L Gilbert Bay Level II Antidegradation Review Report

JORDAN VALLEY WATER CONSERVANCY DISTRICT
Gilbert Bay UPDES Discharge
Level II Antidegradation Review Report
April 2010

Antidegradation Review (ADR) Form

Part A: Applicant Information

Applicant: Jordan Valley Water Conservancy District

Facility Owner: Jordan Valley Water Conservancy District

Facility Location: 8215 South 1300 West

Application or Plans Prepared By: Mark Atencio

Project Name: Southwest Groundwater Treatment Plant

Receiving Water: Great Salt Lake, Gilbert Bay

What are the designated uses of the receiving water?

Infrequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain.

What is the application for? (check all that apply)

☒ An application for a UPDES permit for a new facility or project.

☐ An expansion or modification of an existing wastewater treatment works facility, with no planned construction activities, which will result in an additional of a new pollutant, or increase in the mass or concentration of a pollutant as defined by the current permit.

☐ An expansion or modification of an existing wastewater treatment works facility, that involves construction of new treatment facilities, which will result in an additional of a new pollutant, or increase in the mass or concentration of a pollutant as defined by the current permit.

☐ A permit renewal for a discharge to 1C waters where a previous Level II ADR has been completed.

☐ A proposed minor expansion as defined in Section 5.4.1 of the Implementation Guidance) to an existing permitted facility.

☐ A §401 Certification request.

Part B. Level I Antidegradation Review

B1. Is there any evidence that the project will impair the designated uses of the receiving water?

☐ **Yes** No permit can be issued unless the projects can be modified to address maintain the use. Do not proceed further with the application.

☒ **No** Proceed to question B2.

B2. Will the project require a discharge to a Class 1C (Drinking Water) waterbody?

☐ **Yes** A Level II ADR is required. Proceed to Section C of this application.

☒ **No** Proceed to question B3

B3. Will the proposed project result in degradation to water quality?

☒ **Yes** Proceed to B4

Selenium concentrations in the discharge exceed ambient concentrations in Gilbert Bay.

Mercury concentrations in the discharge potentially exceed the ambient concentrations in Gilbert Bay.

☐ **No** Level II ADR is required if DWQ concurs with the rationale. There is no need to proceed further with application questions. Indicate the applicable scenario below (check all that apply):

- ☐ The proposed net increase in the discharge of a pollutant of concern does not result in an increase in potential mass loading or an increase in the ambient water quality concentration of the receiving water after mixing.
- ☐ The activity is occurring within the design capacity of the treatment plant as specified in the existing construction permit
- ☐ A permit for an existing facility does not propose less stringent permit limits or increased treatment plant design capacity.
- ☐ Additional treatment is added to an existing discharge and the facility retains their current permit limits and design capacity.
- ☐ The activity is a thermal discharge that has been approved through a Clean

Water Act §316(a) demonstration.

B4. Are water quality impacts of the proposed project temporary or limited (see implementation guidance Section 3.1.4)?

☒ **No** Proceed to Part C (optional) or Part D of the ADR Application. A Level II ADR is required.

[Although the impact of this discharge is not expected to degrade water quality of Great Salt Lake, JVWCD opted to continue with a Level II Review. Therefore, the box is checked to indicate "no".]

☐ **Yes** Indicate the rationale for this determination below:

- ☐ The length of time during which water quality will be lowered is temporary. How long?
- ☐ Water quality effects relate exclusively to turbidity and fish spawning will not be impacted.
- ☐ The percent change in ambient conditions is minimal.
  What parameters will be affected?
  For how long?
- ☐ There is little potential for long-term residual influences to beneficial uses. Briefly explain:

Part C. Scoping for Level II Antidegradation Review

C1. Preliminary statement of social, ecological and economic benefit
Briefly describe the nature of the project, receiving water, and the social and economic benefits anticipated from the proposed project.

The Southwest Groundwater Project will benefit the local environment, society, and economy by:

1. **Preventing contaminated groundwater from affecting existing municipal potable water wells.**
2. **Remediating the contaminated aquifer.**
3. **Producing a new supply of potable quality water to be used by the public in the affected area.**

C2. Parameters of concern to be evaluated in the ADR.

selenium, mercury

C2.1. List all of the parameters that DWQ and the applicant believe warrant consideration as a parameter of concern.

Parameter	Reason for inclusion as a "parameter of concern" for ADR purposes.
selenium	Selenium concentration in the discharge is higher than the receiving water concentration. Specific studies were conducted by the Division of Water Quality on selenium in Gilbert Bay. These studies concluded selenium in Great Salt Lake is in a dynamic state of equilibrium, there is no evidence of biologic harm, and led to the development of a numeric selenium standard.
mercury	Mercury concentration in the discharge is higher than the receiving water concentration in Gilbert Bay. However, the mercury in the discharge is a very small portion (1%) of the overall mercury load to Great Salt Lake and no discernible increase in the ambient mercury concentration is anticipated.

C2.2. List parameters that were initially considered, but ultimately were removed from consideration based on the characteristics of the wastewater of receiving water.

Parameter	Reason for exclusion as a "parameter of concern" for ADR purposes.
TDS	TDS in the discharge is lower than the receiving water.
	The same pattern exists for the other parameters.

C3. Scoping of Alternative Treatment Options that will be evaluated in the Level II ADR.

C3.1 Alternatives to reducing all or part of the discharge to the receiving water.

Practicable? (Y/N)	Treatment Alternative	Notes
No	**c) Connection to other wastewater facilities (new facilities only)** ☐ *Not Applicable, ADR is for a Renewal to an Existing Facility* ☐ *Another facility is nearby, but does not have the capacity and is unable to expand.* ☐ *No other facility is nearby.* ☒ *Other (please explain)* South Valley Water Reclamation Facility (SVWRF) is nearby, its treatment process does not provide for TDS or selenium removal. SVWRF discharges to the Jordan River.	

No

e) Seasonable or controlled discharge

☐ *There is not land or facility infrastructure available to store wastewater.*

☐ *Limiting season is in the summer and the wastewater is needed for instream flows.*

☒ *Other (please explain)*

The remediation goal of the project requires year round operation.

No

f) Pollutant trading

☒ *A policy does not presently exist in the watershed to make trades possible.*

No

g) Water conservation

Demand side water conservation will not affect the existing contaminated groundwater aquifer.

No

h) Water recycling and reuse

This project is intended to produce municipal quality (drinking) water; water recycling is not an applicable concept.

No

i) Alternative discharge locations or alternative receiving waters (new facilities only)

☐ *Wastewater is needed for instream flows.*

☐ *The proposed receiving water is the only particle discharge point and other sites are not available to locate the proposed facility.*

☒ *Other (please explain)*

Alternative discharge locations to the Jordan River exist; discharge to the Jordan River was initially permitted – the applicant voluntary abandoned this permit. Discharge to the Jordan River has concerns with TDS and Selenium.

Discharge through deep well injection could allow the by-product to move into the deep aquifer used for drinking water sources.

Discharge to Kennecott Utah Copper's Tailings Impoundment which does not meet the District's goals because it is a temporary solution which would end with mining operations. Organic acids in the shallow aquifer may interfere with the copper recovery process.

No

j) Land application

☐ *Wastewater is needed for instream flows.*

☐ *Local zoning laws prohibit land application.*

☐ *Land application already takes place to the extent feasible.*

☒ *Other (please explain)*

1,000 acres of land required for this project is not available in the vicinity of the project site; the cost to acquire the required land is cost prohibitive (10 to 20 times the proposed project cost).

No

k) **Total containment**

☐ *Wastewater is needed for instream flows.*

☐ *The land necessary for total containment is not available.*

☒ *Other (please explain)*

Total containment (zero liquid discharge) is cost prohibitive (20 times the proposed project cost).

No

l) **Selenium and mercury removal**

☒ *Selenium and mercury removal through selective treatment process*

The high concentration of sulfate in the by-product would form scale on the filter media of the selenium removal filter rendering the process ineffective.

C3.2 Alternative treatment options for projects that involve construction of new facilities or upgrades that involve construction for existing facilities.

Alternative treatment options were evaluated and are documented in the attached Technical Memorandum #1 within Appendix A – Supplemental Information. A summary of these options is listed here:

- **TDS removal is required to produce potable quality water.**
- **Any treatment process which will remove TDS will produce a by-product solution with elevated TDS, selenium, and mercury.**
- **Independent of the treatment process selected for production of drinking water, by-product is produced with elevated TDS, selenium, and mercury.**

C3.3 Alternative procedures for the operation and maintenance of facilities.

There are not any known O&M procedures which will reduce selenium load in the reverse osmosis by-product. Higher treatment levels will result in a higher flow rate of product water (potable water) and a lower flow rate of

by-product; the load of selenium and other salts would same as with a lower treatment level. A higher treatment level results in the same selenium load at a higher selenium concentration.

Multiple alternatives were evaluated; these are discussed in a separate report titled "JVWCD Southwest Groundwater Treatment Plant Disposal Alternatives and Benefits Report".

Part D. Alternative Analysis Requirements of a Level II Antidegradation Review

D1. Attached Report Name:

JVWCD Supplemental Information to Great Salt Lake Level II Review

D2. From the applicant's perspective, what is the preferred treatment option?

Discharge to Great Salt Lake

D3. Is the preferred option also the least polluting alternative?

☐ Yes

☒ No

If no, what is the least polluting alternative?

The least polluting alternative is zero liquid discharge.

If no, provide a brief justification for not using the least polluting alternative:

The cost of this alternative is prohibitive (20 times the proposed project cost).

D4. What is the final alternative approved by DWQ after reviewing the Level II ADR materials? If this is not the least polluting alternative, please describe why this option was selected.

Discharge to Great Salt Lake

Part E. Statement of Net Social, Economic, and Environmental Benefits Importance (SEEI)

JVWCD Supplemental Information to Great Salt Lake Level II Review

E1. Does the project include an associated mitigation plan?

☒ NO

☐ YES

Note: The Southwest Groundwater Treatment Plant will be operating as a remediation project to meet the following objectives:

1. Contain contaminated groundwater,
2. Remediate the aquifer, and
3. Produce potable quality water.

Please attach the plan as an appendix to this report. None

Report Name:

JVWCD Supplemental Information to Great Salt Lake Level II Review

E2. Describe the social and economic benefits that would be realized through the proposed project, including the number and nature of jobs created and anticipated tax revenues.

The project will prevent the spread of the groundwater plume into existing municipal wells; if affected these wells would require a similar water treatment process and creation of a by-product.

The project will create a new drinking water supply which will be used to sustain human life within the JVWCD service area.

E3. Describe any environmental benefits to be realized through implementation of the proposed project.

According to the USGS, without operation of the project the deep and shallow groundwater will slowly migrate into the Jordan River and through the freshwater Great Salt Lake wetlands at the end of the Jordan River. The proposed alternative will prevent the introduction of selenium and mercury into the Jordan River.

E4. Describe any social and economic losses that may result from the project, including impacts to recreation, or current or future commercial development.

None

E5. Describe any potential threats or benefits to human health should the project be implemented.

None

E6. Describe any anticipated changes to the overall appearance to the receiving water and surrounding watershed?

None

E7. Describe any structures or equipment associated with the project that will be placed within or adjacent to the receiving water.

The discharge pipeline will be buried under the bed of Great Salt Lake for approximately 1,000 feet. At the end of the discharge pipeline the pipeline will bend up and be enclosed with a five feet square concrete pad.

E8. Describe other factors that would help explain why the project is necessary to accommodate social and economic development.

The affected cities of West Jordan, South Jordan, Riverton, and Herriman have been impacted by the groundwater plumes either by being prevented from developing groundwater or at risk of the plumes moving into existing wells. This project will produce drinking water from the affected groundwater plume and contain the plume to prevent existing wells from being affected.

Part F. Certification of Antidegradation Review

F1. DWQ Certification and Approval

To the best of my knowledge, the ADR was conducted in accordance with the rules and regulations outlined in UAC R-317-2-3.

WQM Section

Signature: _____

Date: 8/1/10

DWQ Permitting

Signature: _____

Date: 8/11/10

Appendix A

Supplemental Information

1. JVWCD Supplemental Information to Great Salt Lake Level II Review
2. Technical Memoranda Evaluating Reverse Osmosis By-product Disposal Alternatives
    a. Alternative Treatment Technologies
    b. Secondary Water Use
    c. Discharge to Great Salt Lake
    d. Discharge to KUCC Tailings Impoundment
    e. Distillation
    f. Distillation – Disposal of Salts
    g. Zone B to Tailings Pipeline
    h. Zone B to Tailings Impoundment, Lost Use to Great Salt Lake
    i. Zone B to Tailings Impoundment, Lost Use to KUCC Great Salt Lake Outfall
    j. Zone B to Tailings Impoundment, Lost Use Distillation
    k. Zone B to Tailings Pipeline, Lost Use to Great Salt Lake
    l. Zone B to Tailings Pipeline, Lost Use to KUCC Great Salt Lake Outfall
    m. Zone B to Tailings Pipeline, Lost Use Distillation
    n. Water Cost Methodologies
    o. Discharge of Zone B By-product to KUCC Facilities Perpetually
    p. Selenium Removal Treatment
    q. Deep Aquifer Hydrogeology (Deep Aquifer Injection)

M Gilbert Bay Level II Antidegradation Review Report Supplemental Information

JORDAN VALLEY WATER CONSERVANCY DISTRICT
SOUTHWEST GROUNDWATER TREATMENT PLANT

Outfall #1
Great Salt Lake UPDES Permit
Antidegradation Level II Review Supplemental Information

This information is being provided to the Division of Water Quality to provide assistance in completing a Level II antidegradation review, in accordance with 317-2-3.

1. Are there any reasonable less-degrading alternatives? The alternatives identified below were evaluated. A detailed evaluation of each alternative is included in a separate memo attached to this file.

    a. Innovative or alternative treatment options of by-product: A selenium removal process was evaluated; this process would utilize a biologically active media filter. This technology is feasible for some waters; however the by-product would have a tendency to coat and inactivate the filter media rendering the process useless. This same challenge is likely in a mercury specific treatment process.

    b. More effective options or higher treatment levels: If the by-product were to be treated to a higher level more water would be produced and the flow rate of by-product would decrease. The amount of selenium and mercury in the by-product would remain the same. This would result in a higher concentration of selenium and mercury in the by-product.

    c. Connections to other wastewater facilities: Because the treatment process of wastewater facilities in Salt Lake do not remove TDS and/or selenium, a connection to a wastewater treatment plant would result in a discharge to the Jordan River.

    d. Process changes or product or raw material substitution: The project required TDS removal. Any process which removes TDS, independent of the product or material used, will result in a by-product with an elevated concentration of selenium.

    e. Seasonal or controlled discharge options to minimize discharging during critical water quality periods: By its nature, this remediation project must operate year round to achieve the required containment of the contaminated groundwater.

    f. Pollutant trading: No trading partners were identified.

g. Water Conservation: Conservation of water resources will not provide for any remediation of contaminated groundwater and does not apply to treatment alternatives of the by-product.

h. Water recycling and reuse: The objective of this project is to produce municipal quality (drinking) water. Water recycling and reuse do not apply treatment of the by-product.

i. Alternative discharge locations or alternative receiving waters: An alternative discharge location exists to the Jordan River. A permit was issued for this location. Due to downstream concerns of potential bioaccumulation of selenium in freshwater and brackish wetland bird habitats, JVWCD withdrew this permit and does not intend to pursue this option.

j. Land application: Applying the by-product to land application would require 1,000 acres of undeveloped land and has the potential to create a new exposure of elevated selenium to the wildlife food chain. In addition, the cost of the land alone is 20 times the costs of discharging to Great Salt Lake.

k. Total containment: Total containment is theoretically feasible through multiple steps of distillation followed by reverse osmosis and distillation. JVWCD conducted some pilot tests of this technology. The conclusion of this testing is, due to the very high electrical demand, the net present value cost of total containment is 20 times the cost of discharging to Great Salt Lake through a pipeline and pump station.

l. Improved operation and maintenance of existing treatment systems: Not applicable – improved reverse osmosis treatment operations results in less water in the by-product and higher TDS, selenium, and mercury concentrations.

m. Other appropriate alternatives: The selenium removal processes discussed above was also considered for the feed water to remove the selenium ahead of the reverse osmosis process. The selenium removal process does not remove 100% of the selenium. Use of this process ahead of the reverse osmosis would increase the suspended solids concentration in the feed water resulting in a requirement for an additional filtration process ahead of the reverse osmosis process. Consequently, use of the selenium removal process on the feed water with relatively low concentrations and high flow rates would result in an expensive and ineffective process.

2. Special Procedures for 404 Permits

   JVWCD will be applying for a 404 permit through the State Engineer's Office and the Army Corps of Engineers for the construction of the pipeline within Great Salt Lake.

3. Does the proposed activity have economic or social importance?

   a. Employment: The project will result in three permanent full-time jobs and approximately 150 jobs during the design and construction phases.

   b. Increased production; not applicable

   c. Improved community tax base: not applicable – JVWCD is a tax exempt public entity

   d. Housing; not applicable

   e. Correction of an environmental or public health problem; This project will correct a major environmental problem covering 50 square miles of aquifer which is otherwise unusable by the local public. In addition the project will contain the existing contamination and remediate the aquifer over the life of the project.

   f. Other information that may be necessary to determine the social and economic importance of the proposed surface water discharge: If the project is not completed the contaminated groundwater will continue to migrate towards hundreds of existing municipal wells and into shallow aquifer. From the shallow aquifer the elevated TDS will discharge into the Jordan River

   g. Mitigation: JVWCD has taken a number of actions to mitigate the potential impacts and accommodate concerns which have been expressed. These actions include the following:

      1. Withdrawal of its UPDES permit to discharge to the Jordan River
      2. A commitment to facilitate a public stakeholder process to evaluate disposal alternatives
      3. A commitment to pursue the identified discharge alternative at an increased cost of $2.9 million (i.e. discharge to Great Salt Lake)
      4. A commitment to support and help fund selenium studies on Great Salt Lake
      5. A commitment to wait for the studies to be completed prior to applying for a UPDES permit for discharge to Great Salt Lake

6. A commitment to pump the deep groundwater, at increased cost, to Great Salt Lake during start-up and shutdown of the reverse osmosis treatment plant to avoid discharge of deep contaminated groundwater to the Jordan River

4. Will water quality standards be violated by this discharge?

    a. No.

5. Will existing uses be maintained and protected?

    a. Yes

6. Are there existing uses which are higher than the current water quality use designation or classification?

    a. No

CONCLUSION

Great Salt Lake As a result of the commitment JVWCD made to the Stakeholders Forum, four plus years of study were completed on Great Salt Lake to better understand the dynamics of selenium movement and biologic impacts which resulted in the first numeric water quality standard for Great Salt Lake (Selenium.) All evidence indicates the discharge of JVWCD's reverse osmosis by-product will not impact the lake and its ecosystem.

Tailings Impoundment If this UPDES permit is not granted, through an agreement with Kennecott Utah Copper, JVWCD will discharge treat deep aquifer by-product to KUC's Tailings Impoundment. As the Tailings Impoundment has an existing permit to discharge into Great Salt Lake JVWCD by-product is likely to be indirectly discharged into Great Salt Lake. Without a UPDES permit to facilitate discharge to Great Salt Lake JVWCD will not create by-product from the shallow aquifer.

Project Benefits The completion of this project will enable JVWCD to meet the following project objectives:

1. Contain a contaminated groundwater plume and prevent it from affecting hundreds of existing municipal wells.
2. Remediate the contaminated aquifer.
3. Provide a new supply of municipal water for the public.

Perpetual Water Supply Without issuance of the UPDES permit the project will be limited in the volume of water produced and effective operational time frame. Jordan Valley Water Conservancy District has done all that is possible to address the needs and concerns of state agencies, environmental organizations, its member agencies, and individuals who have expressed interest and concern. After six years of effort JVWCD believes the UPDES permit should be issued. Issuance of this permit will allow for a perpetual municipal water supply to be developed for the public.