

STAFF REPORT

IRONHOUSE SANITARY DISTRICT IRONHOUSE SANITARY DISTRICT WASTEWATER TREATMENT PLANT CONTRA COSTA COUNTY

Consideration of adoption of a new NPDES Permit for the Ironhouse Sanitary District Wastewater Treatment Plant.

BACKGROUND

The Ironhouse Sanitary District (Discharger or ISD) owns and operates the Ironhouse Sanitary District Wastewater Treatment Facility and provides sewerage service for the communities of Oakley, Bethel Island, and the unincorporated areas in between serving a population of approximately 31,200. The Facility consists of headworks, 7.5 acres of aerated ponds and 2 effluent storage ponds with a capacity of approximately 350 acre-feet (114 million gallons). Prior to discharge to irrigation fields, the effluent is dosed with sodium hypochlorite for disinfection. The Discharger disposes of the effluent through irrigation of agricultural lands for production of hay and pastureland for grazing cattle. Approximately 162 acres of land is located adjacent to the Facility on the mainland and an additional 425 acres on Jersey Island, one of eight western Delta islands. The current average dry weather flow (ADWF) is 2.64 mgd and the treatment capacity is 2.7 mgd. Due to a lack of adequate storage and disposal capacity, the Discharger requested a year-round surface water discharge of tertiary treated effluent with ultraviolet (UV) light disinfection to the San Joaquin River off of Jersey Island.

The Discharger proposes to construct a tertiary treatment facility with an initial capacity of 4.3 mgd (ADWF) and a build-out capacity of 8.6 mgd (ADWF). The new Facility would include: coarse screening, grit removal, fine screening, anoxic basins, aeration basins, membrane filtration and UV disinfection. The effluent would be nitrified and denitrified and meet California Code of Regulations Title 22 disinfection requirements, or equivalent treatment, for both the surface water discharge and land disposal. The Discharger would continue to maximize land disposal to Jersey Island and water reclamation but discontinue land disposal on the mainland next to the Facility.

The proposed Order only regulates surface water discharges to the San Joaquin River. Currently, Waste Discharge Requirements (WDR) Order No. 5-01-237 regulates the storage and land disposal of wastewater effluent.

The proposed permit includes technology and water quality-based effluent limitations. The technology-based limitations include limitations for biochemical oxygen demand, total suspended solids, and flow. Water quality-based effluent limitations are included in the proposed permit for ammonia, aluminum, copper, manganese, MBAS, iron, fluoride, lead, pathogens, and electrical conductivity (EC).

NEED FOR NPDES PERMIT – EVALUATION OF DISPOSAL ALTERNATIVES

Based on the information submitted by the Discharger, it has adequately demonstrated that it is infeasible to maintain 100 percent land disposal using Discharger-owned land, and the Discharger has adequately demonstrated that additional reclamation land is not currently available within the District. Therefore, a surface water discharge is needed. The different disposal options that were evaluated are discussed below.

Land Only Discharge -The Discharger is currently permitted to discharge up to 3 mgd of disinfected secondary treated wastewater by irrigating pastureland and fodder crops adjacent to the treatment facilities (mainland) and on Jersey Island. From studies conducted by the Discharger, degradation of groundwater beneath the wastewater treatment plant's unlined storage ponds and irrigated lands on the "mainland" property may have occurred or has the potential to occur, and these activities may also impact, or threaten to impact, the beneficial uses of the Contra Costa Canal. Therefore, continued irrigation on the mainland is not recommended.

The water balance for the Phase I expansion (4.3 mgd) shows land disposal only with no surface water discharge is infeasible. The difficulty lies in operating an extensive year-round irrigation program on Jersey Island when groundwater is close to the ground surface. Only parts of Jersey Island could take effluent without ponding during winter months. In addition, storage requirements would be over 1300 acre-feet.. Due to these concerns, 100% land disposal is not a feasible option for the Phase I expansion.

Seasonal Discharge – The Basin Plan and Bay-Delta Plan have restrictions on EC during April through August for protection of agriculture and fisheries. The EC limit can be as low as 440 $\mu\text{hos/cm}$ depending on the month and water year type. Therefore, a seasonal discharge that only allowed a surface water discharge from 15 October through 31 March was evaluated. According to water balances provided by the Discharger, effluent storage during April and May is the limiting factor for a seasonal discharge. Based on these water balances, a seasonal discharge that prohibits surface water discharges during April and May is not feasible.

Water Recycling –The Discharger evaluated recycled water use within ISD in its 1991 and 2005 Wastewater Facilities Expansion Plan reports. The only potential existing customer for recycled water is the Bethel Island Golf Course, approximately 6 miles from the Facility. However, costs to transport reclaimed water to this user are cost prohibitive. Currently, the Discharger is exploring opportunities for reuse in the Delta Diablo Sanitation District service area as the proposed facilities will produce Title 22 tertiary effluent suitable for future recycled water reuse. The proposed Order requires the Discharger to submit this study.

DILUTION AND MIXING ZONES

The San Joaquin River at Jersey Island is within the tidal estuary of the Delta. The tidal zone in this area of the San Joaquin River include flood and ebb tides that move the

river 5 miles upstream and downstream, and slack tides occur with no river movement for about 1 hour, four times each day. The San Joaquin River is approximately 2,600 feet wide at the proposed location for the outfall diffuser. ISD proposes to construct a 150-foot outfall diffuser approximately 500 feet off of Jersey Island at a depth of at least 20 feet. ISD analyzed mixing zones for application of the acute aquatic life criteria, chronic aquatic life criteria, and long-term human health and other long-term criteria. To evaluate the tidal dilution of the discharge, the Department of Water Resources (DWR)'s Delta Simulation Model II (DSM2) was used with baseline flows for reservoir operations based on CALSIM results for the 2020 Operations Criteria and Plan.

The effluent concentrations and mixing zone dimensions for the various water quality criteria are summarized in Table 1, below:

Table 1: Mixing Zones and Dilution Credits

Criteria/Beneficial Use	Effluent Contribution to Rec'ing Water Concentration	Largest Possible Section of the Lower San Joaquin River w/ the Indicated Effluent Concentration	Representative Effluent & Rec'ing Water Quality
Acute aquatic life (at slack tide)	5.19% ¹	150 ft wide by 175 ft	Maximum Concentration
Chronic aquatic life	3.53% ¹	150 ft wide by 175 ft	Maximum Concentration
Long-term human health & Other long-term criteria	0.1% ²	5 miles upstream and down stream	Mean Concentration
Notes: ¹ – Maximum effluent contribution ² – Average effluent contribution			

ASSIMILATIVE CAPACITY

The assimilative capacity of the receiving water was determined by evaluating water quality data for the San Joaquin River in the vicinity of the proposed discharge. This data was collected from several sources. The Discharger sampled the river four times in 2007. The San Francisco Estuary Institute has a Regional Monitoring Program and has collected data since 1993 at sample point, BG30, within five miles of the discharge. Also, within five miles of the discharge are the GWF Power Systems Site IV power Plant and the Mirant Delta Contra Costa power plant that discharge cooling water and collect ambient water quality data. Thus, four sources of water quality data were used in determining assimilative capacity in the receiving water. Based on the available data there is no assimilative capacity for copper, lead, manganese, iron, and aluminum. Therefore, dilution credits may not be allowed for development of water quality-based effluent limitations for these constituents.

WATER SUPPLY INTAKES AND OTHER SURFACE WATER DISCHARGES

Contra Costa Water District has domestic water supply intakes, the closest within eight miles of the proposed outfall, and the City of Antioch has a domestic water supply intake 6 miles downstream of the proposed outfall. At build-out design capacity of 8.6 mgd, the model showed the maximum effluent fraction at a municipal water intake was only 0.25% at the City of Antioch's intake.

OTHER WASTEWATER DISCHARGES NEAR PROPOSED DISCHARGE LOCATION

There are other wastewater discharges in the vicinity of the proposed ISD discharge, including: the City of Brentwood WWTP (to Marsh Creek tributary to San Joaquin River), the Delta Diablo WWTP (the City of Antioch wastewater into New York Slough on the San Joaquin River), the Mirant Delta Contra Costa Power Plant and the GWF Site IV Power Plant (the power plants discharge to the San Joaquin River downstream of Jersey Island). The SIP does not allow a mixing zone to overlap a mixing zone from a different outfall. There is no overlapping of the near field mixing zones with any of the mixing zones for the other wastewater discharges in the vicinity of the proposed discharge.

SALINITY

The Sacramento-San Joaquin Delta has specific salinity and chloride standards established in the Basin Plan, based on the Bay-Delta Plan. The Basin Plan EC limits vary from 450 – 2200 $\mu\text{mhos/cm}$ for at least maximum 14-day running average of mean daily EC from April to June or August 15th depending on the type of water year for agricultural beneficial uses. For protection of the fisheries, the EC water quality objective is 440 $\mu\text{mhos/cm}$ from April 1 through May for all water years except critical. The expected maximum effluent EC is 1505 $\mu\text{mhos/cm}$, therefore, there is reasonable potential for the discharge to cause or contribute to an exceedance of these objectives. The Bay-Delta chloride requirement is 150 mg/L for a specified percentage of the year. The anticipated chloride concentration in the effluent is 160 mg/L.

Compliance with the Bay-Delta Plan's EC objectives is met through reservoir operations by the Department of Water Resources and the Bureau of Reclamation. The EC of the San Joaquin River at Jersey Point fluctuates throughout the year, primarily based on the outflow of the river to the San Francisco Bay. The San Joaquin River at Jersey Point has generally been in compliance with the objectives. An evaluation of historical compliance from 1984 to 2005 was performed and the results of the evaluation are summarized in the Table 2 below.

Table 2: Historical Compliance with Electrical Conductivity Objectives at Jersey Point (Water Years 1984-2005)

Water Year Type	Number of Years of this Type	Number of Years with Exceedances	Year with Exceedances (number of days)	Applicable Objectives ¹ (µmhos/cm)
Wet	7	0	N/A	450
Above Normal	4	1	2005 (3)	450
Below Normal	1	1	2004 (12) ²	450/740
Dry	5	1	1987 (37)	450/1350
Critically Dry	5	0	N/A	2200

Notes:
¹ Objectives apply from April 1 through August 15 as 14-day running daily averages. Objectives change in certain water years partway through June (see Figure 2).
² The Jones Tract levee break occurred on June 3, 2004, and was closed on June 30, 2004; the exceedances of criteria, 450 µmhos/cm as 14-day running averages, occurred from June 10–21, 2004.
 N/A = not applicable

Modeling by ISD showed that EC and chloride concentrations will either increase or decrease San Joaquin River concentrations depending on the salinity of the river. The maximum increases are estimated to be 3 µmhos/cm, which is offset by a decrease in EC due to the discharge increasing the outflow of the San Joaquin River. The net worst-case increase is estimated to be approximately 2 µmhos/cm. The worst-case net increase in chloride is 0.022 mg/L.

The receiving water often has assimilative capacity for salinity and significant dilution is available. During periods when the ambient salinity is adequately below water quality standards (i.e. assimilative capacity exists), an EC effluent limitation of 1505 µmhos/cm is required in the proposed Order, which allows for some dilution. This effluent limitation is based on the EC concentration used in the Discharger’s antidegradation analysis. During periods when there is no assimilative capacity, the discharge must meet the Basin Plan’s site-specific water quality objectives for the San Joaquin River at Jersey Point at the end-of-pipe, without the benefit of dilution.

Effluent limit for EC is as follows:

1. From 16 August through 31 March, the effluent electrical conductivity shall not exceed 1,505 µmhos/cm, as a monthly average.
2. From 1 April through 15 August, the Discharger shall maintain compliance with the salinity effluent limitations specified below:
 - a. If the 14-day running average electrical conductivity of the San Joaquin River at Jersey Point is less than or equal to the concentrations identified in Table 8 below, the effluent electrical conductivity shall not exceed 1,505 µmhos/cm, as a monthly average.

- b. If the 14-day running average electrical conductivity of the San Joaquin River at Jersey Point is greater than the concentrations identified in Table 8 below, the effluent electrical conductivity shall not exceed the concentrations specified in Table 7, below, for the specific water year type and dates shown.

Table 7. Electrical Conductivity Effluent Limitations Based on Water Year Type¹, as a monthly average (µmhos/cm)

Date	Water Year Type				
	Wet	Above Normal	Below Normal	Dry	Critical
1 April – 31 May	440	440	440	440	1505
1 June – 14 June	450	450	450	1350	1505
15 June – 19 June	450	450	450	1350	1505
20 June – 15 August	450	450	740	1350	1505

¹ The Water Year Type is based on the State Water Board's Sacramento Valley 40-30-30 Index.

Table 8. Electrical Conductivity Concentrations Demonstrating Assimilative Capacity Basin Plan Water Quality Objectives – San Joaquin River at Jersey Point, Based on Water Year Type (µmhos/cm)

Date	Water Year Type				
	Wet	Above Normal	Below Normal	Dry	Critical
1 April – 31 May	436	436	436	436	N/A ¹
1 June – 14 June	446	446	446	1346	N/A ¹
15 June – 19 June	446	446	446	1346	N/A ¹
20 June – 15 August	446	446	736	1346	N/A ¹

¹ Not Applicable - During a critical water year, the effluent EC shall not exceed 1505 µmhos/cm, regardless of the receiving water EC concentration.

And a receiving water limit is as follows :

1. To exceed the maximum mean daily chloride concentration of 150 mg/L for at least the number of days shown during the Calendar Year. Must be provided in intervals of not less than two weeks duration (Percentage of Calendar Year shown in parenthesis)

<u>Year Type</u>	<u>No. days each cal. Year < 150 mg/L Cl⁻</u>
Wet	240 (66%)
Above Normal	190 (52%)
Below Normal	175 (48%)
Dry	165 (45%)
Critical	155 (42%)

2. To exceed the maximum 14-day running average of mean daily EC of 440 $\mu\text{mhos/cm}$ from April 1 to May 31 during all Water Year Types, except critical, or to exceed the maximum 14- day running average of mean daily EC in $\mu\text{mhos/cm}$ in the table below:

Water Year Type	450 EC April 1 to	EC from date shown to August 15
Wet	Aug 15	---
Above Normal	Aug 15	---
Below Normal	June 20	740
Dry	June 15	1350
Critical	---	2200

ANTIDegradation ANALYSIS

The Discharger submitted, *Antidegradation Analysis for the Ironhouse Sanitary District Wastewater Treatment Plant, December 2007*, (Robertson-Bryan Inc.), that provides a complete antidegradation analysis following the guidance provided by State Water Board APU 90-004. Pursuant to the guidelines, the Report evaluated whether changes in water quality resulting from the proposed new discharge to the San Joaquin River at Jersey Point (4.3 mgd tertiary treated wastewater) are consistent with the maximum benefit to the people of the state, will not unreasonably affect beneficial uses, will not cause water quality to be less than water quality objectives, and that the discharge provides protection for existing in-stream uses and water quality necessary to protect those uses. The Regional Water Board concurs with the Antidegradation Analysis.

Water quality parameters and beneficial uses which will be affected by this Order and the extent of the impact

- The water quality of San Joaquin River off Jersey Island, with respect to chemical constituents, pH, DO, and turbidity would be minimally affected by the discharge, and water quality necessary to protect beneficial uses would be maintained. This is also expected to be the case for temperature; however, further assessment of this parameter may be warranted in the future.
- The new discharge would use less than 10% of available assimilative capacity for all constituents assessed. The discharge also would negligibly increase loading of bioaccumulative constituents. No beneficial uses of San Joaquin River are anticipated to be adversely affected by the planned action.

Scientific Rationale for Determining Potential Lowering of Water Quality

The Antidegradation Analysis analyzed each pollutant detected in the effluent and receiving water to determine if the proposed discharge of 4.3 mgd authorized potentially allows significant increase of the amount of pollutants present in the upstream and downstream receiving water influenced by the proposed discharge. Details on the scientific rationale are discussed in detail in the Antidegradation Analysis.

Alternative Control Measures

The Discharger considered several alternatives that would reduce or eliminate the lowering of water quality resulting from the proposed 4.3 mgd discharge.

1. Different levels of treatment to address constituent-specific issues (i.e., extended air oxidation ditch with deep-bed sand filtration, MBR with microfiltration, chlorination, and UV disinfection);
2. Zero discharge (100%) recycling of effluent;
3. Alternative disposal options (percolation ponds, offsite reclamation, wetland construction);
4. Winter-only discharge;
5. Connect to, and expansion of, another regional wastewater treatment plant (conveyance of raw sewage to the Delta Diablo Sanitation District Wastewater Treatment Plant);
6. Combined discharge of treated effluent with the City of Brentwood; and
7. Alternative discharge locations (New York Slough and Sacramento River off Sherman Island).

None of the alternatives evaluated would substantially reduce or eliminate significant water quality impacts. Some of the alternatives may result in water quality effects elsewhere, or other environmental impacts, that are worse than those identified for the proposed action.

Socioeconomic Evaluation

The socioeconomic evaluation considered the social benefits and costs based on the ability to accommodate socioeconomic development in the Contra Costa County General Plan and the City of Oakley General Plan. The plant expansion and new 4.3 mgd surface water discharge would accommodate planned and approved growth in the City of Oakley and surrounding areas.

Justification for Allowing Degradation

Potential degradation identified in the Antidegradation Analysis is justified by the following considerations:

1. The alternatives to the proposed project would inhibit socioeconomic growth making it economically infeasible for any new development to occur.
2. The Discharger's planned wastewater treatment process will meet or exceed the highest statutory and regulatory requirements which meets or exceeds best practical, treatment and control (BPTC);
3. The anticipated water quality changes in the San Joaquin River will not reduce or impair its designated beneficial uses and is consistent with State and federal antidegradation policies;
4. No feasible alternatives currently exist to reduce the impacts; and
5. The Discharger has fully satisfied the requirements of the intergovernmental coordination and public participation provisions of the State's continuing planning process concurrent with the public participation period of this Order.

FINAL EFFLUENT LIMITATIONS

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
BOD	mg/L	10	15	20		
	lbs/day ⁷	359	537	717		
TSS	mg/L	10	15	20		
	lbs/day ⁷	359	537	717		
Flow	mgd	4.3				
Ammonia	mg/L	1.1		2.1	---	---
	lbs/day	39.4		75.3	---	---
Nitrate + Nitrite	mg/L	10	---	---	---	---
Aluminum	µg/L	71	---	143	---	---
Manganese	µg/L	50 ¹	---	---	---	---
MBAS	mg/L	340 ¹	---	---	---	---
Iron	µg/L	300 ¹				
Copper, Total	µg/L	8.5		17		
Fluoride	mg/L	19.6	---	---	---	---
Lead, Total	µg/L	3.4		6.9		
Settleable solids	ml/L	0.1	--	0.2	---	---

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Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
pH	std units	--	--	--	6.5	8.5
Oil and Grease	mg/L	10		15		
Turbidity ²	NTU	---	5	2	---	10
Total Residual Chlorine	mg/L	0.01	---	0.02	---	---
Total Coliform ³	MPN/100 mL	---	---	2.2	---	240
Temperature ⁴	°F					
Acute Toxicity ⁵	% survival					
Electrical Conductivity	µmhos/cm	1,505 ⁶				

¹ Annual average effluent limitation

² Effluent turbidity shall not exceed 2 NTU, as a daily average; 5 NTU, more than 5% of the time within a 24-hour period, and 10 NTU at any time.

³ Effluent total coliform organisms shall not exceed 2.2 MPN/100mL as a 7-day median, 23 MPN/100mL more than once in a 30-day period, and 240 MPN/100mL at any time.

⁴ Effluent temperature shall not exceed the receiving water temperature by more than 20°F.

⁵ Survival of aquatic organisms in 96-hour bioassays of undiluted waste shall be no less than 70%, minimum for any one bioassay; and 90%, median for any three consecutive bioassays.

⁶ Effluent limitation for EC dependent on assimilative capacity in San Joaquin River at Jersey Point.

⁷ Based upon a design treatment capacity of 4.3 mgd.

REQUIREMENTS OF THE PROPOSED ORDER

Constituent Study. Upon initiation of the discharge to the San Joaquin River, the Discharger shall conduct twelve (12) months of effluent and receiving water monitoring to better characterize the quality of the discharge and receiving water.

Reclamation Study. The Discharger shall conduct a wastewater reclamation study. The study should identify existing and potential reclaimed water users and include an economic analysis of reclaiming wastewater. The Discharger shall complete and submit the study prior to initiating discharge to the San Joaquin River and no later than 31 December 2008.

Influent Hardness Study. The Discharger shall conduct twice monthly hardness monitoring (as CaCO₃) of the influent to the existing wastewater treatment plant to better estimate the hardness of the effluent that will be discharged to the San Joaquin River, so reasonable worst-case CTR metals criteria can be calculated. The Discharger shall submit the results of the study within 18 months following adoption of the proposed Order.

Mixing Zone Validation Study. After initiation of the discharge to the San Joaquin River, the Discharger shall conduct a mixing zone study to validate the predicted dilution of the water quality modeling. The study shall evaluate the actual dilution at the boundaries of the acute/chronic mixing zone and the human health mixing zone. The study shall be conducted during low flow conditions in the San Joaquin River.

COMMENTS:

The Tentative Order was distributed for public review on 11 February 2008. Written comments on the proposed Orders were required to be received by the Regional Water Board by 17 March 2008 in order to receive full consideration. Comments were received by the deadline from the Central Valley Clean Water Association, Delta Diablo Sanitation District and the Discharger. A complete response to comments is provided in the agenda package.

CHANGES TO TENTATIVE ORDER

The tentative NPDES permit has been modified in a few areas based on comments received to provide clarification and/or correct minor factual errors. The only significant change is described below:

The calculated effluent limitation in the tentative Order incorrectly excluded background fluoride in the San Joaquin River. The correct limitation is 19.6 mg/L instead of 21.0 mg/L. The permit has been changed to reflect this correction.