United States Department of the Interior
FISH AND WILDLIFE SERVICE
UTAH FIELD OFFICE
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WEST VALLEY CITY, UTAH 84119

February 1, 2011

In Reply Refer To:
FWS/R6
ES/UT
11-EC-0004

Walt Baker, Executive Secretary
Utah Water Quality Board
P.O. Box 144870
Salt Lake City, UT 84114-4870

RE: Draft UPDES Permit UT0025836; Jordan Valley Water Conservancy District SW Groundwater Treatment Plant

Dear Mr. Baker:

We have reviewed the Utah Pollutant Discharge Elimination System (UPDES) permit for the Jordan Valley Water Conservancy District (JVWCD) Southwest Groundwater Treatment Plant (UPDES permit #UT0025836), also referred to as the Southwest Groundwater Project (Project), and are providing the following comments for your consideration.

According to the Statement of Basis, the Project will involve remediating groundwater contaminated from historic mining activities in southwest Salt Lake County. The Project will extract groundwater with elevated total dissolved solids via a series of deep aquifer wells and purify the extracted water utilizing a reverse osmosis (RO) treatment process at the Southwest Groundwater Treatment Plant (Treatment Plant). The project will also extract groundwater from shallow wells with elevated total dissolved solids that are not impacted by mining activities. The Treatment Plant is owned and operated by the JVWCD. Drinking water generated from the Treatment Plant will be distributed by JVWCD to its member agencies for supply to their drinking water systems. The RO byproduct water, containing extracted salts from the treated water, will be routed via a 21-mile pipeline to Gilbert Bay of Great Salt Lake. Shallow aquifer wells will periodically discharge to the Jordan River and the Utah and Salt Lake Canal.

The Great Salt Lake is unique in the Intermountain West in its geographic location, large size and its diversity of habitats for migratory birds. This combination of factors makes the Great Salt Lake an important resource for migratory birds such as waterfowl, shorebirds and other waterbirds. Due to its value for shorebirds the Great Salt Lake was recognized as a site of hemispheric importance and included in the Western Hemispheric Shorebird Reserve Network.

General Comments

Cumulative Impacts

The UPDES Discharge Permit, Fact Sheet/Statement of Basis, and other supporting documents provide a detailed overview of the Project. The UPDES permitting process provides for a review of the potential adverse effects to the environment that could occur as a result of the Project. However, this review process does not provide for cumulative impacts that could occur as a result of the Project's discharge of effluent water into the Jordan River and Gilbert Bay.

We understand that the primary goal of the UPDES permit process is to ensure the beneficial uses of receiving waters are protected by limiting concentrations and types of pollutants in a discharge. As such, the proposed permit and supporting documents use a screening level approach of how the discharge could affect the beneficial uses of the receiving waters, but do not take into account ecosystem processes that may be crucial to understanding how the habitats and wildlife that are supported by the receiving waters may respond to additional contaminants loads. A cumulative impacts assessment is not a process generally required by the UPDES permitting program. However, in this case, the ecosystems of the Jordan River, Great Salt Lake wetlands, and Gilbert Bay are already stressed from a combination of existing chemical, biological, and climatic stressors and this new discharge may add additional stress to the receiving ecosystems. Completing a cumulative impacts assessment would show that JVWCD and the Utah Division of Water Quality considered the relationships among all the ecological processes at work in the receiving waters. A more thorough evaluation is warranted for this permit because of the existing concerns regarding selenium and mercury exposure and effects to wildlife of Great Salt Lake.

We are particularly concerned about the cumulative impacts of pollutants to habitats of the south shore of Great Salt Lake. There is no mention in the draft UPDES permit of other sources of contaminants into the south shore of Great Salt Lake, specifically the habitats near the discharge point. Additional sources of contaminants of concern, including selenium and mercury, may include the Kennecott Utah Copper Corporation (KUCC) Outfalls 012 and 004, C-7 ditch, Goggin Drain, Lee Creek Drain, historical causeway near Saltair, and other potential sources of pollutants that may bioaccumulate in biota. Some of the habitats, such as the transitional wetlands created by the KUCC Outfall 012 discharge, may serve as attractive nuisances for birds that feed and nest in these habitats. Similarly, avian habitats near the discharge point contain significantly elevated levels of selenium in water and sediment when compared to other Great Salt Lake habitats (CH2M Hill 2008). Avocet eggs collected from Saltair in 2006 had twice the level of selenium as eggs collected from Ogden Bay and Antelope Island (CH2M Hill 2008).

Historical pollutants also exist in the environment at high levels, particularly in the area of Saltair. For example, the Bingham Complex and Barney's Canyon Mining District emitted approximately 7.5 million kg of mercury from 1864 to 2005 (Ege 2005). Some of this contamination remains in the lake environment in the form of tailings along the south shore of Gilbert Bay. The tailings were used as roadbase material along a 1-mile long lakeshore causeway. This structure is located about 0.25 - 0.5 miles south-southwest of the location of both the JVWCD RO Pipeline outfall and the KUCC Outfall 012. The tailings that were left behind represent an additional source of contaminant exposure to avian and other wildlife species near the discharge point. Based on this information, it is clear that the discharge from the Project will add more contaminants to habitats that are impacted by mining activities and discharges of pollutants, historically and currently.

There are relatively few data on which to base an estimate of the ecological risk of these contaminants to avian and other wildlife species that use the habitats of Gilbert Bay. We recommend that a monitoring plan include a sampling framework that considers how all the local pollutant sources, including the proposed Treatment Plant discharge, may affect the receiving waters, local habitats, and wildlife that depend on those habitats for portions of their life cycle. If designed appropriately, this type of framework will help estimate the ecological risk of the proposed discharge relative to other local pollution sources.

In summary, the Great Salt Lake ecosystem is ecologically crucial to a wide array of wildlife species, particularly migratory birds. As such, we recommend thorough cumulative effects analysis for the proposed discharge to ensure that these activities do not adversely impact the ability of the Great Salt Lake to provide essential wildlife resources. In addition, a monitoring plan should be developed and implemented to ensure long-term conservation of Great Salt Lake wetland and wildlife habitats.

Habitat Alterations from Discharge Effluent

Effluent from the Project may affect existing transitional wetland habitat or create new transitional wetland habitat along the south shore of Gilbert Bay. The discharge point is near the current KUCC Outfall 012, which currently sustains up to 0.75 miles of transitional wetland habitat from intermittent flows of effluent. Surrounding habitats support both salt and (relatively) freshwater-dependent communities of invertebrates that serve as food sources for shorebirds in the Saltair area (CH2M Hill 2008). Flow from the Project's constant discharge is expected to be significantly greater than the current intermittent discharge from the KUCC Outfall 012. Because of the relatively high flow and fresh water nature of the Project's discharge, we anticipate changes to the existing transitional wetland habitats and the organisms that rely on those habitats. For example, historical bird nest sites may no longer be available due to flooding, or conversely, new nesting sites may be become available. Other effects could include changes to diversity or abundance of invertebrate or plant species or a change in the occurrence of vector-borne pathogens, such as West Nile Virus. While the Project provides specific benefits to the local environment, society, and economy, it also may result in adverse effects to the existing transitional wetlands. We recommend JVWCD conduct monitoring in or near the transitional wetlands to determine if increased flow from Treatment Plant effluent is adversely affecting bird nesting habitat or food sources.

Monitoring Plan for Biota

Because the selenium standard for the open waters of the Great Salt Lake was based on predictive modeling, assessment monitoring is essential for validating the models and providing reliable data to estimate risk to wildlife that use habitats of Great Salt Lake (CH2M Hill, 2008).

The draft permit states that JVWCD will be required to develop and implement a Great Salt Lake Monitoring Program for water, sediment, macroinvertebrates, and bird eggs. Bird egg monitoring constitutes the collection of eight birds (but not to exceed 20% of available eggs) during the nesting season for analysis of selenium and mercury. Additional details of the monitoring program are provided in the draft permit; however a formal proposal or Sampling and Analysis Plan are not available in the permit package for review. We recommend the draft Great Salt Lake Monitoring Program plan be made available for public review and comment prior to being finalized and implemented by JVWCD.

Effects of Mercury and Selenium on Birds

The development of a selenium standard for the open waters of the Great Salt Lake required a large-scale evaluation and coordination effort among a variety of partners (Science Panel). One of the recommendations from this process was to conduct further studies of the potential interaction of selenium and mercury and their effects on aquatic birds (CH2M Hill 2008). The draft permit briefly describes the resulting Great Salt Lake Monitoring Program, and specifically identifies the intent to monitor selenium and mercury in bird eggs.

We agree with the permit's identification of monitoring selenium and mercury, and emphasize the importance of monitoring both elements for two reasons. First, there appears to be significant interaction between selenium and mercury in which high blood selenium concentrations in some avian species result from exposure to elevated mercury concentrations (CH2M Hill, 2008). Mercury and selenium concentrations are found at higher-than-expected levels in avian species at the Great Salt Lake (CH2M Hill 2008; Naftz et al. 2008; Conover and Vest 2009[a]; Conover and Vest 2009[b]; CH2M Hill 2009; Vest et al. 2009). Second, mercury and selenium may be antagonistic (ie. counteraction) to each other in adult birds, but additive or synergistic in young (Heinz et al. 1998). Elevated levels of mercury and selenium in bird eggs can cause teratogenesis (i.e. deformities) in avian embryos and reductions in hatching success and survival of young (Heinz et al. 1998).

Avian tissue mercury and selenium concentrations in Great Salt Lake habitats are in the range that would be expected to result in toxic effects to individuals (CH2M Hill, 2008). Thus, we recommend the Great Salt Lake Monitoring Program include an assessment of reproductive success of nests from or near Gilbert Bay in addition to analyses of avian egg mercury and selenium concentrations. Reproductive endpoints may be important for tracking potential effects from local sources of mercury and selenium to breeding birds. Endpoints that have not been previously investigated, such as tissue pathology or oxidative stress, which are linked to avian exposure to selenium and mercury (Custer et al. 1997; Hoffman et al. 1989; Hoffman et al. 1991; Hoffman and Heinz, 1998; Hoffman et al. 1998), may also be useful for identifying more subtle toxic effects that may translate into population level effects.

Fate and Transport of Selenium and Mercury

Selenium fate and transport in the Great Salt Lake and its wetlands is relatively well understood but not complete. There is significant variability in the estimates of volatilization, sedimentation, and other processes that contribute to losses of selenium (CH2M Hill, 2008). Estimates of atmospheric selenium inputs to the Great Salt Lake are currently not available. From the six major tributary sources of selenium to Great Salt Lake, approximately 60% (924 kg) of the tributary selenium load enters Gilbert Bay from KUCC Outfall 012, Lee Creek, and Goggin Drain (Naftz et al. 2008). The draft permit for the Project allows for an additional 224 kg (14%) of Se to enter Gilbert Bay from the JVWCD RO plant pipeline on an annual basis. There is no discussion of how the added selenium to Gilbert Bay will partition, cycle, or be removed from Great Salt Lake. We recommend a screening level assessment and discussion of these processes in the Gilbert Bay Level II Antidegration Review. A similar assessment and discussion should be included in the Jordan River Level II Antidegradation Review to address selenium loads from shallow ground water entering the Jordan River and downstream wetlands.

The current estimate of riverine mercury loading to Gilbert Bay is less than 0.5 kg/year (Naftz et al. 2009), which is approximately 8% of the total riverine mercury load to Great Salt Lake. The Project UPDES permit will allow up to an additional 0.38 kg mercury/year (1% of total mercury load to Great Salt Lake). It is unclear if the effluent mercury load limitation will be met because JVWCD has not fully characterized the mercury concentrations in the deep aquifer. Therefore, no reliable estimates of a mercury load from the JVWCD RO plant to Gilbert Bay can be generated.

The draft permit states that JVWCD will be required to monitor total and methyl mercury concentrations in byproduct water prior to it entering the pipeline and at the end of pipe prior to mixing with the Gilbert Bay. The results from these monitoring activities will be necessary to determine if the allowable total mercury load of 0.38 kg/year to Gilbert Bay is attainable. The results will also provide estimates of how much methyl mercury may be passing through the transitional wetlands that receive Treatment Plant byproduct. The draft permit does not consider the fate of mercury after it enters the open waters of the Great Salt Lake, and it is unclear how the cap of 1% mercury load was derived. We believe it is important to assess how mercury will affect the receiving waters and the biota dependent on the waters, to the extent possible, prior to issuance of the permit. We recommend a review in the final permit that discusses how capping the effluent's mercury load at 1% of the total mercury load for Great Salt Lake will be protective of the receiving water's beneficial uses.

Comments on Gilbert Bay Level II Antidegradation Review

The draft permit identifies only selenium and mercury as having the potential to degrade water quality in Gilbert Bay. We expect that selenium and mercury were selected as the only contaminants of concern because of the elevated levels detected in the Great Salt Lake environment in recent years. However, we recommend that JVWCD and the Utah Division of Water Quality demonstrate the process of elimination that was used to determine which pollutants in the discharge effluent will potentially cause a degradation of water quality and other environmental attributes.

We recommend adding a section to the Antidegradation Review that reviews levels of all contaminants in the discharge and provides a rationale why each contaminant will or will not result in a degradation to water quality. Based on data provided by JVWCD, we anticipate substantial loads of other contaminants, such as arsenic (49 to 149 kg/year), cadmium (2.2 to 6.2

kg/year), hexavalent chromium (49 to 132 kg/year), and nickel (21.4 to 61.7 kg/year) to be additional stressors to the transitional wetland habitat adjacent to Gilbert Bay and the wildlife that depend on the wetland (Shelley 2010). Information on environmental fate and transport and speciation of metals, non-metals, and metalloids should also be included when possible. For example, speciation of selenium (e.g., organic selenium vs. selenite or selenate) should be considered in addition to concentrations and loads of selenium in effluent since the form of pollutant can influence toxicity to wildlife.

Mercury Loading to Gilbert Bay

The current estimate of annual loading of total mercury to Gilbert Bay from Kennecott Outfall 012 is 0.01 kg (Naftz et al., 2009). Estimates of the total mercury concentration that will be in effluent water from the Treatment Plant range from 0.07µg/L (Atencio, 2010) to 0.8 µg/L (Shelley, 2010). Based on these estimates, the total mercury load from the Treatment Plant to Gilbert Bay may vary from 0.29 kg/year to approximately 3.24 kg/year. We are concerned that the actual load of mercury to Gilbert Bay will be more than what is estimated because no reliable estimates of a mercury load from the Treatment Plant to Gilbert Bay can be generated.

We are aware that there is no numeric mercury standard for open waters of Great Salt Lake and this is likely the rationale behind JVWCD being able to obtain a UPDES permit in the absence of reliable deep well mercury data. However, because mercury concentration and load were identified as parameters of concern in the Gilbert Bay Level II Antidegradation Review Report, we believe an assessment beyond what was performed would be beneficial for estimating risks to the habitats in and near Gilbert Bay. The Utah Division of Water Quality states in the draft UPDES permit that no discernible increase in the ambient mercury concentration in Gilbert Bay is anticipated; however, the potential for change in ambient mercury concentrations in transitional wetlands was not addressed. We believe an assessment to quantify the mercury load to receiving waters upstream of the mixing zone in Gilbert Bay will help natural resource managers accurately assess the risk posed from increased exposure of ecological receptors to mercury.

Specific Comments

Draft Permit

Page 6, Item h: insert "d.w." after 12.5 mg/kg

Page 6, Item j: This load needs to refer back to Naftz et al. 2009 somewhere in the permit.

Page 7, table for Outfall 001: We recommend using the same frequency of monitoring for total mercury and total selenium. Selenium is currently listed as 2 times weekly and mercury is monthly.

Page 7, table for Outfall 002: Please see our previous recommendation for Outfall 001, above.

Page 8, Section 6: The current language does not distinguish whether total and/or methyl mercury will be evaluated. We recommend, at a minimum, completing an evaluation of total mercury.

Page 9, Section 8: Avocet geometric mean egg selenium concentration from 2006 was 5.1 μg/g d.w (n = 8; range of 2.9 to 9.2 μg/g). These samples were collected from Saltair. This elevated concentration triggers the initiation of monitoring, assessment, and potential management actions. We assume that implementation of a monitoring program is a requirement of the permit because the lowest egg selenium concentration trigger (5.0 μg/g d.w.) is exceeded at Saltair (see General Comments, Monitoring Plan for Biota, above).

Fact Sheet / Statement of Basis

Page 1, Description of Facility, 3rd paragraph: The paragraph states that start-up flows from deep and shallow wells will be discharged through storm drain systems and at various times to the Jordan River. This statement is not in agreement with the process diagrams which were provided as Section 3 of the UPDES permit application. According to those diagrams, contaminated deep well water is never pumped into the Jordan River (Atencio 2010); instead, deep well water is always sent as overflow to Gilbert Bay during start-up, cleaning, and maintenance of the deep well RO system,. The same flow diagrams demonstrate that shallow well water is sent to the Jordan River during start-up and cleaning and maintenance of the shallow well RO system. Additionally, Slide 23 of Mark Antencio's presentation from March, 2010, concludes that there will be no deep well discharge and no by-product discharge to the Jordan River. Please address this inconsistency.

Page 2, Operating Conditions, 1st paragraph: Flow diagrams for normal operating conditions do not show that groundwater from shallow wells is discharged to the Jordan River. These diagrams demonstrate that groundwater from shallow wells is discharged only during start-up and cleaning and maintenance of the shallow well RO system. Please address this inconsistency.

Page 2, Pump to Waste Start-Up Condition: This section needs to be in agreement with all other language in supporting documents that discuss discharges of deep well water to the Jordan River. It currently states that both deep and shallow wells will discharge into the Jordan River. As stated previously, this appears to be in disagreement with flow diagrams. Please address this inconsistency.

Page 2, Cleaning and Maintenance Conditions for the Shallow Aquifer Wells, 2nd paragraph: Recommend removing term "uncontaminated" on second line. A well water concentration of 7.9 μg Se/L may be considered contaminated in some environments.

Page 3, Monitoring Programs, last paragraph: The first sentence of this paragraph states that a concentration of 27 ppb Se (after the mixing zone) is predicted to not exceed a concentration that will be detrimental to aquatic life. The rationale behind this determination is unclear, especially considering the first sentence of the next paragraph states that some uncertainty remains about the potential effects of selenium on the biota of the Great Salt Lake. We recommend removing any language that makes predictions about effects and simply state what uncertainty exists and how it will be addressed through monitoring. Additionally, there are up to 0.75 miles of transitional wetlands between the discharge site and the shoreline of Gilbert Bay which may be affected before the effluent reaches the mixing zone. We recommend a statement that addresses how selenium may affect areas between the discharge point and mixing zone.

Page 4, Mercury Effluent Limit for Outfall 001 to Gilbert Bay of the Great Salt Lake, 1st paragraph after bullets: Recommend removing or rewording the first sentence. Biochemical, pathological, immunological, and other types of health assessments in Great Salt Lake birds are very limited in scope. All of these types of health assessments have proven useful in avian mercury risk assessments performed outside of the Great Salt Lake. Only one of the three referenced studies performed active assessment of health effects (using biomarkers of effect), and the extent of those effects assessments were limited in scope relative to Gilbert Bay.

Page 4, Mercury Effluent Limit for Outfall 001 to Gilbert Bay of the Great Salt Lake, 1st paragraph after bullets: Recommend including dataset from Kevin Perry (Utah State University Dept. of Atmospheric Sciences) on dry deposition of mercury over Great Salt Lake. His estimate of mercury load is different than estimates from USGS. This demonstrates that there is uncertainty in the mercury load to the Great Salt Lake.

Page 4, Mercury Effluent Limit for Outfall 001 to Gilbert Bay of the Great Salt Lake, 2nd paragraph: Last sentence uses the term "insignificant." Recommend using an alternate word. Significance is based on many things in addition to pollutant load. Additionally, the significance of the load cannot be adequately addressed since JVWCD has not fully characterized mercury concentrations in the deep well aquifer. We have reviewed permit application supporting documents that provide estimates of mercury concentrations ranging from 0.07 to 0.8 μg/L. Additionally, please provide a rationale behind the selection of 1% effluent Hg load cap (0.38 kg/yr). Specifically, please explain why 1% is the preferred cap vs. any other percentage.

Page 4, Mercury Effluent Limit for Outfall 001 to Gilbert Bay of the Great Salt Lake, 4th paragraph: Please provide a rationale for monitoring mercury and methyl mercury during April and June. It's unclear why these two months were selected. The last sentence used the word "insignificant". We recommend using a different term, such as "not substantial", or providing a more in-depth explanation of why 1% is considered insignificant.

Page 7, Great Salt Lake Monitoring Program, 2nd paragraph: We anticipate a detailed Sampling and Analysis Plan (SAP) will be developed for an assessment of contaminant concentrations in eggs, water, sediment, and macroinvertebrates. We recommend JVWCD collaborate with Utah Division of Water Quality, Utah Division of Wildlife Resources, U.S. Fish and Wildlife Service, and potentially other entities on development of the SAP. A monitoring program may need to involve effects assessments (e.g., measure of reproductive success) in addition to exposure assessments.

Page 8, Outfall 002, Shallow Aquifer Discharges to the Jordan River: Please provide a rationale behind selection of a 30% safety factor for the effluent selenium concentration.

Page 9, Self-Monitoring and Reporting Requirements, Outfall 001 table: We recommend total mercury and selenium concentrations be monitored at the same frequency of twice weekly. We recommend including egg total mercury concentrations in the reporting requirements.

Effluent Loading Calculations

We have questions regarding how the Waste Load Analyses for Conservative Substances were calculated. It's unclear how receiving waters of Bingham Creek, Jordan River, Trimble Creek, and Butterfield/Midas Creek could have a combined effluent/receiving water selenium concentration of 0.018 μg/L, despite all of them receiving effluent from different deep wells at different flows and selenium concentrations. We have similar questions regarding the receiving water TDS concentrations. In addition, it is unclear why these calculations are provided in the information packet because it is our understanding that the only receiving waters are Gilbert Bay (receiving deep and shallow well water), Jordan River (receiving shallow well water), and the Utah and Salt Lake Canals.

We appreciate the opportunity to comment on this discharge permit. If further assistance is needed or you have any questions, please contact John Isanhart, Ecologist, at the letterhead address or (801) 975-3330 ext. 144.

Sincerely,

Larry Crist
Utah Field Supervisor

Enclosure: References

References

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