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TO: David Tompkins, Director of Utilities
City of Vacaville

FROM: Thomas E. Gaffney, PE

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SUBJ: Engineer's Report - Wastewater Rates

Introduction

Bartle Wells Associates has been retained to prepare a review of wastewater service charges required to meet the 2008 National Pollutant Discharge Elimination (NPDES) permit advanced treatment requirements, including denitrification, tertiary filtration, and bypass elimination. Capital costs of the plant improvements, called the Tertiary Project, will be shared between current users and future users. Revenues from future users will be derived from capacity fees charged to new development and are not a part of this report. Capital costs of the Tertiary Project assigned to current users would be derived from service charges. Current users would also fund all operation and maintenance costs including increased costs attributable to the 2008 NPDES permit.

This report describes how service charges are determined and projects the level of charges required through completion of the new facilities.

Service Charge Methodology

As a past recipient of State and EPA grants and State Revolving Fund Loans, Vacaville's wastewater rates and charges must conform to the State Water Resources Control Board's *Revenue Program Guidelines*. The City's service charge methodology previously has been approved by the SWRCB on at least two separate occasions.

The *Revenue Program Guidelines* require that sewer service charges must be reasonably proportional to a user's wastewater flow and strength. The City's service charge system has been in place for over ten years and is based on classes of users as compared to an average single family unit. An equivalent dwelling unit (or equivalent sewer unit) is established based on engineering design standards. For Vacaville the average flow and strength from an average residence is 250 gallons per day (gpd) with a strength of 200 milligrams per liter (mg/l) of biochemical demand (BOD) and total suspended solids (TSS). The latter two measures are used by design engineers to measure wastewater strength.

Total costs of operating the entire wastewater system are allocated to flow, BOD and TSS. As an example, 100 percent of collection system costs are related to flow. Costs for treatment are heavily related to BOD and TSS. Based on allocations developed previously and verified again, the weighted average of wastewater costs are allocated 44

percent to flow, and 28 percent each to both BOD and TSS. These costs are then assigned to sewer user classes based on their average user characteristics.

Table 1 shows a summary of sewer user characteristics for typical users based on the SWRCB's *Revenue Program Guidelines*. By far the majority of users discharge domestic strength wastewater. High-strength users are assigned a relative strength factor as compared to domestic-strength dischargers by using the formula shown on Table 2.

The City's current service charges have fixed and variable components. Based on an examination of wastewater expenses about 86 percent of these expenses are fixed. That means that they don't vary if flows are reduced. Costs such as debt service, salaries, and overhead are examples of fixed costs. Variable costs include some power, chemicals and some other supplies.

For residential users the service charges have a fixed component set to generate 86 percent of the residential revenue requirement and a variable component based on the previous winter's water consumption set to generate 14 percent of revenues.

Tertiary Project Financing

Capital costs for the tertiary project are estimated at \$150 million. These improvements are required by the City's NPDES permit issued by the Central Valley Regional Water Quality Control Board. Table 3 shows a cash flow of project costs developed by City engineering staff and consulting engineers.

Of the \$150 million, the City will be able to fund about \$30 million from reserves and from revenues during construction. The remaining \$120 million will be funded by some form of borrowing.

The City would prefer to fund the project using State Revolving Fund Loans (SRF loans.) These loans are repaid over 20 years and carry an interest rate of about 2.5%. However, this funding source is greatly oversubscribed by many California wastewater agencies and their availability is difficult to predict. Regardless, the City will actively seek these loans.

The most likely source of funding is by the issuance of income tax-exempt municipal bonds. The actual interest on these bonds is determined at the time of issuance. For purposes of rate projections used in this report an interest rate of 6% over 25 years is assumed. Currently loans or bonds will only be issued if the City can show complete payback through sewer operations and maintenance rates. Sewer rate increases need to be approved prior to completing the application for a loan or initiating a bond sale.

In addition to capital costs, operating costs will also increase due to the tertiary project. Table 4 shows the estimated increases in O&M expenses. Over the projection period and including an allowance for inflation, operating costs are estimated to increase by over \$13 million annually.

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Table 5 shows the overall impact to wastewater operations. Expenses are projected to increase from the current level of just under \$20 million, to more than double over the next seven years. The projection is based on bond financing. If the City were able to obtain SRF loans, annual costs would decrease by about \$1.7 million per year.

Service Charge Impact

Table 5 shows that service charge increases are required in the amount of 15 percent for the next four years and 7.5 percent in the 5th year (FY 2013/14). Table 6 shows the recommended monthly rate increases necessary to meet this revenue requirement. A pre-approved rate index increase of 3.5 percent was applied to the sewer service charge effective March 1, 2010. The service charge increases outlined above of 15 percent and 7.5 percent were developed prior to this index increase. Therefore, the current monthly rate shown on Table 6 will actually increase by slightly over 11 percent on May 15, 2010 should the proposed rate increase be adopted. The proposed increases incorporate all previously approved index increases.

Table 1
 City of Vacaville
 Wastewater User Characteristics

User Group	BOD (mg/l)	TSS (mg/l)	Strength Factor
Residential			
Single family dwelling	200	200	1.0
Multiple family	200	200	1.0
Mobile homes	200	200	1.0
Hotel/motel	200	200	1.0
Commercial - General			
Office/retail	200	200	1.0
Mixed use	200	200	1.0
hall/church	200	200	1.0
Other	200	200	1.0
Commercial - High Use			
Restaurant/sitdown	1,000	600	2.7
Restaurant/takeout	1,000	600	2.7
Automotive service	200	200	1.0
Mortuary	800	800	2.7
Hotel/motel w/restaurant	500	600	2.0
Mixed use w/restaurant	500	600	2.0
Laundromat	200	200	1.0
Medical/dental	200	200	1.0
Market w/disposal	800	800	2.7
Other	200	200	1.0
Industrial			
General	200	200	1.0
Specific	Measured	Measured	
Public Agency			
School	200	200	1.0
City facility	200	200	1.0
Other public agency	200	200	1.0

Source: SWRCB Revenue Program Guidelines

Table 2
 City of Vacaville
 Equivalent Dwelling Unit (EDU) Assignment Formula

Parameter	Allocation - %	Assumed Strength (1.0 EDU)
Flow	44	250 gal/day
BOD	28	200 mg/l
TSS	28	200 mg/l

EDU Assignment Formula* =

$$\frac{\text{Daily Flow}}{250} \times [0.44 + \frac{\text{BOD Concentration}}{200} \times (0.28) + \frac{\text{TSS Concentration}}{200} \times (0.28)]$$

* Formula provides a multiplier for high-strength flows. Minimum assignment is 1.0 equivalent dwelling unit.

Source: SWRCB Revenue Program Guidelines

Table 3
 City of Vacaville
 Construction Cash Flow (\$ Millions)

	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	Total ⁽⁴⁾
A. Beginning Balance	0.0	3.8	0.9	57.8	37.1	6.5	15.7	0.5	1.5	
B. Tertiary Project Funding										
i. Major Replacement Fund Balance	2.4	1.0	0.4	0.4	0.0	0.0	0.0	0.0	0.0	
ii. O/M Funding	0.0	1.0	0.5	0.6	0.5	1.1	2.9	0.1	0.0	
Sub-total O/M	2.4	2.0	0.9	1.0	0.5	1.1	2.9	0.1	0.0	10.9
iii. Sewer Development Impact Fees (DIF) ⁽¹⁾	2.4	1.5	1.5	3.0	3.0	3.0	3.0	3.0	0.0	20.4
iv. Bond Proceeds ⁽²⁾	0.0	0.0	77.0	0.0	0.0	43.0	0.0	0.0	0.0	120.0
Total Revenue	4.8	3.5	79.4	4.0	3.5	47.1	5.9	3.1	0.0	
C. Tertiary Project Expenses										
i. Project Development ⁽³⁾	1.0	4.0	0.5	0.5	2.2	2.2	2.3	0.0	0.0	12.7
ii. Denitrification Improvements	0.0	2.3	17.0	17.6	0.2	0.0	0.0	0.0	0.0	37.1
iii. Lab Expansion	0.0	0.1	0.3	1.5	0.0	0.0	0.0	0.0	0.0	1.9
iv. Filtration Improvements	0.0	0.0	4.7	4.7	30.4	29.6	14.7	0.0	0.0	84.1
v. Completion Project	0.0	0.0	0.0	0.4	1.3	6.1	6.1	0.1	0.0	14.0
Total Expenses	1.0	6.4	22.5	24.7	34.1	37.9	23.1	0.1	0.0	149.8
D. City Interfund Loan	0.0	0.0	0.0	0.0	0.0	0.0	2.0	-2.0	0.0	
E. Ending Balance	3.8	0.9	57.8	37.1	6.5	15.7	0.5	1.5	1.5	

(1) Assumes annual EDU growth as follows: 09/10 = 500 EDU; 10/11 = 500 EDU; 11/12 forward = 600 EDU.

(2) Bond estimate = \$120M with 6% interest rate.

(3) Project Development includes planning, legal, administration, permitting, contingencies, and preliminary design.

(4) Total project cost = \$150M (Construction Cost = \$100M; Contract Change Orders = \$5M).

Table 4

City of Vacaville

Increased O/M Expenses (\$ Millions)

	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
A. Project Funding (O/M rates)	1.0	0.5	0.6	0.5	1.1	2.9	0.1	0.0
B. Bond Repayment:								
i. 51% O/M	0.0	0.0	3.1	3.1	3.1	4.8	4.8	4.8
ii. 100% O/M	0.0	0.0	6.0	6.0	6.0	9.4	9.4	9.4
C. Increased Measure G Costs:⁽¹⁾								
i. Property Based - 1% of net fixed assets	0.0	0.0	0.0	0.0	0.3	0.3	0.3	1.0
ii. Revenue Based - 5% of revenue	0.0	0.0	0.0	0.0	0.5	0.6	0.6	0.7
Subtotal	0.0	0.0	0.0	0.0	0.8	0.9	0.9	1.7
D. Other Permit Costs:								
i. Tertiary Plant O/M ⁽²⁾	0.0	0.0	0.0	0.3	0.4	0.5	0.6	0.6
ii. New Study Requirements ⁽³⁾	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
iii. SSMP Staffing ⁽⁴⁾	0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.3
iv. Tertiary Plant Staffing ⁽⁵⁾	0.1	0.4	0.5	0.6	0.7	0.9	0.9	1.0
Subtotal	0.3	0.9	1.0	1.4	1.6	1.9	2.0	2.1
E. Total Increased O/M Expenses:	1.3	1.4	4.7	5.0	6.6	10.5	7.8	8.6
i. 51% O/M			7.6	7.9	9.5	15.1	12.4	13.2
ii. 100% O/M								

(1) On the Nov. 2006 ballot, Vacaville voters approved Measure G, a sewer utility tax (1% of net fixed assets, and 5% of revenue).

(2) Tertiary Plant requires increased O&M expenses for power, chemicals, and maintenance.

(3) Permit Study requirements include: TRE, Cyanide, THM, Pollution Prevention Plans, Groundwater monitoring, Salinity reduction, and Mercury reduction.

(4) Sewer System Management Plan (SSMP) requires increased staffing for engineering and inspection.

(5) Tertiary Plant requires increased staffing for lab, operations, maintenance and management.

Table 5

City of Vacaville
Sewer Operations & Maintenance - Tertiary Project Rate Projections
Bond Financing

	Projected									
	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	
Actual										
Annual growth rate (actual and projected)	1.1%	1.0%	1.0%	1.5%	1.5%	2.0%	2.0%	2.0%	2.0%	2.0%
Annual inflation rate (per index)	3.5%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Projected Rate Increases - effective March 1	3.5%	15.0%	15.0%	15.0%	15.0%	7.5%	3.0%	3.0%	3.0%	3.0%
Working Capital (beginning balance)	-\$450,000	-\$2,962,000	-\$4,224,000	-\$3,266,000	-\$5,211,000	-\$3,568,000	-\$8,000	-\$374,000	-\$1,024,000	
Operating Revenue										
Service charges	\$11,490,896	12,480,000	14,560,000	17,070,000	20,010,000	23,000,000	24,870,000	26,130,000	27,460,000	
Volume charges	4,512,963	4,880,000	5,660,000	6,590,000	7,670,000	8,730,000	9,350,000	9,730,000	10,120,000	
Sewer Variable Charges	1,502,945	1,620,000	1,880,000	2,190,000	2,550,000	2,900,000	3,110,000	3,240,000	3,370,000	
Industry pretreatment surcharge	329,952	379,000	436,000	501,000	576,000	619,000	638,000	657,000	677,000	
Other revenue	393,445	547,000	423,000	447,000	478,000	501,000	514,000	527,000	544,000	
Interest income @ 3%	-42,097	-91,000	-110,000	-95,000	-124,000	-100,000	-46,000	-52,000	21,000	
Total operating revenues	18,188,104	19,815,000	22,849,000	26,703,000	31,160,000	35,650,000	38,436,000	40,232,000	42,192,000	
Operating Expenses										
Operations										
Easterly Treatment Plant	5,219,691	5,303,000	5,462,000	5,626,000	5,795,000	5,969,000	6,148,000	6,332,000	6,522,000	
System maintenance (field)	1,564,938	1,612,000	1,660,000	1,710,000	1,761,000	1,814,000	1,868,000	1,924,000	1,982,000	
System administration	1,426,521	1,468,249	1,512,000	1,557,000	1,604,000	1,652,000	1,702,000	1,753,000	1,806,000	
Utilities maintenance	2,348,505	2,463,835	2,538,000	2,614,000	2,692,000	2,773,000	2,856,000	2,942,000	3,030,000	
Permitting/ laboratory/source control/engineering/other	1,534,854	1,710,662	1,013,000	1,783,000	1,837,000	1,892,000	1,949,000	2,007,000	2,067,000	
Tertiary Plant O&M	0	0	0	0	300,000	400,000	500,000	600,000	600,000	
Tertiary Plant/SSMP Staffing	0	139,000	700,000	800,000	900,000	1,000,000	1,200,000	1,200,000	1,300,000	
Tertiary - New Study Requirements	0	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	
Subtotal operating expenses	12,094,509	12,796,746	13,085,000	14,290,000	15,089,000	15,700,000	16,423,000	16,958,000	17,507,000	
Intragovernmental expenses										
Measure G Tax (1)	2,573,871	2,668,000	2,748,000	2,830,000	2,915,000	3,788,000	3,978,000	4,128,000	5,852,000	
Cost allocation	1,374,796	1,444,000	1,516,000	1,592,000	1,672,000	1,756,000	1,844,000	1,936,000	2,033,000	
Bad debt	148,066	153,000	158,000	163,000	168,000	173,000	178,000	183,000	188,000	
Subtotal Intragovernmental expenses	4,096,733	4,265,000	4,422,000	4,585,000	4,755,000	5,717,000	6,000,000	6,247,000	8,077,000	
Transfers for Rehab & Replacements	4,509,097	4,253,800	3,667,000	3,767,000	3,667,000	4,667,000	7,017,000	6,267,000	6,667,000	
Total Operating Expenses	20,700,339	21,315,546	21,894,000	23,652,000	29,521,000	32,094,000	38,806,000	38,838,000	41,613,000	
Net revenue / (deficit)	-2,512,235	-1,500,546	955,000	-1,949,000	1,639,000	3,556,000	-370,000	1,394,000	579,000	

(1) Measure G Property Tax increased in 2013/14 due to completion of \$30M denitrification and laboratory. Revenue tax beginning in 2013/14 reflects 5% of service and volume revenue.

Table 6

City of Vacaville
Proposed Monthly Wastewater Rates

User group (SF = Strength Factor)	Current effective March 1, 2010		May 15, 2010		March 1, 2011		March 1, 2012		March 1, 2013		March 1, 2014	
	Fixed Rate	Variable Rate per hcf	Fixed Rate	Variable Rate per hcf	Fixed Rate	Variable Rate per hcf	Fixed Rate	Variable Rate per hcf	Fixed Rate	Variable Rate per hcf	Fixed Rate	Variable Rate per hcf
Single-family	\$ 31.19	\$ 0.46	\$ 34.65	\$ 0.51	\$ 39.85	\$ 0.59	\$ 45.82	\$ 0.67	\$ 52.70	\$ 0.78	\$ 56.61	\$ 0.84
Condominiums	31.19	0.46	34.65	0.51	39.85	0.59	45.82	0.67	52.70	0.78	56.61	0.84
Apartments	31.19	0.46	34.65	0.51	39.85	0.59	45.82	0.67	52.70	0.78	56.61	0.84
Multiple dwellings	31.19	0.46	34.65	0.51	39.85	0.59	45.82	0.67	52.70	0.78	56.61	0.84
Mobile houses	31.19	0.46	34.65	0.51	39.85	0.59	45.82	0.67	52.70	0.78	56.61	0.84
Rooming houses	31.19	0.46	34.65	0.51	39.85	0.59	45.82	0.67	52.70	0.78	56.61	0.84
Single-family outside City	35.09		38.99		44.84		51.56		59.30		63.75	
Elmira Single-family	35.09		38.99		44.84		51.56		59.30		63.75	
Office/retail		2.71		3.00		3.46		3.97		4.57		4.91
Hotels & Motels	35.09		38.99		44.84		51.56		59.30		63.75	
Per additional Hotel/Motel room	22.46		24.95		28.70		33.00		37.95		40.80	
Mixed uses		2.71		3.00		3.46		3.97		4.57		4.91
Halls/churches		2.71		3.00		3.46		3.97		4.57		4.91
Other - General Commercial		2.71		3.00		3.46		3.97		4.57		4.91
Specific Commercial-eg., Rec Ctrs	35.09		38.99		44.84		51.56		59.30		63.75	
Restaurants - sitdown (SF=2.7)		7.29		8.10		9.34		10.72		12.34		13.26
Restaurants/bakeries - takeout		7.29		8.10		9.34		10.72		12.34		13.26
Automotive service/carwashes		2.71		3.00		3.46		3.97		4.57		4.91
Waste haulers per 1,000 gallons		113.69		126.33		145.28		167.05		192.13		206.55
Septic tank waste		25.26		28.07		32.28		37.12		42.70		45.90
Holding tank waste		7.29		8.10		9.34		10.72		12.34		13.26
Mortuaries (SF=2.7)		5.40		6.00		6.92		7.94		9.14		9.82
Hotel/motel w/restaurant (SF=2.0)		5.40		6.00		6.92		7.94		9.14		9.82
Mixed uses w/restaurant (SF=2.0)		2.71		3.00		3.46		3.97		4.57		4.91
Laundromats		2.71		3.00		3.46		3.97		4.57		4.91
Medical/dental		2.71		3.00		3.46		3.97		4.57		4.91
Other w/pretreatment		7.29		8.10		9.34		10.72		12.34		13.26
Markets w/garbage disposal (2.7)		2.71		3.00		3.46		3.97		4.57		4.91
Mixed other - car wash w/recycle		2.71		3.00		3.46		3.97		4.57		4.91
General industrial		2.71		3.00		3.46		3.97		4.57		4.91
Specific industrial	35.09		38.99		44.84		51.56		59.30		63.75	
Schools		2.71		3.00		3.46		3.97		4.57		4.91
City facilities		2.71		3.00		3.46		3.97		4.57		4.91
Other public agencies		2.71		3.00		3.46		3.97		4.57		4.91
CDC Correctional Facility-per EDU	35.09		38.99		44.84		51.56		59.30		63.75	