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

August 20, 2008

In Reply Refer To
FWS/R6
ES/UT
65411-08-EC-0001

Walt Baker
Department of Environmental Quality
Division of Water Quality
Box 144870
Salt Lake City, UT 84114-4870

RE: Proposed Amendments to the Standards of Quality for Waters of the State Rule

Dear Mr. Baker:

We have reviewed the proposed amendments to Utah Administrative Code section R317-2 (the Standards of Quality for Waters of the State) as presented on the Division of Administrative Rules website (http://www.rules.utah.gov/publicat/bulletin/2008/20080715/31650.htm), and we have reviewed the supporting 21 documents presented on the Division of Water Quality's (Division) website. The proposed amendments are a result of the triennial review process that began in 2007 and were reviewed and revised by the Water Quality Standards Workgroup which was formed by the Division, in part, due to extensive comments provided by the public in 2007. The proposed amendments include significant changes in the anti-degradation review language, a proposal to segment the Great Salt Lake (GSL), and changes in the standards for *E. coli* and total dissolved solids (TDS), among others.

The proposed rule also includes the addition of a tissue-based numeric standard for selenium for Gilbert Bay of GSL. The U.S. Fish and Wildlife Service (Service) has been an active member of the Great Salt Lake Steering Committee, which over the last four years has helped guide the selenium standard setting process and ultimately recommended three numeric selenium standards for Gilbert Bay of GSL.

We provide the following comments for your consideration. Our comments are made pursuant to our authorities under the Endangered Species Act of 1973, as amended, the Migratory Bird Treaty Act, the Clean Water Act, and the Bald and Golden Eagle Protection Act.

GSL Segmentation and Transitional Wetlands

One significant proposal in this triennial review is the segmentation and reclassification of the Great Salt Lake from a Class 5 waterbody into five separate segments: Class 5A Gilbert Bay; Class 5B Gunnison Bay; Class 5C Bear River Bay; Class 5D Farmington Bay; and Class 5E Transitional Wetlands along the GSL Shoreline. The existing classification of the GSL (Class 5) does not include numeric criteria. Under the proposed segmentation plan, the five separate designations would also have no numeric criteria except for a new selenium standard for Gilbert Bay (Class 5A); however, the segmentation and reclassification of the GSL does recognize the diverse conditions that currently exist at GSL.

For example, Gunnison Bay has in recent years been significantly more saline than the other bays. Salinities in Farmington and Bear River bays have fluctuated more due to their closer proximity to freshwater inputs, and Bear River Bay (proposed Class 5C) has even supported a freshwater fishery in the past (Don Paul, Intermountain West Joint Venture, pers. comm.). Each of the four bays has differing chemical and physical properties; however, it is worth noting that these differences are due primarily to human-placed causeways that have divided the lake and not due to natural conditions. Segmenting the lake for classification purposes allows the Division to promulgate numeric standards that can be customized for the various conditions that exist at the lake; however, the Division should strive to manage the GSL holistically as an entire ecosystem, recognizing that the bays and transitional wetlands are connected.

One of the strengths of the segmentation plan is the addition of transitional wetlands as a separate class. Transitional wetlands are particularly important when lake levels are low as freshwater inputs can flow across mudflats for more than a mile before reaching the open, saline waters of the GSL. In a May 25, 2006 letter we recommended that freshwater overland flows (i.e., transitional wetlands) be managed as separate freshwater systems, separate and distinct from the open waters of the GSL. This is particularly relevant since contaminants behave differently and are often more bio-available in freshwater than in the saline waters of the GSL. In addition, more species of birds use the transitional wetlands for foraging and nesting habitat and may be exposed to the more bio-available contaminants. The chemical and physical properties of transitional wetlands along with the potential exposure to a greater diversity of bird species reveal that transitional wetlands are noticeably different than the saline waters of the GSL and hence should be managed separately. The proposed amendment to include transitional wetlands as a separate class recognizes the important differences between the habitats of the bays and the freshwater wetlands.

One similarity between the proposed classes 5A through 5E is that none have numeric criteria except for the proposed selenium standard for Gilbert Bay (Class 5A). Since the transitional wetlands (Class 5E) are freshwater, and the proposed beneficial uses for Class 5E include "waterfowl, shorebirds and other water-oriented wildlife including their necessary food chain," we recommend that the numeric aquatic life criteria for Class 3D[1] be applied to Class 5E. The addition of numeric criteria would immediately provide a basis to protect the aforementioned beneficial uses of the transitional wetlands. If concentrations of a particular contaminant in a

[1] Class 3D is protected for waterfowl, shorebirds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.

transitional wetland exceed the existing Class 3D numeric criteria, the Division should begin the process of developing site-specific criteria. The progression of applying 3D criteria to Class 5E waters and then developing site-specific criteria for a few contaminants of concern would be less arduous and time-consuming than developing site-specific criteria for all contaminants at each Class 5E wetland. We believe that applying the numeric aquatic life criteria from Class 3D to Class 5E is the appropriate action to protect the beneficial uses of transitional wetlands.

As lake levels rise and fall, the extent of the transitional wetlands will vary, and at very high lake levels the transitional wetlands may disappear altogether. As this occurs, Class 5E waters would shift to the class of the appropriate bay. The opposite would also be true in that as lake levels recede and transitional wetlands reform, Class 5E would be reapplied. The dynamic nature of the GSL, including the ebb and flow of transitional wetlands as lake levels rise and fall, provides unique challenges for implementation and monitoring of water quality standards; however, we believe the inclusion of transitional wetlands is a worthwhile effort, because it addresses the dynamic conditions of the GSL, recognizes the unique attributes and benefits of these wetland habitats, and provides a mechanism to better protect migratory birds and their food chain. We do, however, have a few concerns with the proposed 4,208-foot elevation for the transitional wetlands in the proposed rule.

- In the proposed rule the demarcation for transitional wetlands is given a specific upper elevation of 4,208 feet. The 4,208-foot elevation boundary has not been identified on a map which has led to some confusion. In addition, the supporting material does not provide the elevation of dikes surrounding the various waterfowl management areas, national wildlife refuges, mitigation sites and duck clubs which has added further ambiguity. We recommend the Division identify the 4,208-foot boundary on a map or GIS file.

- In some cases, dikes separating impounded wetlands from the open waters of the GSL may be lower than the elevation of 4,208'. This potential overlap of existing impounded wetlands and the proposed transitional wetlands creates confusion about which classification and/or numeric criteria will be applied. During a phone conversation on July 30, 2008, Dr. William Moellmer reiterated that the boundary of the transitional wetlands would not extend up into existing freshwater impoundments where the 4,208-foot elevation exceeds the elevation of the dike and would not supplant existing numeric water quality criteria. Instead, the transitional wetlands begin outside of the dike. We agree with the approach outlined by Dr. Moellmer but are concerned that the language of the proposed rule does not adequately describe this approach. We recommend that additional clarification be provided regarding the relationship between existing impounded wetlands and the proposed boundary of transitional wetlands. One potential solution is to define "Open Waters" as those that are downgradient and/or outside of these impounded wetlands regardless of the dike elevation.

  For example, in the table under section 13.11of the proposed rule, waters within the Farmington Bay WMA have been split from one use designation (covering the entire WMA) into three (open waters below 4208', transitional wetlands, and open waters above 4208'). Under the new proposal, waters above an elevation of 4,208' retain their current classification and numeric criteria; however, open waters below 4,208' have been reclassified Class 5D with no numeric criteria. Since the outer dike may sit at an elevation lower than

4,208', this suggests that the freshwater impoundments between the dike and 4,208' would lose their existing numeric criteria under the proposed rule. Removing the numeric criteria from the impounded wetlands may not be the intent of the proposed rule, but as stated above there is confusion about the proposed 4,208-foot boundary of the transitional wetlands and the elevation of existing impounded wetlands.

- The rationale for downgrading classifications and removing numeric criteria of classes 3C or 3D is that the 3C and 3D classifications are for freshwater and "do not apply to the open waters of Great Salt Lake due to its high level of salinity."[2] It would appear that the Use Attainability Analysis (UAA) does not apply to the impoundments since they are freshwater and do not have a high level of salinity. Because the impoundments contain freshwater (except at very high lake levels), the proposed change to remove classes 3C and 3D from the impoundments is inappropriate. If the intent of the proposed rule is to keep existing numeric criteria for the impoundments, this intent should be clarified. If not, we recommend the Division reconsider this decision and amend the proposed rule to keep the existing use classifications and their associated numeric criteria for the impoundments.

- The above comments also apply to other impoundments around the lake, such as at Howard Slough WMA, Locomotive Springs WMA, Ogden Bay WMA, Public Shooting Grounds WMA, Salt Creek WMA and Timpie Springs WMA. If the intent of the proposed rule is to keep existing numeric criteria for WMA impoundments, this intent should be clarified. If not, we recommend the Division reconsider this decision and amend the proposed rule to keep the existing use classifications and their associated numeric criteria for these impoundments.

- There are certain wetlands such as the Crystal Unit at Farmington Bay WMA and the Layton Wetland Preserve that are outside of existing dikes and yet are freshwater wetlands except under high lake elevations. The Crystal Unit and the Layton Marsh are not saline waters of the GSL. We disagree with the analysis of the UAA that suggests that classes 3C and 3D do not apply to these wetlands. While we do not know the exact elevation of the Crystal Unit or the Layton Marsh, these waters have been freshwater wetlands for at least 15 years. We recommend the Division continue to apply Class 3D numeric criteria to these and other similarly situated wetlands.

- The concerns related to the 4,208-foot boundary of the transitional wetlands would be addressed if the Division were to apply 3D numeric criteria to the proposed Class 5E.

Selenium Standard for Gilbert Bay of Great Salt Lake

Staff members from this office participated in the Great Salt Lake Steering Committee which helped develop recommendations for a tissue-based selenium standard for the GSL. The Service along with four other Steering Committee members recommended the State adopt a No Effect tissue-based concentration in avian eggs of 5 mg/kg on a dry weight basis rather than at 12.5 mg/kg dry weight, which is an estimate of a concentration that is likely to cause a 10% reduction

[2] Use Attainability Analysis: Great Salt Lake, Utah

in egg hatchability (EC_{10}). We provided numerous reasons in our minority report for supporting a No Effect standard which included a desire to be fully protective of the GSL ecosystem rather than partially protective, the hormetic effects of selenium that were not considered in developing the EC_{10}, and numerous uncertainties that impress upon us the need to take a cautious approach. In addition, staff provided a verbal statement to the Water Quality Board describing why the selenium standard for GSL is so unique and why applying methods from other water quality standard setting processes may not be appropriate for the GSL. Again, we reiterate our recommendation that the State adopt a No Effect selenium standard for Gilbert Bay for the following reasons:

- The GSL is a unique ecosystem. It has been designated as a site of hemispheric importance for shorebirds (Manomet Center for Conservation Science, 2007) and each of the five bays (Gilbert, Gunnison, Bear, Ogden and Farmington) has been identified as a globally important bird area by the National Audubon Society. The lake's varied and diverse habitats coupled with its large size and geographic position within the landscape provide an invaluable resource for millions of migratory birds each year. Eared grebes and Wilson's phalaropes extensively use the GSL during the non-breeding season (Jehl, 1988), and more recently Vest *et al.* (2008) demonstrated that the GSL is an important wintering site for common goldeneye and northern shoveler. Many other species of waterbirds also use the GSL during migration and breeding (Manning and Paul, 2003). Setting a selenium standard for the GSL should incorporate a precautionary approach so that the unique ecosystem is fully protected. Setting a standard that is too high could lead to substantial harm to these resources.

- The No Effect standard recommended by the Service is intended to be fully protective of all beneficial uses. The proposed EC_{10} tissue-based selenium standard only considers avian reproduction and does not address non-reproductive effects. Reproductive effects are generally considered the most sensitive endpoint for selenium; however, non-reproductive effects should not be discounted, especially for species such as eared grebe, common goldeneye and Wilson's phalarope that forage heavily on brine flies and/or brine shrimp, especially during the stressful periods of migration, molting and wintering.

  Unpublished data by the Service demonstrates that concentrations of selenium in the livers of eared grebes staging on GSL increased significantly from a mean of 13.8 mg/kg dry weight on 18 Oct 2006 to a mean of 23.2 mg/kg on 20 Dec 2006 (Darnall and Miles, 2008). A less dramatic increase was also observed in breast muscle tissue, 4.5 and 5.6 mg/kg. Similar increases in selenium were also recorded in eared grebes in 2006 by Conover *et al.* (2008a), and selenium also increased in the livers of common goldeneye wintering on GSL (Conover *et al.* 2008b; Vest *et al.* 2008). These data show selenium will accumulate in tissues of birds foraging on the GSL and that some of the existing concentrations are already elevated above levels of concern (5-29 mg/kg in liver; Hoffman, 2002). In an extreme case, adult mortality occurred in mallard ducks at Ouray National Wildlife Refuge when concentrations in livers reach 40-50 mg/kg and 4-8 mg/kg in breast muscle (NIWQP, 1998); however, sublethal effects have been documented at lower concentrations (Heinz, 1996; NIWQP, 1998; Hoffman, 2002).

Currently, we do not know the non-reproductive effects of selenium exposure at current levels in birds occurring on the GSL, but the possibility of allowing selenium in the GSL to increase more than four-fold[3] will likely push liver and muscle concentrations within ranges that could result in adverse population-level effects. The proposed EC_{10} standard does not adequately address concerns related to non-reproductive effects.

- In addition to concerns about the potential inadequacy of the proposed EC_{10} standard to protect non-reproductive effects, the proposed EC_{10} standard may not adequately protect brine shrimp and the *Artemia* cyst industry. At the Water Quality Board meeting (June 20, 2008) Don Leonard presented a third recommendation for a tissue-based standard in avian eggs that is roughly equivalent to an EC_6 (10.4 mg/kg). This lower recommendation was based on the modeled relationships between concentrations of selenium in water, brine shrimp, brine shrimp cysts, and avian eggs that showed that at the EC_{10} value in eggs (12.5 mg/kg), concentrations in brine shrimp and brine shrimp cysts would exceed permissible levels in certain aquaculture markets such as the European Union. Mr. Leonard urged the Water Quality Board to approve a lower standard so that brine shrimp tissues (cysts, nauplii and adults) would not exceed dietary effect thresholds for fish. The Service agrees in concept with the recommendation to lower the proposed standard because of our goal to be fully protective of the GSL and its resources, including brine shrimp and the *Artemia* cyst industry. The case presented by Mr. Leonard shows once again that the proposed EC_{10} standard may not be fully protective. While the recommendation to set a lower standard at 10.4 mg/kg is a step in the right direction, we believe that it does not go far enough. Our recommendation to set a No Effect standard of 5 mg/kg would obviate concerns with concentrations in brine shrimp tissues.

- The proposed EC_{10} standard (12.5 mg/kg) is based on a logistic regression developed by Ohlendorf (2003) on a set of pooled results from different studies, the pooling of data being made possible by converting all results to a control-adjusted basis. The curves developed by Ohlendorf do not consider the hormetic properties of selenium, which is a hormetic chemical, meaning that adverse effects can be caused by deficient dietary exposure as well as by excessive dietary exposure. Consequently, the classic concept of a control group as a zero (or nearly zero) exposure group is inappropriate for evaluating results of selenium toxicity tests. For a hormetic chemical, ignoring the potential effects of hormesis will always lead to potentially overestimating particular effects points such as the EC_{10} (Beckon *et al.* 2008). Including hormesis in the toxicity curves moves the hormetic EC_{10} (8 mg/kg) much closer to our recommended No Effect standard (5 mg/kg). Hormesis was not fully considered by the Science Panel for reasons outlined in the No Effect recommendation prepared by five members of the Steering Committee; however, earlier this summer, Orange County, CA accepted a recommendation to go no higher than the hormetic EC_{10} of 8 mg/kg in mallard eggs for a site-specific selenium objective they are preparing (Joe Skorupa, U.S. Fish and Wildlife Service, per. comm.). If the Division wishes to move forward with an EC_{10} recommendation, we encourage the state follow Orange County's lead and adopt the hormetic EC_{10} of 8 mg/kg.

[3] The predicted four-fold increase is based on models incorporating existing selenium concentrations in all media and the predicted concentrations in water and brine shrimp associated with the EC_{10} value of 12.5 mg/kg in eggs.

- Some members of the Steering Committee and staff from the Division have suggested that setting a standard based on an EC_{10} value is more protective than most other water quality standards which are often based on an EC_{20} value. We agree that this is largely true, but we believe there are a few important differences between previous water quality standards and the one proposed for GSL and that these must be considered in developing a standard.

- Precedent is one argument some use for recommending an EC_{10} value as the standard. The claim is that the Great Lakes Initiative (GLI) set standards based on the EC_{10}; however, this is not entirely true. Instead the GLI developed standards based on a no observed effect concentration (NOEC), it just happens that "a NOEC is similar to an EC_{10} value in terms of level of protection" (Bill Weurthele, Science Panel Meeting, Salt Lake City, Utah; November 30, 2007). Some may consider this a nuance of language, but we believe there is an important distinction between setting out to develop standards based on not observing effects and setting out to intentionally develop standards at an EC_{10} level.

- The GSL selenium standard is unlike any other water quality standard, since it is tissue-based, while all other standards are water-column-based. This is an important consideration since with "typical aquatic life water column value where we know the organisms are not going to be exposed to those levels on a continuous basis...[but when] it comes to a tissue-based value which is what we're looking at here...that's different, because then the organism is exposed to that value on a more or less continuous basis" (Bill Weurthele, Science Panel Meeting, Salt Lake City, Utah November 30, 2007). Because the tissue-based GSL standard will cause organisms to be constantly exposed, applying the usual assumptions of water-column-based standards may not be applicable in this case.

- In addition to the specter of continuous exposure, there are other important differences between this standard and other standards.

    - First, selenium is different than most contaminants regulated by the Division such as chlorine, ammonia, and copper. Selenium toxicity comes not primarily through acute exposure but via chronic exposure because it readily bioaccumulates in organisms, is easily recycled within a system and once introduced into a system takes decades to be removed (Skorupa, 1998). Chlorine and ammonia on the other hand do not persist in the water-column environment and do not bioaccumulate. The Division recognizes the special properties of bioaccumulative compounds and specifically mentions that mixing zones can be limited or disallowed for substances such as selenium (UAC 317-2-5.1).

    - Second, the GSL selenium standard will affect the entire ecosystem of Gilbert Bay, not just a limited section of a river or a mixing zone in lake. In many cases the concentration of a pollutant at the water quality standard will decrease at some point below the point of discharge due to dissipation or dilution, etc. The entire system is not affected and there are refugia areas for aquatic life. This is not the case for the GSL because the standard is a geometric mean representing the entire lake; therefore, the entire ecosystem is affected.

- Third, implementation of water quality standards almost always involves setting maximum concentrations at low flow conditions (e.g., 7Q10). Since low flow conditions rarely occur, concentrations of pollutants are not at their effect levels most of the time. This would not be true for GSL since there is no low flow condition for the GSL. Instead, organisms like brine shrimp would be exposed to the full concentration in the lake all the time.

- Four, the GSL is ecologically different than freshwater rivers and lakes and is even different than the oceans. We are just beginning to understand the lake and its processes, but there are many uncertainties and unknowns. One of these is the possibility that there may be a lag time between new inputs and the observation of impacts on the lake. If the lake responds quickly, adjustments in load reductions should be effective, but if the lake is slow in responding, efforts to reduce loads may prove ineffective at reducing impacts to the lake. Until we know more about the lake and how it responds to new loads, it is appropriate to take a precautionary approach and set a No Effect standard.

- The proposed tissue-based standard for the GSL is the culmination of four years' efforts. It is the first numeric standard for the GSL and the first ever wildlife criterion for the nation. Clearly, this is a historic moment, and perhaps the eyes of the nation are watching. We have outlined a few reasons why we recommend the Division and the State adopt a No Effect standard for the GSL. EPA has stated that they are willing to approve a No Effect standard and EPA has also stated that doing so would not limit the State's ability to set future water quality standards. We urge the Division to adopt a fully protective standard. Again, this is a historic moment and all involved should be congratulated.

Miscellaneous

Comments on DAR File No. 31650

1. Under the proposed rule, a level II anti-degradation review would not be necessary under certain conditions where the project would consume less than 20% or 10% of the remaining assimilative capacity (page 4). While permit limits are usually based on low flow conditions (e.g., 7Q10), the remaining assimilative capacity is apparently calculated from average flows. We are concerned that using an average flow to determine assimilative capacity could severely overestimate the amount of assimilative capacity in many of Utah's waters, especially if high spring peak flows are used to calculate the average flow. The average flow many be the appropriate statistic for waters with relatively constant flows but may not be applicable to western waters. We recommend the Division evaluate the hydrographs from a few waters to determine how daily flows and their assimilative capacity compare to that of the yearly average flow. If there is wide variation, the Division may wish to consider other flow conditions (e.g., 7Q10) when calculating assimilative capacity
2. The words "shore birds" (page 8 and following) can be combined into a single word.
3. Farmington Bay Open Water below 4,208 is shown as 5C; however, it should be 5D (page 30). This should be corrected before being made final by DAR.

4. We support the addition of the chronic aquatic life numeric criteria for ammonia to classes 3C and 3D (page 42).
5. The implementation and assessment methodology under footnote 14 for the GSL selenium standard (page 47 and 48) are based on the EC_{10} value of 12.5 mg/kg dry weight in avian eggs. As stated in the No Effect recommendation (5 mg/kg) a modified assessment methodology could be developed or may not be needed if the state adopted a No Effect standard. One or two members of the Steering Committee disagree with the assessment methodology; however, all members of the Science Panel recommended an assessment methodology be adopted with the standard and a few Steering Committee voted for the EC_{10} rather than a lower standard because of the assessment methodology. Unless the state adopts a lower standard, this assessment methodology should remain as part of the rule. We encourage the state to add brine shrimp triggers that protect the non-breeding migratory birds and the Artemia cyst industry.

We appreciate the opportunity to participate in the Water Quality Standards Workgroup and Great Salt Lake Steering Committee, and we look forward to future collaboration with your staff. If further assistance is needed or you have any questions, please contact Nathan Darnall or John Isanhart, at (801) 975-3330 extensions 137 and 144, respectively.

Sincerely,

Betsy Herrmann

for Larry Crist
Utah Field Supervisor

cc: Utah Division of Water Quality
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