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Stockton Regional Wastewater Control Facility

Memorandum

Prepared by: Jeffrey R. Hauser, P.E.

Reviewed By: Steven L. Beck, P.E.
Neal Colwell, P.E.

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RE: Stockton RWCF Tour on February 11, 2009

On February 11, 2009, several ECO:LOGIC personnel (Steve B., Akram B., Eric B., Lindsey L., Justin H., Jeff H.), together with Gregory Harris of Herwit, participated in a tour of the Stockton Regional Wastewater Control Facility (RWCF), hosted and lead by Steve Gittings, Deputy Director of Utilities in charge of wastewater operations. The tour was the kickoff of our new contract to provide on-call wastewater consulting services to the City, which includes tasks to assist the City with overall operation and maintenance and wastewater treatment process control. The objectives of the tour were to review and discuss with the City the functions, condition, and performance of existing facilities and systems, and their ability to meet permit requirements. As part of this effort, we have also reviewed the City's permit documents. Summarized in this memorandum are the key findings from the tour and permit review, including a list of potential issues and possible areas for study and/or improvement.

Next Steps

One or more meetings should be held with City staff to review and confirm or modify our understanding of issues as set forth herein. As needed additional items can be added. Based on City input, priorities need to be established and work plans and schedules developed for further action on key issues identified by the City.

Summary List of Issues

1. Many deferred maintenance, repair, and miscellaneous facility improvement issues.
    a. Lots of maintenance issues that Justin can help with.
    b. Exterior building maintenance, repairs, and painting.
    c. Reroofing (asbestos issues involved).
    d. New lighting in headworks.
    e. Isolation valves/gates at grit basins.

f. Pump repairs.

g. Interior room partitioning and enclosure to provide air conditioning at influent pump station MCC in the old cogen building.

h. Replacement/rehab of deteriorated main plant piping, especially to the biotowers (some work recent and ongoing, more to be done).

i. Cleanout of biotower feed pump sump, which is full of snails.

j. Wetlands plant/weed control and mosquito abatement. It sounds like Steve has a plan for getting most of this work done. Related issues that require further attention include short-circuiting and a construction berm that was left in place. In general, need to assure a good flow pattern through entire wetlands.

k. Motorized valves at NBTs.

l. Replacement of failed digester gas instruments.

2. SCADA system upgrade and maintenance.

3. Possible Master Plans to be done:

   a. Entire plant.

   b. Headworks (Steve thinks these are in real bad condition)

   c. Solids handling and cogeneration, including restoration of old digesters and waste import.

4. Biotower media replacement and underdrain rehab.

5. Study soluble and particulate BOD removal through ponds, wetlands, and tertiary plant and determine if ponds and wetlands are needed.

6. DAF restart and polymer selection after rehab complete.

7. Install VFDs at DAF feed pumps.

8. Verify compliance status, action plans, and reporting on constituents with compliance time schedules (Aluminum, Dibromochloro., Chlorodibromo, Bis-2, Cyanide) and determine if there are further action items needed beyond the work being done by RBI. In particular, Steve Gittings is concerned with resolving Cyanide compliance.

9. Adjustable weirs or other method to control chlorine contact time.

10. Provide new UV disinfection.

11. Confirm compliance with Title 22 treatment requirements.

12. Find out more about GBTs causing struvite and whether GBTs can be used.

13. Need to add 4th secondary effluent pump.

14. Review plant air permit and suitability of open sludge lagoon regarding greenhouse gas emissions.

15. Sewer system overflows.

Plant Overview

The plant includes the following for liquid stream treatment: influent climber-type bar screens, grit removal channels with chain collectors, dry-pit influent pump station, primary clarifiers with chemical assist, biotowers, secondary clarifiers, oxidation ponds (no aeration, currently bypassed), constructed wetlands, nitrifying biotowers (NBTs) for ammonia removal, DAF for algae and other solids removal (currently being upgraded), multi-media filters, chlorine disinfection (bulk delivery by rail car), sulfur dioxide dechlorination (bulk delivery by truck).

Solids handling includes: gravity belt thickeners for biotower sloughings (currently not being used), gravity thickener for primary sludge and biotower sloughings, mesophilic anaerobic digesters, digested sludge lagoon with dredge (for equalization and storage ahead of dewatering), belt filter presses. The dewatered sludge is stockpiled temporarily on-site and then picked up and hauled for reuse/disposal by a contractor.

Per the permit Fact Sheet, the average annual flow is 31.7 mgd, the maximum annual average flow was 36.37 mgd, and the plant discharges up to 55 mgd intermittently from the tertiary treatment system.

Permit Issues

The plant generally meets BOD, TSS, turbidity, ammonia, and chlorine residual limits. A handful of violations on coliform and Dibromochloromethane have occurred in the past.

CBOD and SS limits are 10, 15, and 20 mg/L as monthly avg, weekly avg., and daily max, respectively.

Ammonia limits are AMEL and MDEL of 2 and 5 mg/L, respectively.

As part of the 2002 permit, the City was required to provide for ammonia removal and full-time Title 22 tertiary treatment. The deadline was extended through challenges and a court order. The deadline for ammonia compliance was August 10, 2008. The deadline for providing full-time tertiary treatment was September 25, 2007. I believe the deadlines were met through recent projects to provide the constructed wetlands and NBTs. As mentioned above, a DAF upgrade is underway.

The City has a Time Schedule Order for compliance with limits for Aluminum, Dichlorobromomethane, Chlorodibromomethane, Bis-2, and Cyanide. Historic effluent concentrations compared to permit requirements from the Time Schedule Order are as follows:

Constituent	Units	Final Effluent Limitations			Historic Discharge Values		Interim Limit
		Annual Average	Average Monthly	Max Daily	MEC	Mean	Max Daily
Aluminum	µg/L	200	311	750	2,900	738	2,900
Cyanide	µg/L		4.1	9.0	13	3.37	8
Chlorodibromo.	µg/L		5.0	16	29	1.17	23
Dichlorobromo.	µg/L		6.8	20	36	3.43	36
Bis-2	µg/L		1.8	3.6	5.5	1.41	5.5

RBI is conducting the required studies and reports on these constituents.

Based on a recent City of Manteca study, a water effects ratio (WER) of 22.7 may be appropriate for Aluminum, which makes the human health criteria non-governing. Final limits in permit are AMEL and MDEL of 311 and 750 ug/L based on aquatic life. There is also an annual average of 200 ug/L based on the secondary MCL for MUN use. Per VII.C. of the permit (page 32) aluminum compliance can be based on acid soluble aluminum. We need to verify if historical monitoring and the reasonable potential analysis were based on total recoverable aluminum and whether there is still a problem based on acid soluble.

The disinfection byproducts limits are apparently being met by feeding a little ammonia for chloramination.

The City has already completed studies on CN and are considering changing analytical methods (which would apparently require construction of new laboratory facilities), operational changes at the filters and disinfection, and UV disinfection (see permit Fact Sheet pg F-31). Steve thinks CN compliance is a big issue.

The City received a 13:1 dilution credit for human health and agricultural constituents. To account for tidal cycles, they used 28 day running average flows in the harmonic mean flow analysis. No dilution credit for aquatic life criteria.

The 13:1 dilution credit was also applied to nitrate + nitrite, in direct contradiction to their action at Donner Summit Public Utilities District (DSPUD) where they said long term averaging is not appropriate. The nitrate + nitrite limit was then reduced to 40 mg/L based on their ability to meet it. Based on the Board's position at DSPUD where no averaging was allowed because nitrate has short-term health effects, nitrate removal could be required in the future.

Based on pathogens and less than 20:1 dilution, treatment equivalent to Title 22 tertiary treatment is required (see pg 31 andF-39). Although this may not be the Regional Board's intent, the specific language of Other Special Provisions 6.a. [pg 31 of the permit] would require full Title 22 treatment, or the equivalent, with all the design criteria and reliability and redundancy features

included in Title 22 to provide a pathogen-free effluent. Should look into whether there is any issue here.

The City is required to study and implement measures for salinity control. Interim limit (EC < 1,300 ug/L annual average) is based on what they can do.

The Regional Board has raised the issue of groundwater degradation based on TDS and nitrates due to the unlined ponds and sludge lagoon. Monitoring wells are currently inadequate to evaluate this, so the City is required to install additional wells and study (see permit pg. 25). We understand that Condor Earth Technologies is currently assisting the City with this expansion of the groundwater monitoring program.

Process Design and Performance Issues

I understand the secondary process effluent typically contains about 20 mg/L ammonia and 45 mg/L BOD and TSS. This used to go to the ponds before tertiary treatment. Now the ponds are bypassed and they go direct to the wetlands then NBTs, DAF, filters, and disinfection.

On the one hand, City staff questions the treatment value of the wetlands which require a huge amount of maintenance. On the other hand, the approximate 50 percent BOD removal through the wetlands may be needed. The City also thinks there is about 50 percent BOD removal in the pond bypass channel from the secondary plant to the wetlands.

What is clear is that the City currently needs additional BOD and TSS removal beyond that in the secondary process and apparently substantial removals occur through the bypass channel and the wetlands. The final effluent after tertiary treatment apparently has no problem meeting 10 mg/L BOD and TSS as monthly averages. I wonder if the ponds and wetlands weren't there if adequate removals of soluble BOD (there is probably very little of this from the secondary process) would occur in the NBTs and particulate BOD and TSS would be eliminated in the DAF and filters (may require the DAF ahead of the NBTs or other measures to limit or accommodate particulate BOD load to the NBTs). In this case neither the ponds nor wetlands would be needed. These ideas and options for improving performance of the secondary process should be looked into. However, the new wetlands may have to be retained for other reasons.

Disinfection byproducts limits apparently can be met by chloramination. The City feeds ammonia for this purpose. If and when they switch to UV as they have apparently committed to do, the DBP issue should go away.

Process by Process Notes

Headworks

1. City staff thinks that the headworks are deteriorated and may be near the end of their useful life, needing to be replaced. This would be a huge and complicated undertaking.

2. Lighting is a real problem. Huge cost to replace. Needs attention now.

3. The climber screens are very old, but I did not hear any specific problems.

4. Grit removal channels with chain and flight collectors are very problematic. They have been broken, but are currently fixed and working. Isolation valves/gates here are apparently a big problem. I do not fully understand the issues here. We need to get more info.

Primary Treatment

1. Primary treatment is chemically enhanced (I think ferric chloride is used).
2. They replace flights on collectors in primary clarifiers every other year.

Secondary Treatment

1. Influent pipes to biotowers are shallow and corroded and collapsing. They are doing Insituform on one now. More work needed.

2. Biotower feed pump wetwell is full of snails. The City needs ideas how to get them out. I think Steve said vactor does not work. (Note: the biotowers were recently upgraded with motorized distributor drives to control dosing rate and prevent snails. I believe the snails in the sump are residuals from before the improvements.)

3. Biotower media are at end of useful life and may need to be replaced soon. Also, biotower underdrains are rotted away.

Ponds and Wetlands

1. See previous comments under Process Design and Performance Issues.

2. Ponds were built in the mid-60's.

3. The ponds, when used, take out the ammonia in the summer but not in the winter. Steve believes ammonia removal due to algae uptake. My guess is that a lot is stripped with pH cycling in the ponds.

4. Because of the ammonia removed in the ponds in the summer, the NBTs would have no food and have no biomass when ammonia increases in winter. They were feeding ammonia to build and maintain biomass in summer. Now they bypass the ponds in the summer to preserve ammonia for the NBTs, which are needed in the winter and can't be allowed to go dead in the summer.

5. Even when they bypass the ponds, Steve said they get 50 percent BOD removal in the bypass channel (this seems high).

6. No DO in first pond, 2-4 mg/L in second and third.

7. With ponds bypassed, they can use ponds for one week storage.

8. Spent $7.5 million in 01/02 to remove sludge from ponds. The City currently have sludge accumulations that have formed islands (I believe near the inlet of the first pond).

9. Wetlands remove 50 percent BOD and TSS.

10. Steve figures they need to spend $250,000 to $350,000 per year to maintain wetlands – weed removal, dredging, mosquito abatement. North cell of wetlands is full of weeds and

will not flow. As temporary fix, they cut channel down the side, which short-circuits this cell. Need to dredge. Doing some rehab now (by Aquamog [spelling?]).

11. Wetlands have 1 day HRT and do not remove any ammonia.

NBTs

1. NBT pumps have vfds.
2. I think they have to add caustic to support NBT operation (nitrification consumes alkalinity). This adds salinity, which is of concern.
3. The City uses ammonia and caustic for snail control at the NBTs. 120 mg/L ammonia recirculated. Recirc 4 hours. Discharge to ponds. Snail kill in NBTs takes full day. Do every 6 to eight weeks. They are now planning to do one unit at a time. Need to add new motorized valves for this.

Tertiary Treatment

1. DAF and filters built in the 70's.
2. DAF feed pumps are constant speed, which is a problem.
3. DAF units don't work well, but are being rebuilt (skirts rusted out). They do not currently monitor DAF effluent quality, so no numbers available. (Usually the DAF should do most of the work and the filters should be lightly loaded. They have the reverse, but hopefully this will change with the rebuild and use of a good polymer.) DAF float goes to the ponds.
4. They use alum at the DAFs and still meet aluminum limits. However, they want to switch to polymer to reduce TDS.
5. With ponds bypassed, I wonder if there is any algae to be removed at the DAFs.
6. Effluent filters rebuilt a couple of years ago and work well.
7. They add acid to lower pH and ammonia toxicity. Adds TDS.

Disinfection

1. The City has made commitment to switch to UV disinfection because of risks associated with chlorine gas. This will eliminate disinfection byproducts concern, ammonia addition, and acid addition?
2. Calgon has pilot tested UV there. Results not yet available.
3. At low flow they have four hours HRT in chlorine contact. They believe this is too high and creates DBPs that they have to mitigate by chloramination. They want adjustable weirs to control contact time. Chlorine contact walls are not current seismic design.
4. They feed ammonia prior to chlorination to get a ¾ mg/L ammonia residual in their effluent so they can chloraminate to limit disinfection byproducts and to avoid breakpoint chlorine demand. This is successful for meeting the Dichlorobromo Bromodichloro limits.

Solids Handling

1. They built gravity belt thickeners to thicken secondary sludge. They are not needed and not used now that canneries have left town. The new GBTs were only used for 30 hours and then abandoned due to struvite problems. Steve believes the GBTs caused struvite formation. Need to investigate and figure out what is going on.
2. They are interested in rebuilding old digesters so they can import waste (dairy, food, grease trap, etc.) to digest and generate gas to generate electricity. We recommend they study this and determine its cost-effectiveness as part of an overall plant energy plan.
3. In digester piping gallery, huge plug valve actuators were installed horizontally without supports on actuators. Some actuators broke off due to lack of support. City has recently added supports from ceiling.
4. Gregory Harris notice that several of the digester gas handling instruments were not functioning. Failed instruments should be identified and replaced with appropriate new equipment.
5. It is surprising that they have a valid air permit for a sludge lagoon after anaerobic digestion. The lagoon must be releasing methane, which is a serious greenhouse gas. The entire plant air permit may need review. Also, there are pending rules and regulations on greenhouse gases that could impact this operation.
6. We did not see the belt filter presses, but understand they are pretty old and this dewatering system should be evaluated for condition/improvements/replacement as part of a solids handling master plan.

Other

1. Sewer overflows are a huge problem for which the City is currently in litigation. Obviously, the collection system needs work.
2. Their SCADA system is unreliable and needs work. Lindsey said they need to go to fiber optics.
3. They have a very substantial cogen system with four 1,000 KW units. One is down for repairs. They can burn either digester gas or natural gas. Blended gas did not work. Currently one unit burns digester gas and two burn natural gas. Engines run 5 years and then need $200k rebuild.
4. Need to add fourth secondary effluent pump.