 208,533	$ 200,654	$ 192,339	$ 183,583	$ 174,535	$ 163,808	$ 152,560	$ 140,781	$ 128,278	$ 115,225
Annual Principal Payment		172,127	181,588	191,169	197,178	207,022	217,009	227,147	241,146	251,614	207,200
Total Annual Payment		$ 380,659	$ 382,241	$ 383,508	$ 380,761	$ 381,557	$ 380,817	$ 379,707	$ 381,927	$ 379,892	$ 322,425
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
Annual Debt Reserve Target on Existing Revenue Bonds		383,508	383,508	383,508	381,927	381,927	381,927	381,927	381,927	379,892	323,350

City of Camas
Water Utility Rate Study
Existing Debt Input

Existing Debt Service - PWTF Loans		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Public Works Trust Fund Loan											
Annual Interest Payment	50%	$ -	$ 400	$ 400	$ 300	$ 200	$ 100	$ -	$ -	$ -	$ -
Annual Principal Payment		-	20,000	20,000	20,000	20,000	20,000	-	-	-	-
Total Annual Payment		$ -	$ 20,400	$ 20,400	$ 20,300	$ 20,200	$ 20,100	$ -	$ -	$ -	$ -
Loan 2											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Loan 3											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Loan 4											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL PWTF LOANS											
Annual Interest Payment		$ -	$ 400	$ 400	$ 300	$ 200	$ 100	$ -	$ -	$ -	$ -
Annual Principal Payment		-	20,000	20,000	20,000	20,000	20,000	-	-	-	-
Total Annual Payment		$ -	$ 20,400	$ 20,400	$ 20,300	$ 20,200	$ 20,100	$ -	$ -	$ -	$ -

City of Camas
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation % Upgrade / Expansion	For CFC Calculation % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations		Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
1							1	Enterprise Fund	$ -	$ -	$ -
2	SR-12 WELL 13 (WELL 4 GWI)	1,200,000	2008	50	100%	0%	1	Enterprise Fund	1,200,000	-	1,200,000
3	SR-11 WATER RIGHT PURCHASE	165,000	2021	50	100%	0%	1	Enterprise Fund	165,000	-	274,737
4	"	300,000	2022	50	100%	0%	1	Enterprise Fund	300,000	-	519,503
5							1	Enterprise Fund	-	-	-
6	D-5 8" MAIN ON 8TH FOR FIRE FLOW	50,000	2014	50	0%	100%	1	Enterprise Fund	-	50,000	70,926
7	D-9 OSTENSON CANYON MAIN	800,000	2008	50	100%	0%	1	Enterprise Fund	800,000	-	800,000
8	D-10 FIRE FLOW ON SIERRA ST	50,000	2014	50	50%	50%	1	Enterprise Fund	25,000	25,000	70,926
9	S-1 WEST PRUNE HILL RES ACQUISITION (FEASIBIL	50,000	2014	50	100%	0%	1	Enterprise Fund	50,000	-	70,926
10	T-7 WASHOUGAL RIVER TRANS CROSS	2,500,000	2008	50	100%	0%	1	Enterprise Fund	2,500,000	-	2,500,000
11	WATER FACILITY PLAN UPDATE	130,000	2008	6	50%	50%	1	Enterprise Fund	65,000	65,000	130,000
12	BOULDER CREEK FISH SCREEN PROJ	25,000	2014	50	0%	100%	1	Enterprise Fund	-	25,000	35,463
13	LOWER PRUNE HILL PUMP #4	20,000	2009	20	100%	0%	1	Enterprise Fund	20,000	-	21,200
	"	50,000	2014	21	100%	0%	1	Enterprise Fund	50,000	-	70,926
14	Source Development	20,000	2009	50	100%	0%	1	Enterprise Fund	20,000	-	21,200
15	CROWN RD PS /MAIN LINE INSTALLATION 60% TD	1,064,400	2010	50	100%	0%	2	Grants/Developer Donation	1,064,400	-	1,195,960
16	CROWN RD PS /MAIN LINE INSTALLATION 40% P	709,600	2010	50	100%	0%	2	Grants/Developer Donation	709,600	-	797,307
17	CROWN RD PS /MAIN LINE INSTALLATION 60% TD	393,600	2010	50	100%	0%	1	Enterprise Fund	393,600	-	442,249
18	CROWN RD PS /MAIN LINE INSTALLATION 40% P	262,400	2010	50	100%	0%	1	Enterprise Fund			294,833
19	WELL 14	900,000	2009	50	100%	0%	2	Grants/Developer Donation	900,000	-	954,000
20	WELL 14	390,000	2009	50	100%	0%	2	Grants/Developer Donation	390,000	-	413,400
21	D-6 12" LINE FOR AIRPORT FIRE FLOW (2/3 Develops	305,333	2011	50	100%	0%	2	Grants/Developer Donation	305,333	-	363,657
22	D-6 12" LINE FOR AIRPORT FIRE FLOW (1/3 City)	152,667	2014	50	100%	0%	1	Enterprise Fund	152,667	-	216,561
23	D-7 BOOSTER STATION ON COUCH FIRE FL	53,800	2014	50	100%	0%	1	Enterprise Fund	53,800	-	76,316
24	T-2 SUCTION SIDE MAIN ON LAKE RD	1,260,000	2015	50	100%	0%	1	Enterprise Fund	1,260,000	-	1,894,574
25	T-3 ADDITIONAL PUMP ON LACAMAS BS	65,000	2011	50	100%	0%	1	Enterprise Fund	65,000	-	77,416
26	T-6 FOREST HOME BOOSTER UPGRADE	100,000	2014	50	100%	0%	1	Enterprise Fund	100,000	-	141,852

City of Camas
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation % Upgrade / Expansion	For CFC Calculation % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations		Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
27	NW 38th AVENUE WATER LINE	750,000	2010	50	100%	0%	1	Enterprise Fund	750,000	-	842,700
28	PAC RIM/38TH WATER INTERTIE (2/3) Developer	213,333	2010	50	100%	0%	2	Grants/Developer Donation	213,333	-	239,701
29	PAC RIM/38TH WATER INTERTIE (1/3) City	106,667	2010	50	100%	0%	1	Enterprise Fund	106,667	-	119,851
30	D-8 8" MAIN ON KLICKITAT FIRE FLOW	62,000	2014	50	100%	0%	1	Enterprise Fund	62,000	-	87,948
31	Reservoir	2,500,000	2014	50	100%	0%	1	Enterprise Fund	2,500,000	-	3,546,298
32	Reservoir Transmission Line	350,000	2014	50	100%	0%	1	Enterprise Fund	350,000	-	496,482
33	UGA RESERVOIR	1,000,000	2014	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,418,519
34	"	1,600,000	2018	50	100%	0%	1	Enterprise Fund	1,600,000	-	2,368,391
35	UGA PRV (2/3) Developer	74,667	2014	50	100%	0%	2	Grants/Developer Donation	74,667	-	105,916
36	UGA PRV (1/3) City	37,333	2014	50	100%	0%	1	Enterprise Fund	37,333	-	52,958
37	UGA PRV (2/3) Developer	74,667	2015	50	100%	0%	2	Grants/Developer Donation	74,667	-	112,271
38	UGA PRV (1/3) City	37,333	2015	50	100%	0%	1	Enterprise Fund	37,333	-	56,136
39	UGA PRV (2/3) Developer	74,667	2016	50	100%	0%	2	Grants/Developer Donation	74,667	-	119,007
40	UGA PRV (1/3) City	37,333	2016	50	100%	0%	1	Enterprise Fund	37,333	-	59,504
41	UGA PRV (2/3) Developer	74,667	2017	50	100%	0%	2	Grants/Developer Donation	74,667	-	126,148
42	UGA PRV (1/3) City	37,333	2017	50	100%	0%	1	Enterprise Fund	37,333	-	63,074
43	D-15 12" MAIN LAKE TO 38TH	815,000	2020	50	100%	0%	2	Grants/Developer Donation	815,000	-	1,304,841
44	T-4 TRANSMSN MAIN EVERETT SOUTH	1,130,000	2014	50	100%	0%	1	Enterprise Fund	1,130,000	-	1,602,927
45	T-5 TRANSMSN MAIN EVERETT NORTH	1,130,000	2015	50	100%	0%	1	Enterprise Fund	1,130,000	-	1,699,102
46	UGA BOOSTER STATION	400,000	2014	50	100%	0%	1	Enterprise Fund	400,000	-	567,408
47	WATER FACILITY PLAN UPDATE	150,000	2014	6	50%	50%	1	Enterprise Fund	75,000	75,000	212,778
48	"	150,000	2020	6	50%	50%	1	Enterprise Fund	75,000	75,000	240,155
49	"	150,000	2026	6	50%	50%	1	Enterprise Fund	75,000	75,000	303,872
50	STIEGERWALD SOURCE DEVELOPMENT	1,000,000	2020	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,601,032
51	MISC WATER MAIN REPLACEMENT	400,000	2008	50	30%	70%	1	Enterprise Fund	120,000	280,000	400,000
52	"	75,000	2009	50	30%	70%	1	Enterprise Fund	22,500	52,500	79,500
53	"	75,000	2010	50	30%	70%	1	Enterprise Fund	22,500	52,500	84,270
54	"	75,000	2011	50	30%	70%	1	Enterprise Fund	22,500	52,500	89,326
55	"	75,000	2012	50	30%	70%	1	Enterprise Fund	22,500	52,500	94,686
56	"	75,000	2013	50	30%	70%	1	Enterprise Fund	22,500	52,500	100,367
57	"	75,000	2014	50	30%	70%	1	Enterprise Fund	22,500	52,500	106,389
58	"	75,000	2015	50	30%	70%	1	Enterprise Fund	22,500	52,500	112,772
59	"	75,000	2016	50	30%	70%	1	Enterprise Fund	22,500	52,500	119,539

City of Camas
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation % Upgrade / Expansion	For CFC Calculation % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations		Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
60	"	75,000	2017	50	30%	70%	1	Enterprise Fund	22,500	52,500	126,711
61	"	75,000	2018	50	30%	70%	1	Enterprise Fund	22,500	52,500	111,018
62	"	75,000	2019	50	30%	70%	1	Enterprise Fund	22,500	52,500	115,459
63	"	75,000	2020	50	30%	70%	1	Enterprise Fund	22,500	52,500	120,077
64	"	75,000	2021	50	30%	70%	1	Enterprise Fund	22,500	52,500	124,881
65	"	75,000	2022	50	30%	70%	1	Enterprise Fund	22,500	52,500	129,876
66	"	75,000	2023	50	30%	70%	1	Enterprise Fund	22,500	52,500	135,071
67	"	75,000	2024	50	30%	70%	1	Enterprise Fund	22,500	52,500	140,474
68	"	75,000	2025	50	30%	70%	1	Enterprise Fund	22,500	52,500	146,093
69	"	75,000	2026	50	30%	70%	1	Enterprise Fund	22,500	52,500	151,936
70	"	75,000	2027	50	30%	70%	1	Enterprise Fund	22,500	52,500	158,014
71	UGA MAIN LINE (2/3) Developer	2,000,000	2013	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	2,676,451
72	UGA MAIN LINE (1/3) City	1,000,000	2014	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,418,519
73	UGA MAIN LINE (2/3) Developer	2,000,000	2014	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	2,837,038
74	UGA MAIN LINE (1/3) City	1,000,000	2014	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,418,519
75	UGA MAIN LINE (2/3) Developer	2,000,000	2015	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,007,261
76	UGA MAIN LINE (1/3) City	1,000,000	2015	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,503,630
77	UGA MAIN LINE (2/3) Developer	2,000,000	2016	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,187,696
78	UGA MAIN LINE (1/3) City	1,000,000	2016	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,593,848
79	UGA MAIN LINE (2/3) Developer	2,000,000	2017	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,378,958
80	UGA MAIN LINE (1/3) City	1,000,000	2017	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,689,479
81	UGA MAIN LINE (2/3) Developer	2,000,000	2018	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	2,960,489
82	UGA MAIN LINE (1/3) City	1,000,000	2018	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,480,244
83	UGA MAIN LINE (2/3) Developer	2,000,000	2019	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,078,908
84	UGA MAIN LINE (1/3) City	1,000,000	2019	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,539,454
85	UGA MAIN LINE (2/3) Developer	2,000,000	2020	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,202,064
86	UGA MAIN LINE (1/3) City	1,000,000	2020	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,601,032
87	UGA MAIN LINE (2/3) Developer	2,000,000	2021	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,330,147
88	UGA MAIN LINE (1/3) City	1,000,000	2021	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,665,074

City of Camas
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation: % Upgrade / Expansion	For CFC Calculation: % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations	Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
89	UGA MAIN LINE (2/3) Developer	2,000,000	2022	50	100%	0%	2 Grants/Developer Donation	2,000,000	-	3,463,353
90	UGA MAIN LINE (1/3) City	1,000,000	2022	50	100%	0%	1 Enterprise Fund	1,000,000	-	1,731,676
91	UGA MAIN LINE (2/3) Developer	2,000,000	2023	50	100%	0%	2 Grants/Developer Donation	2,000,000	-	3,601,887
92	UGA MAIN LINE (1/3) City	1,000,000	2023	50	100%	0%	1 Enterprise Fund	1,000,000	-	1,800,944
93	UGA MAIN LINE (2/3) Developer	2,000,000	2024	50	100%	0%	2 Grants/Developer Donation	2,000,000	-	3,745,962
94	UGA MAIN LINE (1/3) City	1,000,000	2024	50	100%	0%	1 Enterprise Fund	1,000,000	-	1,872,981
95	UGA MAIN LINE (2/3) Developer	2,000,000	2025	50	100%	0%	2 Grants/Developer Donation	2,000,000	-	3,895,801
96	UGA MAIN LINE (1/3) City	1,000,000	2025	50	100%	0%	1 Enterprise Fund	1,000,000	-	1,947,900
97	UGA MAIN LINE (2/3) Developer	2,000,000	2026	50	100%	0%	2 Grants/Developer Donation	2,000,000	-	4,051,633
98	UGA MAIN LINE (1/3) City	1,000,000	2026	50	100%	0%	1 Enterprise Fund	1,000,000	-	2,025,817
99	UGA MAIN LINE (2/3) Developer	2,000,000	2027	50	100%	0%	2 Grants/Developer Donation	2,000,000	-	4,213,698
100	UGA MAIN LINE (1/3) City	1,000,000	2027	50	100%	0%	1 Enterprise Fund	1,000,000	-	2,106,849
101					100%	0%	1 Enterprise Fund	-	-	-
102					100%	0%	1 Enterprise Fund	-	-	-
	Total Capital Projects	**$ 69,796,800**			**98%**	**2%**		**$ 67,866,900**	**$ 1,667,500**	**$ 108,674,720**
	Total Upgrade/Expansion Projects									106,236,945
	Total R&R Projects									2,437,775
	Projects by Grants / Developer Donations							34,696,333	-	56,363,555
	Projects by Enterprise Fund							33,170,567	1,667,500	52,311,165

Year	2008$	Inflated	2008$ Grants	Inifated Grants	2008$ No Grants	Inflated No Grants
2008	5,030,000	5,030,000	-	-	5,030,000	5,030,000
2009	1,405,000	1,489,300	1,290,000	1,367,400	115,000	121,900
2010	3,575,000	4,016,870	1,987,333	2,232,968	1,587,667	1,783,902
2011	445,333	530,399	305,333	363,657	140,000	166,742
2012	75,000	94,686	-	-	75,000	94,686
2013	2,075,000	2,776,818	2,000,000	2,676,451	75,000	100,367
Total	**12,605,333**	**13,938,073**	**5,582,667**	**6,640,476**	**7,022,667**	**7,297,597**

City of Camas
Water Utility Rate Study
Capital Funding Analysis

Summary of Expenditures	2008	2009	2010	2011	2012	2013	2008 - 2013 TOTAL
CAPITAL PROJECTS							
Improvement Upgrades & Expansions	$ 4,685,000	$ 1,433,650	$ 3,957,881	$ 467,871	$ 28,406	$ 2,706,561	$ 13,279,369
Repairs and Replacements	345,000	55,650	58,989	62,528	66,280	70,257	658,704
TOTAL CAPITAL EXPENDITURES	**$ 5,030,000**	**$ 1,489,300**	**$ 4,016,870**	**$ 530,399**	**$ 94,686**	**$ 2,776,818**	**$ 13,938,073**

Capital Financing Plan	2008	2009	2010	2011	2012	2013	TOTAL
Existing PWTF/ Bond Proceeds	4,084,800	-	-	-	-	-	4,084,800
Transfer from REET Fund	500,000	-	-	-	-	-	500,000
Project Specific Grants / Developer Donations	$ -	$ 1,367,400	$ 2,232,968	$ 363,657	$ -	$ 2,676,451	$ 6,640,476
Project to be Funded	945,200	121,900	1,783,902	166,742	94,686	100,367	3,212,797
OTHER FUNDING SOURCES [NOTE A]							
Other Outside Sources	-	-	-	-	-	-	$ -
PWTF Loan Proceeds	-	-	-	-	-	-	-
Other Loan Proceeds	-	-	-	-	-	-	-
System Development Charges	189,104	189,104	189,104	189,104	189,104	189,104	1,134,623
Rate Funded System Reinvestment	-	-	-	200,000	200,000	200,000	600,000
Capital Fund Balance Deficiency	(756,096)	-	(1,594,798)	-	-	-	(2,350,895)
Capital Fund Balance	756,096	-	207,204	-	-	-	963,300
Capital Fund Balance Deficiency	-	-	(1,387,595)	-	-	-	(1,387,595)
Revenue Bond Proceeds [Note B]	-	240,000	1,581,200	-	-	-	1,821,200
Rates							
Total							-

City of Camas
Water Utility Rate Study
Revenue Requirements Analysis

Cash Flow Sufficiency Test	2008	2009	2010	2011	2012	2013
EXPENSES						
Cash Operating Expenses	$ 2,405,137	$ 2,502,332	$ 2,600,866	$ 2,703,549	$ 2,810,491	$ 2,922,049
Existing Debt Service	380,659	402,641	403,908	401,061	401,757	400,917
New Debt Service	-	22,610	171,571	171,571	171,571	171,571
Rate-Funded CIP	-	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	200,000	200,000	200,000
Additions Required to Meet Minimum Op. Fund Balance	-	-	-	-	-	-
Total Expenses	$ 2,785,796	$ 2,927,583	$ 3,176,346	$ 3,476,181	$ 3,583,819	$ 3,694,538
REVENUES						
Rate Revenue	$ 2,710,736	$ 2,751,397	$ 2,792,668	$ 2,834,558	$ 2,877,076	$ 2,920,233
Other Revenue	205,300	216,626	227,778	234,983	245,110	257,979
Operating Fund & Debt Reserve Fund Interest Earnings	125,000	5,477	10,688	19,314	19,775	22,650
Total Revenue	$ 3,041,036	$ 2,973,500	$ 3,031,134	$ 3,088,855	$ 3,141,961	$ 3,200,861
NET CASH FLOW (DEFICIENCY)	**$ 255,240**	**$ 45,917**	**$ (145,211)**	**$ (387,326)**	**$ (441,858)**	**$ (493,676)**

Coverage Sufficiency Test	2008	2009	2010	2011	2012	2013
EXPENSES						
Cash Operating Expenses	$ 2,405,137	$ 2,502,332	$ 2,600,866	$ 2,703,549	$ 2,810,491	$ 2,922,049
Revenue Bond Debt Service	380,659	404,851	555,080	552,333	553,128	552,388
Revenue Bond Coverage Requirement at 1.25	95,165	101,213	138,770	138,083	138,282	138,097
Total Expenses	$ 2,880,961	$ 3,008,396	$ 3,294,716	$ 3,393,964	$ 3,501,901	$ 3,612,535
ALLOWABLE REVENUES						
Rate Revenue	$ 2,710,736	$ 2,751,397	$ 2,792,668	$ 2,834,558	$ 2,877,076	$ 2,920,233
Other Revenue	205,300	216,626	227,778	234,983	245,110	257,979
Interest Earnings - All Funds	125,000	5,477	17,173	25,576	33,192	45,702
Total Revenue	$ 3,041,036	$ 2,973,500	$ 3,037,619	$ 3,095,117	$ 3,155,379	$ 3,223,913
Coverage Realized	1.67	1.16	0.79	0.71	0.62	0.55
COVERAGE SURPLUS (DEFICIENCY)	**$ 160,075**	**$ (34,896)**	**$ (257,097)**	**$ (298,847)**	**$ (346,523)**	**$ (388,622)**

City of Camas
Water Utility Rate Study
Revenue Requirements Analysis

Maximum Revenue Deficiency	2008	2009	2010	2011	2012	2013
Sufficiency Test Driving the Deficiency	*None*	*Coverage*	*Coverage*	*Cash*	*Cash*	*Cash*
Maximum Deficiency From Tests	$ -	$ 34,896	$ 257,097	$ 387,326	$ 441,858	$ 493,676
less: Net Revenue From Prior Rate Increases	-	-	(132,611)	(275,931)	(408,099)	(541,725)
Revenue Deficiency	$ -	$ 34,896	$ 124,485	$ 111,395	$ 33,759	$ -
Plus: Adjustment for State Excise Tax	-	1.848	6.592	5.899	1.788	-
Total Revenue Deficiency	**$ -**	**$ 36,743**	**$ 131,077**	**$ 117,294**	**$ 35,546**	**$ -**

Rate Increases	2008	2009	2010	2011	2012	2013
Rate Revenue with no Increase	$ 2,710,736	$ 2,751,397	$ 2,792,668	$ 2,834,558	$ 2,877,076	$ 2,920,233
Revenues from Prior Rate Increases	-	-	139,633	290,542	429,709	570,410
Rate Revenue Before Rate Increase (Incl. previous increases)	2,710,736	2,751,397	2,932,301	3,125,100	3,306,786	3,490,643
Required Annual Rate Increase	0.00%	1.34%	4.47%	3.75%	1.07%	0.00%
Number of Months New Rates Will Be In Effect	12	9	12	12	12	12
Info: Percentage Increase to Generate Required Revenue	*0.00%*	*1.78%*	*4.47%*	*3.75%*	*1.07%*	*0.00%*
Policy Induced Rate Increases	0.00%	5.00%	5.00%	4.25%	4.00%	4.00%
ANNUAL RATE INCREASE	**0.00%**	**5.00%**	**5.00%**	**4.25%**	**4.00%**	**4.00%**
CUMULATIVE RATE INCREASE	**0.00%**	**5.00%**	**10.25%**	**14.94%**	**19.53%**	**24.31%**

Impacts of Rate Increases	2008	2009	2010	2011	2012	2013
Rate Revenues After Rate Increase	$ 2,710,736	$ 2,854,574	$ 3,078,916	$ 3,257,917	$ 3,439,057	$ 3,630,269
Full Year Rate Revenues After Rate Increase	*2,710,736*	*2,888,967*	*3,078,916*	*3,257,917*	*3,439,057*	*3,630,269*
Additional State Taxes Due to Rate Increases	-	5,189	14,395	21,291	28,262	35,708
Net Cash Flow After Rate Increase	255,240	143,906	126,642	14,742	91,861	180,652
Coverage After Rate Increase	1.67	1.41	1.28	1.44	1.59	1.77

City of Camas
Water Utility Rate Study
Fund Activity

Funds	2008	2009	2010	2011	2012	2013
OPERATING FUND						
Beginning Balance	$ 479,154	$ 175,000	$ 318,906	$ 445,547	$ 460,290	$ 552,151
plus: Net Cash Flow after Rate Increase	255,240	143,906	126,642	14,742	91,861	180,652
less: Transfer of Surplus to Capital Fund	(141,346)	-	-	-	-	(12,297)
Ending Balance	$ 593,047	$ 318,906	$ 445,547	$ 460,290	$ 552,151	$ 720,505
Minimum Target Balance	*593,047*	*617,013*	*641,309*	*444,419*	*461,999*	*480,337*
Maximum Funds to be Kept as Operating Reserves	*593,047*	*617,013*	*641,309*	*666,628*	*692,998*	*720,505*
Info: No of Days of Cash Operating Expenses	*90*	*47*	*63*	*62*	*72*	*90*
CAPITAL FUND						
Beginning Balance	$ 181,256	$ (100,000)	$ 207,204	$ 200,090	$ 428,714	$ 736,549
plus: Rate Funded System Reinvestment	-	-	-	200,000	200,000	200,000
plus: Grants / Developer Donations / Other Outside Sources	-	1,367,400	2,232,968	363,657	-	2,676,451
plus: Transfer from REET	500,000	-	-	-	-	-
plus: Existing PWTF / Bond Proceeds	4,084,800	-	-	-	-	-
plus: System Development Charges	189,104	189,104	189,104	189,104	189,104	189,104
plus: Net Debt Proceeds Available for Projects	-	240,000	1,581,200	-	-	-
plus: Interest Earnings	5,673	-	6,485	6,262	13,417	23,051
plus: Transfer of Surplus from Operating Fund	141,346	-	-	-	-	12,297
plus: Direct Rate Funding	-	-	-	-	-	-
Total Capital Funding Sources	**5,102,178**	**1,696,504**	**4,216,960**	**959,113**	**831,235**	**3,837,453**
less: Capital Expenditures	(5,030,000)	(1,489,300)	(4,016,870)	(530,399)	(94,686)	(2,776,818)
Ending Balance	**$ 72,178**	**$ 207,204**	**$ 200,090**	**$ 428,714**	**$ 736,549**	**$ 1,060,635**
Minimum Target Balance	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
DEBT RESERVE						
Beginning Balance	$ -	$ -	$ 22,610	$ 171,571	$ 171,571	$ 171,571
plus: Reserve Funding from New Debt	-	22,610	148,962	-	-	-
less: Use of Reserves for Debt Service	-	-	-	-	-	-
Ending Balance	$ -	$ 22,610	$ 171,571	$ 171,571	$ 171,571	$ 171,571
Minimum Target Balance	*383,508*	*406,118*	*555,080*	*553,498*	*553,498*	*553,498*

SEWER SYSTEM

City of Camas
Sewer Utility Rate Study
Summary

Revenue Requirements	2008	2009	2010	2011	2012	2013
Revenues						
Rate Revenues Under Existing Rates	$ 3,380,654	$ 3,431,364	$ 3,482,834	$ 3,535,077	$ 3,588,103	$ 3,641,924
Non-Rate Revenues	252,500	136,992	141,419	154,924	180,689	199,286
Total Revenues	**$ 3,633,154**	**$ 3,568,356**	**$ 3,624,253**	**$ 3,690,001**	**$ 3,768,792**	**$ 3,841,211**
Expenses						
Cash Operating Expenses	$ 2,685,081	$ 2,808,285	$ 2,914,495	$ 3,025,097	$ 3,140,399	$ 3,260,227
Existing Debt Service	1,453,353	1,582,175	1,581,721	1,579,057	1,576,928	1,573,447
New Debt Service	-	10,100	156,316	1,249,112	1,667,422	1,711,165
Rate Funded System Reinvestment	-	-	-	-	-	-
Total Expenses	**$ 4,138,434**	**$ 4,400,561**	**$ 4,652,532**	**$ 5,853,266**	**$ 6,384,749**	**$ 6,544,840**
Net Surplus (Deficiency)	**$ (505,280)**	**$ (832,204)**	**$ (1,028,279)**	**$ (2,163,265)**	**$ (2,615,957)**	**$ (2,703,629)**
% of Rate Revenue	14.95%	24.25%	29.52%	61.19%	72.91%	74.24%
Additions to Meet Coverage	$ -	$ -	$ -	$ -	$ -	$ -
Total Surplus (Deficit)	**$ (505,280)**	**$ (832,204)**	**$ (1,028,279)**	**$ (2,163,265)**	**$ (2,615,957)**	**$ (2,703,629)**
% of Rate Revenue	14.95%	24.25%	29.52%	61.19%	72.91%	74.24%
Annual Rate Adjustment	**0.00%**	**34.00%**	**10.60%**	**10.60%**	**8.00%**	**3.00%**
Rate Revenues After Rate Increase	$ 3,380,654	$ 4,306,362	$ 5,161,700	$ 5,794,472	$ 6,351,901	$ 6,640,595
Additional Taxes from Rate Increase	$ -	$ 33,705	$ 64,670	$ 87,032	$ 106,461	$ 115,509
Net Cash Flow After Rate Increase	**(505,280)**	**9,088**	**585,917**	**9,099**	**41,379**	**179,532**
Coverage After Rate Increases	1.84	2.80	4.05	2.29	1.97	2.02
Sample Monthly Bill (SF Fixed)	$ 24.05	$ 32.23	$ 35.64	$ 39.42	$ 42.57	$ 43.85
Monthly Increase	$ -	$ 8.18	$ 3.42	$ 3.78	$ 3.15	$ 1.28

Notes:

No revenue from NUGAE growth is assumed in the study period

2009 increase is in effect for 9 month (effective April)

City of Camas
Sewer Utility Rate Study
Summary

Fund Balance	2008	2009	2010	2011	2012	2013
Operating:						
Beginning Balance	$ 479,154	$ 175,000	$ 184,088	$ 479,095	$ 488,194	$ 516,230
Net Cash Flow after Rate Increase	(505,280)	9,088	585,917	9,099	41,379	179,532
Transfer of Surplus to Capital Fund	-	-	(290,910)	-	(13,343)	(159,835)
Ending Balance	$ (26,127)	$ 184,088	$ 479,095	$ 488,194	$ 516,230	$ 535,928
	$ 441,383	*$ 461,636*	*$ 479,095*	*$ 497,276*	*$ 516,230*	*$ 535,928*
60 Day Target	(4)	24	60	59	60	60
Capital						
Beginning Balance	$ 1,052,178	$ 200,000	$ 200,423	$ 540,169	$ 208,959	$ 206,909
plus: Rate Funded System Reinvestment	-	-	-	-	-	-
plus: Grants / Developer Donations / Other Outside Sources	250,000	-	-	-	-	-
plus: Existing PWTF / Bond Proceeds	1,435,200	2,020,000	7,980,000	-	-	-
plus: System Development Charges	186,163	186,163	186,163	186,163	186,163	186,163
plus: Net Debt Proceeds Available for Projects	-	-	-	7,550,000	4,720,000	520,000
plus: Interest Earnings	32,930	6,259	6,273	16,905	6,540	6,476
plus: Transfer of Surplus from Operating Fund	-	-	290,910	-	13,343	159,835
Total Capital Funding Sources	2,956,471	2,412,423	8,663,769	8,293,237	5,135,006	1,079,383
less: Capital Expenditures	(1,950,000)	(2,212,000)	(8,123,600)	(8,084,278)	(4,928,096)	(869,847)
Ending Balance	**1,006,471**	**200,423**	**540,169**	**208,959**	**206,909**	**209,536**
Minimum Capital Contingency Target	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*

City of Camas
Sewer Utility Rate Study
Assumptions

Economic & Financial Factors

		2008	2009	2010	2011	2012	2013
1	General Cost Inflation	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%
2	Construction Cost Inflation	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
3	Labor Cost Inflation	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
4	Customer Growth (Historical Ann.from Budget)	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
5	General Inflation plus Growth	4.70%	4.70%	4.70%	4.70%	4.70%	4.70%
6	Connection Charge Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
8	No Escalation	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Fund Earnings (5-year average of the LWGSIP)	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%
	Local / State Excise Tax	3.85%	3.85%	3.85%	3.85%	3.85%	3.85%
	State B&O Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
	Collection	29.00%	29.00%	29.00%	29.00%	29.00%	29.00%
	Treatment	71.00%	71.00%	71.00%	71.00%	71.00%	71.00%

Accounting Assumptions

	2008	2009	2010	2011	2012	2013
FISCAL POLICY RESTRICTIONS						
Min. Op. Fund Balance Target (days of O&M expense)	60	60	60	60	60	60
Max. Op. Fund Balance (days of O&M expense)	60	60	60	60	60	60

Minimum Capital Fund Balance Target

Select Minimum Capital Fund Balance Target	2	**User Input**

1 - Defined as % of Plant

		2008	2009	2010	2011	2012	2013
Plant-in-Service in 2007	$ 43,604,604						
Minimum Capital Fund Balance - % of plant assets		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
2 - Amount at Right ==>		$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000

RATE FUNDED SYSTEM REINVESTMENT

Select Reinvestment Funding Strategy	3	**User Input**

Amount of Annual Cash Funding from Rates

1 - Equal to Annual Depreciation Expense
2 - Equal to Annual Depreciation Expense less Annual Debt Principal Payments

	2008	2009	2010	2011	2012	2013
3 - Equal to Amount at Right ==>	$ -	$ -	$ -	$ -	$ -	$ -

4 - Do Not Fund System Reinvestment

City of Camas
Sewer Utility Rate Study
Assumptions

Capital Financing Assumptions

		2008	2009	2010	2011	2012	2013
System Development Charges							
Select SDC Alternative	1	Current Charge is in use					
1 - User Input (Current Charge)	$ -						
2 - Calculated Charge	$ -						
Total Customer Equivalents							
SDC Revenue		$ 186,163	$ 186,163	$ 186,163	$ 186,163	$ 186,163	$ 186,163
REVENUE BONDS							
Term (years)		20	20	20	20	20	20
Interest Cost		5.00%	5.60%	5.60%	5.00%	5.00%	5.00%
Issuance Cost		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Revenue Bond Coverage Requirement	1.25						
PWTF LOAN							
Term (years; 10 year minimum and no more than 20 years)		20	20	20	20	20	20
Interest Cost		0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
OTHER LOANS & REVENUE-SUPPORTED GENERAL OBLIGATION BONDS [a]							
Term (years)		20	20	20	20	20	20
Interest Cost		5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Issuance Cost		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

[a] Tax-supported general obligation bonds are assumed to be accounted for in the General Fund; terms and annual obligations of such bonds are not factors in this analysis.

City of Camas
Sewer Utility Rate Study
Operating Revenue and Expenditure Forecast

Revenues		FORECAST BASIS	Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
Rate revenues								
Residential	4	Customer Growth (Historical Ann.from Budget)	$ 2,003,351	2,033,401	2,063,902	2,094,860	2,126,283	2,158,177
Swr Comm/Industrial	4	Customer Growth (Historical Ann.from Budget)	751,256	762,525	773,963	785,573	797,356	809,317
Swr Ind/Wafer Tech	4	Customer Growth (Historical Ann.from Budget)	626,047	635,438	644,969	654,644	664,464	674,430
Total Rate revenue			**$ 3,380,654**	**$ 3,431,364**	**$ 3,482,834**	**$ 3,535,077**	**$ 3,588,103**	**$ 3,641,924**
Non-rate revenues								
Sewer Hook-up Fees	1	General Cost Inflation	$ 10,000	$ 10,315	$ 10,640	$ 10,975	$ 11,321	$ 11,677
Inspection Fees-Step Syst (100% Sewer)	1	General Cost Inflation	10,000	10,315	10,640	10,975	11,321	11,677
Space & Facilities Leases (50% Sewer)	1	General Cost Inflation	10,000	10,315	10,640	10,975	11,321	11,677
Interest Income (50% sewer)		Calculated	125,000	5,477	5,761	14,994	36,352	50,403
Wtr-Swr Turn off Fees By Owner (100% Water)	1	General Cost Inflation	-	-	-	-	-	-
Penalties	1	General Cost Inflation	60,000	61,890	63,839	65,849	67,923	70,063
Other Rents & Use Charges	1	General Cost Inflation	37,500	38,681	39,899	41,156	42,452	43,789
Total Non-rate revenues			**$ 130,396**	**$ 70,746**	**$ 73,592**	**$ 79,770**	**$ 93,706**	**$ 103,473**
TOTAL REVENUES			**$ 3,511,050**	**$ 3,502,109**	**$ 3,556,426**	**$ 3,614,847**	**$ 3,681,809**	**$ 3,745,398**

City of Camas
Sewer Utility Rate Study
Operating Revenue and Expenditure Forecast

			Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
Expenditures		FORECAST BASIS						
Excise Tax State Tax		*Excise and B&O Tax Rate*	$ 66,000	$ 78,729	$ 79,895	$ 81,127	$ 82,493	$ 83,814
810 **SWR Collection**								
Reg Salar	3	Labor Cost Inflation	$ 21,241	$ 22,303	$ 23,418	$ 24,589	$ 25,819	$ 27,109
Overtime	3	Labor Cost Inflation	1,000	1,050	1,103	1,158	1,216	1,276
Personnel Benefits	3	Labor Cost Inflation	7,737	8,124	8,530	8,957	9,404	9,875
Office and Operating Supplies	1	General Cost Inflation	2,500	2,579	2,660	2,744	2,830	2,919
Small Tools and Minor Equip	1	General Cost Inflation	500	516	532	549	566	584
Supplies - Chemicals	1	General Cost Inflation	-	-	-	-	-	-
Professional Ser	3	Labor Cost Inflation	-	-	-	-	-	-
Communication	1	General Cost Inflation	-	-	-	-	-	-
Travel	1	General Cost Inflation	-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation	-	-	-	-	-	-
Repairs & Maintenance	3	Labor Cost Inflation	40,000	42,000	44,100	46,305	48,620	51,051
Miscellaneous	1	General Cost Inflation	500	516	532	549	566	584
Intfund Oper. Rentals & Lease	1	General Cost Inflation	5,000	5,157	5,320	5,487	5,660	5,839
Total SWR Collection			**$ 78,478**	**$ 82,245**	**$ 86,195**	**$ 90,337**	**$ 94,681**	**$ 99,237**
811 **Swr Pressure Coll**								
Reg	3	Labor Cost Inflation	$ 96,305	$ 101,120	$ 106,176	$ 111,485	$ 117,059	$ 122,912
Overtime	3	Labor Cost Inflation	10,000	10,500	11,025	11,576	12,155	12,763
Personnel Benefits	3	Labor Cost Inflation	35,570	37,349	39,216	41,177	43,236	45,397
Office and Operating Supplies	1	General Cost Inflation	30,000	30,945	31,919	32,925	33,962	35,031
Fuel consumed	1	General Cost Inflation	-	-	-	-	-	-
Small Tools and Minor Equip	1	General Cost Inflation	3,000	3,094	3,192	3,292	3,396	3,503
Chemicals	1	General Cost Inflation	128,000	132,031	136,190	140,479	144,903	149,467
Professional Services	3	Labor Cost Inflation	2,000	2,100	2,205	2,315	2,431	2,553
Travel	1	General Cost Inflation	-	-	-	-	-	-
Operating rentals and Leases	1	General Cost Inflation	200	206	213	219	226	234
Repairs & Maintenance	3	Labor Cost Inflation	50,000	52,500	55,125	57,881	60,775	63,814
Miscellaneous	1	General Cost Inflation	-	-	-	-	-	-
Intfund Oper. Rentals & Lease	1	General Cost Inflation	7,000	7,220	7,448	7,682	7,924	8,174
Intfund Repairs & Maint	1	General Cost Inflation	-	-	-	-	-	-
Total Swr Pressure Coll			**$ 362,075**	**$ 377,066**	**$ 392,709**	**$ 409,033**	**$ 426,068**	**$ 443,848**

City of Camas
Sewer Utility Rate Study
Operating Revenue and Expenditure Forecast

				Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
830 **SWR Pumping**									
Reg Salaries	3	Labor Cost Inflation	$	127,409	$ 133,779	$ 140,468	$ 147,492	$ 154,866	$ 162,610
Overtime	3	Labor Cost Inflation		6,000	6,300	6,615	6,946	7,293	7,658
Personnel Benefits	3	Labor Cost Inflation		46,407	48,727	51,164	53,722	56,408	59,228
Uniforms and Clothing	1	General Cost Inflation		-	-	-	-	-	-
Office and Operating Supplies	1	General Cost Inflation		10,000	10,315	10,640	10,975	11,321	11,677
Fuel Consumed	1	General Cost Inflation		-	-	-	-	-	-
Small Tools and Minor Equip	1	General Cost Inflation		1,000	1,031	1,064	1,097	1,132	1,168
Professional Ser	1	General Cost Inflation		7,500	7,736	7,980	8,231	8,490	8,758
Communication	1	General Cost Inflation		2,000	2,063	2,128	2,195	2,264	2,335
Travel	1	General Cost Inflation		-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation		3,000	3,094	3,192	3,292	3,396	3,503
Public Utility	1	General Cost Inflation		90,000	92,835	95,758	98,774	101,885	105,094
repairs & Maintenance	1	General Cost Inflation		30,000	30,945	31,919	32,925	33,962	35,031
Miscellaneous	1	General Cost Inflation		500	516	532	549	566	584
Intfund Oper. Rentals & Lease	1	General Cost Inflation		15,000	15,472	15,960	16,462	16,981	17,516
Public Utility	1	General Cost Inflation		-	-	-	-	-	-
Total SWR Pumping			**$**	**338,816**	**$ 352,814**	**$ 367,420**	**$ 382,661**	**$ 398,564**	**$ 415,162**
850 **SWR Treatment**									
Reg Salary	3	Labor Cost Inflation	$	174,627	183,358	192,526	202,153	212,260	222,873
Overtime	3	Labor Cost Inflation		5,000	5,250	5,513	5,788	6,078	6,381
Personnel Benefits	3	Labor Cost Inflation		60,984	64,033	67,235	70,597	74,126	77,833
Uniforms & Clothing	1	General Cost Inflation		-	-	-	-	-	-
Office and Operating Supplies	1	General Cost Inflation		20,000	20,630	21,280	21,950	22,641	23,354
Fuel Consumed	1	General Cost Inflation		-	-	-	-	-	-
Small Tools and Minor Equip	1	General Cost Inflation		20,000	20,630	21,280	21,950	22,641	23,354
Supplies - Chemicals	1	General Cost Inflation		240,000	255,000	263,031	271,315	279,860	288,674
Professional Ser	1	General Cost Inflation		147,500	152,145	156,937	161,880	166,978	172,237
Communication	1	General Cost Inflation		2,500	2,579	2,660	2,744	2,830	2,919
Travel	1	General Cost Inflation		1,000	1,031	1,064	1,097	1,132	1,168
Operating rentals and leases	1	General Cost Inflation		12,000	12,378	12,768	13,170	13,585	14,013
Insurance	1	General Cost Inflation		80,000	82,520	85,119	87,799	90,565	93,417
Public Utility	1	General Cost Inflation		130,000	134,094	138,318	142,674	147,167	151,802
Repairs & Maintenance	3	Labor Cost Inflation		36,600	38,430	40,352	42,369	44,488	46,712
Miscellaneous	1	General Cost Inflation		25,000	25,787	26,600	27,437	28,301	29,193
Intfund Oper. Rentals & Lease	1	General Cost Inflation		5,000	5,157	5,320	5,487	5,660	5,839
Total SWR Treatment			**$**	**960,211**	**$ 1,003,024**	**$ 1,040,000**	**$ 1,078,410**	**$ 1,118,313**	**$ 1,159,769**

City of Camas
Sewer Utility Rate Study
Operating Revenue and Expenditure Forecast

				Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
860	**SWR Services**								
	Reg Salaries	3	Labor Cost Inflation	-	-	-	-	-	-
	Overtime	3	Labor Cost Inflation	500	525	551	579	608	638
	Personnel Benefits	3	Labor Cost Inflation	45	47	50	52	55	57
	Repairs & Maintenance	3	Labor Cost Inflation	500	525	551	579	608	638
	Miscellaneous	1	General Cost Inflation	1,000	1,031	1,064	1,097	1,132	1,168
	Intfund Oper. Rentals & Lease	1	General Cost Inflation	-	-	-	-	-	-
	Total SWR Services			**2,045**	**2,129**	**2,216**	**2,307**	**2,402**	**2,501**
100	**Admin/Gen**		50% to water 50% to Sewer						
	Regular Salaries	3	Labor Cost Inflation	78,369	82,287	86,402	90,722	95,258	100,021
	Overtime	3	Labor Cost Inflation	-	-	-	-	-	-
	Personnel Benefits	3	Labor Cost Inflation	27,284	28,648	30,080	31,584	33,163	34,821
	Uniforms & Clothing	1	General Cost Inflation	-	-	-	-	-	-
	OPEB Expense	1	General Cost Inflation	-	-	-	-	-	-
	Office and Operating Supplies	1	General Cost Inflation	2,500	2,579	2,660	2,744	2,830	2,919
	Fuel Consumed	1	General Cost Inflation	-	-	-	-	-	-
	Small Tools and Minor Equip	1	General Cost Inflation	4,750	4,900	5,054	5,213	5,377	5,547
	Professional Ser	3	Labor Cost Inflation	76,500	80,325	84,341	88,558	92,986	97,636
	Communication	1	General Cost Inflation	4,500	4,642	4,788	4,939	5,094	5,255
	Travel	1	General Cost Inflation	250	258	266	274	283	292
	Operating Rentals and Leases	1	General Cost Inflation	-	-	-	-	-	-
	Insurance	3	Labor Cost Inflation	-	-	-	-	-	-
	Public Utility	1	General Cost Inflation	-	-	-	-	-	-
	Repairs & Maintenance	3	Labor Cost Inflation	-	-	-	-	-	-
	Miscellaneous	1	General Cost Inflation	10,750	11,089	11,438	11,798	12,170	12,553
	Interfund Profess. Serv.	1	General Cost Inflation	274,981	283,641	292,574	301,789	311,293	321,098
	Intfund Oper. Rentals & Lease	1	General Cost Inflation	43,165	44,524	45,927	47,373	48,865	50,404
	Total Admin/Gen			**523,048**	**542,892**	**563,530**	**584,994**	**607,320**	**630,545**

City of Camas
Sewer Utility Rate Study
Operating Revenue and Expenditure Forecast

				Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
170	**Customer Services**								
	Regular Salaries	3	Labor Cost Inflation	-	-	-	-	-	-
	Overtime	3	Labor Cost Inflation	-	-	-	-	-	-
	Personnel Benefits	3	Labor Cost Inflation	-	-	-	-	-	-
	Office and Operating Supplies	1	General Cost Inflation	3,000	3,094	3,192	3,292	3,396	3,503
	Small Tools and Minor Equip	1	General Cost Inflation	-	-	-	-	-	-
	Professional Ser	3	Labor Cost Inflation	12,500	13,125	13,781	14,470	15,194	15,954
	Communication	1	General Cost Inflation	375	387	399	412	425	438
	Travel	1	General Cost Inflation	-	-	-	-	-	-
	Operating Rentals and Leases	1	General Cost Inflation	-	-	-	-	-	-
	Repairs & Maintenance	3	Labor Cost Inflation	1,000	1,050	1,103	1,158	1,216	1,276
	Miscellaneous	1	General Cost Inflation	-	-	-	-	-	-
	Interfund Profess. Serv.	1	General Cost Inflation	-	-	-	-	-	-
	Intfund Oper. Rentals & Lease	1	General Cost Inflation	-	-	-	-	-	-
	Total Customer Services			**16,875**	**17,656**	**18,475**	**19,332**	**20,230**	**21,171**
	Other Additions								
	Step Tank Pumping	1	General Cost Inflation	150,000	154,724	159,597	164,624	169,808	175,157
	Total Other Additions			**150,000**	**154,724**	**159,597**	**164,624**	**169,808**	**175,157**
	Add'l O&M from CIP		*From CIP*	-	-	-	-	-	-
	Total Cash O&M Expenditures			**$ 2,685,081**	**$ 2,808,286**	**$ 2,914,495**	**$ 3,025,097**	**$ 3,140,399**	**$ 3,260,227**
	Depreciation Expense in	2007	$ 970,219						
	Depreciation Expense		*Last year's plus annual additions from CIP*	$ 1,012,219	$ 1,056,459	$ 1,218,931	$ 1,380,617	$ 1,479,179	$ 1,496,576
	TOTAL EXPENSES			**$ 3,697,300**	**$ 3,864,745**	**$ 4,133,427**	**$ 4,405,714**	**$ 4,619,578**	**$ 4,756,803**

City of Camas
Sewer Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation % Upgrade / Expansion	For CFC Calculation % R&R	Specific Funding Source 1- Enterprise Fund, 2-Grants & Developer Donations	Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
1	BIOSOLIDS LAND APPLICATION	$ 100,000	2008	20	2%	98%	1 Enterprise Fund	$ 2,000	$ 98,000	$ 100,000
2	"	-	2009	20	2%	98%	1 Enterprise Fund	-	-	-
3	"	-	2010	20	2%	98%	1 Enterprise Fund	-	-	-
4	LACAMAS CREEK LAND ACQUISITION	50,000	2014	50	100%	0%	1 Enterprise Fund	50,000	-	70,926
5	JOY TO MAIN STATION DESIGN	150,000	2014	50	0%	100%	1 Enterprise Fund	-	150,000	212,778
6	STP ROTARY SCREEN REPLACE	150,000	2008	50	0%	100%	1 Enterprise Fund	-	150,000	150,000
7	SEWER MAIN REPLACE (NW 6th, et. al.)	1,400,000	2008	50	0%	100%	1 Enterprise Fund	-	1,400,000	1,400,000
8	STP Upgrade	2,000,000	2009	50	20%	80%	1 Enterprise Fund	400,000	1,600,000	2,000,000
9	SANITARY PS UPGRADES	200,000	2008	50	10%	90%	1 Enterprise Fund	20,000	180,000	200,000
10	SEWER FACILITY PLAN UPDATE	100,000	2008	50	50%	50%	1 Enterprise Fund	50,000	50,000	100,000
11	STP UPGRADE START	7,000,000	2010	50	50%	50%	1 Enterprise Fund	3,500,000	3,500,000	7,000,000
12	"	6,000,000	2011	50	50%	50%	1 Enterprise Fund	3,000,000	3,000,000	6,000,000
13	" Dryer	2,500,000	2012	50	50%	50%	1 Enterprise Fund	1,250,000	1,250,000	2,500,000
14	ANNUAL PS UPGRADES	200,000	2009	50	10%	90%	1 Enterprise Fund	20,000	180,000	212,000
15	LACAMAS CREEK PS UPGRADE(FORCEMAIN)	1,500,000	2015	50	100%	0%	2 Grants/Developer Donation	1,500,000	-	2,255,445
16	JOY TO MAIN STATION CONSTRUCTION	1,000,000	2015	50	100%	0%	1 Enterprise Fund	1,000,000	-	1,503,630
17	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2014	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	1,730,593
18	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2014	50	100%	0%	1 Enterprise Fund			
19	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2015	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	1,834,429

City of Camas
Sewer Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation % Upgrade / Expansion	For CFC Calculation % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations	Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
20	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2015	50	100%	0%	1 Enterprise Fund			
21	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2016	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	1,944,495
22	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2016	50	100%	0%	1 Enterprise Fund			
23	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2017	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	1,736,440
24	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2017	50	100%	0%	1 Enterprise Fund			
25	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2018	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	1,805,898
26	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2018	50	100%	0%	1 Enterprise Fund			
27	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2019	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	1,878,134
28	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2019	50	100%	0%	1 Enterprise Fund			
29	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2020	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	1,953,259
30	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2020	50	100%	0%	1 Enterprise Fund			
31	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2021	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	2,031,390
32	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2021	50	100%	0%	1 Enterprise Fund			
33	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2022	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	2,112,645
34	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2022	50	100%	0%	1 Enterprise Fund			
35	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2023	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	2,197,151
36	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2023	50	100%	0%	1 Enterprise Fund			
37	WEST CAMAS FORCE MAIN-SOUTH PH	1,000,000	2012	50	60%	40%	1 Enterprise Fund	600,000	400,000	1,262,477
38	COLLECTION SYSTEM UPGRADES	1,500,000	2014	50	20%	80%	1 Enterprise Fund	300,000	1,200,000	2,127,779
39	"	2,000,000	2015	50	20%	80%	1 Enterprise Fund	400,000	1,600,000	3,007,261
40	"	2,000,000	2016	50	20%	80%	1 Enterprise Fund	400,000	1,600,000	3,187,696
41	"	2,500,000	2017	50	20%	80%	1 Enterprise Fund	500,000	2,000,000	3,558,280
42	"	1,428,571	2018	50	20%	80%	1 Enterprise Fund	285,714	1,142,857	2,114,635
43	"	1,428,571	2019	50	20%	80%	1 Enterprise Fund	285,714	1,142,857	2,199,220
44	"	1,428,571	2020	50	20%	80%	1 Enterprise Fund	285,714	1,142,857	2,287,189
45	"	1,428,571	2021	50	20%	80%	1 Enterprise Fund	285,714	1,142,857	2,378,676

City of Camas
Sewer Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation % Upgrade / Expansion	For CFC Calculation % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations	Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
46	"	1,428,571	2022	50	20%	80%	1 Enterprise Fund	285,714	1,142,857	2,473,823
47	"	1,428,571	2023	50	20%	80%	1 Enterprise Fund	285,714	1,142,857	2,572,776
48	"	1,428,571	2024	50	20%	80%	1 Enterprise Fund	285,714	1,142,857	2,675,687
49	"	1,714,286	2025	50	20%	80%	1 Enterprise Fund	342,857	1,371,429	3,339,258
50	"	1,714,286	2026	50	20%	80%	1 Enterprise Fund	342,857	1,371,429	3,472,828
51	"	1,714,286	2027	50	20%	80%	1 Enterprise Fund	342,857	1,371,429	3,611,741
52	"	1,714,286	2028	50	20%	80%	1 Enterprise Fund	342,857	1,371,429	-
53	"	1,714,286	2029	50	20%	80%	1 Enterprise Fund	342,857	1,371,429	-
54	"	1,714,286	2030	50	20%	80%	1 Enterprise Fund	342,857	1,371,429	-
55	"	1,714,286	2031	50	20%	80%	1 Enterprise Fund	342,857	1,371,429	-
56	PUMP STATION UPGRADES	250,000	2010	50	10%	90%	1 Enterprise Fund	25,000	225,000	280,900
57	"	250,000	2011	50	10%	90%	1 Enterprise Fund	25,000	225,000	297,754
58	"	250,000	2012	50	10%	90%	1 Enterprise Fund	25,000	225,000	315,619
59	"	250,000	2013	50	10%	90%	1 Enterprise Fund	25,000	225,000	334,556
60	"	250,000	2014	50	10%	90%	1 Enterprise Fund	25,000	225,000	354,630
61	"	250,000	2015	50	10%	90%	1 Enterprise Fund	25,000	225,000	375,908
62	"	250,000	2016	50	10%	90%	1 Enterprise Fund	25,000	225,000	398,462
63	"	250,000	2017	50	10%	90%	1 Enterprise Fund	25,000	225,000	355,828
64	"	250,000	2018	50	10%	90%	1 Enterprise Fund	25,000	225,000	370,061
65	"	250,000	2019	50	10%	90%	1 Enterprise Fund	25,000	225,000	384,864
66	"	250,000	2020	50	10%	90%	1 Enterprise Fund	25,000	225,000	400,258

City of Camas
Sewer Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation % Upgrade / Expansion	For CFC Calculation % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations	Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
67	STP UPGRADE CLOSE-OUT (15%)	850,000	2012	50	50%	50%	1 Enterprise Fund	425,000	425,000	850,000
68	STEP BYPASS LINE, PH. I NUGAE	1,500,000	2014	50	100%	0%	1 Enterprise Fund	1,500,000	-	2,127,779
69	STEP BYPASS LINE, PH. II (SR-14?) NUGAE	1,700,000	2015	50	100%	0%	1 Enterprise Fund	1,700,000	-	2,556,171
70	"	250,000	2016	50	100%	0%	1 Enterprise Fund	250,000	-	398,462
71	TRANSMISSION TRUNK (WEST) TO MAIN STATION	1,500,000	2011	50	0%	100%	1 Enterprise Fund	-	1,500,000	1,786,524
72	PARKER PUMP STATION REPLACEMENT	1,500,000	2014	50	30%	70%	1 Enterprise Fund	450,000	1,050,000	2,127,779
73	WWTF PLAN UPDATE	400,000	2013	50	50%	50%	1 Enterprise Fund	200,000	200,000	535,290
74	"	400,000	2021	50	50%	50%	1 Enterprise Fund	200,000	200,000	666,029
75	38th AVENUE SEWER LINE	750,000	2010	50	100%	0%	1 Enterprise Fund	750,000	-	842,700
76	STP UPGRADE: EQUIPMENT REPLACE	5,000,000	2015	50	0%	100%	1 Enterprise Fund	-	5,000,000	7,518,151
77	STP UPGRADE: DEMO G.P. CONNECTIONS RELAY ADAMS (UPS	1,000,000	2021	50	0%	100%	1 Enterprise Fund	-	1,000,000	1,665,074
78	TREATMENT PLAN EXPANSION (new plnt)	20,026,000	2021	50	100%	0%	1 Enterprise Fund	20,026,000	-	33,344,762
79					100%	0%	1 Enterprise Fund	-	-	-
	Total Capital Projects	**$ 109,276,000**			**56%**	**44%**		**$ 55,368,000**	**$ 47,808,000**	**$ 141,486,102**
	Total Upgrade/Expansion Projects									81,177,244
	Total R&R Projects									60,308,858
	Projects by Grants / Developer Donations							13,700,000	-	21,479,880
	Projects by Enterprise Fund							41,668,000	47,808,000	120,006,222

Year	2008 $	Inflated
2008	1,950,000	1,950,000
2009	2,200,000	2,212,000
2010	8,000,000	8,123,600
2011	7,750,000	8,084,278
2012	4,600,000	4,928,096
2013	650,000	869,847
Total	**25,150,000**	**26,167,821**

City of Camas
Sewer Utility Rate Study
Existing Debt Input

Existing Debt Service - Revenue Bonds		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Water & Sewer Revenue Bonds	26.00%										
Annual Interest Payment		$ 64,999	$ 62,955	$ 60,800	$ 58,535	$ 56,215	$ 53,355	$ 50,365	$ 47,245	$ 43,930	$ 40,485
Annual Principal Payment		48,100	50,700	53,300	54,600	57,200	59,800	62,400	66,300	68,900	72,800
Total Annual Payment		$ 113,099	$ 113,655	$ 114,100	$ 113,135	$ 113,415	$ 113,155	$ 112,765	$ 113,545	$ 112,830	$ 113,285
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
Water and Sewer Revenue and Refunding Bonds 1998	100% Sewer										
Annual Interest Payment		$ 137,514	$ 125,456	$ 111,498	$ 96,840	$ 81,473	$ 65,293	$ 47,971	$ 29,485	$ 10,013	$ -
Annual Principal Payment		265,000	335,000	350,000	365,000	380,000	395,000	415,000	430,000	450,000	-
Total Annual Payment		$ 402,514	$ 460,456	$ 461,498	$ 461,840	$ 461,473	$ 460,293	$ 462,971	$ 459,485	$ 460,013	$ -
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
REVENUE BOND 3											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
REVENUE BOND 4											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
REVENUE BOND 5											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Use of Debt Reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
TOTAL REVENUE BONDS											
Annual Interest Payment		$ 202,513	$ 188,411	$ 172,298	$ 155,375	$ 137,687	$ 118,647	$ 98,336	$ 76,730	$ 53,942	$ 40,485
Annual Principal Payment		313,100	385,700	403,300	419,600	437,200	454,800	477,400	496,300	518,900	72,800
Total Annual Payment		$ 515,613	$ 574,111	$ 575,598	$ 574,975	$ 574,887	$ 573,447	$ 575,736	$ 573,030	$ 572,842	$ 113,285
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
Annual Debt Reserve Target on Existing Revenue Bonds		575,736	575,736	575,736	575,736	575,736	575,736	575,736	573,030	572,842	113,610

City of Camas
Sewer Utility Rate Study
Existing Debt Input

Existing Debt Service - PWTF Loans		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
PW-07-962-PRE-104	5-Year Loan was converted into a 20 Year										
Annual Interest Payment		$ 3,385	$ 5,000	$ 4,750	$ 4,500	$ 4,250	$ 4,000	$ 3,750	$ 3,500	$ 3,250	$ 3,000
Annual Principal Payment		-	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Total Annual Payment		$ 3,385	$ 55,000	$ 54,750	$ 54,500	$ 54,250	$ 54,000	$ 53,750	$ 53,500	$ 53,250	$ 53,000
			$1,000,000	$950,000	$900,000	$850,000	$800,000	$750,000	$700,000	$650,000	$600,000
PW-99-791-006											
Annual Interest Payment		$ 20,291	$ 18,600	$ 16,909	$ 15,218	$ 13,527	$ 11,836	$ 10,146	$ 8,455	$ 6,764	$ 5,073
Annual Principal Payment		169,092	169,092	169,092	169,092	169,092	169,092	169,092	169,092	169,092	169,092
Total Annual Payment		$ 189,383	$ 187,692	$ 186,001	$ 184,310	$ 182,619	$ 180,929	$ 179,238	$ 177,547	$ 175,856	$ 174,165
DOE Loan											
Annual Interest Payment		$ 265,088	$ 248,886	$ 232,012	$ 214,440	$ 196,140	$ 177,082	$ 157,234	$ 136,564	$ 115,039	$ 92,621
Annual Principal Payment		391,170	407,372	424,245	441,818	460,118	479,176	499,024	519,693	541,219	563,637
Total Annual Payment		$ 656,258	$ 656,258	$ 656,258	$ 656,258	$ 656,258	$ 656,258	$ 656,258	$ 656,258	$ 656,258	$ 656,258
STP Clarifier (DOE Loan)											
Annual Interest Payment		$ 28,858	$ 26,257	$ 23,542	$ 20,710	$ 17,754	$ 14,670	$ 11,452	$ 8,094	$ 4,590	$ 934
Annual Principal Payment		59,856	62,457	65,172	68,004	70,960	74,044	77,262	80,620	84,124	43,423
Total Annual Payment		$ 88,714	$ 88,714	$ 88,714	$ 88,714	$ 88,714	$ 88,714	$ 88,714	$ 88,714	$ 88,714	$ 44,357
Public Works Trust Fund Loan											
Annual Interest Payment	50%	$ -	$ 400	$ 400	$ 300	$ 200	$ 100	$ -	$ -	$ -	$ -
Annual Principal Payment		-	20,000	20,000	20,000	20,000	20,000	-	-	-	-
Total Annual Payment		$ -	$ 20,400	$ 20,400	$ 20,300	$ 20,200	$ 20,100	$ -	$ -	$ -	$ -
Public Works Trust Fund Loan - WWTP Pre-Construction											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Public Works Trust Fund Loan - WWTP Construction											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL PWTF LOANS											
Annual Interest Payment		$ 317,623	$ 299,143	$ 277,614	$ 255,168	$ 231,871	$ 207,688	$ 182,581	$ 156,613	$ 129,642	$ 101,627
Annual Principal Payment		620,118	708,921	728,509	748,914	770,170	792,312	795,378	819,406	844,436	826,152
Total Annual Payment		$ 937,740	$ 1,008,064	$ 1,006,123	$ 1,004,082	$ 1,002,041	$ 1,000,000	$ 977,959	$ 976,018	$ 974,078	$ 927,780

City of Camas
Sewer Utility Rate Study
Capital Funding Analysis

Summary of Expenditures	2008	2009	2010	2011	2012	2013	2008 - 2015 TOTAL
CAPITAL PROJECTS							
Improvement Upgrades & Expansions	$ 72,000	$ 421,200	$ 4,370,790	$ 3,029,775	$ 2,464,048	$ 301,101	$ 10,658,914
Repairs and Replacements	1,878,000	1,790,800	3,752,810	5,054,503	2,464,048	568,746	15,508,907
TOTAL CAPITAL EXPENDITURES	**$ 1,950,000**	**$ 2,212,000**	**$ 8,123,600**	**$ 8,084,278**	**$ 4,928,096**	**$ 869,847**	**$ 26,167,821**

Capital Financing Plan	2008	2009	2010	2011	2012	2013	TOTAL
Existing PWTF/ Bond Proceeds	$ 1,435,200	$ -	$ -	$ -	$ -	$ -	$ 1,435,200
Project Specific Grants / Developer Donations	250,000	-	-	-	-	-	250,000
Project to be Funded	264,800	2,212,000	8,123,600	8,084,278	4,928,096	869,847	24,482,621
OTHER FUNDING SOURCES [NOTE A]							
Other Outside Sources							$ -
PWTF Loan Proceeds		2,020,000	7,980,000				10,000,000
Other Loan Proceeds							-
Connection Charges	186,163	186,163	186,163	186,163	186,163	186,163	1,116,979
Rate Funded System Reinvestment	-	-	-	-	-	-	-
Capital Fund Balance Deficiency	(78,637)	(5,837)	-	(7,898,115)	(4,741,933)	(683,683)	(13,408,205)
Capital Fund Balance	78,637	5,837	-	540,169	222,303	366,744	1,213,689
Capital Fund Balance Deficiency	-	-	-	(7,357,946)	(4,519,630)	(316,940)	(12,194,516)
Revenue Bond Proceeds [Note B]	-	-	-	7,550,000	4,720,000	520,000	12,790,000
Rates							
Total							

City of Camas
Sewer Utility Rate Study
Revenue Requirements Analysis

Cash Flow Sufficiency Test	2008	2009	2010	2011	2012	2013
EXPENSES						
Cash Operating Expenses	$ 2,685,081	$ 2,808,285	$ 2,914,495	$ 3,025,097	$ 3,140,399	$ 3,260,227
Existing Debt Service	1,453,353	1,582,175	1,581,721	1,579,057	1,576,928	1,573,447
New Debt Service	-	10,100	156,316	1,249,112	1,667,422	1,711,165
Rate-Funded CIP	-	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-	-
Additions Required to Meet Minimum Op. Fund Balance	-	-	-	-	-	-
Total Expenses	$ 4,138,434	$ 4,400,561	$ 4,652,532	$ 5,853,266	$ 6,384,749	$ 6,544,840
REVENUES						
Rate Revenue	$ 3,380,654	$ 3,431,364	$ 3,482,834	$ 3,535,077	$ 3,588,103	$ 3,641,924
Other Revenue	127,500	131,516	135,658	139,930	144,337	148,883
Operating Fund & Debt Reserve Fund Interest Earnings	125,000	5,477	5,761	14,994	36,352	50,403
Total Revenue	$ 3,633,154	$ 3,568,356	$ 3,624,253	$ 3,690,001	$ 3,768,792	$ 3,841,211
NET CASH FLOW (DEFICIENCY)	**$ (505,280)**	**$ (832,204)**	**$ (1,028,279)**	**$ (2,163,265)**	**$ (2,615,957)**	**$ (2,703,629)**
		80,243				

Coverage Sufficiency Test	2008	2009	2010	2011	2012	2013
EXPENSES						
Cash Operating Expenses	$ 2,685,081	$ 2,808,285	$ 2,914,495	$ 3,025,097	$ 3,140,399	$ 3,260,227
Revenue Bond Debt Service	515,613	574,111	575,598	1,248,303	1,669,156	1,714,091
Revenue Bond Coverage Requirement at 1.25	128,903	143,528	143,899	312,076	417,289	428,523
Total Expenses	$ 3,329,597	$ 3,525,925	$ 3,633,992	$ 4,585,475	$ 5,226,844	$ 5,402,841
ALLOWABLE REVENUES						
Rate Revenue	$ 3,380,654	$ 3,431,364	$ 3,482,834	$ 3,535,077	$ 3,588,103	$ 3,641,924
Other Revenue	127,500	131,516	135,658	139,930	144,337	148,883
Interest Earnings - All Funds	125,000	11,736	12,034	31,899	42,891	56,879
Total Revenue	$ 3,633,154	$ 3,574,616	$ 3,630,526	$ 3,706,906	$ 3,775,332	$ 3,847,686
Coverage Realized	1.84	1.33	1.24	0.55	0.38	0.34
COVERAGE SURPLUS (DEFICIENCY)	**$ 303,557**	**$ 48,691**	**$ (3,467)**	**$ (878,569)**	**$ (1,451,513)**	**$ (1,555,155)**

City of Camas
Sewer Utility Rate Study
Revenue Requirements Analysis

Maximum Revenue Deficiency	2008	2009	2010	2011	2012	2013
Sufficiency Test Driving the Deficiency	*Cash*	*Cash*	*Cash*	*Cash*	*Cash*	*Cash*
Maximum Deficiency From Tests	$ 505,280	$ 832,204	$ 1,028,279	$ 2,163,265	$ 2,615,957	$ 2,703,629
less: Net Revenue From Prior Rate Increases	-	-	(1,138,550)	(1,638,408)	(2,204,949)	(2,697,196)
Revenue Deficiency	$ 505,280	$ 832,204	$ -	$ 524,856	$ 411,008	$ 6,433
Plus: Adjustment for State Excise Tax	20,243	33,341	-	21,027	16,466	258
Total Revenue Deficiency	**$ 525,523**	**$ 865,545**	**$ -**	**$ 545,884**	**$ 427,474**	**$ 6,690**

Rate Increases	2008	2009	2010	2011	2012	2013
Rate Revenue with no Increase	$ 3,380,654	$ 3,431,364	$ 3,482,834	$ 3,535,077	$ 3,588,103	$ 3,641,924
Revenues from Prior Rate Increases	-	-	1,184,164	1,704,048	2,293,287	2,805,255
Rate Revenue Before Rate Increase (Incl. previous increases)	3,380,654	3,431,364	4,666,998	5,239,125	5,881,390	6,447,179
Required Annual Rate Increase	15.55%	25.22%	0.00%	10.42%	7.27%	0.10%
Number of Months New Rates Will Be In Effect	12	9	12	12	12	12
Info: Percentage Increase to Generate Required Revenue	*15.55%*	*33.63%*	*0.00%*	*10.42%*	*7.27%*	*0.10%*
Policy Induced Rate Increases	0.00%	34.00%	10.60%	10.60%	8.00%	3.00%
ANNUAL RATE INCREASE	**0.00%**	**34.00%**	**10.60%**	**10.60%**	**8.00%**	**3.00%**
CUMULATIVE RATE INCREASE	**0.00%**	**34.00%**	**48.20%**	**63.91%**	**77.03%**	**82.34%**
						4.78%

Impacts of Rate Increases	2008	2009	2010	2011	2012	2013
Rate Revenues After Rate Increase	$ 3,380,654	$ 4,306,362	$ 5,161,700	$ 5,794,472	$ 6,351,901	$ 6,640,595
Full Year Rate Revenues After Rate Increase	*3,380,654*	*4,598,028*	*5,161,700*	*5,794,472*	*6,351,901*	*6,640,595*
Additional State Taxes Due to Rate Increases	-	33,705	64,670	87,032	106,461	115,509
Net Cash Flow After Rate Increase	(505,280)	9,088	585,917	9,099	41,379	179,532
Coverage After Rate Increase	1.84	2.80	4.05	2.29	1.97	2.02

City of Camas
Sewer Utility Rate Study
Fund Activity

Funds	2008	2009	2010	2011	2012	2013
OPERATING FUND						
Beginning Balance	$ 479,154	$ 175,000	$ 184,088	$ 479,095	$ 488,194	$ 516,230
plus: Net Cash Flow after Rate Increase	(505,280)	9,088	585,917	9,099	41,379	179,532
less: Transfer of Surplus to Capital Fund	-	-	(290,910)	-	(13,343)	(159,835)
Ending Balance	$ (26,127)	$ 184,088	$ 479,095	$ 488,194	$ 516,230	$ 535,928
Minimum Target Balance	*441,383*	*461,636*	*479,095*	*497,276*	*516,230*	*535,928*
Maximum Funds to be Kept as Operating Reserves	*441,383*	*461,636*	*479,095*	*497,276*	*516,230*	*535,928*
Info: No of Days of Cash Operating Expenses	*(4)*	*24*	*60*	*59*	*60*	*60*
CAPITAL FUND						
Beginning Balance	$ 1,052,178	$ 200,000	$ 200,423	$ 540,169	$ 208,959	$ 206,909
plus: Rate Funded System Reinvestment	-	-	-	-	-	-
plus: Grants / Developer Donations / Other Outside Sources	250,000	-	-	-	-	-
plus: Existing / New PWTF / Existing Bond Proceeds	1,435,200	2,020,000	7,980,000	-	-	-
plus: System Development Charges	186,163	186,163	186,163	186,163	186,163	186,163
plus: Net Debt Proceeds Available for Projects	-	-	-	7,550,000	4,720,000	520,000
plus: Interest Earnings	32,930	6,259	6,273	16,905	6,540	6,476
plus: Transfer of Surplus from Operating Fund	-	-	290,910	-	13,343	159,835
plus: Direct Rate Funding	-	-	-	-	-	-
Total Capital Funding Sources	**2,956,471**	**2,412,423**	**8,663,769**	**8,293,237**	**5,135,006**	**1,079,383**
less: Capital Expenditures	(1,950,000)	(2,212,000)	(8,123,600)	(8,084,278)	(4,928,096)	(869,847)
Ending Balance	**$ 1,006,471**	**$ 200,423**	**$ 540,169**	**$ 208,959**	**$ 206,909**	**$ 209,536**
Minimum Target Balance	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
DEBT RESERVE						
Beginning Balance		$ -	$ -	$ -	$ 673,328	$ 1,094,269
plus: Reserve Funding from New Debt	-	-	-	673,328	420,941	46,375
less: Use of Reserves for Debt Service	-	-	-	-	-	-
Ending Balance	$ -	$ -	$ -	$ 673,328	$ 1,094,269	$ 1,140,644
Minimum Target Balance	*575,736*	*575,736*	*575,736*	*1,249,063*	*1,670,005*	*1,716,380*

Storm Water System

City of Camas
Storm Utility Rate Study
Summary

Revenue Requirements	2008	2009	2010	2011	2012	2013
Revenues						
Rate Revenues Under Existing Rates	$ 517,142	$ 527,485	$ 538,034	$ 548,795	$ 559,771	$ 570,966
Non-Rate Revenues	35,000	-	-	-	1,057	2,237
Total Revenues	**$ 552,142**	**$ 527,485**	**$ 538,034**	**$ 548,795**	**$ 560,828**	**$ 573,203**
Expenses						
Cash Operating Expenses	$ 322,726	$ 473,761	$ 571,805	$ 586,028	$ 600,678	$ 615,767
Street Cleaning	132,421	138,831	138,391	142,338	146,405	150,593
Administration / Taxes	57,300	97,754	136,407	119,519	122,583	125,739
Existing Debt Service	-	-	-	-	-	-
New Debt Service	-	-	-	-	-	-
Rate Funded CIP	56,000	30,300	112,360	119,102	189,372	347,550
Total Expenses	**$ 568,447**	**$ 740,646**	**$ 958,963**	**$ 966,987**	**$ 1,059,038**	**$ 1,239,649**
Net Surplus (Deficiency)	**$ (16,305)**	**$ (213,161)**	**$ (420,928)**	**$ (418,192)**	**$ (498,209)**	**$ (666,446)**
% of Rate Revenue	3.15%	40.41%	78.23%	76.20%	89.00%	116.72%
Annual Rate Adjustment	**0.00%**	**55.00%**	**20.00%**	**20.00%**	**3.00%**	**3.00%**
Rate Revenues After Rate Increase	$ 517,142	$ 745,072	$ 1,000,744	$ 1,224,911	$ 1,286,891	$ 1,352,008
Additional Taxes from Rate Increase	$ -	$ 3,264	$ 6,941	$ 10,142	$ 10,907	$ 11,716
Net Cash Flow After Rate Increase	**(16,305)**	**1,162**	**34,841**	**247,782**	**218,004**	**102,880**
Coverage After Rate Increases	n/a	n/a	n/a	n/a	n/a	n/a
Sample Monthly Residential Bill (1 EDU)	$ 4.45	$ 6.89	$ 8.27	$ 9.92	$ 10.22	$ 10.53
Monthly Increase	$ -	$ 2.45	$ 1.38	$ 1.65	$ 0.30	$ 0.31

Notes:

No revenue from NUGAE growth is assumed in the study period

2009 increase is in effect for 9 month (effective April)

City of Camas
Storm Utility Rate Study
Summary

Fund Balance	2008	2009	2010	2011	2012	2013
Operating:						
Beginning Balance	**$ (58,653)**	**$ (250,000)**	**$ (248,838)**	**$ (213,997)**	**$ 33,785**	**$ 71,479**
Net Cash Flow after Rate Increase	(16,305)	1,162	34,841	247,782	218,004	102,880
Transfer of Surplus to Capital Fund	-	-	-	-	(180,309)	(101,036)
Ending Balance	$ (74,958)	$ (248,838)	$ (213,997)	$ 33,785	$ 71,479	$ 73,323
	$ 42,119	*$ 58,385*	*$ 69,584*	*$ 69,689*	*$ 71,479*	*$ 73,323*
30 Day Target	(53)	(128)	(92)	15	30	30
Capital - Non FB						
Beginning Balance	**$ (36,000)**	**$ (25,000)**	**$ -**	**$ -**	**$ 0**	**$ 180,310**
plus: Rate Funded System Reinvestment	-	-	-	-	-	-
plus: Grants / Developer Donations / Other Outside Sources	75,000	-	-	-	-	-
plus: Existing Revenue Bond and PWTF and Proceeds	-	-	-	-	-	-
plus: System Development Charges	-	-	-	-	-	-
plus: Net Debt Proceeds Available for Projects	-	-	-	-	-	-
plus: Transfers from FB Capital Fund for FB Projects	220,000	68,900	95,506	279,889	170,434	247,961
plus: Rate Funded CIP	56,000	30,300	112,360	119,102	189,372	347,550
plus: Interest Earnings	-	-	-	-	0	5,643
plus: Transfer of Surplus from Operating Fund	-	-	-	-	180,309	101,036
Total Capital Funding Sources	315,000	74,200	207,866	398,991	540,116	882,500
less: Capital Expenditures	(315,000)	(74,200)	(207,866)	(398,990)	(359,806)	(595,510)
Ending Balance	**-**	**-**	**-**	**0**	**180,310**	**286,990**
Capital - FB						
Beginning Balance	**$ 853,937**	**$ 775,000**	**$ 730,355**	**$ 657,706**	**$ 398,402**	**$ 240,436**
plus: Reserve Funding from New Debt	26,725	24,255	22,858	20,584	12,469	7,525
less: Transfer to Non-Fisher Basin Capital Fund for FB Capital	(220,000)	(68,900)	(95,506)	(279,889)	(170,434)	(247,961)
Ending Balance	**$ 660,662**	**$ 730,355**	**$ 657,706**	**$ 398,402**	**$ 240,436**	**$ -**

City of Camas
Storm Utility Rate Study
Assumptions

Economic & Financial Factors

		2008	2009	2010	2011	2012	2013	2014
1	General Cost Inflation	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%
2	Construction Cost Inflation	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
3	Labor Cost Inflation	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
4	Customer Growth	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
5	General Inflation plus Growth	5.21%	5.21%	5.21%	5.21%	5.21%	5.21%	5.21%
6	Connection Charge Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
8	No Escalation	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Fund Earnings (5-year average of the LWGSIP)	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%
	Local / State Excise Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
	State B&O Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%

Accounting Assumptions

	2008	2009	2010	2011	2012	2013	2014
FISCAL POLICY RESTRICTIONS							
Min. Op. Fund Balance Target (days of O&M expense)	30	30	30	30	30	30	30
Max. Op. Fund Balance (days of O&M expense)	30	30	30	30	30	30	30

Minimum Capital Fund Balance Target

Select Minimum Capital Fund Balance Target	1	**Defined as % of Plant**

1 - Defined as % of Plant

		2008	2009	2010	2011	2012	2013	2014
Plant-in-Service in 2007	$ 10,770,683							
Minimum Capital Fund Balance - % of plant assets		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
2 - Amount at Right ==>		$ -	$ -	$ -	$ -	$ -	$ -	$ -

RATE FUNDED SYSTEM REINVESTMENT

Select Reinvestment Funding Strategy	3	**User Input**

Amount of Annual Cash Funding from Rates

1 - Equal to Annual Depreciation Expense
2 - Equal to Annual Depreciation Expense less Annual Debt Principal Payments

	2008	2009	2010	2011	2012	2013	2014
3 - Equal to Amount at Right ==>	$ -	$ -	$ -	$ -	$ -	$ -	$ -

4 - Do Not Fund System Reinvestment

City of Camas
Storm Utility Rate Study
Assumptions

Capital Financing Assumptions

		2008	2009	2010	2011	2012	2013	2014
System Development Charges								
Select SDC Alternative	1	Current Charge is in use						
1 - User Input (Current Charge)	$ -							
2 - Calculated Charge	$ -							
Total Customer Equivalents		-	-	-	-	-	-	-
Connection Charge		$ -	$ -	$ -	$ -	$ -	$ -	$ -
REVENUE BONDS								
Term (years)		20	20	20	20	20	20	20
Interest Cost		5.00%	5.60%	5.60%	5.00%	5.00%	5.00%	5.00%
Issuance Cost		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Revenue Bond Coverage Requirement	1.25							
PWTF LOAN								
Term (years; 10 year minimum and no more than 20 years)		20	20	20	20	20	20	20
Interest Cost		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
OTHER LOANS & REVENUE-SUPPORTED GENERAL OBLIGATION BONDS [a]								
Term (years)		20	20	20	20	20	20	20
Interest Cost		4.00%	4.00%	4.00%	5.00%	5.00%	5.00%	5.00%
Issuance Cost		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

[a] Tax-supported general obligation bonds are assumed to be accounted for in the General Fund; terms and annual obligations of such bonds are not factors in this analysis.

City of Camas
Storm Utility Rate Study
Operating Revenue and Expenditure Forecast

Revenues		FORECAST BASIS	Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013	Projection 2014
Rate revenues									
Storm Drainage - O&M Fisher Basin	4	Customer Growth	$ 121,274	123,699	126,173	128,696	131,270	133,896	136,574
Storm Drainage Revenues - Capital	4	Customer Growth	79,846	81,443	83,072	84,733	86,428	88,156	89,920
Strom Drainage Revenues - O&M Non Fisher B	4	Customer Growth	316,022	322,343	328,790	335,365	342,073	348,914	355,892
Total Rate revenue			**$ 517,142**	**$ 527,485**	**$ 538,034**	**$ 548,795**	**$ 559,771**	**$ 570,966**	**$ 582,386**
Non-rate revenues [a]									
Miscellaneous	1	General Cost Inflation	-	-	-	-	-	-	-
Interest Income		Calculated	35,000	-	-	-	1,057	2,237	2,295
	1	General Cost Inflation	-	-	-	-	-	-	-
Total Non-rate revenues			**$ 35,000**	**$ - **	**$ - **	**$ - **	**$ 1,057**	**$ 2,237**	**$ 2,295**
TOTAL REVENUES			**$ 552,142**	**$ 527,485**	**$ 538,034**	**$ 548,795**	**$ 560,828**	**$ 573,203**	**$ 584,681**

City of Camas
Storm Utility Rate Study
Operating Revenue and Expenditure Forecast

			FORECAST BASIS	Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013	Projection 2014
Expenditures										
53	**Excise Tax State Tax**		*Excise and B&O Tax Rate*	$ 7,097	$ 7,097	$ 8,071	$ 8,382	$ 8,562	$ 8,748	$ 8,920
300	**Operations and Maintenance**									
11	Salaries and Wages	3	Labor Cost Inflation	$ 53,162	$ 69,240	$ 143,973	$ 148,292	$ 152,741	$ 157,323	$ 162,043
12	Overtime	3	Labor Cost Inflation	500	500	500	500	500	500	500
21	Personnel Benefits	3	Labor Cost Inflation	17,971	22,641	50,390	51,902	53,459	55,063	56,715
31	Office and Operating Supplies	1	General Cost Inflation	500	500	-	-	-	-	-
35	Small Tools and Minor Equipment	1	General Cost Inflation	4,000	4,000	4,000	4,000	4,000	4,000	4,000
41	Professional Services	3	Labor Cost Inflation	40,000	29,335					
45	Operating Rentals	1	General Cost Inflation	1,000	1,000	1,000	1,000	1,000	1,000	1,000
46	Insurance	3	Labor Cost Inflation	3,396	3,396	3,498	3,603	3,711	3,822	3,937
48	Repairs and Maintenance	1	General Cost Inflation	65,000	62,750					
	TV and cleaning program	1	General Cost Inflation	-	-	30,000	30,000	30,000	30,000	30,000
	ditch cleaning	1	General Cost Inflation	-	-	15,000	15,000	15,000	15,000	15,000
	pond cleaning	1	General Cost Inflation	-	-	10,000	10,000	10,000	10,000	10,000
	miscellaneous repairs	1	General Cost Inflation	-	-	20,000	20,000	20,000	20,000	20,000
	stencil program	1	General Cost Inflation	-	-	5,000	5,000	5,000	5,000	5,000
49	Miscellaneous	1	General Cost Inflation	6,200	6,200	6,200	6,200	6,200	6,200	6,200
51	Intergovernmental services	1	General Cost Inflation	6,000	6,000	6,000	6,000	6,000	6,000	6,000
95	Interfund Operating Rentals and Leases	1	General Cost Inflation	25,333	58,847	60,612	62,431	64,304	66,233	68,220
91	Intfund Profess Serv	1	General Cost Inflation	99,664	209,352	215,632	222,100	228,763	235,626	242,695
	Total Operations and Maintenance			**$ 322,726**	**$ 473,761**	**$ 571,805**	**$ 586,028**	**$ 600,678**	**$ 615,767**	**$ 631,309**

City of Camas
Storm Utility Rate Study
Operating Revenue and Expenditure Forecast

				Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013	Projection 2014
315	**Street Cleaning**									
11	Salaries and Wages	3	Labor Cost Inflation	$ 49,073	$ 50,058	$ 50,787	$ 52,311	$ 53,880	$ 55,497	$ 57,161
21	Personnel Benefits	3	Labor Cost Inflation	16,548	20,023	16,995	17,505	18,030	18,571	19,128
31	Supplies	5	General Inflation plus Growth	100	100	100	100	100	100	100
48	Other Services and Charges (cath basin cleanir	1	General Cost Inflation	6,700	6,700	6,700	6,700	6,700	6,700	6,700
95	Interfund Payments for Services	5	General Inflation plus Growth	60,000	61,950	63,809	65,723	67,694	69,725	71,817
	Total Street Cleaning			**$ 132,421**	**$ 138,831**	**$ 138,391**	**$ 142,338**	**$ 146,405**	**$ 150,593**	**$ 154,907**
318	**Administration**									
11	Salaries and Wages	3	Labor Cost Inflation	$ 22,208	$ 28,471	$ 44,572	$ 45,909	$ 47,287	$ 48,705	$ 50,166
21	Personnel Benefits	3	Labor Cost Inflation	7,995	10,842	15,600	16,068	16,550	17,047	17,558
41	Other Services and Charges (rate study and lic	3	Labor Cost Inflation	20,000	5,000	-	-	-	-	-
	Education program	1	General Cost Inflation	-	-	10,000	10,000	10,000	10,000	10,000
	code rewrite	1	General Cost Inflation	-	-	-	-	-	-	-
	mapping consultant	1	General Cost Inflation	-	-	20,000				
	Inspection and maintenance procedure	1	General Cost Inflation	-	-	-	-	-	-	-
	rate study	1	General Cost Inflation	-	-	-	-	-	-	20,000
49	Miscellaneous	1	General Cost Inflation	-	2,500					
49	Training	1	General Cost Inflation	-	-	5,000	5,000	5,000	5,000	5,000
95	Interfund Oper. Rentals & Leases	1	General Cost Inflation	-	43,844	33,164	34,159	35,184	36,239	37,326
	Total Administration			**$ 50,203**	**$ 90,657**	**$ 128,337**	**$ 111,137**	**$ 114,021**	**$ 116,991**	**$ 140,051**
	Add'l O&M from CIP		*From CIP*	-	-	-	-	-	-	-
	Total Cash O&M Expenditures			**$ 512,447**	**$ 710,346**	**$ 846,603**	**$ 847,885**	**$ 869,666**	**$ 892,099**	**$ 935,187**
Depreciation Expense in		2006								
	Depreciation Expense [b]		*Last year's plus annual additions from CIP*	$ 6,300	$ 7,784	$ 11,941	$ 19,921	$ 45,634	$ 57,544	$ 67,899
	TOTAL EXPENSES			**$ 518,747**	**$ 718,130**	**$ 858,544**	**$ 867,806**	**$ 915,299**	**$ 949,643**	**$ 1,003,086**

City of Camas
Storm Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation: % Upgrade / Expansion	For CFC Calculation: % R&R	Specific Funding Source (1-Enterprise Fund, 2-Grants & Developer Donations)		Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
1	**Fisher Basin CIP**							Select Source	$ -	$ -	$ -
2	Professional Services	50,000	2008	50	100%	0%	1	Enterprise Fund	50,000	-	50,000
3	Wetland Mitigation Enhancement	35,000	2009	50	50%	50%	1	Enterprise Fund	17,500	17,500	37,100
4	"	35,000	2010	50	50%	50%	1	Enterprise Fund	17,500	17,500	39,326
5	"	35,000	2011	50	50%	50%	1	Enterprise Fund	17,500	17,500	41,686
6	"	35,000	2012	50	50%	50%	1	Enterprise Fund	17,500	17,500	44,187
7	"	35,000	2013	50	50%	50%	1	Enterprise Fund	17,500	17,500	46,838
8	"	35,000	2014	50	50%	50%	1	Enterprise Fund	17,500	17,500	49,648
9	Develop Capital Plan	50,000	2012	6	50%	50%	1	Enterprise Fund	25,000	25,000	63,124
10	Other Improvements	170,000	2008	50	50%	50%	1	Enterprise Fund	85,000	85,000	170,000
11	1/2 decant facility with Washougal	5,000	2009	50	50%	50%	1	Enterprise Fund	2,500	2,500	5,300
12	misc. drainage improvements	25,000	2009	50	50%	50%	1	Enterprise Fund	12,500	12,500	26,500
13	"	50,000	2010	50	50%	50%	1	Enterprise Fund	25,000	25,000	56,180
14	"	50,000	2011	50	50%	50%	1	Enterprise Fund	25,000	25,000	59,551
15	"	50,000	2012	50	50%	50%	1	Enterprise Fund	25,000	25,000	63,124
16	"	50,000	2013	50	50%	50%	1	Enterprise Fund	25,000	25,000	66,911
17	"	50,000	2014	50	50%	50%	1	Enterprise Fund	25,000	25,000	70,926
18	payments for major road improvements in grass valley	150,000	2011	50	50%	50%	1	Enterprise Fund	75,000	75,000	178,652
19	"	200,000	2013	50	50%	50%	1	Enterprise Fund	100,000	100,000	267,645
20					100%	0%	1	Enterprise Fund	-	-	-
21	**Non-Fisher Basin CIP**				100%	0%	1	Enterprise Fund	-	-	-
22	develop capital plan	50,000	2012	6	100%	0%	1	Enterprise Fund	50,000	-	63,124
23	Other Improvements	75,000	2008	50	50%	50%	1	Enterprise Fund	37,500	37,500	75,000
24	1/2 Decant facility with Washougal	5,000	2009	50	50%	50%	1	Enterprise Fund	2,500	2,500	5,300
25	capital reserve building for next permit cycle & payment	-	2009	50	50%	50%	1	Enterprise Fund	-	-	-
26	"	50,000	2010	50	50%	50%	1	Enterprise Fund	25,000	25,000	56,180
27	"	50,000	2011	50	50%	50%	1	Enterprise Fund	25,000	25,000	59,551
28	"	50,000	2012	50	50%	50%	1	Enterprise Fund	25,000	25,000	63,124

City of Camas
Storm Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation: % Upgrade / Expansion	For CFC Calculation: % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations	Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
29	"	50,000	2013	50	50%	50%	1 Enterprise Fund	25,000	25,000	66,911
30	"	50,000	2014	50	50%	50%	1 Enterprise Fund	25,000	25,000	70,926
31	Construction Projects	20,000	2008	50	50%	50%	1 Enterprise Fund	10,000	10,000	20,000
32	pipe replacement/rehab	-	2009	50	50%	50%	1 Enterprise Fund	-	-	-
33	"	50,000	2010	50	50%	50%	1 Enterprise Fund	25,000	25,000	56,180
34	"	50,000	2011	50	50%	50%	1 Enterprise Fund	25,000	25,000	59,551
35	"	50,000	2012	50	50%	50%	1 Enterprise Fund	25,000	25,000	63,124
36	"	110,000	2013	50	50%	50%	1 Enterprise Fund	55,000	55,000	147,205
37	"	115,000	2014	50	50%	50%	1 Enterprise Fund	57,500	57,500	163,130
	Total Capital Projects	**$ 1,885,000**			**53%**	**47%**		**$ 992,500**	**$ 892,500**	**$ 2,306,002**
	Total Upgrade/Expansion Projects									1,209,563
	Total R&R Projects									1,096,439
	Projects by Grants / Developer Donations							-	-	-
	Projects by Enterprise Fund							992,500	892,500	2,306,002

Year	2008 $	Inflated
2008	315,000	315,000
2009	70,000	74,200
2010	185,000	207,866
2011	335,000	398,990
2012	285,000	359,806
2013	445,000	595,510
2014	135,000	354,630
2015	-	-
Total	**1,770,000**	**2,306,002**

City of Camas
Storm Utility Rate Study
Capital Funding Analysis

Summary of Expenditures	2008	2009	2010	2011	2012	2013	2014	2008 - 2015 TOTAL
CAPITAL PROJECTS								
Improvement Upgrades & Expansions	$ 182,500	$ 37,100	$ 103,933	$ 199,495	$ 211,465	$ 297,755	$ 177,315	$ 1,209,563
Repairs and Replacements	132,500	37,100	103,933	199,495	148,341	297,755	177,315	1,096,439
TOTAL CAPITAL EXPENDITURES	**$ 315,000**	**$ 74,200**	**$ 207,866**	**$ 398,990**	**$ 359,806**	**$ 595,510**	**$ 354,630**	**$ 2,306,002**

Capital Financing Plan	2008	2009	2010	2011	2012	2013	2014	TOTAL
Existing Revenue Bond and PWTF Proceeds	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
Project Specific Grants / Developer Donations	75,000	-	-	-	-	-	-	75,000
Project to be Funded	240,000	74,200	207,866	398,990	359,806	595,510	354,630	2,231,002
OTHER FUNDING SOURCES [NOTE A]								
Other Outside Sources								$ -
PWTF Loan Proceeds								-
Other Loan Proceeds								-
Connection Charges	-	-	-	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-	-	-	-
Capital Fund Balance Deficiency	(240,000)	(74,200)	(207,866)	(398,990)	(359,806)	(595,510)	(354,630)	(2,231,002)
Capital Fund Balance	184,000	43,900	95,506	279,889	350,744	529,307	354,630	1,837,975
Capital Fund Balance Deficiency	(56,000)	(30,300)	(112,360)	(119,102)	(9,062)	(66,204)	-	(393,027)
Revenue Bond Proceeds [Note B]	-	-	-	-	-	-	-	-
Rates	56,000	30,300	112,360	119,102	189,372	347,550	354,630	
Total								

City of Camas
Storm Utility Rate Study
Revenue Requirements Analysis

Cash Flow Sufficiency Test	2008	2009	2010	2011	2012	2013	2014
EXPENSES							
Cash Operating Expenses	$ 512,447	$ 710,346	$ 846,603	$ 847,885	$ 869,666	$ 892,099	$ 935,187
Existing Debt Service	-	-	-	-	-	-	-
New Debt Service	-	-	-	-	-	-	-
Rate-Funded CIP	56,000	30,300	112,360	119,102	189,372	347,550	354,630
Rate Funded System Reinvestment	-	-	-	-	-	-	-
Additions Required to Meet Minimum Op. Fund Balance	-	-	-	-	-	-	-
Total Expenses	$ 568,447	$ 740,646	$ 958,963	$ 966,987	$ 1,059,038	$ 1,239,649	$ 1,289,817
REVENUES							
Rate Revenue	$ 517,142	$ 527,485	$ 538,034	$ 548,795	$ 559,771	$ 570,966	$ 582,386
Other Revenue	-	-	-	-	-	-	-
Operating Fund & Debt Reserve Fund Interest Earnings	35,000	-	-	-	1,057	2,237	2,295
Total Revenue	$ 552,142	$ 527,485	$ 538,034	$ 548,795	$ 560,828	$ 573,203	$ 584,681
NET CASH FLOW (DEFICIENCY)	**$ (16,305)**	**$ (213,161)**	**$ (420,928)**	**$ (418,192)**	**$ (498,209)**	**$ (666,446)**	**$ (705,137)**

Coverage Sufficiency Test	2008	2009	2010	2011	2012	2013	2014
EXPENSES							
Cash Operating Expenses	$ 512,447	$ 710,346	$ 846,603	$ 847,885	$ 869,666	$ 892,099	$ 935,187
Revenue Bond Debt Service	-	-	-	-	-	-	-
Revenue Bond Coverage Requirement at 1.25	-	-	-	-	-	-	-
Total Expenses	$ 512,447	$ 710,346	$ 846,603	$ 847,885	$ 869,666	$ 892,099	$ 935,187
ALLOWABLE REVENUES							
Rate Revenue	$ 517,142	$ 527,485	$ 538,034	$ 548,795	$ 559,771	$ 570,966	$ 582,386
Other Revenue	-	-	-	-	-	-	-
Interest Earnings - All Funds	35,000	-	-	-	1,057	7,880	11,277
Total Revenue	$ 552,142	$ 527,485	$ 538,034	$ 548,795	$ 560,828	$ 578,847	$ 593,662
Coverage Realized	n/a	n/a	n/a	n/a	n/a	n/a	n/a
COVERAGE SURPLUS (DEFICIENCY)	**$ 39,695**	**$ (182,861)**	**$ (308,568)**	**$ (299,090)**	**$ (308,837)**	**$ (313,253)**	**$ (341,525)**

City of Camas
Storm Utility Rate Study
Revenue Requirements Analysis

Maximum Revenue Deficiency	2008	2009	2010	2011	2012	2013	2014
Sufficiency Test Driving the Deficiency	*Cash*	*Cash*	*Cash*	*Cash*	*Cash*	*Cash*	*Cash*
Maximum Deficiency From Tests	$ 16,305	$ 213,161	$ 420,928	$ 418,192	$ 498,209	$ 666,446	$ 705,137
less: Net Revenue From Prior Rate Increases	-	-	(291,480)	(464,884)	(679,293)	(730,538)	(784,712)
Revenue Deficiency	$ 16,305	$ 213,161	$ 129,448	$ -	$ -	$ -	$ -
Plus: Adjustment for State Excise Tax	248	3,246	1,971	-	-	-	-
Total Revenue Deficiency	**$ 16,553**	**$ 216,407**	**$ 131,420**	**$ -**	**$ -**	**$ -**	**$ -**

Rate Increases	2008	2009	2010	2011	2012	2013	2014
Rate Revenue with no Increase	$ 517,142	$ 527,485	$ 538,034	$ 548,795	$ 559,771	$ 570,966	$ 582,386
Revenues from Prior Rate Increases	-	-	295,919	471,964	689,638	741,663	796,662
Rate Revenue Before Rate Increase (Incl. previous increases)	517,142	527,485	833,953	1,020,759	1,249,409	1,312,629	1,379,048
Required Annual Rate Increase	3.20%	41.03%	15.76%	0.00%	0.00%	0.00%	0.00%
Number of Months New Rates Will Be In Effect	12	9	12	12	12	12	12
Info: Percentage Increase to Generate Required Revenue	*3.20%*	*54.70%*	*15.76%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*
Policy Induced Rate Increases	0.00%	55.00%	20.00%	20.00%	3.00%	3.00%	3.00%
ANNUAL RATE INCREASE	**0.00%**	**55.00%**	**20.00%**	**20.00%**	**3.00%**	**3.00%**	**3.00%**
CUMULATIVE RATE INCREASE	**0.00%**	**55.00%**	**86.00%**	**123.20%**	**129.90%**	**136.79%**	**143.90%**

Impacts of Rate Increases	2008	2009	2010	2011	2012	2013	2014
Rate Revenues After Rate Increase	$ 517,142	$ 745,072	$ 1,000,744	$ 1,224,911	$ 1,286,891	$ 1,352,008	$ 1,420,419
Full Year Rate Revenues After Rate Increase	*517,142*	*817,601*	*1,000,744*	*1,224,911*	*1,286,891*	*1,352,008*	*1,420,419*
Additional State Taxes Due to Rate Increases	-	3,264	6,941	10,142	10,907	11,716	12,571
Net Cash Flow After Rate Increase	(16,305)	1,162	34,841	247,782	218,004	102,880	120,327
Coverage After Rate Increase	n/a	n/a	n/a	n/a	n/a	n/a	n/a

City of Camas
Storm Utility Rate Study
Fund Activity

Funds	2008	2009	2010	2011	2012	2013	2014
OPERATING FUND							
Beginning Balance	$ (58,653)	$ (250,000)	$ (248,838)	$ (213,997)	$ 33,785	$ 71,479	$ 73,323
plus: Net Cash Flow after Rate Increase	(16,305)	1,162	34,841	247,782	218,004	102,880	120,327
less: Transfer of Surplus to Capital Fund	-	-	-	-	(180,309)	(101,036)	(116,785)
Ending Balance	$ (74,958)	$ (248,838)	$ (213,997)	$ 33,785	$ 71,479	$ 73,323	$ 76,865
Minimum Target Balance	*42,119*	*58,385*	*69,584*	*69,689*	*71,479*	*73,323*	*76,865*
Maximum Funds to be Kept as Operating Reserves	*42,119*	*58,385*	*69,584*	*69,689*	*71,479*	*73,323*	*76,865*
Info: No of Days of Cash Operating Expenses	*(53)*	*(128)*	*(92)*	*15*	*30*	*30*	*30*
CAPITAL FUND							
Beginning Balance	$ (36,000)	$ (25,000)	$ -	$ -	$ 0	$ 180,310	$ 286,990
plus: Rate Funded System Reinvestment	-	-	-	-	-	-	-
plus: Grants / Developer Donations / Other Outside Sources	75,000	-	-	-	-	-	-
plus: Existing Revenue Bond and PWTF and Proceeds	-	-	-	-	-	-	-
plus: System Development Charges	-	-	-	-	-	-	-
plus: Net Debt Proceeds Available for Projects	-	-	-	-	-	-	-
plus: Transfers from FB Capital Fund for FB Projects	220,000	68,900	95,506	279,889	170,434	247,961	-
plus: Interest Earnings	-	-	-	-	0	5,643	8,982
plus: Transfer of Surplus from Operating Fund	-	-	-	-	180,309	101,036	116,785
plus: Direct Rate Funding	56,000	30,300	112,360	119,102	189,372	347,550	354,630
Total Capital Funding Sources	**315,000**	**74,200**	**207,866**	**398,991**	**540,116**	**882,500**	**767,386**
less: Capital Expenditures	(315,000)	(74,200)	(207,866)	(398,990)	(359,806)	(595,510)	(354,630)
Ending Balance	**$ -**	**$ -**	**$ -**	**$ 0**	**$ 180,310**	**$ 286,990**	**$ 412,757**
Minimum Target Balance	$ 221,714	$ 223,198	$ 227,355	$ 235,335	$ 242,531	$ 254,441	$ 261,534
DEBT RESERVE		(5,300)	(112,360)	(119,102)	(189,372)	(347,550)	(354,630)
Beginning Balance	$ -	$ -	$ -	$ -	$ -	$ -	$ -
plus: Reserve Funding from New Debt	-	-	-	-	-	-	-
less: Use of Reserves for Debt Service	-	-	-	-	-	-	-
Ending Balance	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Minimum Target Balance	-	-	-	-	-	-	-

City of Camas
Storm Utility Rate Study
Fund Activity

Funds	2008	2009	2010	2011	2012	2013	2014
FISHER BASIN PROJECTS							
Beginning Balance	$ 853,937	$ 775,000	$ 730,355	$ 657,706	$ 398,402	$ 240,436	$ -
plus: Interest Earnings	26,725	24,255	22,858	20,584	12,469	7,525	-
less: Transfer to Non-Fisher Basin Capital Fund for FB Capital	(220,000)	(68,900)	(95,506)	(279,889)	(170,434)	(247,961)	-
Ending Balance	**$ 660,662**	**$ 730,355**	**$ 657,706**	**$ 398,402**	**$ 240,436**	$ -	$ -
Fisher Basin Projects	**220,000**	**68,900**	**95,506**	**279,889**	**170,434**	**381,394**	**120,574**
Cumulative Ending Fund Balance	**$ 585,704**	**$ 481,517**	**$ 443,709**	**$ 432,187**	**$ 492,225**	**$ 360,313**	**$ 489,621**

SANITATION SYSTEM

City of Camas
Sanitation Utility Rate Study
Summary

Revenue Requirements	2008	2009	2010	2011	2012	2013
Revenues						
Rate Revenues Under Existing Rates	$ 1,815,000	$ 1,851,300	$ 1,888,326	$ 1,926,093	$ 2,014,174	$ 2,054,457
Non-Rate Revenues	55,500	35,401	26,492	27,390	28,402	29,301
Total Revenues	**$ 1,870,500**	**$ 1,886,701**	**$ 1,914,818**	**$ 1,953,483**	**$ 2,042,576**	**$ 2,083,758**
Expenses						
Cash Operating Expenses						
Disposal	$ 560,000	$ 565,020	$ 595,219	$ 643,205	$ 677,621	$ 713,836
Recycling	260,000	314,647	345,329	372,799	389,727	407,583
Collection	717,698	701,461	721,536	757,213	763,510	785,447
Customer Accounts / A&G / Taxes	285,561	238,217	239,574	246,268	253,902	261,006
Existing Debt Service	-	-	-	-	-	-
New Debt Service	-	-	-	-	-	-
Total Expenses	**$ 1,823,259**	**$ 1,819,345**	**$ 1,901,657**	**$ 2,019,486**	**$ 2,084,760**	**$ 2,167,872**
Net Surplus (Deficiency)	**$ 47,241**	**$ 67,356**	**$ 13,160**	**$ (66,003)**	**$ (42,185)**	**$ (84,114**
% of Rate Revenue	0.00%	0.00%	0.00%	3.43%	2.09%	4.09%
Annual Rate Adjustment	**0.00%**	**0.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**
Rate Revenues After Rate Increase	$ 1,815,000	$ 1,851,300	$ 1,926,093	$ 2,003,907	$ 2,135,415	$ 2,221,686
Additional Taxes from Rate Increase	$ -	$ -	$ 566	$ 1,167	$ 1,819	$ 2,508
Net Cash Flow After Rate Increase	**47,241**	**67,356**	**50,360**	**10,644**	**77,238**	**80,606**
Coverage After Rate Increases	n/a	n/a	n/a	n/a	n/a	n/a
Sample Monthly Bill (35 gallon can weekly)	$ 14.12	$ 14.12	$ 14.40	$ 14.69	$ 14.98	$ 15.28
Monthly Increase	$ -	$ -	$ 0.28	$ 0.29	$ 0.29	$ 0.30

Notes:

Starting 2012 Rate Revenue includes additional revenue from Lacams Heights

No revenue from NUGAE growth is assumed in the study period

City of Camas
Sanitation Utility Rate Study
Summary

Fund Balance	2008	2009	2010	2011	2012	2013
Operating:						
Beginning Balance	**$ 618,000**	**$ 455,500**	**$ 149,535**	**$ 156,301**	**$ 165,985**	**$ 171,350**
Net Cash Flow after Rate Increase	47,241	67,356	50,360	10,644	77,238	80,606
Transfer of Surplus to Capital Fund	(515,384)	(373,321)	(43,595)	(960)	(71,873)	(73,775)
Ending Balance	$ 149,857	$ 149,535	$ 156,301	$ 165,985	$ 171,350	$ 178,181
	$ 149,857	*$ 149,535*	*$ 156,301*	*$ 165,985*	*$ 171,350*	*$ 178,181*
30 Day Target	30	30	30	30	30	30
Capital						
Beginning Balance	**$ 55,000**	**$ 344,500**	**$ 384,103**	**$ 439,719**	**$ 454,440**	**$ 540,536**
plus: Interest Earnings	1,721	10,782	12,021	13,762	14,222	16,917
plus: Transfer of Surplus from Operating Fund	515,384	373,321	43,595	960	71,873	73,775
less: Capital Expenditures	(55,000)	(344,500)	-	-	-	-
Ending Balance	**$ 517,105**	**$ 384,103**	**$ 439,719**	**$ 454,440**	**$ 540,536**	**$ 631,228**

City of Camas
Sanitation Utility Rate Study
Assumptions

Economic & Financial Factors

		2008	2009	2010	2011	2012	2013	2014
1	General Cost Inflation	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%
2	Construction Cost Inflation	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
3	Labor Cost Inflation	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
4	Customer Growth*	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
5	General Inflation plus Growth	5.21%	5.21%	5.21%	5.21%	5.21%	5.21%	5.21%
6	Connection Charge Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
8	No Escalation	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Fund Earnings (5-year average of the LWGSIP)	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%
	State B&O Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%

Accounting Assumptions

	2008	2009	2010	2011	2012	2013	2014
FISCAL POLICY RESTRICTIONS							
Min. Op. Fund Balance Target (days of O&M expense)	30	30	30	30	30	30	30
Max. Op. Fund Balance (days of O&M expense)	30	30	30	30	30	30	30

Minimum Capital Fund Balance Target

Select Minimum Capital Fund Balance Target	1	**Defined as % of Plant**

1 - Defined as % of Plant

Plant-in-Service in 2007 $ -

	2008	2009	2010	2011	2012	2013	2014
Minimum Capital Fund Balance - % of plant assets	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
2 - Amount at Right ==>	$ -	$ -	$ -	$ -	$ -	$ -	$ -

RATE FUNDED SYSTEM REINVESTMENT

Select Reinvestment Funding Strategy	3	**User Input**

Amount of Annual Cash Funding from Rates

1 - Equal to Annual Depreciation Expense
2 - Equal to Annual Depreciation Expense less Annual Debt Principal Payments
3 - Equal to Amount at Right ==> $ - $ - $ - $ - $ - $ - $ -
4 - Do Not Fund System Reinvestment

City of Camas
Sanitation Utility Rate Study
Assumptions

Capital Financing Assumptions		2008	2009	2010	2011	2012	2013	2014
REVENUE BONDS								
Term (years)		20	20	20	20	20	20	20
Interest Cost		5.00%	5.60%	5.60%	5.00%	5.00%	5.00%	5.00%
Issuance Cost		2.00%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Revenue Bond Coverage Requirement	1.25							
PWTF LOAN								
Term (years; 10 year minimum and no more than 20 years)		20	20	20	20	20	20	20
Interest Cost		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
OTHER LOANS & REVENUE-SUPPORTED GENERAL OBLIGATION BONDS [a]								
Term (years)		20	20	20	20	20	20	20
Interest Cost		4.00%	4.00%	4.00%	5.00%	5.00%	5.00%	5.00%
Issuance Cost		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

[a] Tax-supported general obligation bonds are assumed to be accounted for in the General Fund; terms and annual obligations of such bonds are not factors in this analysis.

City of Camas
Sanitation Utility Rate Study
Operating Revenue and Expenditure Forecast

Revenues		FORECAST BASIS	Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013	Projection 201
Rate revenues									
Residential Revenue	4	Customer Growth*	$ 1,170,000	1,193,400	1,217,268	1,241,613	1,309,578	1,335,769	1,362,485
Commercial Revenue	4	Customer Growth*	360,000	367,200	374,544	382,035	396,103	404,025	412,106
Public Authority / City Revenue	4	Customer Growth*	20,000	20,400	20,808	21,224	21,649	22,082	22,523
Multifamily Dwelling Revenue	4	Customer Growth*	45,000	45,900	46,818	47,754	48,709	49,684	50,677
Residential Rev - Recycling	4	Customer Growth*	220,000	224,400	228,888	233,466	238,135	242,898	247,756
Total Rate revenue			**$ 1,815,000**	**$ 1,851,300**	**$ 1,888,326**	**$ 1,926,093**	**$ 2,014,174**	**$ 2,054,457**	**$ 2,095,546**
Non-rate revenues [a]									
Other Rents & Use Charges	1	General Cost Inflation	15,000	15,472	15,960	16,462	16,981	17,516	18,067
Interest Income		Calculated	35,000	14,256	4,680	4,892	5,195	5,363	5,576
Rents Containers	1	General Cost Inflation	5,500	5,673	5,852	6,036	6,226	6,422	6,625
Total Non-rate revenues			**$ 55,500**	**$ 35,401**	**$ 26,492**	**$ 27,390**	**$ 28,402**	**$ 29,301**	**$ 30,268**
TOTAL REVENUES			**$ 1,870,500**	**$ 1,886,701**	**$ 1,914,818**	**$ 1,953,483**	**$ 2,042,576**	**$ 2,083,758**	**$ 2,125,815**

City of Camas
Sanitation Utility Rate Study
Operating Revenue and Expenditure Forecast

			FORECAST BASIS	Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013	Projection 201
Expenditures										
53	**Excise Tax State Tax**		*Excise and B&O Tax Rate*	$ 81,000	$ 28,301	$ 28,722	$ 29,302	$ 30,639	$ 31,256	$ 31,887
500	**Disposal**		Rate	$ 76.77	$ 79.29	$ 81.89	$ 84.57	$ 87.35	$ 90.21	$ 93.17
47	C-1 1/2	1	General Cost Inflation		$ 27,255	$ 28,712	$ 30,244	$ 31,863	$ 33,565	$ 35,361
	C-2yd	1	General Cost Inflation		106,352	112,036	120,806	127,270	134,072	141,243
	temp 2yd	1	General Cost Inflation		8,330	8,775	9,244	9,738	10,259	10,808
	35 gal	1	General Cost Inflation		251,208	264,634	286,730	302,072	318,217	335,236
	35 eow*	1	General Cost Inflation		12,352	13,012	14,099	14,853	15,647	16,484
	65 gal	1	General Cost Inflation		138,121	145,503	157,653	166,088	174,965	184,323
	95 gal	1	General Cost Inflation		21,402	22,546	24,428	25,735	27,111	28,561
	Total Disposal			**$ 560,000**	**$ 565,020**	**$ 595,219**	**$ 643,205**	**$ 677,621**	**$ 713,836**	**$ 752,016**

City of Camas
Sanitation Utility Rate Study
Operating Revenue and Expenditure Forecast

				Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013	Projection 201
600	**Recycling**									
31	Office and Operating Supplies	1	General Cost Inflation	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000
35	Small Tools and Minor Equipment	1	General Cost Inflation	25,000	25,000	25,000	25,000	25,000	25,000	25,000
	recycle containers 5% repacement/new = $160	1	General Cost Inflation	-	-	16,000	16,000	16,000	16,000	16,000
41	Professional Services	1	General Cost Inflation	220,000	274,647	289,329	316,799	333,727	351,583	370,382
	Total Recycling			**$ 260,000**	**$ 314,647**	**$ 345,329**	**$ 372,799**	**$ 389,727**	**$ 407,583**	**$ 426,382**
700	**Customer Accounts**									
31	Office and Operating Supplies	1	General Cost Inflation	$ 2,000	$ 2,060	$ 2,122	$ 2,185	$ 2,251	$ 2,319	$ 2,388
41	Professional Services	1	General Cost Inflation	10,000	12,000	12,360	12,731	13,113	13,506	13,911
42	Communication	1	General Cost Inflation	500	500	500	500	500	500	500
91	Interfund Professional Services	1	General Cost Inflation	141,568	145,815	150,189	154,695	159,336	164,116	169,040
	Total Customer Accounts			**$ 154,068**	**$ 160,375**	**$ 165,171**	**$ 170,111**	**$ 175,200**	**$ 180,441**	**$ 185,839**
800	**Administration and General Expenses**									
11	Regular Salaries and Wages	3	Labor Cost Inflation	$ 10,021	$ 10,322	$ 10,631	$ 10,950	$ 11,279	$ 11,617	$ 11,966
21	Personnel Benefits	3	Labor Cost Inflation	3,006	3,096	3,189	3,285	3,383	3,485	3,589
22	Uniforms and Clothing	1	General Cost Inflation	750	750	750	750	750	750	750
31	Office and Operating Supplies	1	General Cost Inflation	1,500	1,500	1,500	1,500	1,500	1,500	1,500
41	Professional Services	1	General Cost Inflation	5,000						
	1. Rate study	1	General Cost Inflation							15,000
	2. recycle contract review	1	General Cost Inflation		5,000					
42	Communication	1	General Cost Inflation	2,500	2,500	2,500	2,500	2,500	2,500	2,500
46	Insurance	1	General Cost Inflation	5,942	4,000	4,120	4,244	4,371	4,502	4,637
48	Repairs and Maintenanvce	1	General Cost Inflation	300	300	300	300	300	300	300
49	Miscellaneous	1	General Cost Inflation	1,500	1,500	1,500	1,500	1,500	1,500	1,500
91	Interfund Professional Services	1	General Cost Inflation	19,974	20,573	21,190	21,826	22,481	23,155	23,850
	Total Administration and General Expenses			**$ 50,493**	**$ 49,541**	**$ 45,681**	**$ 46,855**	**$ 48,064**	**$ 49,309**	**$ 65,592**

City of Camas
Sanitation Utility Rate Study
Operating Revenue and Expenditure Forecast

				Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013	Projection 201
900	**Collection**									
11	Regular Salaries and Wages	3	Labor Cost Inflation	$ 223,356	$ 230,057	$ 236,958	$ 244,067	$ 251,389	$ 258,931	$ 266,699
12	Overtime	3	Labor Cost Inflation	30,000	15,000	15,450	15,914	16,391	16,883	17,389
21	Personnel Benefits	1	General Cost Inflation	92,043	94,804	97,648	100,578	103,595	106,703	109,904
31	Office and Operating Supplies	1	General Cost Inflation	47,000	30,000	30,000	45,000	30,000	30,000	30,000
35	Small Tools and Minor Equipment	1	General Cost Inflation	3,000	500	500	500	500	500	500
42	Communication	1	General Cost Inflation	500	500	500	500	500	500	500
48	Repairs and Maintenance	1	General Cost Inflation	1,000	1,000	1,000	1,000	1,000	1,000	1,000
49	Miscellaneous	1	General Cost Inflation	300	300	300	300	300	300	300
95	Interfund Operating Rentals & Leases	1	General Cost Inflation	320,499	329,300	339,179	349,354	359,835	370,630	381,749
	Total Collection			**$ 717,698**	**$ 701,461**	**$ 721,536**	**$ 757,213**	**$ 763,510**	**$ 785,447**	**$ 808,041**
	Add'l O&M from CIP		*From CIP*	-	-	-	-	-	-	-
	Total Cash O&M Expenditures			**$ 1,823,259**	**$ 1,819,345**	**$ 1,901,657**	**$ 2,019,486**	**$ 2,084,760**	**$ 2,167,872**	**$ 2,269,757**
Depreciation Expense in		2006								
	Depreciation Expense [b]		*Last year's plus annual additions from CIP*	$ 1,100	$ 34,450	$ -	$ -	$ -	$ -	$ -
	TOTAL EXPENSES			**$ 1,824,359**	**$ 1,853,795**	**$ 1,901,657**	**$ 2,019,486**	**$ 2,084,760**	**$ 2,167,872**	**$ 2,269,757**

City of Camas
Sanitation Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Annual O&M Impact	Life in Years	For CFC Calculation: % Upgrade / Expansion	For CFC Calculation: % R&R	Specific Funding Source (1-Enterprise Fund, 2-Grants & Developer Donations)		Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
1						50%	50%	1	Enterprise Fund	$ -	$ -	$ -
2	Machiney & Equipment (6500 containers)	325,000	2009		10	0%	100%	1	Enterprise Fund	-	325,000	344,500
3	Other Financing Uses	55,000	2008		50	50%	50%	1	Enterprise Fund	27,500	27,500	55,000
4					50	50%	50%	1	Enterprise Fund	-	-	-
5					50	50%	50%	1	Enterprise Fund	-	-	-
	Total Capital Projects	**$ 380,000**		**$ -**		**7%**	**93%**			**$ 27,500**	**$ 352,500**	**$ 399,500**
	Total Upgrade/Expansion Projects											27,500
	Total R&R Projects											372,000
	Projects by Grants / Developer Donations			-						-	-	-
	Projects by Enterprise Fund			-						27,500	352,500	399,500

Year	2008 $	Inflated
2008	55,000	55,000
2009	325,000	344,500
2010	-	-
2011	-	-
2012	-	-
2013	-	-
2014	-	-
2015	-	-
Total	**380,000**	**399,500**

City of Camas
Sanitation Utility Rate Study
Capital Funding Analysis

Summary of Expenditures	2008	2009	2010	2011	2012	2013	2014	2008 - 2015 TOTAL
CAPITAL PROJECTS								
Improvement Upgrades & Expansions	$ 27,500	$ -	$ -	$ -	$ -	$ -	$ -	$ 27,500
Repairs and Replacements	27,500	344,500	-	-	-	-	-	372,000
TOTAL CAPITAL EXPENDITURES	**$ 55,000**	**$ 344,500**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 399,500**

Capital Financing Plan	2008	2009	2010	2011	2012	2013	2014	TOTAL
Existing Revenue Bond and PWTF Proceeds	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
Project Specific Grants / Developer Donations	-	-	-	-	-	-	-	-
Project to be Funded	55,000	344,500	-	-	-	-	-	399,500
OTHER FUNDING SOURCES [NOTE A]								
Other Outside Sources								$ -
PWTF Loan Proceeds								-
Other Loan Proceeds								-
Connection Charge	-	-	-	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-	-	-	-
Capital Fund Balance Deficiency	(55,000)	(344,500)	-	-	-	-	-	(399,500
Capital Fund Balance	55,000	344,500	-	-	-	-	-	399,500
Capital Fund Balance Deficiency	-	-	-	-	-	-	-	-
Revenue Bond Proceeds [Note B]	-	-	-	-	-	-	-	-
Rates	-	-	-	-	-	-	-	
Total								

City of Camas
Sanitation Utility Rate Study
Revenue Requirements Analysis

Cash Flow Sufficiency Test	2008	2009	2010	2011	2012	2013	2014
EXPENSES							
Cash Operating Expenses	$ 1,823,259	$ 1,819,345	$ 1,901,657	$ 2,019,486	$ 2,084,760	$ 2,167,872	$ 2,269,757
Existing Debt Service	-	-	-	-	-	-	-
New Debt Service	-	-	-	-	-	-	-
Rate-Funded CIP	-	-	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-	-	-
Additions Required to Meet Minimum Op. Fund Balance	-	-	-	-	-	-	-
Total Expenses	$ 1,823,259	$ 1,819,345	$ 1,901,657	$ 2,019,486	$ 2,084,760	$ 2,167,872	$ 2,269,757
REVENUES							
Rate Revenue	$ 1,815,000	$ 1,851,300	$ 1,888,326	$ 1,926,093	$ 2,014,174	$ 2,054,457	$ 2,095,546
Other Revenue	20,500	21,146	21,812	22,499	23,207	23,938	24,692
Operating Fund & Debt Reserve Fund Interest Earnings	35,000	14,256	4,680	4,892	5,195	5,363	5,576
Total Revenue	$ 1,870,500	$ 1,886,701	$ 1,914,818	$ 1,953,483	$ 2,042,576	$ 2,083,758	$ 2,125,815
NET CASH FLOW (DEFICIENCY)	**$ 47,241**	**$ 67,356**	**$ 13,160**	**$ (66,003)**	**$ (42,185)**	**$ (84,114)**	**$ (143,942)**

Coverage Sufficiency Test	2008	2009	2010	2011	2012	2013	2014
EXPENSES							
Cash Operating Expenses	$ 1,823,259	$ 1,819,345	$ 1,901,657	$ 2,019,486	$ 2,084,760	$ 2,167,872	$ 2,269,757
Revenue Bond Debt Service	-	-	-	-	-	-	-
Revenue Bond Coverage Requirement at 1.25	-	-	-	-	-	-	-
Total Expenses	$ 1,823,259	$ 1,819,345	$ 1,901,657	$ 2,019,486	$ 2,084,760	$ 2,167,872	$ 2,269,757
ALLOWABLE REVENUES							
Rate Revenue	$ 1,815,000	$ 1,851,300	$ 1,888,326	$ 1,926,093	$ 2,014,174	$ 2,054,457	$ 2,095,546
Other Revenue	20,500	21,146	21,812	22,499	23,207	23,938	24,692
Interest Earnings - All Funds	35,000	25,037	16,701	18,653	19,417	22,280	25,332
Total Revenue	$ 1,870,500	$ 1,897,483	$ 1,926,839	$ 1,967,244	$ 2,056,798	$ 2,100,675	$ 2,145,570
Coverage Realized	n/a	n/a	n/a	n/a	n/a	n/a	n/a
COVERAGE SURPLUS (DEFICIENCY)	**$ 47,241**	**$ 78,138**	**$ 25,181**	**$ (52,241)**	**$ (27,962)**	**$ (67,197)**	**$ (124,187)**

City of Camas
Sanitation Utility Rate Study
Revenue Requirements Analysis

Maximum Revenue Deficiency	2008	2009	2010	2011	2012	2013	2014
Sufficiency Test Driving the Deficiency	*None*	*None*	*None*	*Cash*	*Cash*	*Cash*	*Cash*
Maximum Deficiency From Tests	$ -	$ -	$ -	$ 66,003	$ 42,185	$ 84,114	$ 143,942
less: Net Revenue From Prior Rate Increases	-	-	-	(37,944)	(78,180)	(121,811)	(168,015)
Revenue Deficiency	$ -	$ -	$ -	$ 28,059	$ -	$ -	$ -
Plus: Adjustment for State Excise Tax	-	-	-	427	-	-	-
Total Revenue Deficiency	**$ -**	**$ -**	**$ -**	**$ 28,486**	**$ -**	**$ -**	**$ -**

Rate Increases	2008	2009	2010	2011	2012	2013	2014
Rate Revenue with no Increase	$ 1,815,000	$ 1,851,300	$ 1,888,326	$ 1,926,093	$ 2,014,174	$ 2,054,457	$ 2,095,546
Revenues from Prior Rate Increases	-	-	-	38,522	79,370	123,666	170,573
Rate Revenue Before Rate Increase (Incl. previous increases)	1,815,000	1,851,300	1,888,326	1,964,614	2,093,544	2,178,123	2,266,120
Required Annual Rate Increase	0.00%	0.00%	0.00%	1.45%	0.00%	0.00%	0.00%
Number of Months New Rates Will Be In Effect	12	10	12	12	12	12	12
Info: Percentage Increase to Generate Required Revenue	*0.00%*	*0.00%*	*0.00%*	*1.45%*	*0.00%*	*0.00%*	*0.00%*
Policy Induced Rate Increases	0.00%	0.00%	2.00%	2.00%	2.00%	2.00%	2.00%
ANNUAL RATE INCREASE	**0.00%**	**0.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**
CUMULATIVE RATE INCREASE	**0.00%**	**0.00%**	**2.00%**	**4.04%**	**6.12%**	**8.24%**	**10.41%**

Impacts of Rate Increases	2008	2009	2010	2011	2012	2013	2014
Rate Revenues After Rate Increase	$ 1,815,000	$ 1,851,300	$ 1,926,093	$ 2,003,907	$ 2,135,415	$ 2,221,686	$ 2,311,442
Full Year Rate Revenues After Rate Increase	*1,815,000*	*1,851,300*	*1,926,093*	*2,003,907*	*2,137,457*	*2,223,811*	*2,313,653*
Additional State Taxes Due to Rate Increases	-	-	566	1,167	1,819	2,508	3,238
Net Cash Flow After Rate Increase	47,241	67,356	50,360	10,644	77,238	80,606	68,715
Coverage After Rate Increase	n/a	n/a	n/a	n/a	n/a	n/a	n/a

City of Camas
Sanitation Utility Rate Study
Fund Activity

Funds	2008	2009	2010	2011	2012	2013	2014
OPERATING FUND							
Beginning Balance	$ 618,000	$ 455,500	$ 149,535	$ 156,301	$ 165,985	$ 171,350	$ 178,181
plus: Net Cash Flow after Rate Increase	47,241	67,356	50,360	10,644	77,238	80,606	68,715
less: Transfer of Surplus to Capital Fund	(515,384)	(373,321)	(43,595)	(960)	(71,873)	(73,775)	(60,341)
Ending Balance	$ 149,857	$ 149,535	$ 156,301	$ 165,985	$ 171,350	$ 178,181	$ 186,555
Minimum Target Balance	*149,857*	*149,535*	*156,301*	*165,985*	*171,350*	*178,181*	*186,555*
Maximum Funds to be Kept as Operating Reserves	*149,857*	*149,535*	*156,301*	*165,985*	*171,350*	*178,181*	*186,555*
Info: No of Days of Cash Operating Expenses	*30*	*30*	*30*	*30*	*30*	*30*	*30*
EQUIPMENT REPLACEMENT FUND							
Beginning Balance	$ 55,000	$ 344,500	$ 384,103	$ 439,719	$ 454,440	$ 540,536	$ 631,228
plus: Rate Funded System Reinvestment	-	-	-	-	-	-	-
plus: Net Debt Proceeds Available for Projects	-	-	-	-	-	-	-
plus: Interest Earnings	1,721	10,782	12,021	13,762	14,222	16,917	19,755
plus: Transfer of Surplus from Operating Fund	515,384	373,321	43,595	960	71,873	73,775	60,341
plus: Direct Rate Funding	-	-	-	-	-	-	-
Total Capital Funding Sources	**572,105**	**728,603**	**439,719**	**454,440**	**540,536**	**631,228**	**711,324**
less: Capital Expenditures	(55,000)	(344,500)	-	-	-	-	-
Ending Balance	**$ 517,105**	**$ 384,103**	**$ 439,719**	**$ 454,440**	**$ 540,536**	**$ 631,228**	**$ 711,324**
Minimum Target Balance	$ 1,100	$ 7,990	$ 7,990	$ 7,990	$ 7,990	$ 7,990	$ 7,990

System Development Charges

City of Camas
Water Utility Rate Study
System Development Charge

EXISTING COST BASIS:	2008		NOTES:
Plant in Service			
Utility Capital Assets		$ 37,749,068	Original cost of plant-in-service as of 12/31/2007
less: Contributed Capital		(4,830,000)	CIAC, Grants, and other contributed capital
plus: Interest on Non-Contributed Plant		15,616,414	Interest on assets up to a maximum 10-year period
Existing Cash Balances	665,226		Available Construction Cash and Debt Fund Cash
less: Debt Principal Outstanding	(6,382,527)		Total principal outstanding for the existing debt
less: Net Debt Principal Outstanding		(5,717,301)	Debt principal outstanding, net of cash reserves
TOTAL EXISTING COST BASIS		**$ 42,818,181**	
FUTURE COST BASIS:			**NOTES:**
Capital Improvement Plan			
Total Future Projects (2008$)			Total projects identified in the 20-year CIP
Cumulative		$ 4,372,100	Projects which apply to both Non NUGAE & NUGAE
Non NUGAE		7,621,300	Projects which apply to only Non NUGAE
NUGAE		54,127,000	Projects which apply to only NUGAE
less: Identified Repair & Replacement Projects			R&R projects are not eligible for GFC
Cumulative		(290,000)	R&R projects which apply to both Non NUGAE & NUGAE
Non NUGAE		(814,875)	R&R projects which apply only to Non NUGAE
NUGAE		-	R&R projects which apply only to NUGAE
less: Contributed Future Upgrade and Expansion Projects			Not eligible for recovery through GFC
Cumulative		-	Contributions which apply to both Non NUGAE & NUGAE
Non NUGAE		(710,850)	Contributions which apply only to Non NUGAE
NUGAE		(33,406,333)	Contributions which apply only to NUGAE
TOTAL FUTURE COST BAISIS		$ 30,898,342	
CUSTOMER BASE			**NOTES:**
Existing Residential Equivalent Domestic Units			Existing residential customer equivalents 2008
Non NUGAE		9,446	From G&O
NUGAE		-	From G&O
Future Residential Equivalent Domestic Units (Incremental)			Estimated growth in Customer Equivalents 20-year growth 2008-2027
Non NUGAE		6,780	From G&O
NUGAE		5,581	From G&O
TOTAL CUSTOMER BASE		21,807	Estimated growth in Customer Equivalents 20-year growth 2008-2027
RESULTING CHARGE			
Existing Cost Basin Portion		MCE	
Allocable Existing Portion		$ 42,818,181	
Allocable Customer Base		21,807	
Existing Cost Basis Charge Non NUGAE & NUGAE		**$ 1,964**	Applies To Both Non NUGAE and NUGAE
Future Cost Basin Portion - CUMULATIVE			
Allocable Future Portion to Both		$ 4,082,100	
Allocable Customer Base		12,361	
Future Cost Basis Charge Cumulative		**$ 330**	Applies To Both Non NUGAE and NUGAE
Allocable Future Portion Non NUGAE		6,095,575	
Allocable Customer Base		6,780	
Future Cost Basis Charge Non NUGAE		**$ 899**	Applies Only to Non NUGAE
Allocable Future Portion NUGAE		$ 20,720,667	
Allocable Customer Base		5,581	Applies Only to NUGAE
NUGAE Future Cost Basis Charge		**$ 3,713**	Applies Only to NUGAE
Non NUGAE		**3,193**	Applies Only to Non NUGAE
NUGAE		**6,007**	Applies Only to NUGAE

City of Camas
Water Utility Rate Study
System Development Charge

SDC - All classes except Industrial

Meter	MCEs	Proposed	
		Non-NUGAE	NUGAE
5/8"	1	$ 3,193	$ 6,007
3/4"	1.5	4,789	9,010
1"	2.5	7,982	15,016
1.5"	5	15,964	30,033
2"	8	25,542	48,053
3"	16	51,084	96,106
4"	25	79,819	150,165
6"	50	159,637	300,330
8"	80	255,420	480,528

City of Camas
Water Utility Rate Study
System Development Charge

SDC - Industrial Option 1

Meter	MCEs	MSEs	Proposed	
			Non-NUGAE	NUGAE
5/8"	1	1	$ 19,819	$ 38,476
3/4"	1.5	1.1	28,288	55,454
1"	2.5	1.4	45,265	89,449
1.5"	5	1.8	87,569	174,298
2"	8	2.9	138,579	276,362
3"	16	11	276,634	550,561
4"	25	14	429,544	856,633
6"	50	21	853,770	1,706,309
8"	80	29	1,362,684	2,725,763

City of Camas
Water Utility Rate Study
System Development Charge

SDC - Industrial Option 2

Industrial	Customer / Account	Meters & Services/MSE	Base/ERU	Peak/MCE	Fire/Account	SDC
Non-NUGAE	$ -	$ 393	$ 988	$ 1,147	$ 518	**$ 3,046**
NUGAE	$ -	$ 393	$ 2,704	$ 2,324	$ 845	**$ 6,266**

Meter	MCEs	MSEs
5/8"	1	1
3/4"	1.5	1.1
1"	2.5	1.4
1.5"	5	1.8
2"	8	2.9
3"	16	11
4"	25	14
6"	50	21
8"	80	29

Charge Calculation

Non-NUGAE

Customer:	$	-	zero for all customers.
Meter & Service:	$	393	multiplied by appropriate MSE index from the table above.
Base:	$	988	multiplied by (projected consumption divided by 283.6)
Peak:	$	1,147	multiplied by appropriate MCE index from the table above.
Fire:	$	518	for all customers
Total SDC	Sum of all parts		

NUGAE

Customer:	$	-	zero for all customers.
Meter & Service:	$	393	multiplied by appropriate MSE index from the table above.
Base:	$	2,704	multiplied by (projected consumption divided by 283.6)
Peak:	$	2,324	multiplied by appropriate MCE index from the table above.
Fire:	$	845	for all customers
Total SDC	Sum of all parts		

City of Camas
Sewer Utility Rate Study
System Development Charge

EXISTING COST BASIS:	2008		NOTES:
Plant In Service			
Utility Capital Assets		$ 43,604,604	Original cost of plant-in-service as of 12/31/2007
less: Contributed Capital		(6,238,872)	CIAC, Grants, and other contributed capital
plus: Interest on Non-Contributed Plant		18,879,806	Interest on assets up to a maximum 10-year period
Existing Cash Balances	1,006,471		Available Construction Cash and Debt Fund Cash
less: Debt Principal Outstanding	(17,484,419)		Total principal outstanding for the existing debt
less: Net Debt Principal Outstanding		(16,477,948)	Debt principal outstanding, net of cash reserves
TOTAL EXISTING COST BASIS		**$ 39,767,590**	

FUTURE COST BASIS:			NOTES:
Capital Improvement Plan			
Total Future Projects (2008$)			Total projects identified in the 20-year CIP
Cumulative		$ 4,152,500	Projects which apply to both Non NUGAE & NUGAE (cost reflect 20-year capacity)
Non NUGAE		25,260,622	Projects which apply to only Non NUGAE
Phase III		10,634,955	
NUGAE		39,259,124	Projects which apply to only NUGAE (100% build out within 20-years)
less: Identified Repair & Replacement Projects			R&R projects are not eligible for GFC
Cumulative		(3,302,500)	R&R projects which apply to both Non NUGAE & NUGAE
Non NUGAE		(17,536,444)	R&R projects which apply only to Non NUGAE
Phase III		-	
NUGAE		(3,498,800)	R&R projects which apply only to NUGAE
less: Contributed Future Upgrade and Expansion Projects			Not eligible for recovery through GFC
Cumulative		-	Contributions which apply to both Non NUGAE & NUGAE
Non NUGAE		-	Contributions which apply only to Non NUGAE
Phase III		-	
NUGAE		(13,700,000)	Contributions which apply only to NUGAE
TOTAL FUTURE COST BAISIS		$ 41,269,458	

CUSTOMER BASE			NOTES:
Existing Residential Equivalent Domestic Units			Existing residential customer equivalents 2008
Non NUGAE		15,086	From G&O
NUGAE		-	From G&O
Future Residential Equivalent Domestic Units (Incremental)			Estimated growth in Customer Equivalents 20-year growth 2008-2027
Non NUGAE		9,873	From G&O
NUGAE		5,228	From G&O
Phase III Capacity	9,026		
TOTAL CUSTOMER BASE		30,187	Estimated growth in Customer Equivalents 20-year growth 2008-2027

RESULTING CHARGE			
Existing Cost Basin Portion			
Allocable Existing Portion		$ 39,767,590	
Allocable Customer Base		30,187	
Existing Cost Basis Charge Non NUGAE		**$ 1,317**	Applies To Both Non NUGAE and NUGAE
Future Cost Basin Portion			
Allocable Future Portion to Both		$ 850,000	
Allocable Customer Base		15,101	
Future Cost Basis Charge Cumulative		**$ 56**	Applies To Both Non NUGAE and NUGAE
Allocable Future Portion Non NUGAE		$ 7,724,178	
Allocable Customer Base		9,873	
Future Cost Basis Charge Non NUGAE		**$ 782**	Applies Only to Non NUGAE
Allocable Future Portion Non NUGAE Phase III		$ 10,634,955	
Allocable Customer Base		9,026	
Future Cost Basis Charge Non NUGAE Phase III		**$ 1,178**	
Allocable Future Portion NUGAE		$ 22,060,325	
Allocable Customer Base		5,228	
NUGAE Future Cost Basis Charge		**$ 4,220**	Applies Only to NUGAE
Non NUGAE		**3,334**	Applies Only to Non NUGAE
NUGAE		**5,593**	Applies Only to NUGAE

City of Camas
Sewer Utility Rate Study
SDC

Meter Size	Existing Rates	Proposed Non NUGAE	Difference	Proposed NUGAE	Difference
Residential	$ 2,349	$ 3,334	$ 985	$ 5,593	$ 3,244
Commercial I					
5/8"	$ 2,349	$ 3,334	$ 985	$ 5,593	$ 3,244
3/4"	3,523	5,001	1,478	8,390	4,867
1"	5,872	8,336	2,463	13,983	8,111
1.5"	11,745	16,671	4,926	27,967	16,222
2"	18,792	26,674	7,882	44,747	25,955
3"	37,584	53,348	15,764	89,493	51,909
4"	58,725	83,357	24,632	139,833	81,108
6"	117,449	166,713	49,264	279,666	162,217
8"	187,919	266,741	78,822	447,466	259,547
Commercial II					
Flow (gallons)	$ 8.55	$ 16.94	$ 8.39	$ 28.78	$ 20.23
BOD (lbs / day)	1,364	3,149	1,785	5,071	3,708
TSS (lbs / day)	1,006	1,192	186	1,921	914

City of Camas
Storm Utility Rate Study
System Development Charge

EXISTING COST BASIS:	2008		NOTES:
Plant in Service			
Utility Capital Assets		$ 10,770,683	Original cost of plant-in-service as of 12/31/2007
less: Contributed Capital		(8,081,647)	CIAC, Grants, and other contributed capital
plus: Interest on Non-Contributed Plant		489,374	Interest on assets up to a maximum 10-year period
Existing Cash Balances	-		Available Construction Cash and Debt Fund Cash
less: Debt Principal Outstanding	-		Total principal outstanding for the existing debt
less: Net Debt Principal Outstanding		-	Debt principal outstanding, net of cash reserves
TOTAL EXISTING COST BASIS		**$ 3,178,410**	

FUTURE COST BASIS:			NOTES:
Capital Improvement Plan			
Total Future Projects (2008$)			Total projects identified in the 20-year CIP
Cumulative		$ 104,375	
Non NUGAE CIP		10,249,380	
NUGAE CIP		30,672,000	
less: Identified Repair & Replacement Projects			R&R projects are not eligible for GFC
Cumulative		-	
Non NUGAE CIP		(892,500)	
NUGAE CIP		-	
less: Contributed Future Upgrade and Expansion Projects			Not eligible for recovery through GFC
Cumulative		-	
Non NUGAE CIP		(1,175,322)	
NUGAE CIP		(4,600,800)	
TOTAL FUTURE COST BAISIS		$ 34,357,133	

CUSTOMER BASE			NOTES:
Existing Residential Equivalent Domestic Units			Existing residential customer equivalents 2008
Cumulative		9,692	
Non NUGAE		9,692	Assumed annualized sewer growth rates
NUGAE		-	Assumed annualized sewer growth rates
Future Residential Equivalent Domestic Units (Incremental)			Estimated growth in Customer Equivalents 20-year growth 2008-2027
Cumulative		11,559	
Non NUGAE		6,331	Assumed annualized sewer growth rates
NUGAE		5,228	Assumed annualized sewer growth rates based on Sewer to Storm Proporti...
TOTAL CUSTOMER BASE		21,251	Estimated growth in Customer Equivalents 20-year growth 2008-2027

RESULTING GENERGAL CHARGE		
Existing Cost Basin Portion		
Allocable Existing Portion	$ 3,178,410	
Allocable Customer Base	21,251	
Existing Cost Basis Charge	**$ 150**	
Future Cost Basin Portion		
Cumulative		
Allocable Future Portion	$ 104,375	
Allocable Customer Base	11,559	Growth portion is allocable to future customers only
Future Cost Basis Cumulative Charge	**$ 9**	
Non NUGAE Only		
Allocable Future Portion	$ 8,181,558	
Allocable Customer Base	6,331	Growth portion is allocable to future customers only
Future Cost Basis Non NUGAE Charge	**$ 1,292**	
NUGAE Only		
Allocable Future Portion	$ 26,071,200	
Allocable Customer Base	5,228	Growth portion is allocable to future customers only
Future Cost Basis Charge	**$ 4,987**	
Non NUGAE	**$ 1,451**	
NUGAE	**$ 5,145**	

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