City of Biggs

City Administrator agenda item request for the next

(X) Regular ( ) Adjourned Regular ( ) Special Meeting

Meeting Date: December 19, 2011 6:00PM

Date: December 13, 2011

To: Honorable Mayor and Members of the City Council

From: City Engineer

Subject: Engineering Staff Report (Action)

6th Street Bridge

Environmental studies are continuing. Utility relocations will be at the utilities' expense, coordinated by Bennett. Leo Rubio has been requested to present the project to the RD833 board. Pete will attend that presentation also.

Waste Water Treatment Plant

The draft Report of Waste Discharge has been reviewed and minor edits being made. Submittal to the RWQCB is expected in the next two weeks.

The Revised Final Alternatives Study is available for review in City Hall, and the subject of a separate council agenda item.

SunWest

The improvement plans for Phase 2 should be submitted within the next couple of weeks. Site work and building construction continue on Phase 1.

The Lot Line Adjustment is the subject of a separate council agenda item. Assuming council action, the remaining process to perfect the Lot Line Adjustment is to verify that there are no current tax liens, get permission from the deed of trust beneficiary, and record deeds with the new parcel descriptions. That needs to happen before we can issue a building permit for phase 2 buildings.

City of Biggs

Revised Final WWTP
Planning
Alternatives Study

Date: Dec. 19, 2011

To: Honorable Mayor and Members of the City Council

From: Steve Speights, PE – City Engineer

Re: WWTP Planning Study

City Engineer will present the draft report of the Revised Waste Water Treatment Plant (WWTP) Alternatives Study with recommendation of land disposal as the best option for Biggs.

Summary:

The attached excerpts from the Revised Planning Alternatives Study summarize the efforts of Bennett Engineering Services to add a fifth alternative to the Study prepared by Psomas in March 2009. The results are that the alternative of land disposal is the best alternative from a construction cost and life cycle cost. That is the alternative we recommend the City pursue.

Requested Action:

Staff requests that after review, the City Council accept the Revised Final study and direct staff to return to the Council with a work plan to implement the land disposal alternative and proceed with funding applications.

Background:

See attached Study excerpts. A copy of the full Study is available in City Hall for Council review.

Attachments:

Excerpts of Update 1 of Revised Final City of Biggs Wastewater Treatment Plant Planning Alternatives Study.

Update 1

REVISED FINAL

CITY OF BIGGS
WASTEWATER TREATMENT PLANT
PLANNING ALTERNATIVES STUDY

December 2011

Prepared for:
CITY OF BIGGS
3061 Sixth Street
Biggs, CA 95917

Prepared by:

Bennett Engineering Services
1082 Sunrise Ave
Suite 100
Roseville, CA 95661
Project No. 11416

Introduction

The City of Biggs owns and operates the City owned Wastewater Treatment Plant (WWTP) located at 2951 West Biggs Gridley Road in the City of Biggs (City), Butte County, California. The permitted design capacity of the WWTP is currently 0.38 million gallons per day (mgd) with a peak facility design flow of 1.05 mgd. The average dry weather influent flow over the last 3 years was approximately 0.27 mgd. The design capacity of the plant accounts for growth of approximately 300 equivalent dwelling units. The current wastewater treatment plant consists of two facultative ponds, a ballast pond, a rock filter and a chlorine contact basin. The treated wastewater discharges to Lateral K an agriculture ditch. The facility is subject to the requirements set forth by the California Regional Water Quality Control Board (RWQCB), Central Valley Region.

The City of Biggs Wastewater Treatment Plant is in violation of the National Pollutant Discharge Elimination System (NPDES) Permit (No. CA0778930).

To evaluate solutions to the treatment of wastewater for the City, the City authorized preparation of the "*City of Biggs Wastewater Treatment Plant Planning Alternatives Study*" dated March 2009 prepared by Psomas. That study contained four alternatives that would achieve wastewater treatment which would conform to the NPDES permit for discharge to surface waters. The update includes a fifth alternative for Land Disposal and comparisons with the previous four alternatives for the wastewater treatment facility.

The City of Biggs Council had the desire to explore the disposal of wastewater to land to compare costs and feasibility with the initial four alternatives, evaluated in the Study dated March 2009. Bennett Engineering Services was asked to prepare this revision to that Study. The March 2009 Study was reviewed and found to be appropriate for the alternatives evaluated, and this "Revised Final City of Biggs Wastewater Treatment Plant Planning Alternative Study" was prepared. This Revised Final Study added the land disposal alternatives to the evaluation.

The Revised Final Study proposes that the selected City of Biggs Wastewater Plant Alternative be Land Disposal. The Land Disposal alternative will allow the City of Biggs to eliminate the surface discharge of wastewater effluent. This alternative will allow the City of Biggs to become in compliance with the NPDES Permit.

This preliminary estimated construction cost for the Land Disposal process is $4,140,000, the estimated land purchase cost is $1,800,000, and the engineering $827,940. The estimated total project cost, including construction, engineering, construction management and land acquisition is $6,800,000.

Project Background

The current National Pollutant Discharge Elimination System (NPDES) Permit (No. CA0078930) for the WWTP contains stringent ammonia nitrogen removal requirements.

The existing aerated lagoon process has a limited capacity for nitrogen removal. The average monthly ammonia concentration in the plant effluent over the last several years has been approximately 9 mg/L with daily maximums of about 14 mg/L. The permit specifies that interim effluent limitations for ammonia ended on December 31, 2008. The current permit limits are 2.72 mg/L average monthly and 7.44 mg/L maximum daily effluent limitation for total ammonia discharged into the receiving water.

In 2008, the City commissioned Psomas Engineers to evaluate its compliance alternatives. The study was submitted to the City in March 2009 and is entitled *Wastewater Treatment Plant Planning Alternatives* Study (hereafter called the *2009 Alternatives Study*). The 2009 Alternatives Study described various treatment plant improvements necessary to comply with the 2007 Permit's requirements for continued discharge to "Lateral K", with the ammonia limits being the parameter of greatest concern. The 2009 Alternatives Study did not evaluate the facilities required for discharge to land. Land discharge systems generally require a reduced level of treatment, but require the addition of seasonal storage and lease or purchase of cropland for effluent disposal.

In 2011, the City commissioned Bennett Engineering Services to prepare an update to the 2009 Alternatives Study to include a land-based treatment and disposal alternative. This Report provides a description of treatment and land disposal facilities, an opinion of construction and operation costs for land disposal, a comparison to the other treatment and disposal alternatives contained in the 2009 Alternatives Study, and a recommended treatment and disposal plan.

Project Goal

The City must evaluate and determine the most cost-effective and maintainable means to treat and dispose wastewater generated by current and future customers and eventually construct the necessary plant upgrades. The upgraded plant must produce a plant effluent that will meet the requirements specified in the NPDES permit (for surface water discharges) or applicable Waste Discharge Requirements (for land–based discharges). The City must be in permit compliance by January 2014.

Table 13-3
Comparative Construction Costs for Candidate Alternatives

Description	1 - Oxidation	2 - Biolac	3 - MBR	4 - Package	5 - Land Disposal[1]
Headworks	$646,103	$646,103	$646,103	$550,000	$850,000[2]
Equalization	$140,247	$140,247	$140,247	-	-
Biological Reactors	$472,957	$646,161	$5,273,974	$3,135,000	-
Blower Enclosure	$350,000	$450,000	$450,000	-	-
Secondary Clarifier	$285,004	$285,004	-	-	-
RAS/WAS Pump Station	$72,425	$72,425	$72,425	-	-
Aerobic Digester	$177,130	$177,130	$137,130	-	-
Optional Tertiary Filtration	$675,000	$675,000	-	$675,000	-
Sludge Drying Bed Modifications	$52,467	$52,467	$52,467	$52,467	$52,467
Chlorination	$149,895	$149,895	$149,895	$149,895	$75,000
Yard Piping	$110,000	$110,000	$80,000	$60,000	$60,000
Existing Pipe Interferences	$60,000	$60,000	$60,000	$60,000	$20,000
Other Miscellaneous Work	$75,000	$75,000	$75,000	$75,000	$125,000
Electrical and Instrumentation	$538,000	$581,000	$2,362,109	$10,000	$30,000
Diesel Generator	$100,000	$100,000	$120,000	$120,000	$100,000
Temporary Plant By-Pass	$75,000	$75,000	$75,000	$75,000	-
Plant Start-up	$60,000	$60,000	$60,000	$60,000	$40,000
Storage Pond Dist. Pump	-	-	-	-	$200,000
Irrigation Distribution System	-	-	-	-	$200,000
Storage Basin Construction	-	-	-	-	$800,000
Tailwater Recirculation	-	-	-	-	$180,000
SUBTOTAL	**$4,040,000**	**$4,356,000**	**$9,755,000**	**$5,023,000**	**$2,733,000**
Mobilization and Demobilization (10%)	$404,000	$436,000	$976,000	$503,000	$274,000
Contractors Overhead and Profit (20%)	$808,000	$872,000	$1,951,000	$1,005,000	$547,000
Bond (1.5%)*	$61,000	$66,000	$147,000	$76,000	$41,000
Contingency (20%)	$808,000	$872,000	$1,951,000	$1,005,000	$547,000
PROBABLE CONSTRUCTION COST	**$6,121,000**	**$6,602,000**	**$14,780,000**	**$7,612,000**	**$4,142,000**
Engineering/Construction Administration (20%)	$1,225,000	$1,321,000	$2,956,000	$1,523,000	$829,000
Land Acquisition 150 (ac) $12k/ac					$1,800,000
TOTAL PROBABLE PROJECT COST (rounded)	**$7,400,000**	**$8,000,000**	**$17,800,000**	**$9,200,000**	**$6,800,000**

[1] The cost estimate does not include costs for potential mitigation that may be required due to environmental impacts, or revenue generated through land lease and farming.
[2] These costs reflect the relocation of the existing influent lift station.

13.4 Life Cycle Analysis

Table 13-4 reflects the annual operations and maintenance labor hours per process alternative. Hours for alternatives one through three are based on secondary treatment processes and do not include routine maintenance hours associated with the remaining of the plant (i.e. headworks, equalization, disinfection and sludge handling). Hours for Alternate Five include maintenance required for irrigation distribution, pump maintenance, and storage basin maintenance. A full time operator at the treatment plant is required 7 days a week and 8 hours a day for all processes. The annual cost for employing one full time operator is approximately $73,000.

Table 13-4
Annual Operating and Maintenance Hours

Parameter	1 - Oxidation Ditch (hrs/yr)	2 - Biolac Process (hrs/yr)	3 - Membrane Bioreactor (hrs/yr)	5 - Land Disposal (hrs/yr)	Notes
Plant Maintenance	1200	1440	1035	800	checking on plant processes, inspection/lube of pumps, mixers and bolts, cleaning
Instrumentation	6	6	13	6	Calibration
Sampling	104	154	52	52	Additional to discharge permit
Total Annual Man-hours	**1310**	**1600**	**1100**	**858**	

Table 13-5 reflects the equipment replacement costs based on a 50-year life cycle and an effective interest rate of 5%. Optional tertiary filtration is not included in costs.

Table 13-5
Equipment Replacement *

* Short – Lived Assets Reserve, since all items have a life span less than 15 years.

Equipment	Years to Replace	1 - Oxidation Ditch Present Cost	2 - Biolac Process Present Cost	3 - Membrane Bioreactor Present Cost	5 - Land Disposal Present Cost
Blowers	10	$30,000	$60,000	$30,000	-
Screens	5	$500,000	$500,000	$500,000	$500,000
RAS Pumps	12	$83,333	$83,333	$83,333	-
Aerators/Mixers	15	$83,333	$83,333	$83,333	$50,000
Disinfection Equipment	5	$20,000	$20,000	$20,000	$10,000
Membrane Cartridges	15	-	-	$630,000	-
TOTAL COST		**$716,666**	**$746,666**	**$1,346,666**	**$560,000**
Annual Cost		**$39,273**	**$40,917**	**$73,797**	**$30,688**

Table 13-6 reflects the power costs for each alternative. Optional tertiary filtration is not included.

Table 13-6
Annual Power Comparative Costs

Item	1 - Oxidation Ditch	2 - Biolac Process	3 - Membrane Bioreactor	5 - Land Disposal
Total HP	63	68	123	45
Total KW	47	51	92	32
Annual Power Cost ($0.08/kw-hr)	**$33,000**	**$36,000**	**$65,000**	**$25,000**

Table 13-7 reflects the annual costs for each alternative. Optional tertiary filtration is not considered in annual life cycle costs.

Table 13-7
Annual Life Cycle Costs

Item	1 - Oxidation Ditch ($/yr)	2 - Biolac Process ($/yr)	3 - Membrane Bioreactor ($/yr)	5 - Land Disposal ($/yr)
Annual O & M	$73,000	$73,000	$73,000	$73,000
Equipment Replacement	$39,273	$40,917	$73,797	$30,688
Annual Power Costs	$33,000	$36,000	$65,000	$25000
Total Annual Life Cycle Cost	**$145,273**	**$149,917**	**$211,797**	**$128,688**

Table 13-8 reflects the net present value for each alternative. Optional tertiary filtration is not considered in the analysis as annual operational costs were not quantified.

Table 13-8
Net Present Value

Item	1 - Oxidation	2 - Biolac	3 - MBR	5 - Land Disposal
Capital Cost	$7,400,000	$8,000,000	$17,800,000	$6,800,000
Total Annual Life Cycle Cost	$145,273	$149,917	$211,797	$128,688
Inflation Rate	2.7	2.7	2.7	2.7
Year	Cost			
0	$7,400,000	$8,000,000	$17,800,000	$6,800,000
1	$7,545,273	$8,149,917	$18,011,797	$6,928,688
2	$7,549,195	$8,153,965	$18,017,516	$6,932,163
3	$7,553,224	$8,158,122	$18,023,388	$6,935,731
4	$7,557,361	$8,162,391	$18,029,420	$6,939,396
5	$7,561,609	$8,166,776	$18,035,614	$6,943,159
6	$7,565,973	$8,171,279	$18,041,976	$6,947,025
7	$7,570,454	$8,175,903	$18,048,509	$6,950,994
8	$7,575,056	$8,180,653	$18,055,219	$6,955,071
9	$7,579,783	$8,185,530	$18,062,110	$6,959,258
10	$7,584,637	$8,190,539	$18,069,187	$6,963,558
11	$7,589,622	$8,195,684	$18,076,455	$6,967,974
12	$7,594,742	$8,200,967	$18,083,919	$6,972,509
13	$7,600,000	$8,206,394	$18,091,585	$6,977,167
14	$7,605,400	$8,211,966	$18,099,458	$6,981,951
15	$7,610,946	$8,217,689	$18,107,543	$6,986,863
16	$7,616,641	$8,223,567	$18,115,847	$6,991,909
17	$7,622,491	$8,229,603	$18,124,375	$6,997,090
18	$7,628,498	$8,235,803	$18,133,133	$7,002,412
19	$7,634,667	$8,242,169	$18,142,127	$7,007,877
20	$7,641,003	$8,248,708	$18,151,365	$7,013,489
Total	$159,186,577	$171,907,624	$379,320,542	$146,154,285
Net Present Value	$93,433,000	$100,899,00	$222,638,000	**$85,784,000**

14.0 Recommended Alternative

Table 14-1 shows the ranking of the five treatment and disposal alternatives. Land disposal (Alternative 5) is ranked the highest primarily due to the low construction cost and ease of operation. Land disposal allows the City maintain and enhance its current WWTP and addresses new ammonia limits by having the irrigated crops (rice or alfalfa) utilize the nitrogen in the effluent as fertilizer. Land disposal also significantly limits the city's exposure to both existing and future discharge regulations.

Table 14-1
Alternative Comparison/Ranking

Items	Oxidation Ditch	Biolac Process	MBR	Package Plant	Land Disposal
Initial Construction Cost	4	3	1	2	5
Ease of Operations and Maintenance	3	4	1	2	5
Process Stability to Meet the Discharge Limits	2	3	4	1	5
Power Requirements	4	3	1	2	5
Odor Production Potential	3	4	5	2	1
Expandability	1	3	2	5	4
Longevity	4	3	1	2	5
Potential to meet future requirements	2	3	5	4	4
Annualized life cycle costs	4	3	1	2	5
Labor costs	2	1	4	3	5
Total Score	***29***	***30***	***25***	***25***	***44***

Note: Scoring: 5 is the best and 1 is the worst
N/A = Not Applicable

14.1 Effluent Disposal and Water Reclamation

The Biggs WWTP has a rated capacity of 1.05 mgd and a current average flow of approximately 0.27 mgd. Discharge from the plant is to the Later K agricultural drain. Water Rights have been issued by the State Water Board to divert water from Butte Creek downstream of the Biggs WWTP discharge for irrigation purposes. Water from Lateral K is also used for crop irrigation through contracts between the Biggs-West Gridley Irrigation District and Reclamation District #833. The current configuration of the plant is unable to achieve significant nitrogen removal and will be in violation of its effluent discharge limits for ammonia. To rectify this situation, Ben|En has proposed the

construction of a Land Disposal system which eliminates the need for nitrification and denitrification.

Water reuse is a desirable goal, especially in California. Reuse of water must be evaluated on a case-by-case basis. The economics of reuse are specific to each application. The quantity requested, distance to application point, level of treatment required, seasonality of use, and ultimate infrastructure required including O&M annual costs must be balanced with the market value of the water delivered.

Use of recycled water for irrigation is regulated under Title 22 of the California Code of Regulations by the RWQCB in conjunction with the California Department of Public Health (CDPH). All water must meet the minimum requirements for secondary treatment with varying degrees of tertiary treatment and disinfection depending on the application.

14.2 Description of Recommended Facilities

The major components for the Biggs WWTP improvements project are summarized in **Table 14-2**. The preliminary design criteria for the proposed facilities are presented in **Table 14-3.**

Table 14-2
Major Project Components for Biggs WWTP Improvements

Divisions	Components
Headworks	• Construct gravity sewer piping to relocated sewer lift station. • Construct new headworks, install spiral screen and stand by bar grate, parshall flume, and flow meter
Influent Equalization	• Muck existing facultative pond 1, 2 and ballast pond. • Install new aerators • Upgrade existing recycle pump station
Rock Filter Maintenance	• Backwash and clean existing rock filter system
Chemical System	• Modify chlorine contact basin to increase contact time.
Storage Basin Distribution System	• Construct pump and piping system from treatment to storage ponds
Storage Basin	• Construct 161 MG storage basins
Irrigation Distribution System	• Construct irrigation distribution piping and grade field to drain.
Construct Tail water System	• Construct Tail water Ditch, wet well, and pump system for return to storage basins
Operations/Laboratory Building	• Upgrade equipment as required and Laboratory building exterior.

14.3 Construction Cost

The preliminary capital construction cost for the Land Disposal process is $5,940,916, including land purchase cost. The estimated construction cost including engineering and administrative work is $6,829,099. **Table 14-4** provides a construction cost estimate breakdown.

Table 14-3
Preliminary Construction Cost for the Biggs WWTP with Land Disposal

Description	Land Disposal
Headworks	$850,000
Sludge Drying Bed Modifications	$52,467
Chlorination	$75,000
Yard Piping	$60,000
Existing Pipe Interferences	$20,000
Other Miscellaneous Work	$125,000
Electrical and Instrumentation	$30,000
Diesel Generator	$100,000
Plant Start-up	$40,000
Storage Pond Dist. Pump	$200,000
Irrigation Distribution System	$200,000
Storage Basin Construction	$800,000
Tailwater Recirculation	$180,000
SUBTOTAL	**$2,733,000**
Mobilization and Demobilization (10%)	$274,000
Contractors Overhead and Profit (20%)	$547,000
Bond (1.5%)*	$41,000
Contingency (20%)	$547,000
PROBABLE CONSTRUCTION COST	**$4,142,000**
Engineering/Construction Administration (20%)	$829,000
Land Aquistion 150 (ac) $12k/ac	$1,800,000
TOTAL PROBABLE PROJECT COST (rounded)	**$6,800,000**