2016 INTEGRATED REPORT RESPONSE TO PUBLIC COMMENTS

UTAH DEPARTMENT *of* ENVIRONMENTAL QUALITY
WATER QUALITY

2016 Final Integrated Report

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INTRODUCTION

The following is a summary of the comments received on the Draft 2016 Integrated Report during the comment period, which was held between June 10th, 2016 and 5:00 p.m. on September 8, 2016. During that period DWQ received approximately 30 comment letters. Original comment letters that were submitted to DWQ are available on the Draft 2016 IR website. In order to address each comment individually, each letter was divided into discrete questions or comments and placed in the following table which indicates the action taken and the response given by staff. To facilitate addressing a large number of comments regarding Harmful Algae Blooms and Farmington Bay, a *Joint Comment Response Document* is provided in Appendix A.

Key to Letters

Letter	Commenter
EPA	USEPA Region 8
A	L. Meyers, Central Davis Sewer District
B	M. Holden, Central Utah Water Conservancy District
C	M. DeVries, Protect and Preserve American Fork Canyon
D	D. Erley and A. Hulquist, Moab Area Watershed Partnership
E	R. Dubuc, Western Resource Advocates on behalf of Friends of Great Salt Lake, Wasatch Audubon, Great Salt Lake Audubon, Utah Waterfowl Association, League of Women Voters of Utah, South Shore Friends and Wetland Management, and Utah Chapter of the Sierra Club
F	T. Holstrom and P. Heck, Central Valley Water Reclamation Facility
G	T. Miller, Jordan River/Farmington Bay Water Quality Council
H	D. Decker, et al., Provo City
I	R. Mickelsen, Provo City
J	J. Stewart, Salt Lake City
K	L. Adams, Utah Department of Agriculture and Food
L	M. Hodgesett
M	M. Rau, Central Utah Water Conservancy District
N	L. Rawlings, South Valley Water Reclamation Facility
O	T. Bosteels, Great Salt Lake Brine Shrimp Cooperative, Inc.
P	S. Austin, Navajo Nation Environmental Protection Agency
Q	J. Adams, Timpanogos Special Service District
R	D. Richards, OreoHelix Inc.
S	S. Cannon, National Park Service
T	D. Sewell, et al., Provo City
U	D. Wayment, South Davis Sewer District
V	M. Allen, Protect and Preserve American Fork Canyon
W	J. Geertsen, Protect and Preserve American Fork Canyon
X	S. Hatch
Y	J. Judd
Z1	D. Potts, Salt Lake City Fish and Game Association
Z2	E. Sorensen, Metropolitan Water District of Salt Lake and Sandy
Z3	T. Frates, Utah Native Plant Society

Letter	Comment Number	Chapter Number	Public Comment	Action	Agency Response
A	1	5	Thank you for the opportunity to comment. The 2016 Integrated Report represents a significant amount of effort to protect water quality in the State of Utah. We applaud the State Division of Water Quality for their effort in this important endeavor. The Staff and Board of Central Davis Sewer District provide these comments. We approach this in an effort to be collaborative and to improve the integrity of the integrated report. Our comments will focus on the following areas of the report. 1. Listing and assessment methodology associated with harmful algal blooms, specifically cyanobacteria. a. Cell Count as a Basis for Listing b. Sampling Program Considerations c. Summary - Assessment 2. Assessment of Farmington Bay 3. Support for Adaptive Management	None	Please see comment response Appendix A for responses to these comments.
A	3	2	Harmful Algal Blooms Assessment Methodology CELL COUNT AS A BASIS FOR LISTING The IR focuses on information extracted from the WHO for assessment thresholds. Specifically, Table 10 (below) is used to determine support or non-support. While we accept that this is one method used to assess a water body, many states use it primarily as a means to assess recreational use guidance, not for listing. We believe that the decision to list for impairment should be separate from the decision to post or provide warnings and restrictions for recreation. Protection of public health should be precautionary whereas listing has potential cost implications it should be based on a more rigorous standard. Virginia, for example uses essentially the same ranges for assessing recreational guidance as shown below (Virginia Recreational Guidance): The cell count process is used, but they also recommend the evaluation of toxin concentration as part of an effective sampling process. The guidance states: The Virginia Department of Health (VDH) recommends using a combination of cell counts and toxin concentrations to guide public health decision-making during harmful algal bloom events in recreational waters. When toxin results are not available, cell concentrations and other water quality parameters may be used to aid public health and environmental sampling decisions.	None	Please see comment response Appendix A, section 2, for a response to this comment.
A	4	2	Based on our review of the literature, we believe that the assessment method based on cell count only, is the weakest method for assessing recreational impairment. Other states have spent considerable effort to evaluate the available literature and have concluded that toxin concentration or both cell counts and toxin concentration are needed to provide a reliable assessment for recreational safety. As can be seen in Table 1 above, Virginia uses both cell count and toxins to determine notification of a potential health threat.	None	Please see comment response Appendix A, section 2, for a response to this comment.
A	5	2	The main reasons, we believe, that cell count alone is insufficient include the following: 1. Some cyanobacteria are non-toxin producing, and 2. The correlation between cell count and toxin concentration is poor. If cell count is the metric, then any cyanobacteria cells are the impairment if the total count exceeds 100,000. In our opinion, we believe toxins impair the use, not just cell counts. Specifically in Farmington Bay we reject the position that cyanobacteria are an impairment as they are an important part of the food chain. In a presentation given by Gary Belovsky of the Great Salt Lake Ecosystem Project, he explained through their research that the cyanobacteria Coccochloris improves the brine shrimp cysts yield. Farmington Bay cyanobacteria are also a food source for Gilbert Bay brine shrimp. In a 2012 study by Jaclyn Wright and edited by Wayne Wurtsbaugh it was reported that brine shrimp biomass more than doubled along the plume from Farmington Bay into Gilbert Bay. This occurred during a period of significant Nodularia bloom.	None	Please see comment response Appendix A, sections 2, 3, and 11, for responses to this comment.
A	6	2	According to the U.S. Geological Survey in 2008 (Graham, et al): Most cyanobacterial taxa do not produce toxins or taste-and-odor compounds, but many of the common planktonic genera contain one or more toxin and/or taste-and odor producing strains. Whereas some strains may produce toxin and taste-and-odor compounds simultaneously, these compounds do not necessarily co-occur and the presence and concentration of one may not be reliably used to predict the presence and concentration of another (Chorus and Bartram, 1999). Because toxin and taste-and-odor production is strain dependent, algal identification alone cannot be used to determine whether or not these by-products will be present, although genera that contain strains producing these compounds can be identified.	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.

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A	9	2	The District has reviewed data collected by District employees and researchers from the period 2013 to 2015 in Farmington Bay of Great Salt Lake. The data was tabulated and evaluated by Dr. David Richards of Oreohelix in June 2016 (Report included in Appendix 1). The data collected was log(10) transformed and nodularian was regressed against cyanobacteria cell count. Below is a graph of the regression. Dr. Richards concluded that there was only a minor relationship between nodularian and cyanobacteria cell counts. In a report on cyanotoxins, Meriluoto and Spoof stated: In studies performed at the University of Helsinki, Finland, in the 1980s, about 50% of the cyanobacterial blooms tested contained toxins – the majority of them hepatotoxins (microcystins) (Sivonen et al. 1990). Later data from other countries corroborate these findings . . . With only a poor relationship between cyanobacteria and cyanotoxins, why use the weakest metric to assess impairment in Utah? Finally, a study of cyanotoxin removal from five water treatment plants distributed across the United States included the general observation that "There was no correlation between numbers of toxin-producer cyanobacteria and levels of toxins found." (Szlag, et al)	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.
A	10	2	If cell counts are determined to be the only viable method to assess narrative water quality attainment, it would be a better metric to count the potential toxin producing cyanobacteria (PTOX). From the Richards report, again using the data from Farmington Bay, the regression of PTOX cells against Nodularian toxin produces the following relationship: As can be seen, the R2 for this relationship of 0.64 is better than using all cyanobacteria.	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.
A	11	2	For this reason, Washington State in their Recreational Guidance stated the following: Washington State Department of Health (DOH) has identified a list of cyanobacteria genera and species of concern for lakes in Washington. If the following genera are identified in a water sample from an algal bloom, the sample should be tested for toxicity: • Microcystis • Anabaena • Aphanizomenon • Gloeotrichia • Oscillatoria/Planktothrix • Cylindrospermopsis • Lyngbya • Nostoc. Washington uses the following flow chart to instruct local health departments about when to post an area for warning or danger. As can be seen, Washington uses the presence of specific cyanobacteria to trigger sampling which then leads to posting for recreational areas if the toxin level exceeds the determined value. The above flow chart and genera and species screen demonstrates the use of PTOX cells to start the testing process rather than the presence of all cyanobacteria some variants of which may not be toxic formers.	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.
A	12	2	Recognizing that all of the examples quoted are directly related to assessing and warning for potential health effects, we reiterate our recommendation that listing of a water body as impaired should require a more rigorous assessment method. We accept that when public health is a concern, using any available information is necessary to allow people to make an informed decision. However, listing and potential cost implications should be based on additional analysis to provide certainty that a problem exists.	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.
A	13	2	Nebraska recognized this in their assessment methodologies when they included the following: 3.1.2 Cyanobacteria Toxins Cyanobacteria, or blue-green algae as it is commonly known, naturally occur in lakes and reservoirs throughout Nebraska. A few species of cyanobacteria found in Nebraska produce toxins that can be dangerous to humans and animals in high enough concentrations. On rare occasions, large scale cyanobacteria blooms occur in a lake or reservoir can produce enough toxin to make full contact recreation unsafe. Toxic substances are included in Title 117 as a water quality criterion for evaluating the recreation beneficial use (Title 117 Chapter 4, Section 002.02). Title 117 also designates the recreation season to be May 1– September 30, outside of which the criteria does not apply. NDEQ's cyanobacteria toxin limit was set at 20 µg/l, to correspond with the World Health Organization's recommendation. Recreation season data will be pooled independently for each stream segment, lake, and recreation season over the most recent 5-year monitoring period. The established criteria and the assessment of toxin information are provided in Table 3.	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.

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A	15	2	Ingrid Chorus (2013) in a summary of different approaches to cyanotoxin risk management included the following flow chart for Cyanobacterial Protocol for the European Union: Again, this approach uses toxin measurement to declare an elevated health risk and Alert Level 2. If toxin measurement is less than 20 µg/L the Alert Level 2 is not triggered, and a small health risk is the assessment conclusion.	None	Please see comment response Appendix A, sections 2, 3, and 9, for responses to this comment.
A	16	2	Our recommendation is that the State of Utah should use toxin level as the metric for declaring a water body impaired.	None	Please see comment response Appendix A, section 2, for a response to this comment.
A	17	2	Some would suggest that toxin testing is cost prohibitive and cell count is adequate. California in their guidance about harmful algal blooms addresses this issue when they said: As most cyanobacteria produce some combination of cyanotoxins, and as the most commonly found cyanobacteria produce microcystins in particular, the trend in monitoring has often used cyanobacterial cell counts as a proxy for toxin concentrations. This stems from the higher cost for toxin analyses, the small number of laboratories performing the analyses, and the limitations in the research to be able to quantify all of the different cyanotoxins. However, enzyme-linked immunosorbent assay (ELISA)-based testing kits are now available that measure total microcystin concentration in water. These kits provide toxin results more rapidly than is possible for cell count analysis and are likely to become more affordable as this technology matures.	None	DWQ will consider this advancement in toxin measurement technology as we continue to develop methods for detecting and assessing HABs. Also, please see comment response Appendix A, section 2, for a response to this comment.
A	18	2	Paul Brakhage in an article "The Nebraska Experience" stated that by using the ELISA analysis in-house there were able to meet the following schedule for results publication: A weekly routine has been established in which water samples are collected and delivered to the laboratory on Monday and Tuesday, processed using freeze-thaw methods on Wednesday, and analyzed on Thursday. Sample results are reported on Thursday, and by Friday morning, NDEQ website information is updated and if necessary, warning signs are posted at lakes. Brakhage reported that Nebraska saved over $77,000 annually by using this test methodology. US EPA has recommended testing results using the ELISA in the Fourth Unregulated Contaminant Monitoring Rule (https://www.epa.gov/dwucmr/fourthunregulated- contaminant-monitoring-rule). This method for monitoring can be performed by the Division of Water Quality and delays associated with cell counts can be eliminated. Hence, allowing for more accurate assessment of risk. In addition, USGS has reported this method to be comparable to samples measured by LC/MS/MS (Loftin, 2010). As a side note, Abraxis, Inc. has ELISA testing systems available for under $10,000. Such systems would greatly aid the Division of Water Quality to secure lower costs and additional information.	None	DWQ is currently evaluating laboratory options for cyanotoxin quantification, including obtaining and using an ELISA system in house. DWQ will consider the suggestions identified in this comment as we plan for the next HAB season.
A	19	2	By shifting to a methodology that incorporates testing, the state can then create risk assessment levels allowing for accurate impairment assessment. Ohio has created such a tiered approach in their recent Harmful Algal Response Strategy for Recreational Waters that includes the following table:	None	Please see comment response Appendix A, section 2, for a response to this comment.
A	20	2	In the Ohio 2014 integrated report, listing was based on measured concentration in finished drinking water (Ohio 2014 Integrated Report Section H). If two or more excursions above 1 µg/L for microcystins are measured, the water body is listed as impaired. In Section I of the same integrated report, Ohio outlines proposed action to reduce cyanotoxins and includes an excessive nutrient strategy.	None	Please see comment response Appendix A, section 2, for a response to this comment.
A	21	2	We believe that Utah should continue addressing nutrients and cyanobacteria on an adaptive management program rather than through listing and TMDL's. While the listing in Ohio in 2014 was based on drinking water concentration, it is our recommendation that Utah adopt thepublic advisory level of 20 µg/L as a concentration for impairment listing. With appropriate sampling methodologies, this concentration would represent an acceptable threshold for action, including the preparation of a TMDL.	None	Please see comment response Appendix A, section 13, for a response to this comment.

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A	22	2	SAMPLING PROGRAM CONSIDERATIONS After reviewing Section 5 of the integrated report, the selective use of sampling appears to be a significant basis for the impairment declaration for Utah Lake. There are several issues that the Utah Lake sample collection sites raise. First, the assessment methodology does not address sampling philosophy. Specifically, Chapter 2: 2016 303(D) Assessment Methods do not address how sampling should be conducted and where samples are obtained. Sampling on any water body does where cyanobacteria occurs can be biased based on where the sample is obtained. Following is an illustration from a WHO document that demonstrates the varying concentration at different locations. This illustration demonstrates the accumulative affect that a buoyant cyanobacteria and wind can have on the sampling results. In Figure 4 and Figure 5 of Chapter 5 of the IR it can be seen that all sites where values exceeded 100,000 cells /ml are in locations where accumulation can occur. Indeed, samples collected in the open water in general had toxin concentrations below the concentration considered acceptable for finished drinking water (Table 2 from the IR).	None	Please see comment response Appendix A, section 7, for a response to this comment.
A	24	2	We have concerns with the decision to list based on these samples for the following two reasons. 1. The sample results are not uniform and it appears an attempt was made to collect samples with high values for the assessment. This approach paints the whole Lake with the tainted paintbrush that exists only in the accumulated areas. If a segment of the Lake, say Lindon Marina is impaired, list Lindon Marina not the entire lake. Further, if the tainted areas are of concern, place signs in these areas, rather than listing the entire lake. Below is such a sign from Manitoba. 2. The second and even more disconcerting fact is the lack of public input to the determination by DWQ to accept and use worst-case scenario sampling results. We believe that there should be a State management determination as to whether sampling should be representative of the entire lake or only the accumulation locations. Further, once a management determination has been made as to worst case or representative sampling, that determination should be subject to public comment. We do not believe this occurred for the listing of Utah Lake. We accept that the IR comment period allows for public comments, but we still maintain that before the draft IR was issued, representative or worst case sampling issues should have been explicitly included in the Assessment Methodology. As a result of its exclusion from that document, we assumed that sampling would have been representative for the entire lake rather than biased by worst case location samples as actually used by DWQ.	None	Please see comment response Appendix A, section 7, for a response to this comment.
A	25	2	The US Geological Survey (Graham, et al) has developed sampling methodologies in their guidelines for sampling cyanobacteria. Appendix Two of this document has a sampling design approach that includes ankle, knee and chest deep samples at 0.15 and 0.30 below the surface. Dense surface samples may also be collected.	None	Please see comment response Appendix A, section 7, for a response to this comment.
A	26	2	The intended use of sample results should be discussed in the sampling methodology prepared by DWQ and should also be available for public comment before being used in the integrated report.	None	Please see comment response Appendix A, section 7, for a response to this comment.
A	27	2	Based on the above-identified deficiencies in the sampling program used for Utah Lake, it is our recommendation that listing of the lake should be postponed until the deficiencies discussed previously in this section are corrected.	None	Please see comment response Appendix A, sections 7 and 13, for responses to this comment.
A	28	2	SUMMARY – ASSESSMENT METHODOLOGY In summary, we recommend the following changes or actions be taken by DWQ in the current 2016 Integrated Report and/or for future assessment methodologies. 1. Separate public health notice methodologies from listing methodologies for cyanobacteria/cyanotoxins. 2. Establish a listing metric of 20 µg/L for cyanotoxins. Alternatively, establish a numeric value, based on the most exposed individual, in a policy or as a standard subject to public comment and review. 3. Although not directly related to the IR, we recommend DWQ begin an in-house ELISA testing program to provide reliable data for listing decisions in the future. 4. Develop a sampling policy that clearly delineates protocols for sampling location and uses in the integrated report for listing. 5. Allow for public comment on the proposed sampling policy and any sampling plans associated with said policy. 6. For Utah Lake we recommend the	None	Please see comment response Appendix A for responses to these comments. In particular, sections 9, 2, 7, 12, and 13 address the points raised in this comment.

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			State delay listing until a sampling policy is available and a more robust data set is available.		
A	30	6	FARMINGTON BAY AND CYANOBACTERIA The following rationale is suggests that before any listing actions are taken relative to Farmington Bay, significant additional research is needed to determine the appropriate action relative to Famington Bay and nutrients. 1. Cyanobacteria in Farmington Bay are a naturally occurring condition. Listing Farmington Bay for cyanobacteria would be like listing Great Salt Lake for high TDS. The figures below were extracted from the paleo-limnology reports prepared by consultants to DWQ (Leavitt, et al).	None	Please see comment response Appendix A, section 10, for a response to this comment.
A	31	6	The above figure of Total Cyanobacteria Fossils, demonstrates from the sediment core, that current fossils are consistent with fossils from the pre-settlement days. The significant rise and then drop in fossils could be explained by the raw sewage that was sent to GSL that was curtailed by secondary treatment in the beginning of the 1950's. As can be seen, the cyanobacteria fossils demonstrate that cyanobacteria have always been present in the lake. In addition, recent concentrations are similar to those prior to settlement of the area. Clearly, any existing use of Farmington Bay would include a use consistent with the inclusion of cyanobacteria. During the preparation of the paleolimnology report it was argued that the dating on the core is fuzzy. For this reason the state had a third party expert review the dating component of the report. Their expert, Dr. Thure Cerling stated that: It is likely that these cores can provide information on metal concentrations and ecological indicators in the discrete periods including pre-European settlement (ca. prior to 1850), the early metal extraction period (ca. 1860 ca. 1960), and the post-causeway era (ca. 1960 to present). Within each of those periods the stratigraphic rules of superposition give a chronological order, and within each of those periods some consistent historical inferences will be able to be made (Cerling).	None	Please see comment response Appendix A, section 10, for a response to this comment.
A	32	6	In 40 CFR Part 130.10(g) there is a provision that removes a beneficial use designation if it is naturally occurring. Assuming a recreational use in the narrative standard includes a requirement for cyanobacteria density, we believe that the narrative standard does not apply to Farmington Bay based in the following code citation: (g) States may remove a designated use which is not an existing use, as defined in § 131.3, or establish sub-categories of a use if the State can demonstrate that attaining the designated use is not feasible because: (1) Naturally occurring pollutant concentrations prevent the attainment of the use;	None	Please see comment response Appendix A, section 10, for a response to this comment.
A	33	6	Hence, the existing uses of Farmington Bay for recreational purposes or as a part of the narrative standard should not include any condition relating to cyanobacteria. We again reiterate if warning of potential health concerns is separated from impairment listing, protections of public health can readily be accomplished without 303(d) listing considerations.	None	Please see comment response Appendix A, section 10, for a response to this comment.
A	34	6	A second consideration relates to increases in the pigment echinenone. Below is a graph prepared from the Levitt data. This figure of Echinenone (all cyano) above shows a marked increase of pigments about the time the causeways were constructed. Again, the DWQ's paleo report states Instead, causeway construction appears to have constrained the most severe eutrophication to Farmington Bay and may have reduced the degree of eutrophication at some Gilbert Bay locations (Leavitt).	None	Please see comment response Appendix A, section 10, for a response to this comment.

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A	35	6	In 40 CFR Part 131.10(g) it states that if an existing use is not attainable because of one of six factors, an existing use may be modified. In paragraph 40 CFR Part 131.10(g)(4) it states Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use; . . .	None	Please see comment response Appendix A, section 10, for a response to this comment.
A	36	6	If an existing use of Farmington included cyanobacteria, which we believe is not the case, the construction of the dikes would justify the existing use being modified. The presence of cyanobacteria is historic and not just recent. The causeways were constructed prior to the existing use date of November 28, 1975 and cyanobacteria has always been present. An impairment for primary and secondary contact recreation should be removed from the beneficial use since it is not, nor has it been an existing use. We reiterate that protection of public health demands that health officials should post signage as shown following to protect public health and to inform the public of the potential natural risks that exist. Such signage allows the attenuation of public health risks while conforming to the current and past existing use of Farmington Bay.	None	Please see comment response Appendix A, section 10, for a response to this comment.
A	38	6	2. The designated beneficial use for Farmington Bay is: d. Class 5D Farmington Bay Geographical Boundary -- All open waters at or below approximately 4,208-foot elevation east of Antelope Island and south of the Antelope Island Causeway, excluding salt evaporation ponds. Beneficial Uses -- Protected for infrequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain (Utah Administrative Rules). The existing use as a food source for birds and their necessary food chain may conflict with the desire to have infrequent primary and secondary contact as a beneficial use including a cyanobacteria limitation, also. Again, citing the Paleo report, it states: On the other hand, eutrophication can also increase ecosystem productivity and favor production of commercially-important organisms such as fish or invertebrates, including brine shrimp and flies, which support avian production. This issue is of particular interest with regard to Farmington and Bear River bays of Great Salt Lake (GSL), Utah, both of which host large populations of shorebirds, waterfowl and other avian taxa which rely on high production of invertebrates (Paul and Manning 2002) (Leavitt).	None	Please see comment response Appendix A, section 10, for a response to this comment.
A	39	6	Reports on gulls generated during the selenium studies by Conover, et.al. during 2006- 2007 demonstrated that a vast majority of the birds depended on brine shrimp as a primary diet. Reduction in Farmington Bay productivity could significantly reduce brine shrimp concentrations and thus food availability. In addition, John Cavitt reported that primary food sources for shorebirds such as corixidae were dependent on adequate productivity to support the existing populations of birds. Hence, if a reduction in productivity occurs as a result of an attempt to reduce cyanobacteria through nutrient control, the unintended byproduct would be a loss of food mass to support the existing use that involves birds.	None	Please see comment response Appendix A, section 10, for a response to this comment.

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A	40	6	3. It is impractical to control phosphorus in Farmington Bay such that phosphorus control will reduce or eliminate cyanobacteria in this water body. One of the principal purposes for listing is to eliminate the condition(s) that creates impairment. If GSL is listed due to cyanotoxins, the conclusion would be there is a need to reduce or eliminate cyanobacteria from the ecosystem. Numerous sources suggest that to eliminate cyanobacteria, the in-water phosphorus needs to be below 20 µg/L. To achieve such a concentration, reductions would be needed in multiple areas. Current Salt Lake County Storm Water reports indicate a phosphorus concentration exceeding 0.5 mg/L to 0.6 mg/L (Salt Lake County, 2014) or 50 time more phosphorus than necessary to support cyanobacteria. Sampling done by Central Davis Sewer District demonstrated that phosphorus concentration in snow in the valley areas had about 0.5 mg/L of phosphorus. In high mountain areas the snow phosphorus was 0.07 to 0.15 mg/L phosphorus concentration. Again much more than required to support cyanobacteria. While anthropogenic concentrations from wastewater treatment plants range from about 1 to 3 mg/L, 100% removal of wastewater phosphorus will not nearly be sufficient to reduce water concentration to below 20 µg/L. Because of these inputs and the natural presence of cyanobacteria in Farmington Bay, the Division of Water Quality and the Core Nutrient Team recognized that an adaptive approach to phosphorus in this water body was best (Technology Based Limit Document). As such, a 1 mg/L phosphorus standard has been approved by the Water Quality Board.	None	Farmington Bay has not been identified as not supporting designated uses in the 2016 IR. It has been placed in category 3C, assessment methods in development. DWQ has not yet developed assessment methods to evaluate cyanobacteria and cyanotoxins in Farmington Bay, although we aim to accomplish this for the 2018 Integrated Report. Nor, has DWQ developed a linkage between cyanobacteria concentrations and appropriate nutrient targets in Farmington Bay. DWQ will work with Farmington Bay stakeholders over the coming years to conduct research to better evaluate cyanobacteria and cyanotoxins and their linkages to nutrients. DWQ welcomes Central Davis Sewer District to provide studies and data that could be used in evaluation of nutrient loads on Farmington Bay.
A	41	6	In addition to natural and/or anthropogenic sources of phosphorus being sufficient to support cyanobacteria, the Farmington Bay sediments have been evaluated and found to have significant concentrations of phosphorus. Sediment concentrations range from 200 mg/L to 1900 mg/L. Some of the core samples taken show that concentrations of phosphorus have increased over time (Myers, et al) as seen in the graph following. Other samples have shown consistent phosphorus concentrations throughout the core as shown in the next graph. In either case, however, the sediment concentration of phosphorus is significant and would allow for mineralization to return phosphorus to the water column for the foreseeable future. This 2006 study also demonstrated that when sediment was mixed with a low phosphorus water source, it released phosphorus to the water. Conversely, when the sediment was mixed with high phosphorus water the sediment acquired phosphorus from the water. The significant sink of phosphorus in the sediment will continue to exchange phosphorus with the overlying water. Also, vegetation growing in the lakebed will mobilize phosphorus from the sediment, which could be released to water when the vegetation senesces. It is highly likely that phosphorus in the sediment will continuously recycle into the water column making the possibility of reducing to 20 µg/L concentration phosphorus in the water column nearly impossible.	None	Farmington Bay has not been identified as not supporting designated uses in the 2016 IR. It has been placed in category 3C, assessment methods in development. DWQ recognizes that cycling of nutrients within a waterbody is an important aspect of developing appropriate nutrient targets and implementation plans. The importance of phosphorus in Farmington Bay sediments will be considered as DWQ works with Farmington Bay stakeholders over the coming years to conduct research to better assess nutrient impacts on Farmington Bay uses.
A	42	6	4. The final rationale for not listing is the altered state of the Lake due to the construction of causeways through the Lake. These causeways have altered the function of the different segments of the Lake created by the separation. Utah DWQ recognized this when they created separate use designations for the different bays in R317-2-6 in the Utah Administrative Code. At the time of this change the beneficial uses for each bay remained the same, but discussions at the time suggested the beneficial uses may change for each bay as the differences created by the causeways were better understood. In the invertebrates paleo report Mosier stated: Eutrophication processes in the Great Salt Lake (GSL) may be particularly complex as the lake is divided by several causeways, which restrict natural hydrologic circulation (Figure 1; Table 1). In particular, impoundment of individual embayments may influence eutrophication by reducing circulation, isolating contaminants, and altering natural salinities in individual sub-basins. For example, Farmington and Bear River bays are shallow and receive substantial river inflows that dilute salts to nearfreshwater levels during spring runoff. However, as those flows subside, evaporation and intrusion of salts from adjoining bays can increase salinities (Mosier, et al).	None	Farmington Bay has not been identified as not supporting designated uses in the 2016 IR. It has been placed in category 3C, assessment methods in development. DWQ recognizes that hydrologic modification is an important aspect of understanding ecological processes in Farmington Bay and will need to be reflected in any nutrient targets or implementation plans developed for this unique waterbody. DWQ has recognized the value of comparing Farmington Bay and Bear River Bay health in further evaluating the effects of nutrient concentrations on uses in both bays. DWQ will work with Farmington Bay stakeholders over the coming years to conduct research to better evaluate the effects of nutrients on Great Salt Lake uses.
A	43	6	While it is well understood that changes between the bays has occurred, how those changes	None	DWQ will consider these recommendations as we move forward with development of assessment methods

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			relate to the beneficial uses of the bays has not been determined. As such, before listing of Farmington Bay for recreational uses occurs, the actual changes created by the causeways should be defined and beneficial uses adjusted accordingly.		and research studies specific to Farmington Bay.
A	44	6	Mosier further stated: Eutrophication and salinity interact to control the organisms that survive in GSL, and this interaction may add complexity to the mechanisms degrading water quality in individual embayments. For example, Gilbert Bay has a limited diversity of phytoplankton (algae in the water column) and periphytic (bottom-dwelling) algae, and includes only two metazoans—brine shrimp (Artemia) and brine flies (Ephydra). Similarly, the salt-saturated waters of Gunnison Bay support only a few types of algae, bacteria and Archaea (a bacteria-like organism), and presently includes very few invertebrates. In addition, the high spatial and temporal variability of salinities in Farmington and Bear River bays may cause significant changes in the biotic composition throughout the year.	None	Neither Farmington Bay nor Bear River Bay has been identified as not supporting designated uses in the 2016 IR. DWQ recognizes that salinity gradients are an important aspect of understanding ecological processes in both bays. DWQ has recognized the value of comparing Farmington Bay and Bear River Bay health in further evaluating the effects of nutrient concentrations on uses in both bays. DWQ will work with Farmington Bay stakeholders over the coming years to conduct research to better evaluate the effects of nutrients on Great Salt Lake uses.
A	45	6	As stated previously, the information presented explains why an understanding of Lake division and the effects on ecosystem function should be defined and the beneficial uses adjusted accordingly before being declared impaired.	None	DWQ will consider these recommendations as we move forward with development of assessment methods and research studies specific to Farmington Bay.
A	46	6	In summary, Central Davis Sewer District maintains the four following items discussed above demonstrate that cyanobacteria and phosphorus in Farmington Bay are not and should not be considered impairments: 1. Because of the nature of a terminal water body, Farmington Bay has naturally occurring cyanobacteria and is naturally high in phosphorus. 2. The bird designated beneficial use of Farmington Bay requires the Lake be highly productive, such that algal or cyanobacteria growth is beneficial and not a detriment. 3. It is impractical to control cyanobacteria with phosphorus because of the historic and current inputs to the system. 4. The lake is a sink for phosphorus and mineralization and recycling will always occur.	None	DWQ will consider this input as we move forward with development of assessment methods and research studies specific to Farmington Bay. The purpose of the Integrated Report assessment is to identify waters that are not supporting their designated uses due to water quality issues. Identification of sources, causes and remediation strategies is not part of the Integrated Report process.
A	47	6	Adaptive Management Central Davis Sewer District supports the continued use of adaptive management as a tool for managing water quality in Farmington Bay. The District believes that any changes in Farmington Bay should be done on a measured basis so as not to destroy the beneficial uses or cause undue expenditures on dischargers to the Bay. The Utah Nutrient Strategy: Technology Limits Document states: Monitoring following implementation of TBLs will provide valuable data with regard to potential ecological improvements downstream of treatment facilities. However, it must be understood that recovery can take years or decades given legacy accumulation, particularly for phosphorus. Whether or not immediate improvements to downstream conditions are observed, the proposed strategy helps reduce the risk that increasing levels of nutrients from ongoing growth will cause or exacerbate nutrient problems. This adaptive logic behind these reductions applies to both N and P for all water bodies except for GSL. The GSL is unique because N reductions have the potential to harm the ecosystem because N may limit the abundance of brine shrimp, and potentially brine flies, that are of critical importance as food to the millions of birds that depend on the GSL ecosystem.	None	DWQ appreciates your comment and your support of Utah's Nutrient Reduction Strategy, including the adaptive management elements that depend on implementation of the Technology Based Phosphorus Effluent Rule.
A	48	6	In the case of Farmington Bay, the reduction to 1 mg/L phosphorus should be monitored and evaluated before any further changes are considered. In addition, further changes in nutrient control should not be triggered by the mere presence of cyanobacteria in Farmington Bay. Additional changes should be based on sound science that justifies that changes should be made.	None	DWQ agrees that additional research is needed to better understand the role of nutrients in triggering cyanobacteria blooms in Farmington Bay.
A	49	6	The Division of Water Quality's web page on nutrients supports this adaptive management approach, also when it states: The Division's goal is to protect Utah's waters for their beneficial uses while taking into consideration the respective characteristics and potential of these waters. Given the wide diversity of streams and lakes throughout Utah, the levels of nutrients protective of the beneficial uses in one type of stream will be different in another type of stream.	None	DWQ appreciates your comment and your support of Utah's Nutrient Reduction Strategy, including the adaptive management elements that depend on implementation of the Technology Based Phosphorus Effluent Rule.

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A	50	6	In addition, the December 2013 EPA Long Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program also provides support for the use of adaptive management as an alternative approach. This document states: By 2018, States use alternative approaches, in addition to TMDLs, that incorporate adaptive management and are tailored to specific circumstances where such approaches are better suited to implement priority watershed or water actions that achieve the water quality goals of each state, including identifying and reducing nonpoint sources of pollution The purpose of this Goal is to encourage the use of the most effective tool(s) to address water quality protection and restoration efforts. For the past two decades, many TMDLs have been developed in response to litigation. As a result, States and EPA have not always had the opportunity to objectively evaluate whether a TMDL would be the most effective tool to promote and expedite attainment of State water quality standards. With most of their consent decree and settlement agreement TMDLs completed, States and EPA are using their program experience to make more informed decisions about selecting and using the tools that have the best opportunity to restore and protect water quality.	None	DWQ appreciates your comment and your support of Utah's Nutrient Reduction Strategy, including the adaptive management elements that depend on implementation of the Technology Based Phosphorus Effluent Rule. DWQ continues to support adaptive management as a key element of our state-wide nutrient reduction strategy. The TBPEL will give DWQ and stakeholders more time to develop site-specific water quality standards and assessment methods that incorporate the unique nature of many of Utah's waters. DWQ will be reaching out to stakeholders in the coming year to help identify prioritization criteria for development and implementation of site-specific nutrient standards and assessment methods.
A	51	6	While we do not believe or support the notion that Farmington Bay should be listed on the 303(d) list, we do believe that EPA is correct in calling for adaptive management especially when the water body is as complex as Great Salt Lake or the Farmington Bay component.	None	DWQ continues to support adaptive management as a key element of our state-wide nutrient reduction strategy.
A	52	6	Finally, Central Davis supports and has been heavily involved in research on Farmington Bay to better understand the ecosystem and to allow for possible development of water body specific standards when the information available warrants such action. We firmly believe that a thorough understanding of Farmington Bay will answer the questions about appropriate nutrient levels or whether cyanobacteria needs to or can be controlled. While this research is taking place, we believe the adaptive step of 1 mg/L phosphorus is sufficient to protect the Bay and eliminate any further degradation in the next 10-20 years.	None	DWQ agrees that additional research is needed to better understand the role of nutrients in triggering cyanobacteria blooms in Farmington Bay and appreciates the efforts and resources provided by Central Davis Sewer District to better understand the ecosystem.
A	53	6	Bibliography and infromation attached to comment letter	None	DWQ has reviewed it in the process of responding to your associated comments.
E	54	NA	On behalf of FRIENDS of Great Salt Lake, Wasatch Audubon, Great Salt Lake Audubon, Utah Audubon Council, Utah Waterfowl Association, League of Women Voters of Utah, South Shore Wildlife and Wetland Management, and Utah Chapter of the Sierra Club (collectively "Friends"), thank you for the opportunity to submit comments on the draft 2016 Integrated Report (2016 IR). We'd like to express our appreciation for all of the thought and hard work that has gone into this draft, and we view this document as a clear indication that the Utah Division of Water Quality (DWQ) is willing to take whatever actions it deems scientifically necessary to protect Utah water, and especially Utah Lake and Great Salt Lake, from the effects of excess nutrient loading. FRIENDS supports you in that effort. To that end, FRIENDS has asked Dr. Wayne Wurtsbaugh (report attached as Exhibit A) and Dr. Timothy Otten (report attached as Exhibit B) to comment on aspects of the draft 2016 IR. Additionally, we are including declarations from two Utah Airboat Association members that outline the extent of their recreational use of Farmington Bay and how that use is negatively influenced by the growing algal blooms in Farmington Bay.	None	DWQ appreciates your detailed feedback regarding the IR and water quality assessment methods.
E	55	5	By way of executive summary, Dr. Wurtsbaugh's analysis of the draft 2016 IR suggests: 1) DWQ's approach for listing lakes as impaired due to toxic cyanobacterial blooms is appropriate.	None	DWQ appreciates your feedback regarding the IR and water quality assessment methods.
E	56	5	2) Clarification is needed on how the manner of field collection (e.g. normal limnological sampling versus targeted collections of bloom scums) relates to the WHO guidelines that DWQ wishes to use. Additional information is needed in the report to clarify that it is "toxic" cyanobacteria, and not all cyanobacteria, that are of concern.	None	Please see comment response Appendix A, sections 2, 3, and 7, for a response to this comment.
E	57	5	3) Although the use of toxic cyanobacterial cell densities is currently the most realistic metric to be used as a criterion for listing, DWQ needs to increase its capability to quickly and accurately measure toxin concentrations from these blooms, as this will provide a much more proximal measure of public health threat.	None	DWQ agrees that cyanotoxins are an important component of HAB monitoring and assessment and is working to improve methods for monitoring and assessing these data. However, please see comment response Appendix A, section 2, for additional information

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E	58	6	4) Although microcystin is one of the most widely occurring cyanotoxins, and is focused on in the 303d report, additional criteria need to be developed by DWQ for other cyanotoxins (e.g. anatoxins).	None	Please see comment response Appendix A, section 5, for a response to this comment.
E	59	6	5) Toxic cyanobacterial blooms in both Utah Lake and Farmington Bay present threats to human health, and thus warrant 303(d) listing as impaired waters. The very high reported values in Farmington Bay are actually a conservative measure, because that sampling did not target cyanobacterial scums, which are the basis for the proposed criteria (following the WHO's protocols). Outflow waters from Farmington Bay also are a threat to bathers at a popular swimming beach at Antelope Island State Park.	None	Thank you for your comment and additional context regarding potential impacts of HABs in Farmington Bay.
E	60	6	6) Comparison of large algal concentrations in Farmington Bay with more moderate ones in Bear River Bay suggests that the extensive waste water discharges into Farmington are the cause of the cyanobacterial blooms there. More comparative studies on these two bays will be helpful for understanding the toxic cyanobacterial blooms, but such studies will need to be done after (or when), the lake rises and refills the bays with water.	None	DWQ agrees that studies comparing conditions among bays of Great Salt Lake provide important context for understanding anthropogenic impacts on the lake.
E	61	6	7) More work is needed to understand the cyanobacteria produced in the benthic region of Farmington and Bear River Bays, and the importance of the biota in that region for fish and birds.	None	DWQ agrees that benthic organisms in general are an understudied component of the Great Salt Lake ecosystem.
E	62	6	8) Although human health risk is the focus of the current Integrated Report, eutrophication in Farmington Bay also presents risks to aquatic biota. Additionally, eutrophication-related odor problems in Farmington Bay fail to meet DWQ's criteria for this parameter.	None	Utah's Narrative Water Quality Standard does include a provision regarding offensive odors. However, DWQ has not yet identified a suitable means for assessing odor issues. Suggested methods for odor assessments would be welcome during public comment periods for future IR methods. Information and updates for Utah's IR program, including calls for public comment, are posted on DWQ's website (http://deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/index.htm).
E	63	2	Regarding the 2016 303(d) assessment methods, Dr. Wurtsbaugh notes that several clarifications of terms and statements found in Chapter 2 of the 2016 IR are warranted. Specifically, he: 1. Seeks clarification of terms "pollutants," "pollution impairments," (Wurtsbaugh at 1) and "conventionals." Id. at 3.	Text clarification	Definitions for these terms are available in Chapter 2 under the header, "Identifying Causes of Impairments". Additional clarifying language regarding these terms has also been added to this section.
E	64	6	2. Notes the lack of clarity on how Farmington Bay is being assessed. Id. at 1.	None	Because standards and assessment methods are still in development for Great Salt Lake and Associated Wetlands, Farmington Bay has not been assessed as meeting or not meeting water quality standards in the 2016 IR. Great Salt Lake has been placed in category 3C, assessment methods in development. The waterbody definitions presented in Chapter 1, Table 3 are general guidelines for delineating between different water body types. The categorization, Great Salt Lake and Associated Wetlands includes waterbodies that fit definitions for both lakes or reservoirs and wetlands. At this time, numeric water quality standards do not exist for Farmington Bay. However, Utah's Narrative Water Quality Standard applies to all waters of the state including Farmington Bay.
E	65	5	3. Notes that the State should clarify that toxic cyanobacteria are the constituents of concern in these algae blooms and that the State should include more proximal measures of health threats than is supplied by raw densities of cyanobacteria alone. Id. at 1-2.	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.
E	66	5	4. Notes that the standard used by State should specify the type of day that samples are collected and that the State should consider deploying recording sondes that can measure oxygen, temperature and pH at one-hour or less intervals in its sampling procedures. Id. at 2.	None	DWQ recognizes the importance of diurnal variations in important water quality parameters, particularly dissolved oxygen, pH, and temperature, and is actively expanding its capacity to collect and analyze high frequency data with sonde deployments in water bodies including Utah Lake, Farmington Bay, Jordan River, and others. However, this effort is resource intensive and it is not currently feasible to deploy high frequency sondes at all monitoring locations. As such, DWQ assesses all readily available data for these parameters, including grab samples, instantaneous measurements, and high frequency data, against water quality standards to identify impairments as outlined in Chapter 2: Assessment Methodology. Please also see Chapter 7 which outlines Utah's proposed assessment methods for high frequency dissolved oxygen data.
E	67	2	5. Notes that DWQ should clarify whether the TN:TP ration is in molar or weight units. Id. at 2.	Clarified in text that the ratio is in molar units.	The units in this table are molar and this clarification has been added to the table. Relationships among TSI values are not currently used by DWQ for assessment purposes. Instead, this table is strictly presented as an example of one method for interpreting TSI values.

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E	68	2	6. Seeks clarification on the plot depicted in Figure 18. Id. at 2.	Citations added to text.	This figure is derived from information presented in: Carlson, R.E. 1983. Discussion on "Using differences among Carlson's trophic state index values in regional water quality assessment," by Richard A. Osgood. Water Resources Bulletin. 19:307-309, which describes conditions where TSI(Chl)>TSI(TP) as indicative of phosphorus limitations on algal biomass. This method is also described in EPA's 2000 Nutrient Criteria Technical Guidance Manual for Lakes and Reservoirs. Relationships among TSI values are not currently used by DWQ for assessment purposes. Instead, this figure is strictly presented as an example of one method for interpreting TSI values. These citations and clarifications have been added to chapter 2.
E	69	2	7. Seeks clarification of the type of cyanobacteria referred to on Page 71 of Chapter 2. Id. at 3	None	Please see comment response Appendix A, section 3, for a response to this comment.
E	70	6	8. Requests that DWQ add language regarding the calibration of oxygen probes in hypersaline waters. Id. at 3.	None	Dissolved oxygen probes are calibrated following manufacturer's recommended procedures. At this time, water quality in Great Salt Lake is not formally assessed for dissolved oxygen in the IR, but data and information demonstrating calibration issues for hypersaline waters can be submitted to DWQ's Great Salt Lake water quality program. Please see http://www.deq.utah.gov/locations/G/greatsaltlake/gslwaterquality/index.htm for contact information.
E	71	6	9. And requests that the State add language regarding the percent recovery of internal spikes because of the potential interferences with sampling in Great Salt Lake. Id. at 3.	None	A full characterization of all data QA/QC procedures is beyond the scope of the IR. QAQC procedures for DWQ's Great Salt Lake monitoring program are available in DWQ's Great Salt Lake Quality Assurance Project Plan available on DWQ's website (http://www.deq.utah.gov/locations/G/greatsaltlake/gslmonitoring/). Percent recoveries for matrix spikes for individual metals are in table 6, page 33.
E	72	5	Regarding Chapter 5, Narrative Standard Assessment of Recreational Use Support in Lakes and Reservoirs and Application to Utah Lake, it is critical that the 2016 IR link the appropriate methodology of collection with the criteria being proposed. Id. at 3. Specifically, clarification is needed on how the manner of field collection (e.g. normal limnological sampling versus targeted collections of bloom scums) relates to the WHO guidelines that DWQ wishes to use. This is important because normal limnological sampling involves integrated water column samples – not just surface samples – and because the criteria outlined in Table 1 would not be appropriate with normal limnological sampling. Id.	None	Please see comment response Appendix A, section 7, for a response to this comment.
E	73	5	Dr. Wurtsbaugh recommends that DWQ move towards greater use of direct measures of cyanotoxins to supplement cell count data, rather than depending on cell counts alone. Id. at 3-4. This is because measuring cyanotoxins provides a more definitive indication of human health threats. Id. To that end, additional information is needed in the report to clarify that it is "toxic" cyanobacteria, and not all cyanobacteria, that are of concern. Id. at 4.	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.
E	74	5	Regarding the use of microcystin-LR concentrations as a secondary indicator of human health impairment, additional criteria for other cyanotoxins besides microcysin need to be developed by DWQ, especially neural toxins such as anatoxin. Id. As an example of why this is necessary, the genus of cyanobacteria found in Utah Lake in July 2016 – Aphanizomenon – is capable of producing anatoxins. Id.	None	Please see comment response Appendix A, section 5, for a response to this comment.
E	75	6	Dr. Wurtsbaugh notes that the harmful algal bloom criteria established by the WHO (100,000 cells/ml; 20 µg/L microcystin and 50 µg/L chlorophyll) should be protective of most users, although the majority of states use lower criteria levels. Id. And although the use of toxic cyanobacterial cell densities is currently the most realistic metric to be used as a criterion for listing, DWQ should increase its capability to quickly and accurately measure toxin concentrations from these blooms, as this will provide a much more proximal measure of public health threat. Id.	None	DWQ agrees that cyanotoxins are an important component of HAB monitoring and assessment and is working to improve methods for monitoring and assessing these data. However, please see comment response Appendix A, section 2, for additional information
E	76	6	Dr. Wurtsbaugh goes on to note that the data related to harmful blooms in Utah Lake is difficult to interpret because the locations where samples were collected are not well depicted. Id. These locations should either be depicted on a map, or GPS coordinates should be provided for each site. Id.	None	The targeted HAB monitoring locations are displayed in a map in Chapter 5, Figure 3 and described textually in Figure 4. Samples collected in marinas varied somewhat depending on the distribution of blooms, so location information beyond those descriptions have not been provided.

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E	77	6	Dr. Wurtsbaugh states that toxic cyanobacterial blooms in both Utah Lake and Farmington Bay present threats to human health, and thus warrant 303(d) listing as impaired waters. Id. at 13. With regard to Utah Lake, the lake is located in one of the fastest growing urban centers in the State and nutrient loading to the lake will continue to increase unless reduction procedures are implemented. Id. at 5. While it is fortunate that a phosphorus reduction program is in place, DWQ should also consider nitrogen reduction as well. Id. at 6.	None	Please see comment response Appendix A, sections 10, 11, and 13, for responses to this comment.
E	78	6	Regarding Chapter 6, Evaluation of Harmful Algal Bloom Data in Farmington Bay, Great Salt Lake, Dr. Wurtsbaugh notes that the very high reported values in Farmington Bay are actually a conservative measure, because that sampling did not target cyanobacterial scums, which are the basis for the proposed criteria (following the WHO's protocols). Id. at 13. This is because the samples were taken from about .25 meters in depth, along the center axis of the Lake, at routine sampling stations rather than specifically targeting cyanobacterial blooms. Id. at 6. Had the blooms been sampled, it is probable that the concentrations found would have been 100 to 1,000 times higher than measured, placing them in the "very high" risk category. Id at 7. Thus, he concludes, Farmington Bay has excessive concentrations of toxin producing cyanobacteria. Id. Because of these high concentrations, outflow waters from Farmington Bay also are a threat to bathers at a popular swimming beach at Antelope Island State Park. Id. at 6.	None	DWQ agrees that these types of samples are not necessarily directly comparable to WHO guidelines and may underestimate human health risks. However, DWQ is obligated to analyze readily available data in the IR and has therefore included this dataset as part of the IR analysis. Please see comment response Appendix A, section 7, for additional information related to this comment.
E	79	6	In comparing the algal concentrations of Bear River Bay with those of Farmington Bay, those in Bear River Bay have never exceeded the WHO criteria for human health effects. Id. at 7. Dr. Wurtsbaugh notes that comparative work between the two bays would be useful for understanding how nutrient loading relates to cyanobacterial blooms. Id. at 7-8. Regarding whether there have always been large cyanobacterial blooms in Farmington Bay, Dr. Wurtsbaugh concludes that the contrast between Bear River Bay and Farmington Bay suggests that it is the extreme nutrient loading in Farmington Bay that is a primary cause of the cyanobacterial blooms there. Id. at 7-8. He states that studies show that cyanobacterial blooms and eutrophication in Farmington Bay have increased substantially since European settlement, in some cases 7 to 12-fold. Id. at 9.	None	DWQ agrees that studies comparing conditions among bays of Great Salt Lake provide important context for understanding anthropogenic impacts on the lake. DWQ is also aware of paleolimnological studies suggesting that cyanobacterial blooms in Farmington Bay have increased since settlement around Great Salt Lake. However, defining natural conditions and identifying sources of pollution are beyond the scope of the IR. These suggestions will be considered as DWQ outlines additional studies required to develop standards and assessment methods for Great Salt Lake.
E	80	6	Dr. Wurtsbaugh notes that more work is needed to understand the cyanobacteria produced in the benthic region of Farmington and Bear River Bays, citing the importance of the biota in that region for fish and birds. Id. at 9-10. And, although human health risk is the focus of this Chapter in the 2016 Integrated Report, eutrophication in Farmington Bay also presents risks to aquatic biota, thus implicating a threat to the protection of "waterfowl, shore birds and other water-oriented wildlife including their necessary food chain." Id. at 11; see also R317-2-6.5(c) & (d).	None	DWQ agrees that benthic organisms are an understudied aspect of the Great Salt Lake ecosystem and recognizes that algal blooms may have impacts on aquatic life as well as human health. DWQ continues to work towards appropriate water quality standards and assessment methods for Great Salt Lake and these comments will be considered as we move forward.
E	81	6	Finally, Dr. Wurtsbaugh cites the offensive eutrophication-related odor problems in Farmington Bay resulting from the production of hydrogen sulfide in the sediments and deep brine layer of the bay noting that this odor is specific to Farmington Bay. Id. at 12.	None	Although the Narrative Water Quality standard does include a statement regarding offensive odors, at this time DWQ does not have a clear means to assess the relationship of odors to water quality and therefore has not performed an odor assessment for Farmington Bay. This concern will be considered as DWQ moves forward with studies to support development of standards and assessment methods for Great Salt Lake.
E	82	2	By way of executive summary, Dr. Otten's analysis of the draft 2016 IR suggests: 1) A well thought out sampling methodology is of critical importance for making accurate assessments of CyanoHAB risks in Utah lakes. Results will be influenced by the time of day and location that samples are collected. As such, it is recommended that depth-integrated samples are collected, and from these the public health risks of a surface scum can be determined (see Appendix I of Dr. Otten's analysis).	None	DWQ will consider the methods you have proposed as we continue to work to improve our HAB monitoring and assessment methods. Also, please see comment response Appendix A, section 7, for a response to this comment.
E	83	2	2) The use of cell counts as a primary indicator is the most conservative approach, because even blooms that do not produce any recognized cyanotoxins would still result in the waterbody's listing on the 303(d). From a public health perspective, it can be argued that this is the safest course of action since cyanobacteria may produce other deleterious compounds besides the five recognized classes of cyanotoxins (anatoxin-a, cylindrospermopsin, microcystin, nodularin and saxitoxin); one example is the neurotoxin BMAA that has been linked to cyanobacteria.	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.

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E	84	2	3) The use of 50 µg/L chlorophyll a as a meaningful threshold for cyanobacterial bloom risks is arbitrary. In Utah Lake, up to 70% of samples from some regions of the lake would exceed this threshold, even though cyanobacterial blooms are not present 70% of the time based on cell counts. Therefore, in order for chl a to be a useful proxy for cyanobacterial biomass, an understanding of "normal" chl a concentrations for the waterbody is required. From these data, anomalous chl a concentrations (e.g., greater than two standard deviations above the average) could be used to indicate a cyanobacterial bloom event. Further, since all phytoplankton possess chlorophyll, but only cyanobacteria possess the photopigment phycocyanin, the latter is likely a more useful proxy for cyanobacterial biomass.	None	DWQ recently installed long term water quality sondes in Utah Lake that measure several water quality parameters including phycocyanin. However, phycocyanin data were not readily available for the 2016 IR, and therefore the readily available chlorophyll a data were included as a supplementary indicator. Please see comment response Appendix A, section 6, for additional information.
E	85	2	4) In addition to cell counts, water quality managers should have the option to use cyanotoxins or QPCR assessments of toxigenic cyanobacteria as primary indicators of water quality impairment. The latter two are desirable because they are amenable to high throughput processing and can generally return results in a more timely fashion (e.g., days as opposed to weeks).	None	For reasons described in comment response Appendix A, DWQ's current HAB assessment methods use cyanobacteria cell counts as a primary indicator. However, local health departments are free to develop their own means for quantifying human health risk as science and technology allow. Please see comment response Appendix A, in particular sections 2, 3, and 9, for additional information.
E	86	2	5) Regarding cyanotoxin thresholds, the report needs to specify the concentrations for each of the five classes of cyanotoxins that would constitute an exceedance. The WHO criteria only says that 20 ppb is a suitable health threshold for microcystins, not the other toxins. Other states have developed thresholds for these other toxins and these could be used as a starting point for developing such standards in Utah.	None	Please see comment response Appendix A, section 5, for a response to this comment.
E	87	2	6) The guidance document should clarify that only potential toxin-producing genera of cyanobacteria are to be included in the cell count assessments.	None	Please see comment response Appendix A, section 3, for a response to this comment.
E	88	6	Dr. Otten cites what he calls compelling evidence that Utah Lake has become increasingly eutrophic over the past 10-20 years. Otten at 1. The trophic indicators for Utah Lake during the summer months over the past two decades are all increasing and this trend is likely due to a combination of anthropogenic and climatic factors – both of which are expected to intensify in the future. Id. at 1-2. Prior to the massive cyanobacterial bloom in July 2016, June 2016 was the hottest June on record for the U.S., part of a growing pattern of 14 straight months of high record temperatures. Id. at 2. Dr. Otten states that it is likely that nitrogen plays an important role in controlling algal bloom proliferation in Utah Lake and that water temperatures and decreased snow pack due to climate change are likely to enhance cyanobacterial utilization of lake nutrients. Id. at 3. As a result, a dual nitrogen and phosphorus reduction strategy may be necessary in order to reach the water quality goals necessary to remove Utah Lake from the 303(d) list for cyanobacterial impairment and/or chlorophyll a. Id. In order to determine the appropriate nutrient reduction targets, nutrient dilution bioassays will be necessary. Id.	None	DWQ will incorporate your recommendations into the Utah Lake Water Quality study currently underway. Although DWQ's initial statewide nutrient reduction efforts have focused on phosphorus, we recognize the importance of considering both nitrogen and phosphorus in development of nutrient targets, as well as climatic and water management factors. We have done so in several nutrient TMDLs (e.g. Rockport Reservoir and Echo Reservoir) and intend to consider all factors contributing to water quality degradation in Utah Lake in our current study. Additional information regarding DWQ's Nutrient Reduction Program is available at http://deq.utah.gov/Pollutants/N/nutrients/ .
E	89	2	Dr. Otten states that cell counts as a primary indicator, as opposed to direct measurements of cyanotoxins, is a more conservative approach, because not all cyanobacteria are capable of producing toxins. Id. at 3-4. From a public health perspective, it can be argued that this is the safest course of action because cyanobacteria may produce other deleterious effects upon exposure. Id. at 4, 8. He therefore concurs with Utah DWQ's reliance on 100,000 cyanobacterial cells/mL as representative of a human health risk. Id. at 4. He points to health effects being linked to "nontoxic" blooms in Utah Lake, with over 100 people reporting common cyanobacterial exposure symptoms such as vomiting, diarrhea, headaches and rashes follow recreation contact. Id. In addition to cell counts, water quality managers should have the option to use cyanotoxins or QPCR assessments of toxigenic cyanobacteria as primary indicators of water quality impairment. Id. at 8. The latter two are desirable because they are amenable to high throughput processing and can generally return results in a more timely fashion (e.g., days as opposed to weeks). Id.	None	For reasons described in comment response Appendix A, DWQ's current HAB assessment methods use cyanobacteria cell counts as a primary indicator. However, local health departments are free to develop their own means for quantifying human health risk as science and technology allow. Please see comment response Appendix A, in particular sections 2, 3, and 9, for additional information.

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E	90	2	Dr. Otten notes that while he supports DWQ's cell count criteria, the sampling methodology outlined in the 2016 IR is not clearly discussed. Id. at 5. He notes that a well thought out sampling methodology is of critical importance for making accurate assessments of CyanoHAB risks in Utah lakes and the results will be influenced by the time of day and location that samples are collected. Id. at 5, 8. For that reason, he recommends that depth-integrated samples be collected, and that from these samples the public health risks of surface scum be determined. Id. at 5-6, 8.	None	DWQ will consider the methods you have proposed as we continue to work to improve our HAB monitoring and assessment methods. Also, please see comment response Appendix A, section 7, for a response to this comment.
E	91	2	Dr. Otten goes on to note that the manner in which the secondary indicators of total cyanotoxin and total chlorophyll a are intended to be used is unclear, and he outlines a number of possible scenarios for DWQ to consider. Id. at 7. For instance, he feels that the use of 50 µg/L chlorophyll a as a meaningful threshold for cyanobacterial bloom risks is arbitrary. Id at 7-8. The reason for this is that in Utah Lake up to 70% of samples from some regions of the lake would exceed this threshold, even though cyanobacterial blooms are not present 70% of the time based on cell counts. Id. Therefore, in order for chlorophyll a to be a useful proxy for cyanobacterial biomass, an understanding of "normal" chlorophyll a concentrations for the waterbody is required. Id. From these data, anomalous chlorophyll a concentrations (e.g., greater than two standard deviations above the average) could be used to indicate a cyanobacterial bloom event. Id. Further, since all phytoplankton possess chlorophyll, but only cyanobacteria possess the photopigment phycocyanin, the latter is likely a more useful proxy for cyanobacterial biomass. Id.	None	DWQ recently installed long term water quality sondes in Utah Lake that measure several water quality parameters including phycocyanin. However, phycocyanin data were not readily available for the 2016 IR, and therefore the readily available chlorophyll a data were included as a supplementary indicator in support of the determination made based on cyanobacteria cell counts. DWQ will consider the methods recommended in development of the 2018 IR and in revising the Standard Operating Protocols currently used to respond to HABs in Utah (http://deq.utah.gov/Divisions/dwq/health-advisory/harmful-algal-blooms/docs/SOP-HAB-Phytoplankton-Samples-2016.pdf). Please see comment response Appendix A, section 6, for additional information.
E	92	2	Dr. Otten states that the 2016 IR should specify the concentrations for each of the five classes of cyanotoxins that would constitute an exceedance, noting that other states have developed thresholds for these toxins that might be used as a starting point for developing these criteria. Id. He concludes by stating that the 2016 IR should clarify that only potential toxin-producing genera of cyanobacteria are to be included in the cell count assessments.	None	Please see comment response Appendix A, sections 2, 3, and 5, for responses to this comment.
E	93	6	Attached are declarations by R. Jefre Hicks (Exhibit C) and Kerry McCloud (Exhibit D) which outline in detail the extent of the recreational use of Farmington Bay. As is evidenced in these declarations, while there is some usage of Farmington Bay in the summer months, there is a great deal of airboat usage beginning in the middle of September each year. Both Mr. Hicks and Mr. McCloud are aware of significant algal blooms in the Bay, and their enjoyment of Farmington Bay is impacted because both are concerned about the possible health impacts of these blooms.	Declarations have been added to the text of Chapter 6.	DWQ is committed to protecting recreational uses on Utah's waterbodies. This comment provides useful information regarding the timing and frequency of recreational uses in Farmington Bay as well as the concerns of recreational users. This information will be used as DWQ moves forward with development of standards and assessment methods to protect the uses of Great Salt Lake and has been incorporated into the final 2016 IR.
E	94	6	Mr. Hicks is a member of several organizations that are concerned about the health of the ecosystem of Great Salt Lake, including water quality. Those organizations are Utah Airboat Association, Friends of Great Salt Lake, Utah Waterfowl Association, and Delta Waterfowl. Hicks Decl. at ¶ 2. Mr. Hicks owns an airboat that he uses on a frequent basis in Farmington Bay, approximately 40 times annually. Id. at ¶ 3. While the majority of that usage occurs between September 15 and the end of March, he does go out in Farmington Bay during the summer months, including 5 trips so far this summer. Id. While access to Farmington Bay is limited during the summer months, the access gate is unlocked beginning September 15th of each year. Id. at ¶ 4. Once the gate is open, Mr. Hicks estimates that approximately 10 boats per day launch into Farmington Bay. Id. This summer, while out on Farmington Bay, Mr. Hicks has witnessed huge algal mats, covering multiple acres, especially near "stinky," the discharge point into Farmington Bay for the sewer treatment plant north of Salt Lake City. Id. at ¶ 5. Mr. Hicks notes that the algal blooms are not limited to summer months; these blooms sometimes linger well into October. Id. at ¶ 6. While much of the algae washes off as the boat goes through the water, some of the algae flies up onto the boat or becomes airborne as a fine mist. Id. at ¶ 7. Because of the recent publicity regarding algal blooms, Mr. Hicks has become concerned about the possible health impacts of the algae present in Farmington Bay. Id. at ¶ 8.	None	DWQ is committed to protecting recreational uses on Utah's waterbodies. This comment provides useful information regarding the timing and frequency of recreational uses in Farmington Bay as well as the concerns of recreational users. This information will be used as DWQ moves forward with development of standards and assessment methods to protect the uses of Great Salt Lake and has been incorporated into the final 2016 IR.

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E	95	6	Mr. McCloud is President of the Utah Airboat Association and owns an airboat which he mainly uses in Farmington Bay. McCloud Decl. at ¶¶ 2-3. He estimates that he uses his airboat in Farmington Bay approximately 20 times annually, primarily between September 15 and the end of March each year. Id. at ¶ 3. Mr. McCloud does go out in the summer months in Farmington Bay, including twice so far this year. Id. Mr. McCloud agrees with Mr. Hicks that once the gates open during the middle of September, approximately 10 airboats per day use Farmington Bay. Id. at ¶ 4. He also agrees with Mr. Hicks that large algal blooms were evident this summer and that the blooms cover multiple acres. Id. at ¶ 5. These blooms are especially evident in the area of "stinky," as well as up close to Antelope Island. Id. After a ride in Farmington Bay in the summer, Mr. McCloud's propeller cage is typically covered with algae and he is also concerned about the toxicity and possible health impacts of these blooms. Id. at ¶ 6.	None	DWQ is committed to protecting recreational uses on Utah's waterbodies. This comment provides useful information regarding the timing and frequency of recreational uses in Farmington Bay as well as the concerns of recreational users. This information will be used as DWQ moves forward with development of standards and assessment methods to protect the uses of Great Salt Lake and has been incorporated into the final 2016 IR.
EPA	96	3	The IR for Fremont River-2 Assessment Unit (UT14070003-005) shows impairment for TP but, it also shows a delisting for TP. It can only be a category 5 or it is delisted, not both.	Edits made to Chapter 3	This AU (UT14070003-005) was delisted for Dissolved Oxygen. There is an approved TMDL for TP, but DWQ is not proposing to delist that parameter. It is also not supporting designated uses for pH and temperature. Therefore, the AU will remain in Category 5.
EPA	97	4	In 2016, the previous Utah Lake Assessment Unit (UT16020201-004_00) was sub-divided into two new assessment units, Utah Lake other than Provo Bay (UT16020201-004_01) and Provo Bay (UT16020201-004_02). Past 303(d) listings (PCBs in Fish Tissue, Total Dissolved Solids, and Total Phosphorus) for the combined waterbody (UT16020201-004_00) were applied only to the new Utah Lake assessment unit (UT16020201-004_01) and not to the new Provo Bay assessment unit (UT16020201-004_02). In addition, without providing any explanation, UDWQ excluded Provo Bay from the 303(d) listing for harmful algal blooms (HABs) that was applied to the rest of Utah Lake. Comment: The new Provo Bay assessment unit (UT16020201-004_02) should also be listed for the same parameters as Utah Lake unless rationales for delisting or non-listing are provided. There are no de-listing justifications provided for previously existing causes of impairment in Provo Bay. Therefore, the listings previously assigned to UT16020201-004_00 should also be assigned to the new Provo Bay assessment unit (UT16020201-004_02). The draft Integrated Report does not include a rationale for excluding Provo Bay from the HABs listing. Since the Utah Lake HABs assessment indicates impairment of the recreational use throughout the lake, the new Provo Bay assessment unit (UT16020201-004_02) should be listed as impaired for HABs or a rationale for its exclusion should be provided.	Listings for total phosphorus and fish PCBs added to the Provo Bay AU. TDS in Provo Bay delisted.	DWQ has carried the listings for total phosphorus and fish PCBs to Provo Bay. Data collected in Provo Bay support a delisting for TDS which is included in the final delisting table. As described in chapter 5, cyanobacterial densities >= 100,000 cells/mL have not been identified in Provo Bay and Provo Bay is therefore not listed for harmful algal blooms. DWQ anticipates that fish sampling conducted during 2015 and 2016 will be adequate to perform a full assessment of fish PCBs in both Utah Lake AUs in the 2018 IR.
EPA	98	7	Farmington Bay has federally approved designated uses that must be protected, and an approved narrative water quality standard that describes circumstances under which those uses would be considered threatened or impaired. UDEQ has developed an assessment method with which HABs data may be assessed against the narrative water quality standard to determine if designated uses are protected. This section provides a summary of the designated uses, narrative standard, HABs data that are available, and HABs assessment method that may be used for Farmington Bay. The Farmington Bay portion of Great Salt Lake is categorized as Class 5D in the Utah Use Designations (UAC R317-2-6.5.d). The use designations for Class 5D are: "Beneficial Uses -- Protected for infrequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain". This classification is applied to: "All open waters at or below approximately 4,208-foot elevation east of Antelope Island and south of the Antelope Island Causeway, excluding salt evaporation ponds," which includes Farmington Bay. The Utah narrative water quality standard (UAC R317-2-7.2) applicable to the Farmington Bay portion of Great Salt Lake states: "It shall be unlawful, and a violation of these rules, for any person to discharge or place any waste or other substance in such a way as will be or may become offensive such as unnatural deposits, floating debris, oil, scum or other nuisances such as color, odor or taste; or cause conditions which produce undesirable aquatic life or which produce objectionable tastes in edible aquatic organisms; or result in concentrations or combinations of substances which produce undesirable physiological responses in desirable resident fish, or other desirable aquatic life, or undesirable human health effects, as determined	None	DWQ evaluated readily available data regarding HABs in Farmington Bay. Although exceedances for HAB indicators were identified in Farmington Bay, methods specified in the integrated report excluded Great Salt Lake from assessment decisions for the 2016 IR. When developing the 2016 IR assessment methods, UDWQ did not anticipate having new data that could be used to perform a beneficial use assessment in Farmington Bay or Great Salt Lake and therefore deferred any 303(d) listing decisions until further methods were developed and data collected, and has placed Farmington Bay in category 3, assessment methods in development in the 2016 IR.

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			by bioassay or other tests performed in accordance with standard procedures; or determined by biological assessments in Subsection R317-2-7.3." (Emphasis added) The ongoing recreational use of Farmington Bay is documented in Chapter 4 (p. 7). As the recreational use of Farmington Bay provides the opportunity for human exposure to HABs and algal toxins if they are present, HABs data for Farmington Bay must be evaluated to determine the degree of human health risk posed by recreation in this water. Additionally, the presence of HABs and their associated algal toxins at levels that pose an unacceptable risk to human health would constitute nonattainment of this narrative water quality standard that makes discharge of any substance that may cause conditions which produce undesirable human health effects unlawful. UDEQ's HABs assessment method (see Chapter 2) addresses both drinking water and recreational use attainment. Hence, the assessment method may be applied to evaluate attainment of the recreational use of Class 5D waters, including "infrequent primary and secondary contact recreation". For the 2016 listing cycle, the State updated the HABs assessment method to provide more information on the indicators used to identify lakes and reservoirs impaired for HABs including cyanobacteria cell counts and supplemental indicators such as cyanotoxins, chlorophyll-a, phycocyanin, and harmful algal bloom–related beach closures. The HABS assessment methodology establishes a number of thresholds with which to assess a water body for impairment of the narrative standard. It states that "the beneficial use is not supported if cyanobacteria cell counts exceed 100,000 cells/ml for more than one sampling event or other narrative indicators (e.g. phycocyanin, chlorophyll a, harmful algal bloom–related beach closure) suggest recreational uses are not being attained" (Chapter 2, page 60). The methodology also indicates that for chlorophyll a, concentrations greater than 50 ug/l pose a high human health risk. For the 2016 IR, UDEQ assembled and reviewed the available HABS data for Farmington Bay. These data include cyanobacteria cell counts, algal toxin values (Nodularin), and chlorophyll a levels (see Chapter 6). The data spanned 2012 to 2014 and passed the credible data review the State applies to determine which data will be used in assessments. Therefore, the available HABs data are suitable for use in assessing attainment of the narrative water quality standard in Farmington Bay for the recreation use and must be assembled and evaluated per 40 C.F.R. § 130.7(b)(v). The draft IR (Chapter 6) includes an analysis of the available HABs data for Farmington Bay, applying the thresholds and exceedance frequencies established in the State's assessment methodology. On page 15, a summary table shows numerous exceedances of the thresholds established in the HABs assessment methodology: These data indicate that the recreational use in Farmington Bay is not being attained and provide convincing support for a finding of impairment caused by HABs. Despite this, Farmington Bay is excluded from the draft 303(d) list. Comment: EPA's regulations at 40 C.F.R. § 130.7(b)(v) require states to "assemble and evaluate all existing and readily available water quality-related data and information" when developing their 303(d) listings. Chapter 6 of the draft IR contains a variety of water quality-related data and information pertaining to HABs in Farmington Bay. Accordingly, this data must be evaluated, and should be assessed against Utah's narrative water quality standard using the assessment method provided in Chapter 2 to determine if HABs in Farmington Bay pose a risk for recreation. Based on the data analysis provided by UDEQ in Chapter 6, Farmington Bay's recreational use should be listed as impaired for HABs.		
EPA	99	4	UDWQ analyzed the existing and readily available HABS data for Utah Lake using the State's HABS assessment methodology (see above for details). The available data indicate the waterbody is impaired based on five exceedances of the cyanobacterial cell count threshold of 100,000 µg/L. See the table below for a summary of all exceedances. In addition, results from the supplemental indicators (i.e., chlorophyll-a; recreational use advisories; dog deaths) provide additional information suggesting that the recreational use in Utah Lake is not being attained. Events of July 2016 also support the State's decision to list Utah Lake as impaired due to HABs. On July 15th, the State closed Utah Lake for recreation due to multiple exceedances of the	None	DWQ agrees that data collected in Utah Lake support an impairment listing for harmful algal blooms.

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			State's cyanobacteria cell count threshold. Data collected during the bloom showed multiple samples exceeding the cyanobacteria cell count of 100,000 cells/mL (even exceeding 1 million cells/mL). Comment: Based on a comparison to the HABS methodology and information from the multiple lines of evidence considered in the state's assessment, EPA agrees that Utah Lake is impaired		
EPA	100	6	In Chapter 6, on pages 5, 6, 14, and 15, information on Figure 4 and Table 2 include 'WHO and EPA' in referring to indicators and threshold values. EPA has not yet finalized their guidance for HABS threshold values and indicators. EPA requests that the State change this to refer only to the World Health Organization (WHO).	References to EPA harmful algal bloom guidelines removed.	DWQ has clarified in the final IR that these guidelines are derived from the World Health Organization.
EPA	101	6	We previously discussed the Utah Lake AU split into two new AUs; Provo Bay and Utah Lake other than Provo Bay. The Lakes Assessment didn't carry forward the existing 303(d) listings to the new Provo Bay AU and not delistings for the new Provo Bay AU were identified. Thus, an error.	Listings for total phosphorus and fish PCBs added to the Provo Bay AU. TDS in Provo Bay delisted.	DWQ has carried the listings for total phosphorus and fish PCBs to Provo Bay. Data collected in Provo Bay support a delisting for TDS which is included in the final delisting table. As described in chapter 5, cyanobacterial densities >= 100,000 cells/mL have not been identified in Provo Bay and Provo Bay is therefore not listed for harmful algal blooms. DWQ anticipates that fish sampling conducted during 2015 and 2016 will be adequate to perform a full assessment of fish PCBs in both Utah Lake AUs in the 2018 IR.
EPA	102	3	I looked at all of the River/Stream AUs that were identified for splits. All had existing 303(d) listings. However, in the River/Streams assessments, only the previous AUs were identified; no new AUs resulting from splits. In Chapter 1, changes in AUs is discussed and the term 'proposed' is used. It is unclear if the new AUs are being implemented in 2016, or not. Certainly, it is being handled differently between lakes/reservoirs and rivers/streams. I suggest consistency. If you do implement the splits for rivers/streams, carry the existing 303(d) listings forward to the new AUs. Then reassess. If appropriate for a new AU, you can delist a parameter based on change in assessment methodology (a new assessment unit).	None	DWQ has determined that the proposed splits are not appropriate at this time. During the 2018 IR, DWQ will consider the appropriateness of future AU splits.
F	103	3	Mill Creek Jordan River/Utah Lake UT 16020204-026 Mill Creek from confluence with Jordan River to Interstate 15 Not Supporting Dissolved Oxygen Central Valley Water Reclamation Facility has been in compliance with the D.O. requirement of 5.5 mg/L in its permit (measured immediately downstream of reaeration) and the actual D.O. levels in our discharge downstream of the cascade aeration at the edge of Mill Creek are generally 1 mg/L higher than values measured for permit compliance. Since our flow is a significant proportion of the streamflow during most flow conditions, this leads us to believe the D.O. levels downstream of our discharge should be more than adequate. Are the sample locations that show D.O. impairment of the creek upstream or downstream of CVWRF discharge?	Removed Listing	Your question relates to DO data that were used to make previous assessment decisions, which were initially carried over to the 2016 IR because more recently collected data were insufficient to justify changing this determination. However, after a thorough review of data submitted during public comment combined with the most recent data collected by DWQ, a decision has been made to delist this section of Mill Creek for DO. While some DO violations were observed in recent years, more contemporary data suggest that the frequency of these excursions—3 of 47 samples—is insufficient to define a DO impairment in Lower Mill Creek. Please see the response to Comment #104 for additional information about the data used to make the older impairment listing decision, including a description of monitoring locations.

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F	104	3	Mill Creek Jordan River/Utah Lake UT 16020204-026 Mill Creek from confluence with Jordan River to Interstate 15 During and after precipitation events, we observe significant solids and dark coloration of the flow in Mill Creek upstream of our discharge and downstream from our discharge emanating from the Vitro Ditch. In addition, there is often an oily sheen on the water surface or both streams. This appears to be organic material washed from urban surfaces including roads and parking lots and would be expected to exert significant oxygen demand. We also observe significant flow of Utah Lake water in Mill Creek upstream of our discharge due to irrigation exchanges during the summer months. This water is turbid with and laden with algae and other organic material which also likely exerts a significant oxygen demand. Are the sample locations that show D.O impairment of the creek upstream or downstream of our discharge or the discharge location of the Vitro Ditch? Were the samples taken in the summer months or during/after precipitation events when significant organic material is entering the creek from other sources?	Removed Listing	The review of statewide water quality data is sometimes complicated by a lack of local observations and DWQ appreciates any comments that help with the interpretation of water quality data. Your questions relate to data that were used to make an impairment decision in a previous IR (summarized below). Initially, this earlier impairment determination was carried forward to the Draft 2016 IR. However, after a thorough review of data submitted during public comment of the Draft 2016 IR, combined with the most recent data collected by DWQ, a decision has been made to delist this section of Mill Creek for its DO impairment. While this decision to delist may eliminate the principle reason for the questions raised in this comment, DWQ nevertheless has answered them because it may provide useful insight into the historical listing determination. In 2014, data were analyzed from two locations in the lower Mill Creek AU (UT 160202-026). One site (MLID 4992480) was just below both outfalls: the Central Valley discharge and the Vitro Ditch to Mill Creek. Another site (MLID 4992505) was located ~210 meters upstream of the Central Valley discharge outfall. In 2014, all DO data collected from 2007-2011 at both locations were evaluated against a DO criterion of 5 mg/L. At the upstream location only 1 sample of 26 (~3.8%) fell below the criterion, whereas 6 of 56 (11%) samples fell below the criterion at the downstream location. Samples at both locations were collected throughout the year. Samples that fell below the criterion at the lower location were observed each year, whereas the single violation at the upper site was observed in September of 2012. With one exception—a sample collected in February of 2009—the water quality standard violations occurred during the growing season (April-September). Based on existing data analysis methods (see IR, Chapter 2), DWQ listed this AU because one of the two MLIDs that were evaluated was considered to be not supporting designated uses.
F	105	3	Mill Creek Jordan River/Utah Lake UT 16020204-026 Mill Creek from confluence with Jordan River to Interstate 15 It is also our understanding that DWQ has likely used instantaneous DO readings to declare impairment as if they represented 7-day or 30-day average values. We understand that this method differs from EPA's 1986 guidelines (Water Quality Criteria for Dissolved Oxygen). We request that the sample locations and methods used for this assessment and the accompanying data be provided.	NONE	All of the data used for conducting all assessments are provided on DWQ's website (http://deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/rsdatafiles2016.htm) both during the public comment period and subsequently upon finalization of each IR. Published data include raw data files, geolocations and other metadata, and summary statistics of assessment results, so that all assessment decisions are as transparent as possible. Contacts are also provided should stakeholders have any questions. This particular comment relates to DO data that were used to make previous assessment decisions, which were initially carried over to the 2016 IR because more recently collected data were insufficient to justify changing this determination. However, after a thorough review of data submitted during public comment combined with the most recent data collected by DWQ, a decision has been made to delist this section of Mill Creek for DO. While some DO violations were observed in recent years, more contemporary data suggest that the frequency of these excursions—3 of 47 samples—is insufficient to define a DO impairment in Lower Mill Creek. Please see the response to Comment #104 for additional information about the data used to make the older impairment listing decision, including a description of monitoring locations.
F	106	3	Mill Creek Jordan River/Utah Lake UT 16020204-026 Mill Creek from confluence with Jordan River to Interstate 15 Not Supporting O/E Bioassessment Please provide a list of reference sites which were used to compare O/E conditions against this reach of Mill Creek. Does this assessment and comparison take into account degradation of the aquatic habitat from the annual dredging of Mill Creek from the confluence with Jordan River to several hundred yards upstream of CVWRF's discharge point by Salt Lake County to maintain the creek as a flood control channel? Does this assessment take into account degradation of habitat from the organics/oils/debris from the irrigation exchange of Utah Lake water and the significant urban runoff that enters Mill Creek? Also, please list the site-specific physical characteristics which were used to compare Mill Creek and the reference sites.	None	Expected assemblages are not derived through a comparison of each site to a particular reference site or set of reference sites. Instead, they are calculated from site specific predictions of probabilities of capture (Pc) for all taxa. Pc values are predicted from a multi-taxon niche model that relates frequencies of occurrence of all taxa at all reference sites to natural environmental gradients. E is calculated as the sum of all Pc values >=0.5, and O is calculated as the number of those taxa with predicted Pc>=0.5 that are observed in a sample. The model building methodology is explained in the Biological Assessments of Rivers and Streams section of Chapter Two of the report. The first step in the assessment process is to determine whether the waterbody is meeting the designated beneficial uses, regardless of surrounding land uses. If the waterbody is considered not meeting any of the uses, it will be identified on the 303(d) list for further evaluation such as the cause(s), source(s), and magnitude of potential pollutants.
F	107	3	Mill Creek Jordan River/Utah Lake UT 16020204-026 Mill Creek from confluence with Jordan River to Interstate 15 Not Supporting E. coli Central Valley Water Reclamation Facility has been in compliance with the E. coli parameter in its permit and the E. coli levels in our discharge are typically 10 times lower than the permit requirements. We suspect that the source of E. coli in the stream reach is most likely wildlife and the large numbers of waterfowl that inhabit this segment. There are typically dozens of ducks and geese in the stream reach downstream of CVWRF's	None	Geographic location information, as well as individual sample results that were included in the assessment, can be found in the Supplemental Information section of the 2016 Integrated Report website. Monitoring Location IDs can also be displayed on the DEQ interactive map. Determining sources of E. coli is outside the scope of the Integrated Report. Source identification is addressed during TMDL development.

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			discharge. Is there any information on the source of the E. coli (i.e., human origin, avian or other)? We request clarification of the sample locations and rationale for this listing.		
F	108	3	Jordan River Jordan River/Utah Lake UT 16020204-001, 002, 003 Jordan River from Farmington Bay to Confluence with Little Cottonwood Creek Not Supporting O/E Bioassessment Please provide a list of reference sites which were used to compare O/E conditions against these three reaches of the Jordan River. Also please list the site-specific physical characteristics which were used to compare these three reaches of the Jordan River and the reference sites.	None	Expected assemblages are not derived through a comparison of each site to a particular reference site or set of reference sites. Instead, they are calculated from site specific predictions of probabilities of capture (Pc) for all taxa. Pc values are predicted from a multi-taxon niche model that relates frequencies of occurrence of all taxa at all reference sites to natural environmental gradients. E is calculated as the sum of all Pc values >=0.5, and O is calculated as the number of those taxa with predicted Pc>=0.5 that are observed in a sample. The model building methodology is explained in the Biological Assessments of Rivers and Streams section of Chapter Two of the report.
F	109	3	Jordan River Jordan River/Utah Lake UT 16020204-001, 002, 003 Jordan River from Farmington Bay to Confluence with Little Cottonwood Creek TMDL Approved (Phase 1) for Dissolved Oxygen We believe that available data demonstrates that low D.O. in these three reaches of the Jordan River is a result of high-flow introduction and suspension of rapidly oxidizable organic materials during storm events and that DWQ has yet to address the use attainability issues surrounding this impairment. We remain convinced that organic materials exiting our secondary clarifiers do not materially contribute to the settled organic load that is re-mobilized during these infrequent storm events and request DWQ's view on this issue.	None	Although this comment is outside the scope of assessment decisions provided in the Integrated Report, the view of DWQ on organic matter sources can be summarized as follows. There are many organic matter sources contributing to the dissolved oxygen impairment in the lower Jordan River (segments 1, 2, and 3) and all should be thoroughly considered in understanding when, where, and how they contribute to the consumption of oxygen in the water column. DWQ is committed to conducting the scientific analyses, in partnership with stakeholders, needed to better understand the relative contributions of all sources of organic matter on dissolved oxygen levels, including both acute and chronic effects to aquatic life uses. Once this analysis is complete, DWQ will use these data to complete a TMDL for the lower Jordan River.
F	110	3	Jordan River Jordan River/Utah Lake UT 16020204-001, 002, 003 Jordan River from Farmington Bay to Confluence with Little Cottonwood Creek Not supporting E. coli As described above for Mill Creek, Central Valley Water Reclamation Facility has been in full compliance with the E. coli parameter in its permit. We suspect that the source of E. coli in these reaches of the Jordan River is most likely wildlife and the large population of waterfowl that inhabit the river. Is there any information on the source of the E. coli (i.e., human origin, avian or other)? We request clarification of the rationale for this listing and request consideration be given to a site-specific UAA that addresses these issues.	None	Individual sample results that were used to perform the assessment can be found in the Supplemental Information section of the 2016 Integrated Report website. Determining sources of E. coli and site specific Use Attainability Analysis are outside the scope of the Integrated Report. Source identification and standards issues are addressed through the TMDL development and Triennial Review processes respectively. Information on the Triennial Review can be found at the following web address: http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/standards/triennialrev.htm.
F	111	3	Jordan River/Utah Lake UT 16020204- 003 Jordan River from North Temple to 2100 South Not Supporting Total Phosphorus What was the threshold for P used in this determination? How was this threshold developed?	None	This river segment was first listed in 2008 and was linked to the dissolved oxygen impairment made during the same cycle. Section 12 of the 2008 assessment methodology (http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/docs/2011/04Apr/IR2008/Part1/2008_Part-1-IR_CWB10102010.pdf) outlines the procedures for identify river and stream segments that needed further evaluation based on phosphorus concentrations (mean concentration greater than 0.06 mg/L AND more than 10% of samples exceeding the total phosphorus indicator of 0.05 mg/L). Review of this listing is being considered as part of the lower Jordan River TMDL effort.
F	113	6	Evaluation of Harmful Algal Bloom Data in Farmington Bay, Great Salt Lake. Central Valley has received and reviewed a copy of the "Utah 2016 Integrated Report Comments" provided by Central Davis Sewer District and prepared by Mr. Leland Myers, PE. We concur with the content of Mr. Myers' well-researched paper and offer the following reiteration of key points contained therein: It is generally recognized that not all cyanobacteria produce toxins. Use of cell count data in lieu of toxin concentration is tenuous to prompt water body closure or to declare a water body impaired. However, we recognize that prudence must be exercised in water body postings or closure and believe that this activity should be distinct from any declaration of impairment. We believe that the State of Utah should use toxin level as the metric for declaring a water body impaired. The State could employ the enzyme-linked immunosorbent assay (ELISA)-based testing kits to measure total microcystin concentration in water. Use of the 20 ug/L public advisory limit for impairment listing appears appropriate.	None	Please see comment response Appendix A, sections 2, 3, and 9, for responses to this comment.

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F	114	6	Sampling of a water body should be consistent with State management criteria and not driven by attempts to sample only accumulation zones, or, conversely to ignore the same in an attempt to expose lower levels representative of only open water. The State should establish such consistent sampling criteria.	None	Please see comment response Appendix A, section 7, for a response to this comment.
F	115	6	Declaring Farmington Bay as impaired due to cyanobacteria ignores the crucial role of cyanobacteria as an important part of that ecosystem's food chain. Historically, cyanobacteria has naturally occurred in Farmington Bay. Therefore, its existing uses for recreation should not include stated conditions related to cyanobacteria. The existing use as a food source for birds and their necessary food chain may conflict with the desire to have infrequent primary and secondary contact as a beneficial use -- including a cyanobacteria limitation.	None	Farmington Bay has not been identified as not supporting designated uses in the 2016 IR. It has been placed in category 3C, assessment methods in development. Please see comment response Appendix A, section 10, for additional information related to this comment.
F	116	6	Listing of Farmington Bay as impaired also ignores the historic alteration of the lake through causeway construction, which impedes the past circulation patterns in the lake.	None	Farmington Bay has not been identified as not supporting designated uses in the 2016 IR. It has been placed in category 3C, assessment methods in development. As assessment methods are developed for Farmington Bay, DWQ will consider the relationship between cyanobacteria and both the recreational and aquatic life uses. Please see comment response Appendix A, section 10, for additional information related to this comment.
G	117	6	An important consideration for DWQ in performing a recreational use assessment is the issue most described by Tom_ankov_a et al. (2013). In order to avoid misinterpretation, the following are quotations from this report: "Density of macroinvertebrates declined by two-thirds, from 15 300 individuals m _2 in 1997/1998 to 5115 individuals m2 in 2010, with concomitant declines in biomass. These changes coincided with a sustained decline in phytoplankton concentration and a sudden decline in the overwintering numbers of diving ducks, principally pochard, tufted duck and goldeneye (Tom_ankov_a et al., 2013).	None	Farmington Bay has not been identified as not supporting designated uses in the 2016 IR. It has been placed in category 3C, assessment methods in development. As assessment methods are developed for Farmington Bay, DWQ will consider the relationship between cyanobacteria and both the recreational and aquatic life uses. Please see comment response Appendix A, section 10, for additional information related to this comment.
G	118	6	"In an effort to control eutrophication, tertiary treatment was introduced in 1981 at major sewage treatment works in the Lough Neagh catchment (Foy et al., 2003). Initially, total phosphorus concentrations decreased (Heaney et al., 2001), but the impact was only temporary, and by the late 1990s, total phosphorus values exceeded those prior to control efforts, mostly due to non-point source pollution (Heaney et al., 2001) and retention and release of phosphorus from the sediments (Foy et al., 2003). Bunting et al. (2007) noted that, in the 1990s, water column concentrations of NO3 reached a historical maximum, while P concentrations also remained high, resulting in a historical peak in chlorophyll-a concentration. This maximum in algal biomass coincided with Bigsby's (2000) macroinvertebrate study and a period when large numbers of diving ducks overwintered on the Lough. Today, Lough Neagh remains extremely eutrophic, but the recent reductions in chlorophyll-a concentrations (and probably underlying primary production) are likely to reflect changes in nutrient availability or dynamics and are clearly worthy of further study.	None	Farmington Bay has not been identified as not supporting designated uses in the 2016 IR. It has been placed in category 3C, assessment methods in development. As assessment methods are developed for Farmington Bay, DWQ will consider the relationship between cyanobacteria and both the recreational and aquatic life uses. Please see comment response Appendix A, section 10, for additional information related to this comment.
G	119	6	"In other lakes, improvements in water quality have led to shifts in the macroinvertebrate communities (Schloesser et al., 1995; Carter et al., 2006) and decreased total macroinvertebrate abundance (K€ohler et al., 2005). In the Firth of Forth in Scotland, attempts to improve water quality by installation of sewage treatment works resulted in a decline in overwintering diving ducks, namely scaup and goldeneye (Campbell, 1984); however, it was unclear whether the declines were caused by the loss of food carried in the sewage or the actual decline of macroinvertebrates associated with the sewage (Campbell, 1984). Thus, the decline in macroinvertebrates at Lough Neagh and concomitant changes in overwintering duck populations may well be an unintended consequence of improving water quality. "	None	Farmington Bay has not been identified as not supporting designated uses in the 2016 IR. It has been placed in category 3C, assessment methods in development. As assessment methods are developed for Farmington Bay, DWQ will consider the relationship between cyanobacteria and both the recreational and aquatic life uses. Please see comment response Appendix A, section 10, for additional information related to this comment.
G	120	6	From these quotations, it is clear that nutrient reductions may or may not work and this failure may be twofold: 1) there are other unknowns associated with uncontrolled nonpoint sources, including atmospheric deposition and sediment nutrient recycling; and 2) there may be an unintended overwhelming decline in higher levels in the food chain that directly rely on primary production for their health, survival and reproduction. This very same issue has been proposed by myself numerous times while in conversation with DWQ staff. For example, Marden, 2014 reported the	None	Farmington Bay has not been identified as not supporting designated uses in the 2016 IR. It has been placed in category 3C, assessment methods in development. As assessment methods are developed for Farmington Bay, DWQ will consider the relationship between cyanobacteria and both the recreational and aquatic life uses. For example, DWQ may compare avian health and productivity in Bear River Bay with that in Farmington Bay. Please also see comment response Appendix A, section 10, for a response to this comment.

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			remarkable diversity and biomass of of the zooplankton and macroinvertabrates in Farmington Bay and Cavitt (2006 and 2010) has reported the dietary preference and direct utilization of macroinvertebrates by both waterfowl and shorebirds as they nest and later stage in impoundments and sheetflow wetlands of Farmington Bay. Moreover, this is not even considering the evidence that whatever nitrogen gets "fixed" by these heterocysteous cyanobacteria and the entire Farmington Bay bloom itself, is consumed by the Artemia in the South arm of Great Salt Lake (Gilbert Bay) (Dr. Gary Belovski, presentation to Great Salt Lake Ecosystem Program, Technical advisory Committee). Gilbert Bay Artemia production both supports waterbirds such as eared Grebes and goldeneye ducks (Conover 2008), as well as contributes to a several-hundred- million- dollar per/ year brine shrimp cyst-harvesting industry. Moreover, during an average harvest, brine shrimp cyst removal includes the annual removal of approximately 225 tons of phosphorus (personal observations and simple calculation). Hence, the effort to reduce nutrients in Farmington Bay may have unintended consequences upon unintended consequences. It is clear, from the few cases discussed above and from what we know thus far about Farmington Bay and the South Arm, that implementation of drastic nutrient reduction may indeed lead to drastic reduction in waterfowl and shorebird numbers (Tom _ankov _ et al. 2013) as well as hinder the economic benefits of a renewable resource. Yet, it appears that, under the auspices of independent applicability, DWQ intends to list Farmington Bay and proceed toward a typical TMDL that has no regard for the consequences, nor the accountability for such actions. Hence, it appears that the tiny number of apparent recreationists who mostly visit Farmington bay when the cyanobacteria bloom, if it occurs, is gone, takes precedence. Most certainly, DWQ needs to recognize that research and subsequent reports that, in collaboration with large grants from Central Davis Sewer District and the EPA WPDG grant program, describe the ecosystem services and phenomenal value in supporting millions of waterfowl and shorebirds. Assuring that the nutrient-based availability of food resources for all life stages of millions of these waterfowl and shorebirds should take high precedence over the remote, perceived risk of a handful of recreations who visit Farmington Bay for the purpose of watching this visual phenomenon or hunting and again, which largely occurs after peek blooms have diminished. We need to be much more certain that any perceived benefits will outweigh the much larger potential for having the unintended consequences of reducing the carrying capacity of these wetlands by starvation. We must assure that these waterbirds have sufficient resources to successfully nest and stage in, and migrate from this most critical refuge that includes the impounded and sheetflow habitats of Farmington Bay for so many millions of birds. As scientists, resource managers and regulators, let's be more certain this is not another case of unintended consequences.		
G	121	6	Despite the literature cited in Chapter 6 concerning the correlation between cyanotoxin concentration and cell counts or Chla, The Marden et al. (2015) report, clearly displays the very reason why cell counts or Chl a alone inadequately predict cyanotoxin. Is this why DWQ did not graph total cyanobacteria cells against cyanotoxin concentration- because the Pseudoanabaena species in the Bay is not a toxin producer? The same is true for Chl a. There is simply not a significant relationship between cyanotoxin concentrations and cell counts or Chl a. Hence, two of the three indicators fail to predict cyanotoxin concentrations in Farmington Bay. For example, on the surface, Table 2 is an attempt to demonstrate that there were substantial numbers of exceedences for all three indicators. However, I suggest DWQ plot each of these data points on a temporal scale. Chl a may be high or low in relation to nodularin and cell counts will reach very high numbers while nodularin will be well below the 20 ug/L threshold.	None	Please see comment response Appendix A, sections 1, 2, 3, and 6, for additional information.
G	122	6	Notwithstanding, because Nodularia is similar to Mycrocystis in its ability to produce significant concentrations of nodularin (one of the microcystin compounds), at about 100,000 cells/mL, This adds further credence to my comment for Chapter 5, that WHO was willing to use 100,000 cell/mL counts or 50 ug/L Chl a as SECONDARY threshold indicators because the great majority of cyanobacteria blooms and the great majority of research as a whole in North America and	None	Please see comment response Appendix A, sections 1, 2, 3, and 6, for responses to this comment.

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			worldwide indeed focuses on Microcystis (Juan et al. 2014). With other species, this relationship may or may not have any predictive value. Therefore, as with comments for Chapter 5, the Indicator thresholds need to be modified to include the requirement for the bloom to be a microcystis or nodularia bloom before Chl a or cell counts have any validity. Because Chapters 5 and 6 make for a similar case of impairment using a mostly similar set of references, my comments provided for Chapter 5 to apply to Chapter 6. As such we should expect similar detail of response for both chapters.		
G	123	6	Finally, and to reiterate, unfortunately, it appears that DWQ is prioritizing the recreational support assessment far in front of an aquatic life and waterfowl and shorebird beneficial use assessment. As an aquatic ecologist, and I'm sure I speak for all other aquatic and wildlife ecologists and managers that are familiar with Farmington Bay, I highly recommend that the "waterfowl and shorebird and the necessary aquatic life in their foodchain" beneficial use support receive higher priority than recreational use. In short, just place signage at the points of access when toxins appear and let's keep working hard to ensure that the waterfowl and shorebirds retain this most critical and special habitat.	None	Please see comment response Appendix A, section 10, for a response to this comment.
G	124	3	Listing: Jordan River/Utah Lake UT16020204-001 Jordan River- Reach 1. Jordan River from Farmington Bay upstream contiguous with the Davis County line 5 Not Supporting Copper, Dissolved 3B; 3D Low 2014 8.6. Comment: DWQ should perform at least the Biotic Ligand Model at sites listed for the divalent metals. This would provide clear evidence that these metals are not as toxic as EPA's and DWQ's hardness-based criteria. This would save immense amounts of time in listing and delisting or more time-consuming, expensive and unwarranted performance of a TMDL. This model can be performed in-house.	Out of Scope	This comment is not within the scope of the IR. The adoption of such a model would require the development of site specific standards and require a change to water quality standards (UAC R317.2). We encourage you to bring this recommendation to the Water Quality Workgroup during the Triennial Review.
G	125	3	Listing: Jordan River/Utah Lake UT16020204-001 Jordan River- Reach 1. Jordan River from Farmington Bay upstream contiguous with the Davis County line 5 Not Supporting OE Bioassessment 3B; 3D Low 2008 8.6 Comment: First, DWQ needs to understand that the Jordan River does not flow into Farmington Bay. Rather, the flow downstream from Burnham Dam is distributed throughout Newstate Duck Club, where it flows through approximately 25 ponds. This water then enters the Turpin Unit of the Farmington Bay Waterfowl Management Area. Finally, through 19 separate and adjustable culverts, this water is released to Farmington Bay. A small overflow sometimes enters the NW Oil Drain about 1 mile upstream from the west side of the Turpin Dike. The Reach description should end at Burton Dam, which is the last diversion of the River where it flows into impoundments owned by Newstate Duck Club. Also, the description does not include an upstream end of the reach in question. This needs to be added.	Out of Scope	Since the delineation of waterbodies in R317.2 do not often capture the complexity of hydrologic management, waterbody descriptions are therefore general. For this reason, current assessment maps delineate the Jordan River-1 segment beginning approximately 1 mile north of the Burton Dam continuing upstream to the Davis County Line. For the purpose of the IR, the scope of the impairment matches this description. The data and the resulting assessment result were derived from sites entirely within this corridor upstream of the Burton Dam. Therefore, the assessment result was not applied to the regions cited in the comment. As this is a hydrologically complex area, modifying the description in R317.2 would require additional study. As for the upper limit of this reach, the segment ends at the junction with the Davis Co. line.
G	126	3	Listing: Jordan River/Utah Lake UT16020204-002 Jordan River-Reach 2. Jordan River from Davis County line upstream to North Temple Street 5 Not Supporting OE Bioassessment 3B; 3D Low 2008 6.1 and Listing: Jordan River/Utah Lake UT16020204-003 Jordan River-Reach 3. Jordan River from North Temple to 2100 South 5 Not Supporting OE Bioassessment 3B Low 2008 2.7 Comment (for Reaches 1, 2 and 3): What are the reference sites for O/E? It is difficult to imagine what other river systems in Utah function as valid reference sites. I certainly believe and I would think that DWQ staff should believe this to be critical? Wouldn't DWQ agree that gross average watershed characteristics can hardly predict the macroinvertebrate community of Reach 1 of the Jordan River? There is a growing consensus among stream ecologists that (Brett Marshell, River continuum Concepts, David Richards, Oreohelix Consulting and others), that the only utility of O/E, it is as a screening tool, to list an AU as category 3 to follow-up with additional site surveys and comparisons of physical habitat characteristics with reference condition to determine that O/E is truly different from reference sites based only on WQ parameters or whether the physical condition of this channelized, straightened, dredged and dewatered segment is the cause. Again, as many times before, this is being requested in the spirit of transparency and collaboration for the purpose of improving the assessment process. For example, all other western states that include O/E use many additional metrics to validate true impairment and assist in determining the	None	Expected assemblages are not derived through a comparison of each site to a particular reference site or set of reference sites. Instead, they are calculated from site specific predictions of probabilities of capture (Pc) for all taxa. Pc values are predicted from a multi-taxon niche model that relates frequencies of occurrence of all taxa at all reference sites to natural environmental gradients. E is calculated as the sum of all Pc values >=0.5, and O is calculated as the number of those taxa with predicted Pc>=0.5 that are observed in a sample. The model building methodology is explained in the Biological Assessments of Rivers and Streams section of Chapter Two of the report. The first step in the assessment process is to determine whether the waterbody is meeting the designated beneficial uses, regardless of surrounding land uses. If the waterbody is considered not meeting any of the uses, it will be identified on the 303(d) list for further evaluation such as the cause(s), source(s), and magnitude of potential pollutants.

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			cause. Utah is considered behind in identifying and performing more thorough bioassessments that include multiple metrics and indicators that elucidate various potential/stressors that ultimately dictate the composition of the macroinvertebrate community in a particular stream reach.		
G	127	3	Clearly, Jordan River is the most high-profile stream segment of any Utah stream and has been the subject of millions of dollars worth of monitoring and research. DWQ should understand the importance of physical data associated with biological responses and understand that this entire lower reach consists of a highly modified depositional zone, most often characterized by several feet of organic-rich silt and clay with deposition occurring continually. It seems impossible to identify ANY reach of stream in Utah that would qualify as a reference reach for the lower Jordan or the site(s) sampled to represent the lower reaches of the Jordan River. Identification of such reference sites is critical in order to more thoroughly evaluate causation of the O/E impairment.	None	Expected assemblages are not derived through a comparison of each site to a particular reference site or set of reference sites. Instead, they are calculated from site specific predictions of probabilities of capture (Pc) for all taxa. Pc values are predicted from a multi-taxon niche model that relates frequencies of occurrence of all taxa at all reference sites to natural environmental gradients. E is calculated as the sum of all Pc values >=0.5, and O is calculated as the number of those taxa with predicted Pc>=0.5 that are observed in a sample. The model building methodology is explained in the Biological Assessments of Rivers and Streams section of Chapter Two of the report. DWQ does not rely solely upon reference sites located in Utah but uses some reference sites in the intermountain west, particularly rivers. Future models will incorporate more of these data as they become available and resources allow.
G	128	3	Also, DWQ needs identify the location of the sample site where biological collections are made. DWQ needs to list reference sites for all sites listed as impaired for O/E – such would be a welcome addition to the Appendix of the 305(b) section. Otherwise, it is impossible to provide a thorough and necessary scientific review that DWQ is requesting for this important document. Transparency is paramount. Also, see and address the additional comments presented herein and those provided by Dr. David Richards.	Added site information to appendix	DWQ has updated the IR to include the coordinates of all reference sites and test sites evaluated in this IR cycle.
G	129	3	In short, DWQ should only use O/E as a screening tool, to list a AU in Category 3 to follow-up with additional site surveys and comparisons of physical habitat characteristics to determine that O/E and other critical metrics such as sensitive taxa, feeding guilds as well as important physical stressors that can co-vary with a water quality parameter such as turbidity, temperature, stream gradient, substrate size, riparian quality, adjacent land use, etc. are truly similar to reference sites. This is necessary to determine whether a water quality parameter or whether other physical condition(s) is the cause. All other states that include O/E use many additional metrics to validate true impairment cause. Utah needs to join other western states in performing better bioassessments that include multiple metrics and detailed physical habitat characterization as indicators of true reference condition?	None	Both multiple metric indices (MMIs) and O/E indices have potential strengths and weaknesses. At this time, DWQ has identified the RIVPACS O/E index approach as the most scientifically defensible method for performing bioassessment. Alternative biological assessment methods would require the same level of technical review and documentation that has been completed for the currently employed methods.
G	130	3	As mentioned above, DWQ should identify the location(s) along these reaches of the sample site where biological collections are made. This will provide for a true scientific review of the assessment method. Finally, in addition to identifying these reference sites, taxa lists, that include the complete list of taxa, as well as the final list that is present at 50% of reference sites, should be provided in the appendix or under separate cover. Providing this important O/E data is critical in being able to provide a legitimate scientific review of the method and how it is applied. For example, we understand that DWQ collects EMAP – type physical data at each site, whether reference or targeted. This information provides for a more thorough understanding of the physical data used for reference condition and how it is compared to the targeted sites along the Jordan River. How this data fits into the assessment needs to be discussed.	Added site information to appendix	DWQ has updated the IR to include the coordinates of all reference sites and test sites evaluated in this IR cycle. The physical data the commenter is referring are not currently used in conducting water quality assessments. Once physical assessment methods are complete, DWQ will submit these for pubic comment through the IR and input on how the draft methods might be improved would be welcome at that time.
G	131	3	Listing: Jordan River/Utah Lake UT16020204-001 Jordan River-Reach 1 Jordan River from Farmington Bay upstream contiguous with the Davis County line 5 TMDL Approved [Phase 1 approved] Dissolved Oxygen 3B; 3D High 2006 8.6 and Listing: Jordan River/Utah Lake UT16020204-002 Jordan River-Reach 2. Jordan River from Davis County line upstream to North Temple Street 5 TMDL Approved [Phase 1 approved] Dissolved Oxygen 3B High 2006 6.1 and Listing: Jordan River/Utah Lake UT16020204-003 Jordan River-Reach 3. Jordan River from North Temple to 2100 South 5 TMDL Approved [Phase 1 approved] Dissolved Oxygen 3B High 2008 2.7 Comment: As has been discussed many times, the cause of low DO excursions in the Lower Jordan River is elevated stormwater flow events. Although after some of these events the	Out of Scope	This comment is not within the scope of the IR. Performing and adopting a Use Attainability Analysis or site-specific criteria for the segments indicated would require a change to water quality standards (UAC R317.2). We encourage you to bring this recommendation to the Water Quality Workgroup during the Triennial Review. Further, identifying the sources of low dissolved oxygen excursions in late summer is the subject of an ongoing TMDL analysis for the reach. Please also see Chapter 7 for a summary of DWQ's analysis of high frequency data in the lower Jordan River.

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			river takes a few days to perhaps a week or two to "recover", clearly, these watershed events mobilize reduced compounds such as methane, that are rapidly oxidized and particularly through urban landscapes where stormwater vaults and conduits accumulate all sorts of organic matter from street runoff, yard runoff, including grass clippings, leaf litter, etc. etc. During the worst of these recorded events (July 4-7, 2013), the DO in the lower Jordan River remained at or near 0.0 DO where the sondes were located for about 13 hours. Yet, daily observations within Legacy Nature Preserve and the State Canal indicated that no fish mortalities had occurred. Clearly there are substantial refuge areas where fish survival is ensured as indicated by the many carp that were observed before and after the event. These occasional excursions are impossible to predict and for all intent and purposes are impossible to mitigate. For example, if more sedimentation basins are constructed, this will only provide additional locations where organic matter will decompose- creating new pockets of methane and sulfide that will rapidly consume oxygen as these sediments are mobilized during a storm event. Since these are naturally occurring flood flows through channels that have been straightened, channelized, dewatered, regularly dredged, etc., primarily for the purpose of facilitating flood flows (and that have been constructed with no regard for aquatic habitat preservation or improvement), this characteristic qualifies for one or more of the section 131.10(g) factors including , (4) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would re-suit in the attainment of the use; or (5) Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; We suggest that DWQ perform an UAA/ site-specific criteria modification that modifies the DO criterion and accounts for these occasional excursions. This would recognize the limitations of this drastically modified reach and save us all a lot of money, heartache and headache. Also, DWQ needs to list the dates and DO values where low DO events were recorded that support the continued listing of the Jordan River for low DO. This will correlate to high flow events.		
G	132	3	In addition, although DWQ is currently proposing a method on how to assess high-frequency data, there continues to be no excuse for using the EPA method guidelines of just retrieving the sonde data to capture the morning minima and afternoon maxima for 7 consecutive days to determine whether a Chronic DO violation has occurred.	Clarrified Methods	DWQ has attempted to more thoroughly explain the proposed methods for calculating 7- and 30-day averages in the final version of the IR, but in the interest of transparency additional details are provided in this response. Where high frequency data are available DWQ proposes a direct calculation of the daily mean (i.e., 96 measurements per day at 15 minute intervals) and not the daily minima and maxima (i.e., 2 measurements). Once the daily averages are calculated, DWQ proposes calculating the 7- and 30-day averages exactly as proposed in EPA's DO Guidance: rolling averages. The only stipulation is that DWQ requires a contiguous dataset with at least 7 or 30-days of data that was collected in a manner that is temporally consistent. While DWQ acknowledges that EPA guidance recommends the latter, it is important to understand that this was never intended to preclude the use of a moving average when higher frequency data are available. It is not clear whether the commenter believes that any 7-day excursion below the standard would constitute an impairment. However, DWQ believes that the assessment criterion that fewer than 10% of days should violate the criterion is more consistent with EPA (1986) guidance, which cautions that that violations of the 7-day criteria are particularly concerning when they are recurring (pp. 37-38).
G	133	3	Listing: Jordan River/Utah Lake UT16020204-001 Jordan River-1 Jordan River from Farmington Bay upstream contiguous with the Davis County line 5 Not Supporting E. coli 2B High 2010 8.6 and Listing: Jordan River/Utah Lake UT16020204-002 Jordan River-2 Jordan River from Davis County line upstream to North Temple Street 5 Not Supporting E. coli 2B High 2006 6.1 and Listing: Jordan River/Utah Lake UT16020204-003 Jordan River-3 Jordan River from North Temple to 2100 South 5 Not Supporting E. coli 2B High 2006 2.7 and Comment: These reaches in the Lower Jordan River have been listed for many years. Yet, the priority is listed as "high". As POTWs that discharge to the Jordan River have not violated discharge permit values for E. coli, the source of E. coli is most likely wildlife and waterfowl that inhabit the Jordan River and its tributaries. DWQ should proceed with a site-specific/UAA that acknowledges this condition.	None	Determining sources of E. coli and site specific Use Attainability Analysis are outside the scope of the Integrated Report. Source identification and standards issues are addressed through the TMDL development and Triennial Review processes respectively. DWQ identified the Jordan River E. coli impairments as high priority for TMDL development in the 2016 303(d) Vision with a commitment to complete the TMDL by 2022. Information on the Triennial Review can be found at the following web address: http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/standards/triennialrev.htm.

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G	134	3	Listing: Jordan River/Utah Lake UT16020204-003 Jordan River-Reach 3 Jordan River from North Temple to 2100 South 5 Not Supporting Total Phosphorus Unknown** Low 2008 2.7 Comment: This is a peculiar listing. What was the threshold for P used in this determination and how was it determined and why?. For example, all reaches of the Jordan River exceed the 0.05 mg/L narrative standard.	None	DWQ first made this impairment determination in the 2008 IR, which underwent formal public and EPA review. As a result, a decision of whether the previous listing was appropriate is outside the scope of the current IR. However, DWQ researched the history of this listing to answer the questions posed in this comment. DWQ first listed this segment of the Jordan River in the 2008 IR. At that time EPA strongly encouraged states to either promulgate EPA's proposed regional numeric nutrient criteria, or develop a mechanism for identifying sites with nutrient-related problems. In response, DWQ developed assessment methods that required the following for a site to be listed as not supporting designated uses for phosphorus: mean total phosphorus (TP) > 0.06 mg/L, AND >10% of all samples with TP >0.05 mg/L (UAC R317-2, Table 2.14.2), AND additional investigations (e.g., diurnal DO investigations) confirm a threat to aquatic life uses (see pp. 1-68 to 1-69), http://deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/docs/2011/04Apr/IR2008/Part1/2008_Part-1-IR_CWB10102010.pdf).
G	135	3	Listing: Jordan River/Utah Lake UT16020204-034 State Canal State Canal from Farmington Bay to confluence with the Jordan River 5 Not Supporting Dissolved Oxygen 3B; 3D Low 2014 0.0 Comment: To reiterate, it has been acknowledged that excursions of DO below the 5.5 mg/L chronic standard and the 4.0 acute standard occur as a result of storm events. As such see applicable comments concerning the DO impairment in Reaches 1, 2 and 3 of the JR. This canal was built for the sole purpose of conveying water from the Jordan River to the North-east impoundments of the Farmington Bay WMA. It was NOT intended to support a 3B fishery. In fact, the impoundments that this water flows into are treated annually with rotenone to eradicate carp and DWR has expressed interest in treating the State Canal with rotenone to provide greater elimination of carp for the greater beneficial use of waterfowl management. In addition, preliminary analysis of benthic samples indicates that the benthos is nearly identical to that in the 3E waterway, the NW oil drain or to the impounded wetlands that have been studied for more than a decade. As both of these canals are perfect examples of severely habitat limited waterbodies, DWQ should acknowledge this fact and initiate UAA /Site-specific analysis and acknowledge that support for the highly invasive nuisance fish, the common carp, is not a valid use of the State Canal. A discussion of this process and how to proceed with the UAA is requested. In addition, the State Canal has no east bank. The water spreads out over 20-30 acres at various locations along its downstream reaches. This area is owned and managed by DWR for waterfowl support. Moreover, the benthic community is similar to the benthos of the impounded wetlands located downstream. Therefore, we suggest that the State Canal and associated wetlands be incorporated in the UAA/site-specific adjustment of the Farmington Bay impounded wetlands at large. Again, this is scientifically appropriate and save a lot present and future contention over what are appropriate beneficial uses and classification. In addition, the comments provided above for Reaches 1, 2 and 3 apply here and deserve an explanation.	Out of Scope	This comment is not within the scope of the IR. Performing and adopting a Use Attainability Analysis or site-specific criteria for the segments indicated would require a change to water quality standards (UAC R317.2). We encourage you to bring this recommendation to the Water Quality Workgroup during the Triennial Review.
G	137	3	Jordan River/Utah Lake UT16020204-034 State Canal State Canal from Farmington Bay to confluence with the Jordan River5 Not Supporting Total Dissolved Solids 4 Low 2016 0.0 Comment: As mentioned in the comments for listing TDS in the middle/upper Jordan River, the source of elevated TDS is the fact that in all but two of the last 16 years, the Jordan River Watershed has experienced drought conditions. As such, Utah Lake has essentially become an evaporation pond, with required pumping for every bit of water leaving the lake. In addition, with the majority of tributary water being diverted for either culinary, or more significantly for irrigation, this has vastly reduced the ability of Utah Lake to adequately flush. Therefore, this violation is due the Section 131.10(g) factor 4. Hydrologic modification prevents to attainment of the use.	Out of Scope	DWQ has identified Utah Lake as a candidate for development of a site-specific TDS standard in the 303(d) vision. DWQ is also currently working on development of an assessment method for Category 4C. We encourage you to provide comments during the development of these assessment methods for the 2018 Integrated Report.

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G	138	3	Listing: Jordan River/Utah Lake UT16020204-004 Jordan River-Reach 4. Jordan River from 2100 South to the confluence with Little Cottonwood Creek 5 Not Supporting OE Bioassessment 3B Low 2010 5.7. Comment: This reach is basically characterized as a transition zone between the deposition-dominated lower reaches (downstream from 2100 S) and the erosion-dominated upper reach (from about 14600 through the top of the narrows). It is important to understand these more subtle, yet critically important transitions between stream types. As such, comments provided for the listing of Reaches 1. 2 and 3 apply to Reach 4 as well. To reiterate, it is critical to make sure that representative reference sites for each stream type are identified and sampled. For example, see Montana DEQ's method for identifying reference streams between the Western Forested ecoregion and the eastern prairie region. This is a great example for going beyond just the determination of O/E, and using watershed based mean geographic indicators of stream condition. Additional comments provided for the listing of the lower reaches of the Lower Jordan River also apply.	Revised methods text	Expected assemblages are not derived through a comparison of each site to a particular reference site or set of reference sites. Instead, they are calculated from site specific predictions of probabilities of capture (Pc) for all taxa. Pc values are predicted from a multi-taxon niche model that relates frequencies of occurrence of all taxa at all reference sites to natural environmental gradients. E is calculated as the sum of all Pc values >=0.5, and O is calculated as the number of those taxa with predicted Pc>=0.5 that are observed in a sample. Contrary to the misunderstanding by the commenter, site-specific, GIS-based predictor variables are used to develop RIVPACS models rather than simply regional, watershed means. The spatial resolution for these predictor variables is 800 m which makes the assessment at reach segment scale rather than watershed. The watershed mean values used in Utah's RIVPACS models are derived from each sample site's unique watershed. The text of the methods in Chapter 2 have been updated to help clarify this further.
G	139	3	Listing: Jordan River/Utah Lake UT16020204-004 Jordan River - Reach 4. Jordan River from 2100 South to the confluence with Little Cottonwood Creek 5 Not Supporting E. coli 2B High 2014 5.7 Comment: Despite this more recent listing, the same comment as for the E. coli listing for the lower Jordan River applies. If DWQ does not agree that this E. coli is naturally occurring from wildlife and waterfowl, it should engage in detailed DNA studies to determine whether the bacteria are from humans or from natural sources.	None	Determining sources of E. coli is outside the scope of the Integrated Report. Sources of E. coli are determined as part of TMDL development and DWQ is considering the use of microbial source tracking to assist with E. coli source identification.
G	140	3	Listing: Jordan River/Utah Lake UT16020204-005 Jordan River-Reach 5 Jordan River from the confluence with Little Cottonwood Creek to 7800 South 5 Not Supporting E. coli 2B High 2006 4.5 Comment: Same comment as for Reach 4.	None	Determining sources of E. coli is outside the scope of the Integrated Report. Sources of E. coli are determined as part of TMDL development.
G	141	3	Listing Jordan River/Utah Lake UT16020204-005 Jordan River-5 Jordan River from the confluence with Little Cottonwood Creek to 7800 South 5 Not Supporting Temperature 3A Low 2006 4.5 Comment: As has been modeled, it is virtually impossible to mitigate this violation for temperature. The channel is vastly dewatered as a result of multiple diversions, reducing the mass of water necessary to preserve cool temperatures during daylight hours. In addition, riparian shading is virtually nil. DWQ Should plan on performing a UAA.	Out of Scope	Performing and adopting a Use Attainability Analysis or site-specific criteria for the segments indicated would require a change to water quality standards (UAC R317.2). DWQ is currently pursuing development of a site-specific standard for temperature in the Upper Jordan River.
G	142	3	Listing Jordan River/Utah Lake UT16020204-005 Jordan River-5 Jordan River from the confluence with Little Cottonwood Creek to 7800 South 5 Not Supporting Total Dissolved Solids 4 Low 2006 4.5 . Comment: If the TDS at this site is compared to the Utah Lake TDS and lake level and the years that the lake is below the compromise point, it will become clear that the TDS violation is due to the lack of flushing of Utah Lake. This is simply a case of hydrologic modification that prevents Utah Lake from flushing and turns it into an evaporation pond. DWQ should perform a UAA that accounts for this irreversible Condition: 40CFR section 131.10(g) condition "4" : Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use;	Out of Scope	Performing and adopting a Use Attainability Analysis for the segments indicated would require a change to water quality standards (UAC R317.2). Rather than conducting a UAA, DWQ has identified several Upper Jordan River segments, including Jordan River-5, as candidates for site-specific standard development for TDS. The schedule for such development will depend on priorities set by the Water Quality Standards Workgroup.
G	143.1	3	Listing: Jordan River/Utah Lake UT16020204-006 Jordan River-6 Jordan River from 7800 South to Bluffdale at 14600 South 5 Not Supporting Dissolved Oxygen 3A Low 2014 12.5 Comment: This listing is questionable. For example, I listed below most of the readings collected by JR/FBWQC technicians over the last several years and which were collected early in the morning to capture values that are near the diel minimum. In short, none of these values violate the minimum DO for the Jordan River.	AU delisted for DO	The provided data has assisted to further clarify earlier observations and DWQ has made a decision to delist this Assessment Unit for DO. Additional information about the historical listing decision and DWQ's subsequent decision to delist this segment for DO is provided below. DWQ has two routine monitoring locations in this AU (4994090 and 4994100). In 2014, when data from these locations was evaluated, there was an early indication that there may be improvements to DO in this segment of the Jordan River. Only one of the two sample locations had DO concentrations that exceeded assessment screening levels (30-day criterion), but fewer than 10% of samples did so (3/48 occurrences) and this mostly occurred early in the index period. The 2016 analysis also suggests a continued positive trend, with no exceedances of the screening value (0/41 events). However, only two samples were from the last couple of years, so DWQ initially opted to retain the listing in the 2016 IR until more recent data could be used to confirm the DO improvement. Considering that DWQ has no plans for using this impairment as the basis for any regulatory decisions over the next several years, this precautionary approach to delisting was prudent. Additional data

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					were submitted by the JR/FBWQC following the public comment period for the draft 2016 IR. These data confirm the analysis based on DWQ's more limited recent data. At the monitoring location at 7800 South 2/64 (3.1%) samples exceeded the DO water quality assessment threshold (6.5 mg/L). Similar trends were observed at the two monitoring locations further upstream in the AU at 9000 South (4/64 samples, 6.3%) and 14600 South (3/64 samples, 4.6%). Hence, fewer than 10% of samples from all three sites in the AU were in exceedance of impairment thresholds, which means that this AU is fully supporting it aquatic life uses with respect to DO using DWQ's assessment methods.DWQ also examined data collected from sondes deployed just upstream and downstream of this AU. While these high frequency data did reveal several violations of water quality standards at these locations, the frequency and duration of these violations were not sufficient to conclude that either acute or chronic DO violations occurred at either location. While neither of these sondes are within the AU in question, this information provides additional evidence that delisting Jordan River-6 is appropriate. DWQ made the decision to delist this segment of the Jordan River for its DO impairment based on the combination of all lines of evidence. While DWQ always appreciates submission of data and information that can help the agency make more informed decisions, it would be much more efficient, for all parties, for DWQ to receive data during the formal call for data period in future IR cycles.
G	143.2	3	Where such a listing has huge implications as to the causes and sources, DWQ should list the raw data used for this assessment in the appendix so that a quick review of the data can be performed. As such, we now request a list of the data used for this assessment as a specific response to this comment.	None	In the interest of transparency, DWQ routinely publishes data for all listings when draft and final reports are posted on the internet (http://deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/rsdatafiles2016.htm). These data include detailed metadata and geospatial data to assist stakeholders with their review of the data. The website also contains contact information, so that DWQ can provide assistance as needed. If you still want to review the data and have difficulties obtaining the data, please contact us for additional assistance.
G	143.3	3	Also, as commented elsewhere in this review and in earlier comments (on the 2010 and 2014 Integrated Reports), it is likely that DWQ used an inappropriate (using the mean of instantaneous readings) method that is not an accurate reflection of actual conditions rather than following the EPA guidelines outlined in EPA's water quality criteria for dissolved oxygen document published in 1986. After 30 years of this document being available, and DWQ has gone through at least two Triennial Revue sessions, this is inexcusable.	None	DWQ does not use the average of instantaneous readings. Instead, conventional parameters are evaluated to determine if >10% of observations exceeded chronic screening levels (UAC R317-2-7.1(b)) for assessment purposes. Please refer to the Chapter 2 (pp. 42-43) of the IR for details. With respect to the existing DO assessment method, DWQ agrees that high-frequency data are preferable and has drafted proposed methods for using these data when they are available (see Chapter 7, 2016 IR); however, the agency also believes that in circumstances where only instantaneous data are available, the existing DO assessment methods for grab samples are appropriate and consistent with EPA rules, regulations and guidance, including the 1986 EPA Ambient Water Quality Criteria for Dissolved Oxygen documentation, and other EPA guidance documents associated with IR expectations. One additional clarification is that DWQ has not ignored EPA's guidance for 30-years. The current DO water quality standards are reflective of EPA recommendations in the 1986 DO criteria recommendation document (UAC R317-2, Table 2.14.2). In general, criteria recommendation documents from EPA provide the scientific rationale for the proposed criteria and generally do not address the application of these criteria for specific regulatory purposes. For instance in EPA's DO recommendations (EPA 1986), the only application provided is general guidelines about the application of the criteria to one class of permit limits. The general lack of implementation information in these documents is both intentional and appropriate. EPA guidance and regulations are replete with examples where EPA acknowledges the need for flexibility with respect to the application of water quality standards to different regulatory programs. For instance, waste load analyses for permit limits typically focus on periods of limiting condition (often 7Q10) and use models to better understand the interplay of non-conservative water quality constituents. Similarly, TMDLs are based on loads of pollutants to waters not supporting designated uses, rather than the concentration-based criteria that were the basis of impairment decision. EPA also acknowledges the need for flexibility with respect to the interpretation of averaging periods throughout their IR guidance documents. In these IR guidance memoranda, EPA encourages States to use their professional judgement when extrapolating data obtained from a grab samples to longer averaging time periods. These memoranda also point out that there is a legal obligation to make the most defensible decisions possible based on "all existing and readily available data" (40 CFR 130.7(b)(5)), and DWQ and others have interpreted this statement to include the development of reasonable assessment methods for grab sample DO data. All appropriately protective assessment methods

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					should balance Type I (false positive) and Type II (false negative) impairment decisions. In some respects, the practical realities of the methods employed for this purpose of DO grab sample collections favors the latter over the former. DWQ collects grab samples in the daytime, when DO values are generally greater than daytime minima. As a result, if daytime DO grab samples are consistently violate chronic criterion (defined as >10% of all collection events UAC R317-2-7.1(b)), then DO problems are likely to be pervasive than these data suggest. In addition, DWQ bases instantaneous DO assessments on data collected throughout the year, including samples collected in the wintertime when low DO conditions are least likely to occur. In contrast, the use of the 30-day criterion to screen grab sample data is somewhat more conservative, but given the less conservative realities of these datasets, DWQ maintains that a more conservative screening value is a reasonable way to identify water bodies with DO impairments. The commenter is correct that a daily average could be estimated from morning and evening collections, but practically speaking the resources needed to collect such data statewide are not feasible. As the commenter suggests, this would require two visits per day. Moreover, a strict interpretation of chronic averaging periods would require that these repeated visits be conducted over either 7 or 30 days. Given these practical considerations, DWQ has determined that a reasonable approach to obtaining a more complete DO record to calculate daily averages can be more efficiently accomplished by deploying sondes then evaluating the resulting high frequency data (see Chapter 7, 2016 IR). Despite the shortcomings intrinsic to the interpretation of instantaneous DO data, DWQ maintains that the current methods are consistent with the evidence EPA presented in support of DO criteria (EPA 1986). For example, in several different contexts, the documentation (EPA 1986), states that absolute minimum criteria alone may not be adequately protective, as follows: "Any dissolved oxygen criteria should include absolute minima to prevent mortality due to the direct effects of hypoxia, but such minima alone may not be sufficient protection for the long-term persistence of sensitive populations under natural conditions. Therefore, the criteria minimum must also provide reasonable assurance that regularly repeated or prolonged exposure for days or weeks at the allowable minimum will avoid significant physiological stress of sensitive organisms." The intrinsic assumption that grab samples are reflective of daily averages is questionable, but this is not how DWQ interprets grab sample DO data. Instead, DWQ uses grab sample DO data in circumstances where these data are the only, and therefore the best, source of information available for a water body. Moreover, the tabulation of the percent of days where low DO conditions are observed is entirely consistent with in the underlying EPA (1986) rationale for protection of harm from chronic DO conditions, "The significance of deviations below the mean will depend on whether they occur continuously or in daily cycles, the former being more adverse than the latter."
G	143.4	3	DWQ need only place a reach suspected of chronic DO violation into Category 3 – insufficient data and then collect daily minima and maxima DO data on a priority basis. As such DWQ should place this reach in Category 3 until an accurate reassessment using EPA guidelines is performed. This really shouldn't be too much to expect for such a high-profile DO TMDL.	None	The recommendation of the commenter to use category 3A for this listing warrants agency comment because it reflects a misunderstanding of the purpose for, and ramifications of, IR impairment decisions generally, and the use of Category 3 specifically. EPA has issued guidance about the appropriate use of Category 3 in the guidance memoranda provided to states for several IR cycles (EPA 2010). In this guidance EPA states that moving a site from Category 5 (Not supporting designated uses) to Category 3 in a subsequent listing cycle rarely makes sense. After all, the State would presumably have more information due to follow-up monitoring, not less. EPA goes on to state that if States make an exception to this rule they are required to demonstrate why the data used to make the previous assessment are now considered to be invalid or insufficient for making an impairment determination (40 CFR Section 130.7(b)(6)(iv)). Demonstrations that require the use of historical data can be challenging due to the availability of the specific record used for the analysis. Often, a simpler and better approach is to collect a sufficient amount of new data to demonstrate the waterbody is no longer violating water quality standards, in which case the water body can be removed from Category 5 for the parameter assessed in the next IR cycle.
G	143.5	3	In addition, although DWQ is currently proposing a method on how to assess high-frequency date, there continues to be no excuse for using the old fashioned method of just retrieving the sonde data to capture the morning minima and afternoon maxima for 7 consecutive days to determine whether a Chronic DO violation occurred. This at will comply with EPA guidelines.	None	At present there are no high frequency data that are associated with this Assessment Unit (14600 South downstream to 7800 South), which DWQ hopes to rectify over the next couple of years. As a result, the high frequency methods (IR, Chapter 7) are not directly applicable to this listing. DWQ acknowledges that EPA's criteria documentation provides a mechanism for calculating a daily average from the average of a morning minima and a saturation adjusted afternoon maxima. If such data were the best available data,

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					DWQ agrees that this summary statistic would be preferable to a single daily grab sample. However, in the case of high frequency data (i.e., 15-minute interval observations), DWQ does not believe that this method is the best, nor most defensible way to calculate a daily average.
G	144	3	Listing: Jordan River/Utah Lake UT16020204-006 Jordan River-6 Jordan River from 7800 South to Bluffdale at 14600 South 5 Not Supporting OE Bioassessment 3A Low 2008 12.5 Comment: See comments for O/E listings proposed elsewhere in this document.	None	Expected assemblages are not derived through a comparison of each site to a particular reference site or set of reference sites. Instead, they are calculated from site specific predictions of probabilities of capture (Pc) for all taxa. Pc values are predicted from a multi-taxon niche model that relates frequencies of occurrence of all taxa at all reference sites to natural environmental gradients. E is calculated as the sum of all Pc values >=0.5, and O is calculated as the number of those taxa with predicted Pc>=0.5 that are observed in a sample. The model building methodology is explained in the Biological Assessments of Rivers and Streams section of Chapter Two of the report.
G	145	3	Jordan River/Utah Lake UT16020204-026 Mill Creek1-SLCity Mill Creek from confluence with Jordan River to Interstate 15 crossing 5 Not Supporting Dissolved Oxygen 3C Low 2014 0.9 Comment: This assessment decision is questionable. In the last six years of approximately monthly samples, we have only measured one DO value that was just slightly lower that the chronic criterion value (see below). Notably, this value is also within the instrument specifications for accuracy. Further, this measurement was relatively early in the morning and therefore would not likely have resulted in a 7-day or 30-day average violation. Moreover, DWQ likely used the inappropriate method of assessing chronic criteria violations which is to use instantaneous readings of < 5.5 mg/L as if they represented 7-day or 30-day average values. As this method continues to be drastically different that EPA's 1986 guidelines (Water Quality Criteria for Dissolved Oxygen), this remains an inappropriate manner of assessment. Although I provided comment on this listing during the 2012-2014 IR comment period and the 2010 IR comment period, it was not adequately addressed in the written response and appropriate assessment methods have not been adopted, despite EPA guidance was released 30 years ago. Therefore, I request again the sample location(s) used for this assessment and all of the the accompanying data used in the assessment. For comparison, I have included some of the data collected by JR/FBWQC technicians that include both morning and afternoon measurements, even just one week apart, to demonstrate that it is unlikely that the chronic criteria, either the 7-day or 30-day average were actually in violation.	Removed Listing	DWQ has evaluated the recently submitted data for this segment and has made a determination to delist this segment for its DO impairment. Please see the Agency response to 103 and 104 for additional details on this delisting decision. With respect to the comments about the DO assessment methods, these were made by the commenter elsewhere and DWQ's response to these concerns in detailed in the responses to comments 105, 143.3 and 143.5.
G	146	3	Listing: Jordan River/Utah Lake UT16020204-026 Mill Creek1-SLCity Mill Creek from confluence with Jordan River to Interstate 15 crossing 5 Not Supporting OE Bioassessment 3C Low Comment: The same comments provided for Reaches 1,2 and 3 of the lower Jordan River also apply here. In short, the exact sample location(s) need to be identified so that data and model review can proceed. What are the reference sites for O/E need to be identified and the local site-specific physical characteristics between Mill Creek sites and reference sites need to be provided in order to provide for transparent review and comment on this listing. It is difficult to imagine what other river systems in Utah function as valid reference sites for these low-gradient valley streams. This needs to be better defined. Also, please review the O/E comments provided by Dr. David Richards. Addressing these comments and applying the associated suggestions will greatly improve DWQ's ability to perform detailed and site-specific bioassessments that account for both the physical and ambient water quality associated with reference and target sites.	Added site information to appendix	Expected assemblages are not derived through a comparison of each site to a particular reference site or set of reference sites. Instead, they are calculated from site specific predictions of probabilities of capture (Pc) for all taxa. Pc values are predicted from a multi-taxon niche model that relates frequencies of occurrence of all taxa at all reference sites to natural environmental gradients. E is calculated as the sum of all Pc values >=0.5, and O is calculated as the number of those taxa with predicted Pc>=0.5 that are observed in a sample. The model building methodology is explained in the Biological Assessments of Rivers and Streams section of Chapter Two of the report. DWQ has updated the IR to include the coordinates of all reference sites and test sites evaluated in this IR cycle.
G	147	3	Listing: Jordan River/Utah Lake UT16020202-027 Beer Creek and tributaries from confluence with Spring Creek to headwaters 5 Not Supporting OE Bioassessment 3C Low 2014 16.5. DWQ needs to provide the data used to make this assessment. Such could be provided in the appendix. In particular, the sample site location needs to be identified as well as the reference sites used to develop the "Expected taxa" for this reach. There likely is not a lot of data, so providing this data will not be time-consuming nor require a lot of extra pages. The question focuses on what reach in Utah is a low gradient valley stream in the same elevation range that is absent stressors associated with agricultural/rural development.	Added site information to appendix	Expected assemblages are not derived through a comparison of each site to a particular reference site or set of reference sites. Instead, they are calculated from site specific predictions of probabilities of capture (Pc) for all taxa. Pc values are predicted from a multi-taxon niche model that relates frequencies of occurrence of all taxa at all reference sites to natural environmental gradients. E is calculated as the sum of all Pc values >=0.5, and O is calculated as the number of those taxa with predicted Pc>=0.5 that are observed in a sample. The model building methodology is explained in the Biological Assessments of Rivers and Streams section of Chapter Two of the report. DWQ has updated the IR to include the coordinates of all reference sites and test sites evaluated in this IR cycle.

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G	148	3	See comments provided for other reaches within the Jordan River Watershed concerning the O/E assessment. Please address those comments for this listing as well.	None	Expected assemblages are not derived through a comparison of each site to a particular reference site or set of reference sites. Instead, they are calculated from site specific predictions of probabilities of capture (Pc) for all taxa. Pc values are predicted from a multi-taxon niche model that relates frequencies of occurrence of all taxa at all reference sites to natural environmental gradients. E is calculated as the sum of all Pc values >=0.5, and O is calculated as the number of those taxa with predicted Pc>=0.5 that are observed in a sample. The model building methodology is explained in the Biological Assessments of Rivers and Streams section of Chapter Two of the report.
G	149	3	**Listing: Jordan River/Utah Lake UT16020202-027 Beer Creek and tributaries from confluence with Spring Creek to headwaters 5 Not Supporting Total Ammonia 3C Low 2016 16.5.** Just to remind DWQ, this reach was the only reach of the entire Utah Lake/Jordan River Watershed that contains the freshwater mussel, Anodonta sp. We also measured elevated ammonia in Beer Creek (close to the current chronic ammonia criterion). DWQ's response should be a part DWQ's Review of Dr. Richard's report on mussel distribution, as it presents clear evidence that local species are not susceptible to the new proposed nor the existing ammonia criteria.	None	The current ammonia criteria, upon which the listing referenced is based, is not based on the presence or absence of sensitive mussel species. However, the information referenced will be considered as DWQ considers adoption of EPA's new 2013 ammonia criteria for receiving waters in Utah.
G	150	3	Further, with the intensity of surrounding agricultural practices and the amount of organic rich sediments, these elevated ammonia measurements are likely a combination of instream nutrient recycling and agricultural runoff.	None	The analysis in the IR does not consider sources of contaminants in making an assessment determination. The evaluation of sources both natural and human-caused is performed during the development of TMDLs or similar watershed studies. We encourage you to provide comments and justification at such time.
G	151	3	Listing: Utah Lake UT-L-16020201- 004_01 Utah Lake other than Provo Bay 5 Not Supporting Harmful algal blooms 2B High 2016 87929. The primary concern about listing lakes for recreational impairment due to HABs is the degree of regulatory reaction to the occurrence of such blooms. Granted, this is a relatively new field of research but the appearance of such blooms has been occurring for decades to hundreds of years and across most midwest and western states (Boland, 1976, L Meyers comments: 2016 IR). Most states that have a HAB assessment program have a tiered approach for monitoring and placing warning signs and finally lake closure. These protocols require additional detail, particularly specific identification of toxigenic cyanobacteria AND the presence of significant concentrations (either 6, 10 or 20 ug/L) toxin themselves.	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.
G	152	3	For example Washington lists the following "species of concern" in their monitoring program: Microcystislf, Anabaena, Aphanizomenon, Gloeotrichia, Oscillatoria/Planktothrix, Cylindrospermopsis, Lyngbya, Nostoc, If any of these taxa are identified in weekly monitoring samples, additional samples are collected to determine if toxins are present and that concentrations meet a certain threshold. Washington's recreation threshold is much more conservative (6 ug/L microcystin) than WHO (1999) recommendations (20 ug/L microcystins), at which point the warning signs are posted. Nevertheless, note that both potentially toxigenic taxa and the toxins must be present at designated thresholds before warning signs are posted. Moreover, Washington does not "list" lakes as impaired at this level of toxin.	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.
G	153	3	Although Nebraska has not posted their policy on beach or lake closures, Nebraska requires more empirical toxin concentration data, correlating with the 20 ug/L WHO recreational limit for posting or closing a lake. More notably, Nebraska does not list a lake as Impaired until there are > 20 ug/L microcystin in > 10% of samples.	None	Please see comment response Appendix A, sections 1, 2, 3, and 6, for responses to this comment.
G	154	3	Clearly, Utah has adopted the most conservative approach known for assessing, closing and listing Utah Lake as impaired. First, it is common knowledge that, although Aphanizomenon is a toxin producer, it is not a prolific toxin producer. Although it was always the most abundant taxa during the 2014 bloom (Miller 2014), the lake and even the beaches contained little toxin.	None	Please see comment response Appendix A, sections 1, 2, 3, 6, and 9 for responses to this comment.
G	155	3	Only from the controversial sample collected from the windrowed pile of scum on the edge of the beach within Lindon Marina, was the 20 ug/L threshold exceeded and all samples collected in the open water of Utah Lake were below or very near detection limits of 0.05 ug/L.	None	Please see comment response Appendix A, section 7, for a response to this comment.
G	156	3	Again, aphanizomenon, the dominant cyanobacterium during the bloom, and again during the minor blooms in a couple of the harbors in 2015 and again during the 2016 bloom is a very weak toxin producer (i.e. even during the more extensive bloom of 2016, where cell counts exceeded 20-30 million, microcystin was largely undetectable. Indeed, only beach scum samples	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.

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			at Lincoln Marina and Sandy beach, where cell counts were near 40,000,000/mL, exceeded 20 ug/L microcystin. Therefore WHO's assumption that 100,000 cell/mL count needs to be more fully read and understood because it was developed based on how the 100,000 cells/mL correlates to a microcystin concentration of 20 ug/L of *Microcystis auroginosa* (WHO 1999).		
G	157	3	Again, use of this metric when the cyanobacterial population is dominated by a non toxin producer or a weak toxin producer such as aphanizomenon is not valid as it results in overprotection and overregulation.	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.
G	158	3	Even so, phytoplankton samples collected throughout the lake, and at the beach near Saratoga Springs during the 2014 bloom, including surface skims, contained far less than the 100,000 cells/mL threshold suggested by the WHO and which is in DWQ's assessment protocol. Yet, DWQ has decided to list all of Utah Lake.	None	Please see comment response Appendix A, sections 7 and 8, for responses to this comment.
G	159	3	Moreover, DWQ did not even collect samples for Chl a analysis.	None	As described in chapter 5, chlorophyll a samples from routine water quality monitoring events were compared to the supplementary chlorophyll a indicator. Please see comment response Appendix A, section 6, for additional information.
G	160	3	Therefore, except for two samples (one a surface skim sample at the Utah Lake outlet and the other, the beach scoop within Lindon Marina), no samples contained > 100,000 cells/mL.	None	As described in chapter five, of 18 HAB phytoplankton samples collected during October 2014 on Utah Lake, five exceeded the primary HAB indicator of 100,000 cells/mL. These occurred in three locations, Lindon Harbor, the Utah Lake State Park Harbor, and near the lake outlet.
G	161	3	In fact, all three metrics of DWQ's own threshold criteria for listing a lake as impaired for HABs WERE NOT MET during this 2014 bloom event.	None	As described in chapter five, of 18 HAB phytoplankton samples collected during October 2014 on Utah Lake, five exceeded the primary HAB indicator of 100,000 cells/mL. These occurred in three locations, Lindon Harbor, the Utah Lake State Park Harbor, and near the lake outlet.
G	162	3	At the most, DWQ need only place signage warning swimmers and waders to stay off the beach areas in Lindon Marina and keep their pets away from the beach.	None	Please see comment response Appendix A, introduction and section 9, for responses to this comment.
G	163	3	All samples collected from open water zones of the lake were well below any of the three threshold metrics. This is a very public and potentially very expensive decision that deserves proper assessment, transparency and considerable scientific scrutiny.	None	Please see comment response Appendix A, section 7, for a response to this comment.
G	164	3	Again, from Chapter 5. "The assessment methods identify two exceedances of this indicator as a recreational use impairment." These occurred from wind driven accumulations within Lindon Marina and at the Utah Lake outlet and not in any of the samples of the open water. The lake itself was perfectly safe.	None	Please see comment response Appendix A, section 7, for a response to this comment.
G	165	3	Therefore, the listing criteria for lakes should include at least 10 samples from multiple sites around the lake (and not targeted sites at the beaches; DWQ's current data set is from sampling beaches and harbors and hence, this is a beach closure issue and not a lake impairment or closure issue), across at least a 2-year assessment cycle and result in at least 10% exceedence of both the cell counts and microcystin concentrations. This will avoid the unnecessary and inappropriate overreaction that has occurred in this listing. This would be similar to the Nebraska protocol, which has been accepted by EPA.	None	Please see comment response Appendix A, sections 1, 2, 3, 6, and 7, for responses to this comment.
G	166	3	In short, even DWQ's primary criteria of exceeding 100,000 cells/mL was not met in any of the open water samples.herefore it is not appropriate to list the entire lake for HAB impairment.	None	Please see comment response Appendix A, section 7, for a response to this comment.
G	167	3	Therefore, a listing of category 3A, insufficient data should be used instead of category 5.	None	Please see comment response Appendix A, section 13, for a response to this comment.
G	168	3	When compared with other states that assess for HABs, Utah is the only state that uses cell counts as the primary indicator. There is only minimal scientific evidence that supports this approach – and this evidence is predicated on data sets pertaining to Microcystis blooms.	None	Please see comment response Appendix A, sections, 1, 2, and 3, for responses to this comment.
G	169	3	Only the anecdotal data offered by Pilotto et al. 1997 – where they report that low cell counts MAY be related to various allergenic symptoms has supported the idea that cell counts alone may suggest the occurrence of symptoms.	None	Please see comment response Appendix A, section 1, for a response to this comment.

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G	170	3	However, as explained in greater detail below and in the comments by Dr. David Richards, the second lowest cell count bin had an overall lower odds ratio than that of the lowest cell count bin. Although the authors tried to make the case that exposure to such low cell counts were statistically significant, there is a stronger case (based on odds ratios) that a few more cells actually imparted a protective effect against exposure to cyanobacteria cells. This is one of dangers of using this type of anecdotal data to make what should be a more scientific judgment or conclusion.	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	171	3	Also noteworthy, the final paragraph of the Pilotto et al. 1997 report reads: "we cannot exclude the possibility that these symptoms may have been caused by other causative factors, for example, other microorganisms, that may have correlated with the presence of cyanobacteria."	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	172	3	This fact, coupled with the need to exclude participants that had recreated during the previous five days and to wait until the 7th day past recreation (because there was no significant occurrence of symptoms at the second day after exposure) before any level of significance was detected clearly suggests that exposure to other irritants have occurred after the supposed cyanobacteria exposure. There is simply no explanation for this delayed response except that the sample population (having been interviewed on day 2 following exposure) was now "aware and sensitized" to the symptoms, they could have been more attentive to ANY slight symptom which could have been anything from overeating, overdrinking, or rolling in the grass to cleaning out the attic between day 2 and day 7.	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	173	3	Stewart et al (2006), also cited in the IR in support of using just cell counts of total cyanobacteria, basically repeated the Pilotto et al. (1997) study. The main difference was that Stewart et al. (2006) measured toxin concentrations as well. From their introduction: "Specifically, we sought to: 1) quantify cyanotoxins in designated water recreation sites, and 2) assess the relationship between exposure to cyanobacteria and cyanotoxins in recreational waters and the incidence of reported symptoms." Notably, "Two statistically significant findings were identified: compared to the low exposure group, reporting of both respiratory symptoms, odds ratio (OR) 2.1 (95%CI: 1.1–4.0), and the pooled "any symptom", OR 1.7 (95%CI: 1.0–2.9), was increased to be perhaps weakly significant in the high exposure group. Clearly, the authors tried every which way to demonstrate significant results. For example, "the significance of the latter result was not maintained with the exclusion of subjects with recent prior recreational water exposure, OR 1.6 (95%CI: 0.8–3.2)."	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	174	5,6	Notably, Pilotto et al. (1997) had to exclude those individuals that had previous exposure in order to gain statistical significance, while Stewart et al. (2006) had to retain those that were previously exposed to create significance. These two reports, showing only slight significance of symptoms, but after opposite treatment of the data only exemplifies the overall confusion and inconsistancy of data and conclusion that actually characterizes significant symptoms when exposed to low levels of cell counts or toxins. This should be noted in both Chapters 5 and 6 of the IR.	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	175	3	Consequently, Utah Lake should not be listed in Category 5 but rather in Category 3A – additional information is necessary.	None	Please see comment response Appendix A, section 13, for a response to this comment.
G	176	3	Stewart et al. (2006) further report: "The main findings of this work were that individuals exposed to recreational waters from which total cyanobacterial cell surface areas exceeded 12 mm^2/mL were more likely to report symptoms, particularly respiratory symptoms, after exposure than those exposed to waters where cyanobacterial cell surface areas were less than 2.4 mm^2/mL.	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	177	3	"Although the symptom category that appeared to be weighting the pooled "any symptom" category was that of respiratory symptoms, from Table 3 we see that respiratory symptom reporting was skewed towards the "mild" symptom rating. Therefore, the conclusion that symptom reporting was higher in individuals exposed to high cyanobacteria levels must be tempered by the observation that most reported respiratory symptoms were mild." This further supports the premise that these low cell counts or small concentrations of toxins suggest minor allergenic responses, such as allergic to pollen, or ragweed or mold or myriad other microbes or dust – and	None	Please see comment response Appendix A, section 1, for a response to this comment.

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			not worthy of listing a lake on the 303(d) list of impaired waters.		
G	178	3	Stewart et al. 2006 further note: "Epidemiological studies into recreational exposure to cyanobacteria are also few in number. Five have been published to date: three cross-sectional studies from the United Kingdom using identical survey instruments [2, 3, 4], a small case-control analysis from Australia [5], and a larger prospective cohort study, also from Australia [6]. The UK studies (Philipp R 1992; Philipp R, Bates AJ, 1992; Philipp R, Brown M, Bell R, Francis F. 1992) and the smaller Australian study (5. El Saadi OE, Esterman AJ, Cameron S, Roder DM 1995) did not find any significant hazard from exposure to cyanobacterial blooms in recreational waters, but the study by Pilotto *et al* [6] reported an increase in illness amongst those exposed to relatively low levels of cyanobacteria (>5,000 cells per mL)."	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	179	3	Hence, 4 of 5 of the currently available studies did not find any significant hazard from exposure to cyanobacterial blooms in recreational waters and issues related to the 5th (Pilotto et al. 1997) has been discussed above, and the comments by Richards. But most notable, most of the current literature has not reported allergic symptoms to exposure to low concentrations of cyanobacteria cells. DWQ needs to present equal data demonstrating the state of the literature rather than "cherry picking" papers that align with DWQ's agenda.	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	181	3	Stewart et al. (2006) further note: "Despite this limited and inconclusive evidence, the World Health Organization (WHO), Australia and several European countries have recommended guideline levels for recreational exposure to cyanobacteria [[7] (pp.149–54), [8]]. WHO guidelines present a three-tier approach, suggesting: 1) low probability of adverse health effects from waters with 20,000 cyanobacterial cells/mL or 10 µg chlorophyll-a/L, **if cyanobacteria are dominant** (emphasis added); 2) moderate probability of adverse effects from waters with 100,000 cells/mL or 50 µg chlorophyll-a/L, if cyanobacteria are dominant; Page 150, WHO, (2003), and 3) high probability of adverse effects from contact with and/or ingestion/aspiration of cyanobacteria at scum-forming densities [[7] (p.150)]. However, the WHO (2003) clearly notes: "There is concern, however, that the current management practice in some countries (such as Australia or Germany) of warning all users or closing access to waterbodies is overly proscriptive. Such practices can result in unease amongst regular users of recreational waters that are affected by cyanobacteria, and can impact communities surrounding these waters, which are important social and economic resources."	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	182	3	The above discussed data and this WHO conclusion, clearly suggests that Utah DWQ is overly proscriptive in their evaluation and are indeed guilty of causing unease amongst regular users of Utah Lake and this has indeed resulted in impacting important social and economic resources. With all the TV interviews and Op-ed newspaper articles, was this a biased agenda of DWQ?	None	For reasons described in comment response Appendix A, sections 1-3 and 5, DWQ has identified cyanobacteria cell counts as the most scientifically defensible means for HAB assessments. Comments regarding media coverage are outside the scope of the integrated report and do not relate to DWQ's decision to list Utah Lake as not supporting designated uses for harmful algal blooms. Concerns about media coverage should be discussed with DEQ's Public Information Officer.
G	183	3	It should be the policy of the Division of Water Quality to understand the ramifications and withhold listing or even closing a lake when only sparse data, of an obviously known poor indicator of Cyanobacteria toxicity (cell counts alone), while toxin concentrations were non-detect except for two targeted beach scum scrapings, from a known poor toxin producer is used as the indicator.	None	Please see comment response Appendix A, sections, 1-3 and 7-9, for responses to this comment.
G	184	3	Other states and the WHO have recognized that cell counts alone can be a highly inaccurate indicator of exposure risk and as a result, have recommended the appropriate risk factor of actual toxin concentrations.	None	Please see comment response Appendix A, sections, 1, 2, and 3, for responses to this comment.
G	185	3	Moreover, and I reiterate that the use of the indicator of 50 ug/L Chl a alone, is misused by DWQ. The WHO, and as cited in the above paragraph by Stewart et al. 2006, specifies the use of Chlorophyll a concentrations only if Cyanobacteria dominate the phytoplankton community.	None	Please see comment response Appendix A, section 7, for a response to this comment.

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G	186	3	DWQ also cited Lin et al. (2015) for support of the idea that despite low cell counts, cyanobacteria can cause allergenic responses. However, problems with including this study in support of DWQs case for symptoms are threefold, 1) None of the cyanobacteria taxa identified in this study are related to the freshwater taxa that occur in Utah Lake or to the brackish water taxa in Farmington Bay: 2) There were no measurements of actual cyanotoxin in the study. Yet it was presented as evidence that such low cell counts are dangerous with various symptoms after exposure to the cells alone; However, 3) there is NO supporting evidence of some minimal concentrations of toxin or otherwise NO scientific evidence in the literature at large that cell surface-based allergenic protein, or systematic identification of allergens or skin irritants, etc. even exists.	None	This study is simply one example of HAB related human health effects in the apparent absence of known toxins. Lin et al. 2015 quantified concentrations of two marine cyanotoxins in their sampling, but concentrations were non-detectable in all samples. Despite this apparent lack of cyanotoxins, significant health effects were observed with exposure to cyanobacteria cells. DWQ has not attributed these observed health effects to particular properties of cyanobacteria. Please see comment response Appendix A, section 2, for additional information.
G	187	3	In short, this supports the notion that DWQ is using anecdotal comments and pure speculation and misusing cell counts, and Chl a concentration to support the listing of Utah Lake and the intent to list Farmington Bay.	None	Please see comment response Appendix A, sections 1, 2, and 6, for responses to this comment.
G	188	3	Although this remains a conundrum and should indeed be the subject of intense investigation, it reveals the fact that there is no current explanation for what is causing the reported symptoms. Hence, the conclusion by Stewart et al. (2006) "*Using levels of toxin-producing cyanobacteria as indirect measures of cyanotoxin presence may overestimate the public health risks*" is a reflection of the absence of empirical evidence/explanation of any link between cell counts and allergic responses. Therefore, although interesting, this supports the criticism that these studies are largely anecdotal in nature. Most noteworthy, is the fact that where cyanobacteria cell counts have been linked to such allergen symptoms, such as skin rash or runny nose, these symptoms are associated with tier one, low risk responses, which have had no evidence of the presence particular allergens.	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	189	3	Indeed, anyone who phoned in and reported allergic responses during the 2016 bloom, could have experienced what I suffer from, an allergy to phragmites pollen. But there was no and remains no scientifically controlled diagnostic observations that link exposure to these symptoms.	None	The Utah Lake HAB assessment was not based on the self-reported symptoms of exposure to the 2016 cyanobacteria bloom events to the Utah Poison Control Center. The 2016 IR is based on data collected 2008-2014. However, this information does provide additional supporting evidence for the recreational impairment. Medical diagnoses regarding the cause of the symptoms reported to the Utah Poison Control Center or by the commenter are unavailable. Callers self-identified as contacting Utah Lake water and reported symptoms consistent with HAB exposure. Overlap exists with the symptoms associated with cyanobacteria exposure and other allergens such as eye irritation and temporary respiratory illness, but symptoms such as gastrointestinal distress, headaches, earaches and skin irritation are not consistent general allergens.
G	190	3	Again, such anecdotal evidence and misuse of WHO guidelines should dictate that Utah Lake should not be Category 5 at this time, but placed in Category 3-insufficient data.	None	Please see comment response Appendix A, sections 1 and 13, for responses to this comment.
G	191	3	This provides additional support to the comments provided by Central Davis Sewer District, for the need to provide a stronger link between cell counts, cyanotoxin concentration and the potential allergic or toxic symptoms of exposure to Cyanobacteria.	None	Please see comment response Appendix A, sections, 1, 2, and 3, for responses to this comment.
G	192	3	Until then, it is strongly recommended that DWQ protocol of using cell counts of toxin or nontoxin-producing cyanobacteria be altered to require the existence of microcystins in concentrations > 20 ug/L as the threshold in accordance with WHO guidelines.	None	Please see comment response Appendix A, sections, 1, 2, and 3, for responses to this comment.
G	193	3	This should include the various tiers for signage or eventual closing of beaches and marinas, or, in the case of lakes, only when microcystin concentrations exceed 20 ug/L in the open water areas of the lake.	None	Please see comment response Appendix A, introduction and section 9, for responses to this comment.
G	194	3	As such, although cyanobacteria cell counts of significant toxin producing species (not Aphanizomenon) may be a good predictor of potential cyanotoxin concentrations (Dolman et al. 2012), DWQ has the obligation to do its due diligence and collect follow-up samples to confirm whether toxins exist in dangerous concentrations.	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.
G	195	3	Because only about half of all cyanobacteria are toxin producers and one of the most common cyanobacteria, Aphanizomenon, is a very poor toxin producer, cell counts alone are a weak and inaccurate indicator when the consequences of closing or listing a lake have significant perception and economic consequences.	None	Please see comment response Appendix A, sections, 1, 2, and 3, for responses to this comment.

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G	196	3	Unfortunately, such actions, including multiple media interviews by various DWQ members and op-ed articles in the newspapers, were likely used and exaggerated to convince the public and elected officials that Utah Lake is experiencing this “sky is falling”, “life-threatening” bloom because of “excessive” nutrient loads from the POTWs.	None	This comment is outside the scope of the Integrated Report. DWQ worked diligently with our partners and the local health departments to protect human and animal health from the risks of Harmful Algal Blooms. DWQ worked closely with the media to answer the communities questions about the public health issues related to HABs and the known causes of HABs, including nutrient loads. This comment does not relate to DWQ's decision to list Utah Lake as not supporting designated uses for algal blooms.
G	197	3	Such representation, without supporting scientific evidence and linkage is premature, disingenuous and serves to usurp the current efforts to perform the necessary studies needed to verify such linkages.	None	This comment is outside the scope of the integrated report and does not relate to DWQ's decision to list Utah Lake as not supporting designated uses for algal blooms. Concerns about media coverage should be discussed with DEQ's Public Information Officer.
G	198	3	Such media coverage and articles were intended only to serve DWQ’s agenda of POTW nutrient reduction to radical low values and to expedite this process prior to agreed-upon timelines.	None	This comment is outside the scope of the integrated report and does not relate to DWQ's decision to list Utah Lake as not supporting designated uses for algal blooms. Concerns about media coverage should be discussed with DEQ's Public Information Officer.
G	199	3	This bias needs to be recognized by DWQ and Utah’s elected officials.	None	DWQ intends to include elected officials in the execution of the Utah Lake Water Quality study through the Utah Lake Commission.
G	200	3	The assessment criteria show be: 10% of samples over a representative area of the open water of the lake (not targeted marina or beach samples), collected over the two- year assessment cycle, that exceed 20 ug/L microcystin demonstrate that a lake should be listed on the 303(d) list. Following this thorough assessment, a scientific decision of beneficial use support is possible, and not before.	None	Please see comment response Appendix A, sections 7 and 8, for responses to this comment.
G	202	3	A review of the potential for toxin entry from inhalation is also warranted. Utah’s IR and EPA documents (e.g. Health Effects Support Document for the Cyanobacterial Toxin Microcystins: EPA Document Number: 820R15102, June 15, 2015) suggest that inhalation is also an important route of exposure.	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	203	3	Two papers often cited on this subject is that of Fitzgeorge et al. (1994), and Ito et al. (2001). In the Fitzgeorge report, two types of dosing were prepared; (50 microg/L) in the water used as a fine aerosol spray (resulting in a dose of 0.0005 ug/kg) and a second sublethal dosing mechanism using the same 50 microg/L in daily intranasal instillation (i.n.) for seven days. The second method resulted in a total dose of 31.3 ug/kg. The aerosol resulted in no adverse effects while the i.n. caused a 75% increase in liver weight after 7 days. Similarly, Ito et al. (2001) evaluated the distribution of purified microcystin-LR after intratracheal instillation of lethal doses in male ICR mice. Microcystin-LR in saline solution was instilled at doses of 50, 75, 100, 150 and 200 µg/kg into 34 mice; three mice were sham-exposed as controls. Mortality was 100% in 12 mice receiving doses of 100 µg/kg and greater. At 75 µg/kg, two of four mice died, while no deaths occurred in 18 mice given 50 µg/kg intratracheally.These are the seminal studies implicating potential inhalation as a mode of exposure.	None	Please see comment response Appendix A, section 1, for a response to this comment.

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G	204	3	However, Backer et al. (2008) sought to evaluate the true exposure of microcystins in an actual recreational setting in a lake experiencing a microcystis bloom. They planned to monitor individuals participating in boating, swimming, jet skiing, and waterskiing during as bloom of at least 10 ug/L microcystin. However, the study got underway a week later when microcyctin concentrations fell to 3-5 ug/L. They collected air samples from above the lake surface as well as at the shoreline and found that microcystin was in air samples at slightly above detection limits (0.00378 ng/m3). EPA (2015) cited this paper as evidence that air samples above a lake experiencing a microcystis bloom contained some aerosol –containing micocystin and consequently reported that this is a valid mechanism of exposure. However, Backer (2008) found that with such low air concentrations blood concentrations of MC were all below detection limits (0.147 ug/L) Moreover, given this low exposure level, study participants reported no symptom increases following recreational exposure to microcystins. Backer et al. conducted a more recent study on two lakes in California that did contain $\geq$ 10 ug/L MC (Backer et al 2009). In this report Backer et al. (2009) reported microcystin concentrations ranged from14.5 to 357 ug/L using the ELISA method. However, relatively very little MC was actually aerosolized ranging from 0.0 to 0.8 ng/m^3. Further, the daily mean concentrations of MC in air sampler carried by individuals did not correlate with the concentrations of Microcystis spp. cells, dissolved MC, or total MC in the Bloom Lake water. Despite this unpredictability Backer et al. 2009 found slight increases in nasal mucosal swabs in post activity participants as compared to pre-activity samples. The average aerosolized MC concentration above the lake surface was 0.3 ng/m^3 and the average nasal swab of the exposed group was 0.39 ng. With the average exposure time of 109 minutes and an inhalation rate of 25 L/min during light exercise the exposed group would have been exposed to 0.8 ng during that day's visit. Although this provides evidence that inhalation may be a valid route of exposure Backer et al. 2009 provided this evaluation: "There is limited information from animal studies available for comparison with our data. Benson et al. (2005) examined the toxicity of MC-LR in mice after inhalation exposure. The investigators exposed mice to 260 mg MC/m^3 for 0.5–2 h each day for 7 days and observed treatment related microscopic lesions in the nasal cavities of mice in the groups exposed for longer times. Although the overall NOAL dose was 3 ug/kg, exposure to 260 mg/m^3 for ½, 1 and 2 hrs was the treatment. While these results suggest that the nasal cavity may be the primary site of response to inhaled MC, these experimental doses are many orders of magnitude greater than those we have documented in our study participants." Backer et al. (2009) further reported: "The second important component of environmental epidemiologic studies is an accurate measure of the health outcome. Based on anecdotal reports and earlier studies (Pilotto et al., 1997; Stewart et al., 2006a), we hypothesized in this and our previous study (Backer et al., 2008) that exposure to aerosolized MC during recreational activities in lakes with M. aeruginosa blooms would result in increased frequencies of self-reported acute dermal or respiratory symptoms over baseline. Some study participants reported throat and skin irritation after being in the bloom-affected waters. However, these are common symptoms with myriad causes and only a few participants reported such symptoms. Thus, we were not able to demonstrate differences in symptom reporting between exposed and unexposed participants, nor were we able to examine associations between reported symptoms and environmental measurements (cyanobacterial cell concentrations, water and air MC concentrations, or other water quality parameters)."	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	205	3	The reason why I go into such detail about this issue is to inform DWQ and EPA that even waterskiing and swimming resulted in participants receiving very low doses of MC (with no significant increase in symptoms. Therefore, unless a subject is standing in the spray of an airboat for at least 109 minutes, and taking deep breaths, the risk of accumulation of MC by aerosol inhalation is virtually nil.	None	Please see comment response Appendix A, section 1, for a response to this comment.

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G	206	3	So what should be the accurate representation of the current state of knowledge, given that the Backer et al. (2008 and 2009) studies included non-detectable concentrations of microcystins in blood from people directly at risk for swallowing water or inhaling spray while swimming, water skiing, jet skiing, or boating during an algal bloom that actually included high concentrations of MC?	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	207	3	In other words, it appears that EPA and DWQ are inappropriately exaggerating and incorrectly extrapolating unrelated laboratory studies to real field conditions using speculation and anecdotal data. Yet, the only quantitative report available today dismisses inhalation by recreationists as a valid route of entry.	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	208	3	Therefore, accurate representation in the IR should read that "although forced nasal or tracheal instillation of extremely high concentrations of MC in mice can be lethal, there is currently no reasonable scientific, quantitative link between exposure of recreationists that were boating, swimming, jet skiing, and waterskiing, during a microcystis bloom than included high MC concentrations (Backer et al. 2009) Yet, respiratory ailments were not recorded nor was MC detected in the blood of the participants. Therefore, although further study may be warranted, inhalation during recreation activities does not appear to be of concern at this time.	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	209	3	Comments above should also be applied to Farmington Bay.	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	210	3	Listing: Utah Lake UT-L-16020201- 004_01 Utah Lake Utah Lake other than Provo Bay 5 Not Supporting Total Phosphorus 3B High 2014 87929. As of 2014 Utah Lake had remained the only lake that was listed for the narrative standard for P of 0.025 mg/L. Even at that time, it was DWQ policy and my practice when employed with DWQ, not to list for a narrative standard for a nutrient without confirmation with a parameter that has numeric standard, such as low DO or high pH.	None	A decision to remove the phosphorus listing that originated in the 2002 Integrated Report will require a demonstration that the lake is fully supporting its uses and that nutrients are not contributing to impairments. The Utah Lake Water Quality Study will determine whether nutrients, and phosphorus in particular, are contributing to beneficial use impairments in Utah Lake. Until that study is complete and there is evidence to demonstrate otherwise, DWQ must maintain listings from prior Integrated Report cycles.
G	211	3	This policy particularly applied to Utah Lake because it very rarely stratifies, eliminating the tendency for hypolimnetic hypoxia	None	A decision to remove the phosphorus listing that originated in the 2002 Integrated Report will require a demonstration that the lake is fully supporting its uses and that nutrients are not contributing to impairments. The Utah Lake Water Quality Study will determine whether nutrients, and phosphorus in particular, are contributing to beneficial use impairments in Utah Lake. Until that study is complete and there is evidence to demonstrate otherwise, DWQ must maintain listings from prior Integrated Report cycles.
G	212	3	AND Utah Lake always contained a diverse and abundant fishery containing several popular game fish as well as necessary forage species and abundant zooplankton, indicative of a fully supporting lake ecosystem.	None	A full inventory of the current and historic aquatic life uses in Utah Lake will be included in the Utah Lake Water Quality Study.
G	213	3	This ecological condition persisted with an abundant and diverse fishery and zooplankton population throughout the summer of 2016 as well as the 2014 and 2015 years. There was no evidence of fish kills or stress, no evidence of bird stress or mortalities and the abundant zooplankton community has been sustained. In short, there never was and there is still no evidence that the elevated P concentrations have any adverse impact on aquatic life uses and therefore, Utah Lake should be removed from the 303(d) Category 5 list for phosphorus impairment to aquatic life – because it doesn't exist.	None	A full inventory of the current and historic aquatic life uses in Utah Lake will be included in the Utah Lake Water Quality Study. Please also see response to Comment 210.
G	214	3	Also, if Provo Bay is currently classified as part of Utah Lake (i.e. 3B fishery), why specifically is Provo Bay assessed separately from the lake.	None	Please see comment response Appendix A, section 11, for a response to this comment.
G	215	3	In other words, with an order of magnitude more P in Provo Bay than the Lake proper why specifically is Provo Bay not listed for 3B non supporting for P while the lake proper is listed for 3B non supporting for P? Why the contradiction?	Listings for total phosphorus and fish PCBs added to the Provo Bay AU. TDS in Provo Bay delisted.	DWQ has carried the listings for total phosphorus and fish PCBs to Provo Bay. Data collected in Provo Bay support a delisting for TDS which is included in the final delisting table. As described in chapter 5, cyanobacterial densities >= 100,000 cells/mL have not been identified in Provo Bay and Provo Bay is therefore not listed for harmful algal blooms. DWQ anticipates that fish sampling conducted during 2015 and 2016 will be adequate to perform a full assessment of fish PCBs in both Utah Lake AUs in the 2018 IR.

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G	216	3	Listing UT-L-16020201- 004_02 Provo Bay Provo Bay portion of Utah Lake 5 Not Supporting pH 3B High 2016 3609. This waterbody is clearly misclassified.	None	Please see comment response Appendix A, section 11, for a response to this comment.
G	217	3	For all but two of the past 17 years, water levels in Provo Bay have been prohibitively shallow for use by warmwater fishes. It has been shallow (<20 cm) and very clear - even during spring runoff in May and June. This condition has prevented fish from inhabiting the bay (either by stranding or succumbing to predation by piscivorous birds). During the summer of 2014, 2015 and 2016 the Bay has averaged < 10 cm as it is even difficult to sample by airboat.	None	Please see comment response Appendix A, section 11, for a response to this comment.
G	218	3	Alternatively, Provo Bay should be classified as a 3D habitat for waterfowl and shorebirds. For example, during the visits of 2014, 2015 and 2016, the Bay has contained an estimated 10,000 to 15,000 American avocets, white faced ibis, blacknecked stilts, dowitchers, and a few hundred waterfowl of various species. Indeed Provo Bay has been key waterfowl and shorebird habitat for decades (Dick Bueller, personal communication 2016).Therefore, as with the use class for Farmington Bay impounded wetlands, a UAA/site specific criteria modification should be performed to appropriately classify the Bay for what it is currently so importantly used for and remove the pH, DO and ammonia criteria because they are internally generated – exactly similar to Farmington Bay impoundments (See Table 1).	None	Please see comment response Appendix A, section 11, for a response to this comment.
G	219	3	Hence an Assessment Category of 3A (insufficient data) should be used until this information can be appropriately evaluated and assembled, including an active pursuit of a UAA.	None	Please see comment response Appendix A, sections 11 and 13, for responses to this comment.
G	220	3	Further, I learned that DWQ's assessment data included the years from 2008 to 2014. Eliminating the obvious outliers, there was 5-6 readings over pH 9.0. As this was >10% of readings, pH measurements were performed at least 50-60 times. As these measurements were from just one sampling site, there had to be either 40 to 50 visits to this site, or there were multiple individual recordings of pH while at the site. Clearly, there were multiple readings performed in the bay that was < 0.5 m deep, totally clear and homogeneous from top to bottom. Therefore, measurements throughout the water column were simply replicates of the same pH value and DWQ used the accumulation of these data recordings, only a few seconds apart, to acquire enough data points to meet the 10% of measurements threshold. Is this biased? Are these indeed independent, representative data points from a 1 ft to 1.5 ft deep isolated waterbody?	None	DWQ's lake assessment methods for pH are based on water column profiles. As described in chapter 2, the beneficial use is not supported if greater than 10% of the water column measurements (minimum of two discrete measurements outside thresholds) exceeds one of the two pH criteria. A total of 18 unique profiles were collected at the Provo Bay monitoring location from 2008-2014 with an average depth of 1.1 meters. Four profiles showed pH exceedances in greater than 10% of the water column with a minimum of two discrete measures exceeding.
G	222	3	Finally, as opposed to previous assessments, why did DWQ suddenly decide to separate Provo Bay from the remainder of Utah Lake?	None	Please see comment response Appendix A, section 11, for a response to this comment.
G	223	3	Listing :Utah Lake UT-L-16020201- 004_02 Provo Bay Provo Bay portion of Utah Lake 5 Not Supporting Total Ammonia 3B High 2016 3609. The comment provided for the pH listing above, applies to the listing for total ammonia. Notably, multiple months and years of DMR data from the Provo POTW has demonstrated that ammonia consistently remains about 0.03 mg/L. Therefore the elevated ammonia concentrations are the result of decomposition of organic matter in this productive and important wetland habitat (See Table 2 below) rather than from any point sources. Therefore the elevated ammonia concentrations are the result of decomposition of organic matter in this productive and important wetland habitat (See Table 2 below) rather than from any point sources. There is simply no way of controlling this internal generation of ammonia and elevated pH. Therefore, numeric ammonia criteria should be similarly removed from Provo Bay.	None	Please see comment response Appendix A, section 11, for a response to this comment.
G	227	3	Based on DMR data from the Provo POTW, ammonia averages about 0.03 mg/L and pH averages about 7.6. Yet, the IR claims that Provo Bay is impaired due to ammonia and pH criteria violation. With pH presumably above 9, the ammonia chronic criterion is in the range of 2.5 mg/L. The only way that this is possible is from internal generation of ammonia from decomposition of the organic-rich wetland sediments throughout the bay as well as the adjacent emergent marsh surrounding the bay and through elevated primary production, such as in Farmington Bay impounded wetlands.	None	Please see comment response Appendix A, section 11, for a response to this comment.

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G	228	3	The only difference between FB impoundments and Provo Bay is that primary production in FB impoundments is primarily from SAV while that within Provo Bay is from benthic periphyton as the water is shallow and nearly completely clear. Some Stuckenia is also beginning to spread into the Bay from Mill Race which suggests that Provo Bay will likely continue to improve as waterfowl and shorebird habitat.	None	Please see comment response Appendix A, section 11, for a response to this comment.
G	229	3	The following table includes data from our March June and and our first August sampling run We were not allowed to sample during the July aphanizomenon bloom). Samples were analyzed in the certified laboratory at the Timpanogos SSD treatment facility. It is clear that the ammonia is low (see Provo DMR data) and clearly, there is no violation for ammonia in the Bay.	None	Please see comment response Appendix A, section 11, for a response to this comment.
G	230	3	Also, pH is notably low as it enters Provo Bay (Table3). pH in our monitoring never exceeded the Standard so we must request to see the data set that DWQ used to make this assessment.	None	Assessments for the IR are based on in-waterbody conditions and do not consider monitoring conducted at discharge compliance points or tributary inflows. DWQ's lake assessment methods for pH are based on water column profiles. As described in chapter 2, the beneficial use is not supported if greater than 10% of the water column measurements (minimum of two discrete measurements outside thresholds) exceeds one of the two pH criteria. A total of 18 unique profiles were collected at the Provo Bay monitoring location from 2008-2014 with an average depth of 1.1 meters. Four profiles showed pH exceedances in greater than 10% of the water column with a minimum of two discrete measures exceeding. Lake profile worksheets have been posted to the IR website (http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/currentIR2016.htm#sup). Water chemistry based assessment data are available for query through Utah's Ambient Water Quality Monitoring System (awqms.utah.gov) and were also previously shared with both Provo City (July 18, 2016) and the Jordan River/Farmington Bay Water Quality Council (April 20, 2016).
G	231	3	Nevertheless, pH is elevated above the value at the Provo POTW discharge point as well as at the point of entry into Provo Bay. Again, this is clear evidence that any elevation in pH the result of Provo Bay internal processes, including elevation primary production and consumption of the majority of CO2 that is generated within the bay.	None	Assessments for the IR are based on in-waterbody conditions and do not consider monitoring conducted at discharge compliance points or tributary inflows. The IR also does not identify sources of pollutants or whether they may result from internal processes. These issues can be considered in the development of TMDLs or site specific water quality standards.
G	232	3	Additional notable data concerning the dynamics of P has been collected during this project. Table 2. Also includes concentrations of various species of N and fractions of P. It is apparent that as water leaves the Provo POTW (P concentrations average approximately 3.5; DMR data) and follows the path through East Bay, down Mill Race and across Provo Bay, there is a dramatic decrease in total, ortho and dissolved P. For example, at the middle of the Bay the total P is only 0.96 mg/L in March but as low as 0.16 mg/L in the middle of June. This is telling evidence that the Utah Lake budget that currently uses DMR data vastly overestimates the actual concentration and load discharged from the Provo City POTW.	None	This comment is outside the scope of the Integrated Report. The Utah Lake Water Quality Study will investigate the role of nutrient cycling in Mill Race and the influence on nutrient concentrations in Provo Bay and the open water of Utah Lake.
G	233	3	Also note that although the Provo POTW discharges 28 mg/L nitrate in its effluent, it has decreased to only 8.7 at ehe bottom of Mill Race, and to only 3.4 mg/L at 200 m from the Mill Race mouth and only 0.5 mg/L in mid Provo Bay during summer.	None	This comment is outside the scope of the Integrated Report. The Utah Lake Water Quality Study will investigate the role of nutrient cycling in Mill Race and the influence on nutrient concentrations in Provo Bay and the open water of Utah Lake.
G	234	3	Clearly, when considering the reduction in phosphorus, ammonia and nitrate, these values are far below the discharge values, upon which DWQ's OCP was calculated.	None	This comment is outside the scope of the Integrated Report. The calculation of Oxygen Consumption Potential (OCP) is not used to determine beneficial use support in the context of the Integrated Report.
G	235	3	Not only is this estimate a misrepresentation of the reality of Provo Bay and Utah Lake, but the assimilation of these nutrients into this wetland ecosystem results abundant food resources and the full support of vast numbers and diversity in species of shorebirds and waterfowl.	None	This comment is outside the scope of the Integrated Report. The calculation of Oxygen Consumption Potential (OCP) is not used to determine beneficial use support in the context of the Integrated Report.

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G	236	3	Therefore, again it is necessary to see the data the DWQ collected and the methods for analysis and assessment that resulted in an impaired classification.	None	Lake profile worksheets have been posted to the IR website (http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/currentIR2016.htm#sup). Water chemistry based assessment data are available for query through Utah's Ambient Water Quality Monitoring System (awqms.utah.gov) and were also previously shared with both Provo City (July 18, 2016) and the Jordan River/Farmington Bay Water Quality Council (April 20, 2016).
G	237	3	Moreover, if data from the middle of the Bay were in exceedence of the criterion, this present data indicates that the elevated pH, as with the DO is internally generated from elevated primary production typical of the fully functioning impounded wetlands of Farmington Bay,	None	Assessments for the IR are based on in-waterbody conditions and do not consider monitoring conducted at discharge compliance points or tributary inflows. The IR also does not identify sources of pollutants or whether they may result from internal processes. These issues can be considered in the development of assessment methods, TMDLs, or site specific water quality standards.
G	238	3	Once again, this suggests that Provo Bay has been misclassified for at least the last 1.5 decades. Alternatively, the Bay has been fully supporting waterfowl and shorebirds in similar densities as Farmington Bay impounded and sheetflow wetlands (See Figure 1).	None	Please see comment response Appendix A, sections 10 and 11, for responses to this comment.
G	239	3	In summary, these data sets beg the questions of where, when and how were samples collected in Provo Bay and how they were assessed by DWQ that justified listing as impaired?	None	Lake profile worksheets have been posted to the IR website (http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/currentIR2016.htm#sup). Water chemistry based assessment data are available for query through Utah's Ambient Water Quality Monitoring System (awqms.utah.gov) and were also previously shared with both Provo City (July 18, 2016) and the Jordan River/Farmington Bay Water Quality Council (April 20, 2016).
G	240	3	Because these data are contradictory, this data needs to be revealed before DWQ can list Provo Bay for pH or ammonia.	None	Lake profile worksheets have been posted to the IR website (http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/currentIR2016.htm#sup). Water chemistry based assessment data are available for query through Utah's Ambient Water Quality Monitoring System (awqms.utah.gov) and were also previously shared with both Provo City (July 18, 2016) and the Jordan River/Farmington Bay Water Quality Council (April 20, 2016).
G	241	3	More importantly, however, DWQ should engage in a UAA/Site-specific analysis that reflects the uses of Provo for at least the last 60 years and likely long before that.	None	Please see comment response Appendix A, section 11, for a response to this comment.
G	242	5	Page 8, Paragraph entitled: Harmful algal bloom indicators for recreational use attainment. The WHO uses this cell count because it is associated with production of about 20 ug/L microcystin from Microcystis (Reference). This should not be construed to think that this relationship occurs with non toxin producers or weak toxin producers such as aphanizomenon. In fact, recent EPA documents exclude aphanizomenon from the list of microcystin producers (EPA 2015).	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.
G	243	5	The reason for this is the relationship between the 100,000 cell count and the expected 20 up/L microcystin concentration just does not hold up for aphanizomenon blooms and this is true for Utah Lake and hence should be excluded from the assessment method application.	None	Please see comment response Appendix A, sections 2 and 3, for responses to this comment.
G	244	5	Also as for the use the 50 ug/L Chl a concentrations, WHO specifies that this metric may be useful When toxin producing cyanobacteria are dominant! DWQ excluded the remainder of the sentence presented in the WHO document - stating that Chl a concentrations are an indicator when cyanobacteria dominated the phytoplankton community. This fact should require DWQ to revisit their assessment criteria and make the appropriate adjustment in the assessment protocol. I suggest that the Technical Advisory Group be re-assembled to discuss this important omission.	None	Please see comment response Appendix A, section 7, for a response to this comment.
G	245	5	Page 9, Figure 1. Toxins should be the primary indicator. As suggested throughout the WHO 1999 and the 2003 documents, these secondary indicators are to be used as screening tools and supporting evidence and primary assessment tools.	None	Please see comment response Appendix A, sections 1-3, for responses to the specific recommendation that toxins be the primary indicator. In addition, the basis for the commenter's interpretation of the WHO HAB guidelines as specifying certain indicators as primary, secondary, screening, or supporting indicators is unclear. The WHO HAB guidelines do not specifically identify any of the three HAB indicators as primary, secondary, screening, or supporting.
G	246	5	Page 9. Table 1. Again. This table constitutes and oversimplification of WHO advice. The use of Chl a is similar to the Cell counts in that WHO includes the caveat “when cyanobacteria are dominant” or “when cyanobacteria dominate the phytoplankton community” . cell Hence Chl a and	None	Please see comment response Appendix A, section 6, for a response to this comment.

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			cell counts need to be excluded from the assessment criteria.		
G	247	5	In addition, with the ability of DWQ and other agencies to measure cyanotoxins, there is no excuse NOT TO USE the direct measure of the toxin itself.	None	Please see comment response Appendix A, section 2, for a response to this comment.
G	248	5	Page 10 reference to Stewart et al. 2006 and and Pilotto, et 1997. Reference or citation of Stewart et al. is miss-quoted. Stewart et al. did not use cell counts as their metric. It was cell surface area. Your citation is misleading and you should not use it in this way.	None	Although the paper presents results in surface area units, these can be mathematically translated into cell count units that are generally comparable to WHO low, medium, and high risk categories elsewhere by the author. In particular, the >12 mm2/mL high exposure category is broadly equivalent to WHO's 100,000 cell/mL benchmark. Therefore, the health effects observed in this study at cyanobacteria surface area concentrations <12 mm2/mL are comparable to health effects observed below WHO's 100,000 cell/mL benchmark. Please see Stewart, Ian, Webb, Penelope M., Schluter, Philip J., Fleming, Lora E., Burns, John W., Gantar, Miroslav, Backer, Lorraine C. and Shaw, Glen R. (2005) Epidemiology of Recreational Exposure to Freshwater Cyanobacteria: An International Prospective Cohort Study (http://espace.library.uq.edu.au/view/UQ:9111) for further information.
G	249	5	Also, See comments on Pilotto (1997) in my Chapter 3 comments i.e. Although Pilotto has been cited by EPA, it is not a strong reference (i.e. see my comments on the Utah lake listing in Chapter 3 and Dr. Richards' review of the Pilotto et al. 1997 paper).	None	Please see comment response Appendix A, section 1, for a response to this comment.
G	250	5	Page 15, Exceedences of Primary Indicator: Cyanobacteria cell counts, Figure 4. This Figure clearly shows the nature of the targeted sampling that occurred during the 2014 bloom and which DWQ now uses to "list" Utah Lake.	None	Please see comment response Appendix A, section 7, for a response to this comment.
G	251	5	In short, there are two issues here: 1) The ONLY sites that had exceedences were very localized harbor samples. As with other states' assessment methods, this does not support the decision to close and especially to list the lake as impaired. This is dramatic unscientific and unprecedented overreaction to this very localized problem.	None	Please see comment response Appendix A, section 7, for a response to this comment.
G	252	5	2) The dramatic photographs, undoubtedly included to persuade the reader of how "nasty" these local blooms were, only support my statement – that these blooms are VERY localized, and targeted surface skim samples or actually beach windrowed samples of the scum were used to make this erroneous and over-reactive assessment of Utah Lake. Consequently, this does not warrant listing of the lake – only posting of signs that warn users not to wade or swim where scums occur. I think DWQ should comment on its apparent objective to gather and present any evidence that supports its agenda to target POTWs for drastic nutrient removal; and that this is occurring before DWQ is allowing the TMDL and necessary data associated with loading sources and phosphorus speciation and fate in the lake is gathered and analyzed by the appropriate scientific community. I suggest this is highly premature, absent of essential scientific underpinnings and misleading and highly inappropriate. It subverts stakeholder trust who themselves are beholden to the public and elected officials to provide transparent accountability for the programs and budgets of which they are accountable.	None	Please see comment response Appendix A, sections 7 and 13, for responses to this comment.
G	253	5	2. The bloom was > 99% Aphanizomenon, (see Miller 2014) at these locations. This species is a relatively very poor toxin producer. Indeed, except for the beached sample in Lindon harbor, the 20 ug/L recreational threshold WAS NOT VIOLATED.	None	The HAB samples collected by DWQ during the 2014 Utah Lake HAB events primarily consisted of two cyanobacteria genera of concern, Aphanizomenon and Dolichospermum. The relative abundance of both of these genera in these samples ranged from <0.1 to 1. Of the five HAB samples that exceeded the 100,000 cell/mL indicator, Aphanizomenon was the dominant genus in only one (relative abundance =~0.5). Dolichospermum was the second most abundant genus in this sample with relative abundance of about 0.4. The other four samples exceeding the cell count indicator were either dominated by Dolichospermum or comprised of a relatively equal mixture of Dolichospermum and Aphanizomenon. Samples results from phytoplankton collected during the 2014 Utah Lake HAB events have been posted to the IR website (http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/currentIR2016.htm#sup). Also see comment response Appendix A, sections 2, 3, and 7 for additional information.
G	254	5	Page 17, Paragraph entitled: Chlorophyll a concentrations. See comments above concerning the use of Chl a or cell counts as primary indicators for HAB assessments.	None	Please see comment response Appendix A, sections 2, 3, and 6, for responses to this comment.
G	255	5	Indeed the figures and tables provide data that support my comments – that an aphanizomenon	None	Please see comment response Appendix A, sections 3 and 7, for responses to this comment.

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			bloom is not considered a major toxin producer; only in the most unique beach/surface scum sample that has been blown to a beach or trapped in a harbor.		
G	256	5	Page 18, the 2015 bloom; Although there is uncertainty in identifying this event as a HAB, it did result in a public health advisory for recreational uses in Lindon Harbor (8/20/2015). Explain how far DWQ is willing to accept uncertainty, i.e. without ANY quantitative data, a public health advisory was released for Lindon Marina. This only points to the need to acquire more and better science to support the actions. The ramifications associated unwarranted public opinion and economic hardship is addressed elsewhere in my comments which again, aligns with the overreaction of closing the entire lake or listing the entire based on a very few beach or harbor samples.	None	The Utah County Health Department and the State Department of Health have the responsibility and authority to protect public health by posting advisories and closing waters. DWQ supports the UCHD and UDOH by providing monitoring data and interpretation.
G	257	5	The ramifications associated unwarranted public opinion and economic hardship is addressed elsewhere in my comments which again, aligns with the overreaction of closing the entire lake or listing the entire based on a very few beach or harbor samples.	None	Comments regarding the closure of Utah Lake during an HAB event should be directed to the Utah County Health Department or the Utah Department of Health.
G	258	5	Page 18 Utah Lake dog deaths. The report states: UDWQ recognizes the uncertainty associated with diagnosing the causes of these deaths and directly linking them to algal toxins, and initial reports for the first reported death did not identify a conclusive cause of death. However, veterinarian investigations into the second reported death did conclude ingestion of cyanobacteria or cyanotoxins to be the cause of death. This finding was based on the dog's symptoms including rapid breathing, the veterinarian's past experience dealing with cyanotoxin poisonings in another state, and clear signs of exposure to cyanobacteria including the presence of cyanobacteria on the dog's nose. Despite the lack of confirmation that cyanobacteria poisoning was the cause of the death for the dog that died on October 5, 2014, UDWQ and Utah Department of Health scientists still suspect cyanobacteria as the sole or a contributing cause of death for both dogs. Both dogs died within hours of being in the water where toxin-producing cyanobacteria were present. The symptoms exhibited were consistent with cyanotoxin poisoning, specifically neurotoxins.	None	Please see comment response Appendix A, section 4, for a response to this comment.
G	259	5	This statement is among the worst of anecdotal statements that occur in the IR. Why would DWQ present totally anecdotal statements when an appropriate necropsy WAS NOT PERFORMED? Indeed the only investigation was based on what the dog owners told the Vet – indeed cyanobacteria on the nose were not even confirmed by microscopically – nothing was actually confirmed. And why is DWQ abjectly ignoring the profession conclusions of a Vet that did perform a complete necropsy? Could it be because these conclusions did not support DWQ's agenda?	None	Please see comment response Appendix A, section 4, for a response to this comment.
G	260	5	When a qualified veterinarian that performed a thorough necropsy that concludes that "it was acute cardiovascular collapse"…and "Blue-green algae is not identified in gastric contents and Anatoxin-a and microcystin toxins are not identified chemically, making blue-green algae toxicity highly unlikely.", should this be just ignored or minimized, because it doesn't support DWQ's agenda?	None	Please see comment response Appendix A, section 4, for a response to this comment.
G	261	5	In my own literature review of the toxicology of cyanotoxin exposure, every CONFIRMED death included all of the above indicators. Indeed the presence of cyanobacteria cells and toxins in the mouth and stomach contents is the "smoking gun" of cyanoabacterial intoxication.	None	Please see comment response Appendix A, section 4, for a response to this comment.
G	262	5	The DWQ/UDPH denial of the valid Veterinary Report is nothing more than arrogance and a mind closed to all but what fits the agenda. I could think of 10 other ways to say the same thing, but in short, this is just unacceptable ignorance of good science. Did I say this was agenda-driven?	None	Please see comment response Appendix A, section 4, for a response to this comment.
G	263	5	The current use of such weak and anecdotal information and the way it is being used reflects poorly on DWQ's scientific credibility and undermines public and stakeholder trust and hinders the systematic process of scientific investigation that is essential to determine if and to what degree Utah Lake algae blooms can be mitigated.	None	Please see comment response Appendix A, section 4, for a response to this comment.

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G	264	5	Page 21 Paleolimnology. All lakes become increasing eutrophic over time. Read any limnology test and DWQ staff will understand this natural phenomenon. What really counts, is whether Utah Lake has changed since 1975.	None	Page 21 of the Integrated Report Chapter 5 presents a number of Frequently Asked Questions received from the public. DWQ summarized the Bolland, 1974 and Macharia, 2012 studies to help readers understand there is evidence in the paleo record that water quality conditions have become more nutrient rich following human settlement in proximity to Utah Lake. These statements are significant because they demonstrate to the reader that algal productivity has increased over time and that current cyanobacteria conditions are not natural to Utah Lake. DWQ did not change the beneficial uses assigned to Utah Lake for the 2016 Integrated Report as a result of the information presented in Bolland, 1974 and Macharia, 2012. The beneficial uses assessed for this report include infrequent primary contact recreation (2B), warm-water species of game fish and other warm water aquatic life (3B), waterfowl, shore birds and other water oriented wildlife (3D), and agricultural uses (4).
G	265	5	Page 21 Review of Boland's Dissertation. DWQ Stated: This study found that pre-settlement diatoms in the lake reflected a greater representation of oligo/meso-trophic diatom taxa and benthic taxa. This means that historic conditions were very likely less turbid and typified by lower nutrient conditions. DWQ needs to explain the significance of this statement. For example, paleo- and Geological studies tell us that the lake was deeper (e.g. Boland's data "suggests" that the lake was 3 meters deeper at 1850). But the lake has been known to be deeper at various times during and following the existence of Lake Bonneville (up to 400 feet deeper; this would likely allow the lake to be less turbid).	None	Page 21 of the Integrated Report Chapter 5 presents a number of Frequently Asked Questions received from the public. DWQ summarized the Bolland, 1974 and Macharia, 2012 studies to help readers understand there is evidence in the paleo record that water quality conditions have become more nutrient rich following human settlement in proximity to Utah Lake. These statements are significant because they demonstrate to the reader that algal productivity has increased over time and that current cyanobacteria conditions are not natural to Utah Lake. DWQ has updated Chapter 5 to clarify the relevance of the Boland dissertation to understanding changes in Utah Lake.
G	266	5	Of course, the greater questions are: Was the water clearer a century ago when the lake generally receded to its current depth; and more importantly, did clear water exist before November 28, 1975? It is "very likely" that the answer to both of these questions is NO. Hence, although it would be highly preferential, it is unlikely that any action can be taken that will clear the lake up. For example, having spent many days on Utah Lake sampling since 2014, and under various weather conditions, we have made several important observations: First, hydrologic records reveal that the lake has spent most of its time since 2000 below the compromise level. Hence, shallow littoral zones extend from 100 m to >500 m from the current shoreline. Consequently, ANY wind mobilizes fine clay and silt material- reducing Secchi depths to <10 cm. Because such winds generally occur most days of the week, the littoral zone is constantly characterized by highly turbid water and constantly shifting sand, silt and clay bottom materials, making SAV germination nearly impossible. During this past spring there was a small protected bay between Provo Bay and the State Park that was starting to support a few Stuckenia plants, however, as the lake receded approximately 3 feet this year, that area was left dry. This characteristic of severe annual fluctuations and near-constant turbulence from wind action will continue to preclude Utah Lake from developing a clear condition or developing extensive areas of SAV– regardless of carp or nutrient removal.	None	This comment is outside the scope of the Integrated Report. The Utah Lake Water Quality Study will investigate the role of nutrient, climatological, and ecological influences on the ability improve water clarity and establishment of submerged aquatic vegetation.
G	267	2	1. On page 38, bottom paragraph entitled "Screening Values" insert: "or 7-day or 30-day chronic criteria." after "minima"	Edits Made to Chapter 2	The recommended edit has been made to the document.
G	268	2	2. General comment on E. coli: To my knowledge, the only lake where beach E. coli values are regularly measured is Lake Powell. As part of the early methods development with Dr. William Moellmer, it was determined that beach closures were due to illegal dumping of houseboat holding tanks. In turn, contamination of beach water typically lasted 3-5 days, depending on location on the lake protection of wind and water currents. This type of contamination is highly ephemeral and does not constitute entire lake closure or listing as impaired. As Dr. Moellmer recommended to the National Park Service, and which was implemented in about 1995, it was illegal for any houseboat to possess the ability to self-pump its holding tank and routine inspections were implemented for all houseboats registered on Lake Powell. These beach closures include only tiny percentages of the lake at any time, and additional measures as part of a TMDL, other than massive fines if caught, would not be practicable.	None	Each year, DWQ works with local health departments to prioritize lakes and reservoirs for E. coli monitoring across the State. Routine beach monitoring occurs monthly from May through October at these areas. More frequent sampling occurs if there is an exceedance of the water quality standard as outlined in Utah Administrative Code R 317-2. The local Health Department may issue an advisory that affects the whole lake, or a portion of the lake depending on many factors. Factors that could impact the extent of the advisory include (but are not limited to), size of the lake, extent of the problem as indicated by testing, and potential sources of E. coli.

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G	269	2	3. Page 45, paragraph entitled "Duplicate and Replicate Samples" Comment: There is no statistical reason for selecting the extreme value. For example, is this hoping for potential impairment to be determined? and does this demonstrate DWQ's bias toward this end> This is misuse of science and the data. It may equally be one or the other. I suggest you take the average of the two numbers to give equal weight. Or better yet, put the site in Category 3 and collect another round or two of data and increase your certainty for such an important decision! This present method is just not acceptable.	None	The comment refers to assessment methods and procedures that have already undergone extensive review and a separate public comment period. Assessment methodology for future Integrated Reports will clarify how DWQ will approach the case of multiple observations of a parameter at a given site within a day, to arrive at a conservative (i.e. protective of the water body's beneficial use(s)) single daily value for that parameter.
G	270.1	2	4. Page 46, Table 7. DO parameter Comment: It has now been 6 years and at least two Triennial Reviews (comment on the 2010 IR) since I first brought this unacceptable, misrepresentation of the 7-day or 30-day chronic criteria by using instantaneous grab samples - to the attention of DWQ and EPA. How this method even passed and continues to pass EPA scrutiny continues to baffle the mind and suggests that EPA is remiss in performing oversight duties.	None	DWQ's chronic DO criteria have been promulgated in rule (UAC R317-2, Table 2.14.2). These criteria were taken directly from EPA recommendations (EPA 1986) and have been approved by Utah's Water Quality Board and EPA. Nothing in the IR changes or modifies these criteria, nor can they without first following the necessary regulatory procedures more making a change to water quality standards. With respect to the DO assessment method for grab samples, please see DWQ's response to Comment 143-3.
G	270.2	2	But again, this is still against EPA's 1986 guidelines. Now these guidelines are only 30 years old. Yet, DWQ does not follow the simple method of identifying the daily maximum and minimum and then averaging these numbers for the appropriate 7-day or 30-day average. When high-profile DO assessments and TMDLS are dependent upon such a simple and doable process for determining the 7-day or 30-day average numbers such as the Jordan River, this remains inexcusable. For example, these numbers are easily acquired by monitoring between 0730 and 0930 and between 1630 and 1830 in the evening. This does not even require much, if any overtime.	None	The appropriate allocation of limited monitoring resources is well outside the scope of IR comments, as is DWQ overtime budgetary considerations. The commenter is encouraged to work with DWQ during the upcoming revisions to the Strategic Monitoring Plan. DWQ would also be willing to calculate daily averages, as suggested, if such easily acquired data were submitted to DWQ for consideration during the call for data. At present, the agency believes that the best and most economical way to obtain daily averages is from the deployment of sondes, although this will never be feasible for all monitoring locations in the state. DWQ has not ignored previous comments on the need for more accurate characterization of DO. Indeed, previous comments are among the principal reasons for the development of draft assessment methods for high frequency data (see Chapter 7, 2016 IR for details). Again, additional details with respect to DWQ's position on current DO assessment methods for grab samples can be found in comments 105, 143.3 and 143.5.
G	270.3	2	Again, the case continues that the Jordan River should never have been listed based on 7-day or 30-day criteria violations because they were never documented. Furthermore, DWQ might respond that there have been a few instances where such 7-day violations have occurred as more recently documented using the recording sondes.	None	A pilot investigation on the Jordan River that was conducted in association with proposed high frequency assessment methods (IR, Chapter 7), which provides insight into the nature and extent of low DO conditions in the Jordan River. These analyses, do suggest that DO problems are largely non-existent in the upper reaches of the lower Jordan. However, they also suggest that DO problems are much more pervasive in the lower reaches than the commenter suggests. Sites in the lower Jordan River that exhibited extensive problems with low DO include: 1) 800 South, 2) 300 North and 3) Cudahy. Among all observations a fairly high proportion of days exceeded the absolute minimum (acute) DO criterion (45%, 22% and 46% respectively). There also were several circumstances where these violations were of considerable duration, with a maximum of 39, 21, and 78 consecutive hours of acutely low DO conditions at these three sites respectively. Similarly, a high proportion of 7-day and 30-day moving average calculations exceeded both the 7-day chronic criteria (45%, 22%, and 46% respectively) and the 30-day criteria (46%, 19%, and 49% respectively). Taken together, there are several lines of evidence that support the initial DO impairment in the lower Jordan River. Please see Table 2 (e.g., Site specific statistics for Jordan River High frequency Pilot for 2014) and Figure 23 (e.g., Longitudinal view of DO daily minima exceedance for the Jordan River for 2014) in Chapter 7 of the 2016 IR for additional details.

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G	270.4	2	But again, I have demonstrated in our TAC meetings that such violations are associated with storm flows that mobilize various sources of reduced organic matter that have accumulated in storm drains, storm vaults and tributary and mainstem backwater areas. Moreover, capture and containment of such high flows and associated contaminants with the intention of withholding this organic debris and subsequent decomposition products, such as methane and H2S are unmitigatable, except for perhaps artificial aeration. Nevertheless, these pockets of reduced and readily oxidizable organic compounds accumulate because of long term practices include damning, diversions, and channelization and hence qualifies the Jordan River for a UAA based on at least one of the section 301.10(g)factors – principally hydrologic modification as well as natural conditions associated with the flashy storm events."	None	Allocations of pollutant sources are not part of the IR decision process, so this comment is largely out of scope. The attribution of cause to the observed low DO water quality problems in the lower Jordan River will be conducted through the TMDL process. The TMDL process will also determine endpoints that are appropriate and achievable. As the commenter states, DWQ has initiated a stakeholder Technical Advisory Committee (TAC) to help steer these investigations and the commenter is encouraged to continue dialogue with respect to the attribution of cause in this forum. If these ongoing efforts suggest that the existing water quality standards are not attainable due to irreversible hydrologic conditions, then a UAA and ultimately a change to water quality standards may be proposed by DWQ. However, these actions are governed by their own rules and processes, which are overseen by specific stakeholder groups, and are outside of the scope of the IR. If the commenter believes that sufficient data are already available to initiate this process, they should present these data to the Water Quality Standards Workgroup (http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/standards/subworkgroups.htm).
G	271	2	5. Page 47 Paragraph entitled "Toxic Parameters" Comments on Bullet 1: EPA's criteria already accounts for toxics that bioaccumulate. Hence, this point is moot. Hence, the probably of Type 1 error increases with lower. Comment on Bullet 2: Same comment as for Bullet 1 applies. Also, this is not a valid reason to require fewer data points. In reality, the variability of tissue data warrants a larger data set to gain some confidence in the data. Your approach may make less work up front (the only reason for changing this from prior IR cycles (that required at least 10 samples), but a false positive will make much more work trying to chase a TMDL.	None	The comment refers to conservative (i.e. protective of a water body's beneficial use(s)) assessment methods and procedures for toxic constituents that have already undergone extensive review and a separate public comment period, and have remained essentially the same over the last three Integrated Report cycles. The Assessment Methodology for the next IR cycle will be available for public comment in the near future.
G	272	2	6. Page 48. Paragraph entitled: Equation-Based Toxic Parameters, midway through paragraph Comment: remove the word "only"	Edits made to Chapter 2	The recommended edit has been made to the document.
G	273	2	Page 48. Bullet entitled: Only hardness-dependent toxics: Comment: FYI, All hardness values are calculated from Ca and Mg laboratory measurements. Isn't this part of DWQ's standard analyte list? Also, 100 mg/L is very minimal. Most waters in Utah are well above this. I suggest you use a default of at least 150 mg/L or better yet, wait until the next cycle when you actually have real data. Again, making use of Category 3 - insufficient data, would be the best decision until you actually have scientific data. DWQ has spent many pages describing the strict needs of data and describing high data quality objectives and then falls far short of scientific understanding and evaluation when it comes to making an assessment decision. In short, estimating hardness in this manner is basically a "WAG" when it comes to determining a value as critical as hardness for calculating criteria for divalent metals. This should be considered unacceptable by DWQ QA/QC personnel. Also, when it comes to listings on such minimal data, DWQ should at least perform the Biotic Ligand Model to determine if actual violation of the metal criterion really occurs.	None	The comment refers to conservative (i.e. protective of a water body's beneficial use(s)) assessment methods and procedures for toxic constituents that have already undergone extensive review and a separate public comment period. As described in the text for hardness-dependent toxic constituents, and where no hardness value can be obtained for a specific observation, a surrogate value of 100 mg/L CaCO3 equivalent was used to complete the hardness-dependent criterion calculation during the assessment. Further, no new non-attainment (Assessment Category 5) listing was made for a hardness-dependent metal constituent that had been assessed using a surrogate-hardness calculated criterion.

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G	274	2	7. Page 53, last paragraph Comment: Only 11 watershed variables are listed when determining stream reference condition? And without any site-specific data?. DWQ needs to explain how staff can use watershed or regional indicators without confirmation using site-specific physical characters associated with the actual sample site. There is a plethora of site-specific variables that directly influence the invertebrate community at a particular site. To leap from watershed indicators to taxa lists – whether for reference or target sites, needs the additional conformational data to support reference and assessment decisions, DWQ may have done this, but it is not explained in this section. This needs to be clearly explained. For example just review Idaho DEQ Temperature Criteria. In short, such changes in temperature or substrate particle size or allochthonous vs autochthonous energy sources, etc, etc. (natural transitions described in River Continuum Theory), dominate the environmental variables that drive natural shifts in benthic communities (i.e. read Odum or Hynes). Such shifts cannot be detected using mean watershed indicators that have incorporated 1st order to 8th order streams in one assessment. It is just not possible as a scientific approach. RIVPACS apparently ignores or vastly simplifies these principles. This is one reason, of many, (See Dr. David Richards' comments), why RIVPACS alone is a poor and often misleading metric of stream health.	None	Expected assemblages are not derived through a comparison of each site to a particular reference site or set of reference sites. Instead, they are calculated from site specific predictions of probabilities of capture (Pc) for all taxa. Pc values are predicted from a multi-taxon niche model that relates frequencies of occurrence of all taxa at all reference sites to natural environmental gradients. E is calculated as the sum of all Pc values >=0.5, and O is calculated as the number of those taxa with predicted Pc>=0.5 that are observed in a sample. The Random Forest models that are used to make the site-specific predictions intrinsically weights each predictor variable independently using statistically robust bootstrapping procedures. Contrary to the misunderstanding by the commenter, site-specific, GIS-based predictor variables are used to develop RIVPACS models rather than regional, watershed means. The spatial resolution for these predictor variables is 800 m which makes the assessment at reach segment scale rather than watershed. The text of the methods have been updated to help this clarification. The model building methodology is explained in the Biological Assessments of Rivers and Streams section of Chapter Two of the report and it will help clarify why GIS-based predictor variables are used rather than in-stream physical data.
G	275	2	8. Page 53, last paragraph Comment: Because of the issues described above, DWQ should only use RIVPACS models as a screening tool and list O/E "violations" as only 3A or 3C – more information is needed - until you have made site-specific visits to include the complete EMAP protocols of physical habitat of reference sites and target sites and include additional metrics now used by all other western states (such as Montana) that have used RIVPACS models for just such screening purposes or in combination with a suite of additional metrics. Omission of this procedure and other valuable will just continually be challenged by stream ecologists and will indeed result in erroneous assessment conclusions that are environmentally unsound and may be extremely costly for society if TMDL development proceeds including costly restoration practices that result in no biological improvement because of the constraints of basic river continuum principles.	None	DWQ is authorized by R317-2-7.3.c. to use quantitative biological assessment methods which are "documented methods that have been subject to technical review and produce consistent, objective and repeatable results that account for methodological uncertainty and natural environmental variability." The model building methodology is explained in the Biological Assessments of Rivers and Streams section of Chapter Two of the report and will help clarify why GIS-based predictor variables are used rather than in-stream physical data. In addition, the commenter's context of Montana's use of other metrics in addition to O/E is specific to sedimentation pollutant assessment. DWQ's use of O/E is applied to the broad suite of anthropogenic stressors. Biological listings will trigger additional study to determine which stressors are contributing to the impairment.
G	276	2	9. Page 60 Table 10 Comment: Unfortunately, and even throughout the science review panel meetings, insufficient time was provided to thoroughly review DWQ's proposed protocol. A profound oversight was that the WHO recommendations are inaccurately cited and the associated literature used in developing these guidelines are weak anecdotal studies. For instance, the "WHO Chlorophyll a thresholds are based on an important caveat: that this metric is only useful if the phytoplankton community is dominated by Cyanobacteria (WHO pages 201-205). This is one of basic tenets of the Central Davis SD comments by Leland Myers. Indeed Chl a by itself has little utility in predicting cyanobacterial blooms and particularly toxigenic cyanobacteria. Additional comments related to this subject are included in the Review of Chapters 5 and 6.	None	Please see comment response Appendix A, section 6, for a response to this comment.
G	277	2	10. Page 66. Paragraph entitled Toxics: Dissolved metals Comment: DWQ should consider that in most every case where toxic metals are elevated near the sediments, the fish are excluded from this zone because of hypoxia. This is part of the chemistry that releases metals from the sediment. Review your data to confirm this for yourself. Therefore, on your return visit, described in the next section, collect a sample from the inhabitable zone or wait until turnover for a more thorough evaluation to see if fish are actually exposed. In fact, benthic foraging during turnover events is likely the major time and condition that methyl Hg can ascend through the food chain. The point is that there is not a thing you can do about it unless you prescribe artificial hypolimnetic aeration which has been used to some success by USGS. Further, with continual accumulating data indicating that the primary source of Hg is atmospheric deposition, a TMDL is pretty much a waste of time.	None	Aquatic organisms may be exposed to toxic metals through multiple pathways. The dissolved metal sampling and assessment methods are intended to capture the potential for toxic metals to enter the water column or food web and negatively impact aquatic life uses. Anoxic conditions combined with a decrease in Eh potential can result in some metals and metalloids, but not all, being reduced which are more soluble than in oxygenated waters. However, sediments can be a source of metals in toxic waters as well. As discussed in the assessment methods and IR, toxics are assessed using more conservative methods than conventional pollutants because of their toxicity and to compensate for the infrequent sampling. False positives will be identified from the more frequent sampling triggered by an impairment determination and subsequent investigations (e.g., TMDL) conducted to resolve the impairment. All current mercury impairments in lakes and reservoirs are based on fish tissue concentrations and not water column results. Assessing if water quality supports the uses by comparisons to standards does not consider whether the impairment is tractable or not. The TMDL will consider feasibility of water quality improvements.

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G	277	2	10. Page 66. Paragraph entitled Toxics: Dissolved metals Comment: DWQ should consider that in most every case where toxic metals are elevated near the sediments, the fish are excluded from this zone because of hypoxia. This is part of the chemistry that releases metals from the sediment. Review your data to confirm this for yourself. Therefore, on your return visit, described in the next section, collect a sample from the inhabitable zone or wait until turnover for a more thorough evaluation to see if fish are actually exposed. In fact, benthic foraging during turnover events is likely the major time and condition that methyl Hg can ascend through the food chain. The point is that there is not a thing you can do about it unless you prescribe artificial hypolimnetic aeration which has been used to some success by USGS. Further, with continual accumulating data indicating that the primary source of Hg is atmospheric deposition, a TMDL is pretty much a waste of time.	None	Aquatic organisms may be exposed to toxic metals through multiple pathways. The dissolved metal sampling and assessment methods are intended to capture the potential for toxic metals to enter the water column or food web and negatively impact aquatic life uses. Anoxic conditions combined with a decrease in Eh potential can result in some metals and metalloids, but not all, being reduced which are more soluble than in oxygenated waters. However, sediments can be a source of metals in toxic waters as well. As discussed in the assessment methods and IR, toxics are assessed using more conservative methods than conventional pollutants because of their toxicity and to compensate for the infrequent sampling. False positives will be identified from the more frequent sampling triggered by an impairment determination and subsequent investigations (e.g., TMDL) conducted to resolve the impairment. All current mercury impairments in lakes and reservoirs are based on fish tissue concentrations and not water column results. Assessing if water quality supports the uses by comparisons to standards does not consider whether the impairment is tractable or not. The TMDL will consider feasibility of water quality improvements.
G	278	2	11. Page 68. Paragraph entitled: Weight of Evidence Comment: Two points does not a trend make. With DWQ's assessment schedule of once every six years, DWQ will only visit a site (maybe) twice in ten years. This should be extended to all available data and then make sure the slope is statistically significant. Or better yet return to the two-year schedule that DWQ used to collect appropriate samples and data. Thinking that a six-year schedule is adequate, when seasonal succession alone may cause rapid and hundreds of % changes in Chl a or cyanotoxins is just ludicrous. If DWQ can't collect more representative data, then it should shorten the list of lakes or hire more people. With the current sampling schedule, DWQ should use the acquired data as a screening exercise, assess the waterbody as 3A (insufficient dat) and plan to perform more frequent and rigorous testing in order to more fully understand the magnitude, seasonality and frequency of the actual presence of cyanotoxins.	None	The Tier II factors in evaluating the weight of evidence are applied using best professional judgement. The BPJ considers factors such as confidence in the representativeness of the data. In the absence of a specific case where the commenter believes that the assessment conclusions that include Tier II evaluations are erroneous, no changes were made. The assessments are similar to screening exercises. The limited available data for assessment does decrease the confidence in the conclusions. However, if decision errors are made, they will be resolved because an impairment determination results in an increase in sampling frequency. In addition, although IR assessments are primarily based on the previous six years of sampling, Tier II assessments are not restricted to only those data and older data may be included in trend analyses as data allow and BPJ suggests.
G	279	2	12. Page 71. Figure 8. Comment: Explain this figure in greater detail.	Citations added	This figure is derived from information presented in: Carlson, R.E. 1983. Discussion on "Using differences among Carlson's trophic state index values in regional water quality assessment," by Richard A. Osgood. Water Resources Bulletin. 19:307-309, which describes conditions where TSI(Chl)>TSI(TP) as indicative of phosphorus limitations on algal biomass. This method is also described in EPA's 2000 Nutrient Criteria Technical Guidance Manual for Lakes and Reservoirs. Relationships among TSI values are not currently used by DWQ for assessment purposes. Instead, this figure is strictly presented as an example of one method for interpreting TSI values. These citations and clarifications have been added to chapter 2.
G	279	2	12. Page 71. Figure 8. Comment: Explain this figure in greater detail.	None	This figure is derived from information presented in: Carlson, R.E. 1983. Discussion on "Using differences among Carlson's trophic state index values in regional water quality assessment," by Richard A. Osgood. Water Resources Bulletin. 19:307-309, which describes conditions where TSI(Chl)>TSI(TP) as indicative of phosphorus limitations on algal biomass. This method is also described in EPA's 2000 Nutrient Criteria Technical Guidance Manual for Lakes and Reservoirs. Relationships among TSI values are not currently used by DWQ for assessment purposes. Instead, this figure is strictly presented as an example of one method for interpreting TSI values. These citations and clarifications have been added to chapter 2.
G	280	2	13 Page 80. Last paragraph After the word "waterbodies" Suggest replacing the word "and" with the word "with"	Edits made to Chapter 2	The recommended edit has been made to the document.
G	281	2	Finally, it appears more and more that DWQ dedicates less and less effort performing rigorous data collection science, and objective scrutiny. Alternatively, DWQ places more and more onerous on a potential discharger or his permit when it comes to establishing truly scientifically-based criteria or performing assessments or developing Water Effects Ratios or performance of BLM and then strenuously resists accepting rigorous scientific endeavor and results when a permittee or his representative goes through this process. Alternative, in prior years, DWQ staff worked closely with permittees to understand their concerns and share in additional scientific analysis or monitoring when it was appropriate. Reducing required sample sizes for assessment or resisting performing site-specific criteria/UAA analyses are prime example of this practice. What	Out of Scope	DWQ recognizes the commenter's concerns. However, the comment is outside the scope of the IR. The assessment that results in the Integrated Report is only the first step in identifying and resolving water quality problems, which are further defined through studies such as TMDLs, WLAs, or UAAs. DWQ shares your concern in building trust and scientific integrity into its programs. DWQ continually strives to improve its programs and looks forward to working collaboratively with stakeholders and the regulated community on solving water quality issues.

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			happened? DWQ management should allow staff some time to keep up on the literature, engage in meaningful dialogue with permittees, share monitoring and data evaluation and expect more scientific rigor and objective evaluation from its staff, not less. This will restore trust, reduce confrontation and ultimately provide for better management of water quality and the issues that we all care about. With a little more scientific investigation, for the purpose of providing adequate accountability, the POTW group would be VERY willing to support and plan for necessary controls or upgrades where potential benefits have been demonstrated with a higher probability of success than presently exists. All we are asking for is a little more accountability and less speculation or guessing.		
H	282	4/5	Provo City Public Works (Provo) appreciates the opportunity to comment on the Utah 2016 Integrated Report. Access to good quality water is vital to sustaining Utah's economy. Provo agrees with determining a technologically feasible and responsible level for treatment and look forward to working collaboratively with the Utah Division of Water Quality (DWQ) using best professional judgement to ensure that this vital natural resource is properly protected and managed. RESPONSE SUMMARY - State's vision for Utah Lake, Provo Bay? o Provo Bay separated (higher level of attainment required?) - Rush to listing - Economic impacts - Phosphorous loading - Water Quality Council - Unintended Consequences - Tone of the report - Concerns with the upcoming process as this is a first step sets the framework for future regulations	None	DWQ has provided responses to each of the concerns raised in your letter in subsequent comment responses.
H	283	4/5	In order for DWQ to assess the quality of a water body, it is first classified and designated for beneficial uses. Water quality standards are then developed by DWQ staff to determine if the water body is meeting these beneficial uses. If there are violations to the adopted standards, DWQ can move forward with assessment for impairment. These standards are not absolutes and can be assessed on a site specific basis. Provo is in support of taking meaningful and scientifically proven, effective measures to address water quality in Utah Lake. Many of Provo's citizens, businesses and visitors use and rely on this natural resource. We want to care for it in a way that will keep it useful for generations to come. Recognizing this, Utah Lake is not a pristine high mountain lake. It is located in a semi-arid region in the bottom of a basin. The lake is naturally shallow, turbid and eutrophic (biologically productive).	None	Water Quality Standards developed by DWQ are specific to the designated uses for specific water body. For Utah Lake, the assigned water quality standards are protective of the designated infrequent primary contact recreation (2B), warm water aquatic life use (3B), waterfowl and shore birds (3D), and agricultural irrigation and stock watering (4). These may be re-evaluated to develop a site-specific standard if it is determined though a scientific investigation that the assigned standards are not representative of the use, are not sufficient to protect the use, or are unachievable. DWQ has determined that the current uses and standards for Utah Lake are appropriate and protective of the current use. Site-specific standard proposals should be raised during the 2017 Triennial Review. DWQ intends to develop site specific numeric nutrient criteria for Utah Lake through the ongoing Utah Lake Water Quality Study.
H	284	4/5	The Integrated Report designates Provo Bay as impaired for not supporting warm water aquatic life due to ammonia and high pH. However, Provo Bay, especially in dry years, acts more like a wetland area that supports birds and waterfowl. This use is necessary for the ecosystem and is not wholly compatible with being a warm water fishery when water levels are low. If the ammonia levels in Provo Bay are lowered, it could favor harmful algal blooms, which currently are not an issue in Provo Bay. The high pH also helps precipitate phosphorous. Changing these characteristics may cause undesirable consequences in Provo Bay.	None	Please see comment response Appendix A, section 11, for a response to this comment.
H	285	4/5	In order to plan for the future, Provo needs a better understanding of DWQ's direction for management of the two water bodies: - What is DWQ's vision for the uses of Utah Lake? Provo Bay? - Is DWQ's intent to regulate Provo Bay to a higher standard than Utah Lake? - What types of uses can be supported in consideration of the structure and characteristics? - What level of water quality can be reasonably expected from Utah Lake? Provo Bay? - What level of water quality is attainable in dry years such as 2016 or even more significant droughts? - Can harmful algal blooms be controlled through reasonable means or is it something like a hurricane that is out of our control and needs to be managed to mitigate damage?	None	DWQ is committed to working closely with Provo City and other communities around Utah Lake to develop the necessary scientific studies to develop appropriate numeric nutrient criteria for Utah Lake. These questions are outside the scope of the Integrated Report. The study and standards development effort will be coordinated with a formalized stakeholder group, science panel as well as our existing Nutrient Core Team and Water Quality Standards workgroup.

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H	286	4/5	Provo respectfully requests that DWQ not list Utah Lake as EPA Category 5 impairment for secondary contact recreation due to Harmful Algal Blooms at this time based on the following: - Only one IR cycle was used for the determination - DWQ has not fully developed a monitoring and reporting program for harmful algal blooms - Concerns that the Wastewater Treatment Plants are being targeted as the primary cause of the blooms - The listing is premature and delisting is difficult	None	DWQ is required to follow the assessment methods for harmful algal blooms that were published for public comment in March 2015. Data from Utah Lake collected during an HAB event in 2014 includes 5 data points collected at three sites on two separate sampling events that exceed the 100,000 cells/mL threshold for listing. The HAB event in 2016 further confirms that recreational uses are impacted by harmful algae in Utah Lake. DWQ has not identified the cause of HABs in the Integrated Report. Procedures for delisting are the same as those for listing. Once data collected within the IR's 6 year data window demonstrates that cyanobacteria concentrations are consistently below 100,000 cells/mL, DWQ can move forward with a delisting. The data collected during the 2016 bloom will be assessed in the 2018 IR and will confirm the 2016 IR listing. DWQ's assessment methods do not require that more than one cycle be considered for listing because each cycle considers a full 6 years of available data. DWQ has developed a monitoring and reporting program for harmful algal blooms available on our website at: http://deq.utah.gov/Divisions/dwq/health-advisory/harmful-algal-blooms/docs/2015/08Aug/HABGuidanceUDOHFinal.pdf and http://deq.utah.gov/Divisions/dwq/health-advisory/harmful-algal-blooms/docs/SOP-HAB-Phytoplankton-Samples-2016.pdf. Considering the magnitude and extent of the Harmful Algal Bloom in summer 2016 that resulted in the closure of Utah Lake to recreational users combined with the data and information available for 2014, DWQ disagrees that the listing is premature.
H	287	4/5	One IR Cycle – Chapter 5, Page 22 of the Integrated report states that DWQ's "… assessment methods for lakes and reservoirs previously required two IR cycles of equivalent support status to change the use support designation." The report goes on to explain that two cycles worked when the monitoring data was collected every other year for each lake, but now the sampling cycle is every six years, which is too long to wait to list. For Utah Lake, only one cycle was used based on this justification. However, 2014 was not a sampling year, but the data from the 2014 algal bloom is 3 Response to Utah's 2016 Integrated Report| Provo City Public Works used for the listing. Therefore, this rationale for rushing the listing in this IR cycle is not warranted. Provo recommends continued planning, testing and coordination to ensure the solutions will be effective.	None	DWQ submits an updated IR on a two year cycle. However, the IR is based on six full years of data. Although some lakes may only be sampled once every six years, many high priority lakes including Utah Lake, are sampled much more frequently and at multiple locations. DWQ is obligated to assess all readily available data in the IR, including data collected beyond the scheduled rotating basin sampling events. Therefore, the HAB related data collected in 2014 on Utah Lake was used in this assessment.
H	288	4/5	Monitoring and Reporting – In the Integrated Report, DWQ says that it is, "…actively developing a monitoring and reporting program for harmful algal blooms. In the interim, DWQ will use the recommendations by the World Health Organization to guide this assessment" (Chapter 2 Page 59). The WHO standards focus on health impacts and not the causes of the blooms. Health advisories and listing are diverse issues that Provo requests be handled separately. While it is appropriate to utilize the WHO standards for the health advisories, this is a lower threshold necessitated by potential health risks due to exposure. Due to the characteristics of Utah Lake, it is not reasonable to hold to a standard that it is impaired if at any time the cyanobacteria cell count exceeds 100,000 mg/L especially when DWQ is using surface scum samples to obtain the high concentrations. According to the experts Provo has consulted, Utah Lake, in its best possible state, will continue to have algae blooms. WHO monitoring guidelines state – "In designing and implementing monitoring programmes, all interested parties (legislators, nongovernmental organizations, local communities, laboratories, etc.) should be consulted. Every attempt should be made to address all relevant disciplines and involve relevant expertise." Combining the expertise of all stakeholders in establishing the monitoring program will create a cohesive and validated program that will be most useful in making decisions.	None	Please see comment response Appendix A, sections 9, 11, 12, and 13, for responses to this comment.
H	289	4/5	Targeting Wastewater Treatment Plants – Provo is concerned that even though DWQ says in the report that they don't know the cause of the harmful algae blooms, there is a rush to assume that reducing the nutrients from the wastewater treatment plants is "the solution" to water quality woes. DWQ's answers to the frequently asked questions on their website confirm this.	None	This comment relates to DWQ's nutrient program, harmful algal bloom program, and Utah Lake water quality study. It is outside the scope of the Integrated Report. Nonetheless, the best available data currently indicates that wastewater treatment plants in Utah County represent a large proportion of the nutrient loads to Utah Lake. DWQ will be evaluating this further as part of a revised load analysis for Utah Lake following the development of site-specific nutrient standards of this important water body.

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H	290	4/5	Premature – For all of the above reasons, Provo feels that listing Utah Lake as an EPA Category 5 impairment for secondary contact recreation due to harmful algal blooms is premature. Provo has similar concerns about the listings for ammonia and pH in Provo Bay. The mechanisms for the listing seem to lack substantive proof that there is impairment. Delisting is a difficult process that requires justification. In order to best address water quality concerns in Utah Lake, Provo requests that DWQ designate Utah Lake and Provo Bay as EPA Category 3D – Further Investigation Required. This will enable Provo to move forward in collaboration with DWQ to assess issues and find appropriate solutions.	None	DWQ is required to follow the assessment methods for harmful algal blooms, ammonia, and pH that were published for public comment in March 2015. Lake data related to the pH and ammonia listings have been published as supplemental materials to the Final Integrated Report website. Procedures for delisting are the same as those for listing. When data is collected within the IR's 6 year data window demonstrates that pH and ammonia are consistently meeting water quality standards, DWQ can move forward with a delisting.
H	291	4/5	IMPACTS In the frequently asked questions for the 2016 Utah Lake Algae bloom, DWQ published the following two questions and responses (emphasis added): "IS THERE ANYTHING THAT CAN BE DONE UNDER CURRENT LAW TO FORCE ANYONE TOREDUCE THE AMOUNT OF NUTRIENTS GOING INTO THE LAKE? A: EPA has made nutrient reductions a national priority, as has DWQ. However, EPA has not established a numeric standard for nutrients, given the site-specificity of an 4 Response to Utah's 2016 Integrated Report| Provo City Public Works appropriate standard. DWQ has implemented a phased approach to nutrient reductions. One of the first phases of our approach is to require phosphorus limits for treated wastewater. These limits were established based on available treatment processes that were thought to best balance phosphorus reductions against treatment costs. On average, this modest step would cost taxpayers $1.18/mo. To aggressively attack the problem the cost would be approximately $15.50/month." "IF IT IS MOSTLY THE [WASTEWATER] PLANTS, HOW MUCH TIME DOES THE 2020 SOLUTION BUY US? A: The 2020 nutrient control plan is a modest first step in controlling excessive nutrients. It would establish a 1 mg/l phosphorus limit to discharges from the municipal wastewater treatment plants—with the exception of the Salem City lagoon which would receive a phosphorus cap. The present value cost estimate for this is $114 million (2010 $) statewide for the 34 mechanical treatment plants. That minimalistic step will not likely control future algal blooms, only help reduce them. Controlling algal blooms would take a much more aggressive approach—which would be to establish an effluent limit of 0.1 mg/l for phosphorus and 10 mg/l for nitrogen. The cost of that approach is estimated to have a present value cost of $1,352 million (2010 $), or on average $15.50/month per household. The upgrades would include having wastewater facilities adopt biological nutrient removal technology, combined with filters."	None	This comment is outside the scope of the Integrated Report. Concerns regarding Utah's Harmful Algal Bloom and Nutrient Reduction programs and the publication of information materials should be directed to the appropriate program leads at DWQ.
H	292	4/5	DWQ's responses to these questions bring up several questions on how the integrated report will be implemented. - Does DWQ have scientific evidence that the limitation of phosphorous to 0.1 mg/L will eventually be able to control or prevent algal blooms? - Is there a documented nexus between reducing nutrient discharge from wastewater treatment plants and reducing harmful algal blooms? - Considering the historic loadings in the lake and inputs from natural sources, when would these limits start to show an effect on the lake? - Is any amount of nutrient removal from the treatment plants going to change the nature of the lake? - What level of improvement can Utah's citizens expect in Utah Lake and Provo Bay for the millions or billions of dollars that are expected to be spent to reach the potential nutrient limits? - If treatment plant improvements do not make a difference, what is DWQ's next step?	None	The questions raised in this comment are out of the scope of the Integrated report but will be addressed through the Utah Lake Water Quality study and implementation of site-specific standards derived through this study. Utah Lake was listed as not supporting designated uses on the 303(d) list several IR cycles ago, with phosphorus listed among the causes. The new HAB listing does not change the need for DWQ to address water quality problems associated with nutrients in Utah Lake. DWQ hopes to address the commenter and other stakeholder concerns through the planning and implementation of the Utah Lake Water Quality Study. Regarding phosphorus effluent limits, DWQ has not made any Phosphorous reduction requirements beyond the 1 mg/L associated with the Technology-Based Phosphorus Effluent Limit (UAC R317-1-1.3). DWQ has no plans for further requirements unless the Utah Lake Water Quality study demonstrates the need to do so. If the science suggests that further reductions are necessary, DWQ remains committed to incorporating appropriate implementation planning into permits that take into account the costs of the requisite projects and other engineering logistics.
H	293	4/5	The $1.18/month/household cost for removal of phosphorous to 1 mg/L provided by DWQ appears to assume a chemical process. Though the capital cost for such a process is substantially less expensive than biological, the operating costs are much higher. Chemical processes are not as environmentally responsible or sustainable because the phosphorous removed is not biologically available, which means must be disposed of in a landfill. Through our master planning process, Provo has determined that in order to renovate the wastewater treatment plan to enable a biological phosphorous removal process, the cost is over $12/month/household. In order to get down to 0.1 mg/L , those costs will likely double.	None	This comment is outside the scope of the Integrated Report. The cost study completed by DWQ in 2010 was conducted in close coordination with each facility. The costs include capital costs and operation and maintenance costs that are amortized over a 20 year timeframe.

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H	294	4/5	Provo has a responsibility to its citizens to show that money spent to improve water quality will yield meaningful results. While the residents of Utah have expressed a willingness to financially support improvement to water quality, there is no reasonable expectation of a significant water quality improvement in Utah Lake with the anticipated nutrient regulations. Based on our discussions with experts, increased nutrient removal may not give us any bang for our buck. What is the benefit/cost ratio of the proposed regulations for Utah Lake specifically? DWQ has provided no assurance that the benefit is much greater than zero and the costs are significant making the benefit/cost ratio infinitesimal. Provo does not consider this a prudent or responsible financial investment.	None	This comment is outside the scope of the Integrated Report. Concerns regarding Utah's nutrient reduction program should be directed to appropriate program leads at DWQ or to members of the Nutrient Core Team.
H	295	4/5	The economic impact is not only limited to the money spent for upgrading and operating the plant, but what is the effect of designation on perception of the lake. Provo agrees that Utah Lake does experience algal blooms that are sometimes dominated by cyanobacteria, but these are not continuous events. In the most recent Utah Lake Commission meeting, staff brought up how the recent press coverage, which included interpretations by DWQ, of the algal bloom has damaged the public's perception of the lake and caused some to feel that it is perpetually unsafe. Provo recommends that DWQ continue working with the Health Department to limit risks to health and safety of recreational users by determining a methodology for identifying potential times of risk, establishing testing protocols, providing signage and education, and providing health advisories as appropriate. All of this can be done in a responsible manner that protects the public safety while limiting unwarranted health scares.	None	DWQ response procedures for Harmful Algal Blooms are outside the scope of the Integrated Report. DWQ partners with the Utah County Health Department, the State Department of Health, and others in responding to harmful algal blooms on Utah Lake. We will continue to do so in a manner that protects public and animal health and communicates the information to the public in a responsible manner.
H	296	4/5	The IR states that, "The decision to list a water body as impaired is only the first step in a series of steps aimed at addressing the problem. Additional investigations are required before remediation plans can be proposed and implemented" (Chapter 5, Page 21). The IR assesses an impairment for harmful algal blooms on Utah Lake and establishes a high priority for the TMDL based on a narrative standard. Provo is concerned that the vagueness of this listing opens up the possibility for DWQ to implement a myriad of water quality standards. Though the report says that there is uncertainty about the cause, one point that is repeated in the frequently asked questions on DWQ's website is that Phosphorous is one of the main culprits, and the wastewater treatment plants put 76.5% of the phosphorous into Utah Lake. It is our understanding that Timpanogos and Orem are in compliance with the 1 mg/L. Provo's water discharged through the golf course is entering Provo Bay at a rate less than 1 mg/L. Were these rates factored into the percentages shown?	None	The scope of the Integrated Report is limited to identifying water quality issues that do not support the designated uses for the waterbody. The harmful algal blooms on Utah Lake have clearly had an impact on recreational uses of the lake. The cause of this impairment will be a central consideration in the Utah Lake water quality study over the next several years. DWQ welcomes Provo's input on the direction of that study. Regarding the proportion of phosphorus loading from POTWs in Utah County relative to other loads, DWQ has recalculated POTW loads with the most recent data reported by facilities. DWQ would be happy to share these calculations with Provo which show changes in some facilities over the past 10 years both due to growth and changes in treatment capability. DWQ also recently received a report from Dr. LaVere Merritt with updated loading calculations that indicate POTWs represent 79% of the total phosphorus load to Utah Lake. DWQ would be happy to share this study with Provo as well.
H	297	4/5	Golf course wetlands clean the water discharged by Provo's Water Reclamation Plant and provide higher water quality in Provo Bay and Utah Lake. Water quality sampling shows that the wetlands remove 30-40% of the Phosphorous before it is discharged to Provo Bay. Provo is not getting any credit for this on the discharge permit. In the future, we request that DWQ look at flexibility for multiple points of compliance to facilitate sustainable best management practices to enhance water quality.	None	DWQ appreciates the comment and underlying concern; however, questions with respect to downstream uptake are most germane to future load allocations, which are several steps removed from the decision to classify Utah Lake as not supporting designated uses based on ongoing HABs. First, the Water Quality Investigations will need to demonstrate that phosphorus causes or contributes to the recreational or aquatic life impairment and an appropriate water quality objective for the pollutant of concern (e.g., numeric water quality standard) that "will attain and maintain applicable water quality criteria and will be fully protect the use." (40 CFR §122.44(d)(1)(iv). Once these goals are established, then DWQ will evaluate sources, including regulated discharges, to determine appropriate load reductions. It is in this final step of the process where uptake through the downstream wetland becomes germane, because any permanent loss of the pollutant of concern (e.g. phosphorus) upstream affects the load of nutrients to Utah Lake (the principal water body of concern). Hence, data such as the uptake information presented to DWQ will ultimately have standing, and may result in a reduction in permit requirements, but this is well removed from any of the decisions in this IR.
H	298	4/5	With all of this, a significant question remains to be answered: If phosphorous is limited from the wastewater treatment plants, will it make a difference?	None	This question will be a central focus of the Utah Lake water quality study to be conducted over the next few years. This is outside the scope of the Integrated Report.
H	299	4/5	WATER QUALITY COUNCIL Provo is actively involved in finding solutions for water quality concerns in Utah Lake. To this end, we have joined with the Utah Lake, Farmington Bay, Jordan River Water Quality Council. Though this council, we are getting experts involved and monitoring	None	DWQ is committed to working with Provo City as well as all other stakeholders interested in water quality issues in Utah Lake. We look forward to a productive partnership moving forward.

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			water quality in the lake to help assess the myriad of factors and seek out real solutions. Provo would like to continue to work with DWQ to determine an effective, sustainable approach that provides real results for the money spent.		
H	300	4/5	UNINTENDED CONSEQUENCES Without good evidence that there will be significant improvement to the water quality of Utah Lake, the potential exists for the consequences outweighing the benefits. One consequence is the increased carbon footprint of the process required to limit nutrients to the suggested levels. Good air quality is another desirable feature for Utah residents that should be considered in decisions made. Treating nutrients to this higher level costs more in energy, transportation of chemicals, and other high carbon footprint impacts. Additionally, treating water to the higher standards would make it more valuable for other uses rather than discharging it into the lake. How would removing effluent water affect Utah Lake over the long-term and especially in sustained droughts?	None	Unintended consequences were considered during the development of the phosphorus rule requiring POTWs to meet a 1 mg/L effluent limit by 2020. The effects of nutrient reductions on Utah Lake will be further explored in the Utah Lake water quality study.
H	301	4/5	In the 2016 integrated report, Provo Bay is being separated as a water body and is being listed as impaired due to pH and ammonia for aquatic life. This listing could potentially put it at a higher level of regulation than Utah Lake, which could lead Provo and other POTWs to make the decision to bypass Provo Bay and put water directly into in Utah Lake. How would Provo Bay be affected if it is bypassed by Provo and the other treatment plants? Could this negatively impact Provo Bay's support of aquatic life?	None	Understanding the pH and ammonia impairments in Provo Bay will be an important element of the Utah Lake water quality study to be conducted over the next several years. The scope of the Integrated Report is limited to identifying waters in which standards are not being met.
H	302	4/5	In the documentation from the experts, the assertion is made that limiting Nitrogen may lead to more toxic algal blooms. Cyanobacteria can fix Nitrogen (pull it from the atmosphere). When Nitrogen is limited, cyanobacteria have the competitive advantage over green algae. Provo Bay is an excellent example of the benefit of high available nitrogen in the form of ammonia. When Utah Lake was experiencing the harmful algal blooms in July 2016, Provo Bay did not have high cyanobacteria counts. To address the water quality concerns in Utah Lake, Provo recommends working together and looking at the whole picture to make sure more problems are being solved than created.	None	Please see comment response Appendix A, sections 11 and 13, for responses to this comment.
H	303	4/5	TONE OF REPORT – The tone of Chapter 5 of the Integrated Report is distressing. While it is good to educate the public on the potential dangers of exposure to toxins created by cyanobacteria, this report should not present a biased narrative. There are a number of areas where the language in the report moves from fact into speculation. Provo requests that the section on the dog deaths be stricken entirely. The explanation does not fully present the opposing evidence and is dismissive of the alternate explanations. This discussion is only useful in evoking an emotional response and does not belong in this type of a report.	None	Please see comment response Appendix A, section 4, for a response to this comment.
H	304	4/5	The monitoring information does not present a clear picture of what was being tested or how the testing is being performed. All the data is provided like it is performed the same. It is our understanding that the test with the largest concentration was a surface scum sample, and that the toxin result was questionable even to the person who did the test. In order to present this data in a scientifically helpful manner, standardized sampling and testing protocols need to be implemented and maintained. If different types of tests are performed, they should be presented in separate categories to enable meaningful conclusions to be made.	None	The sample with the highest recorded microcystin concentration identified in the IR was analyzed by two independent laboratories with two different methods. Namely, Greenwater Labs using the ELISA method and EPA using the HPLC/MS method. Both are established cyanotoxin methods that provide different information. The ELISA method gives the total microcystin concentration while the HPLC/MS provides the concentration of Microcystin congeners. In this case microcystin-LR, one congener of the total. This sample exceeded the maximum quantification limit for microcystin-LR, demonstrating that this sample had concentrations at least as high as 284 ug/L. The total microcystin concentration using ELISA was quantified as 730 ug/L. Also, please see comment response Appendix A, sections 2 and 7, for additional relevant information.
H	306	4/5	UPCOMING PROCESS As stated in the integrated report, designation is only the first step. The tone of the report and quotes in news articles and in the frequently asked questions raise concerns about the future regulations that will be based on this report and the site specific study for Utah Lake. Provo requests working with DWQ in the spirit of collaboration as stakeholders seeking a sustainable approach. We support adaptive management and best professional judgement based on scientific reasoning and good quality data. If you have any questions, please feel free to contact us.	None	DWQ is committed to working with Provo City as well as all other stakeholders interested in water quality issues in Utah Lake. We look forward to a productive partnership moving forward.

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I	307	1	Chapter 1 page 13 (Chapter 2 page 58) narrative lists 137 lakes and reservoirs in the state. On the next page the sum of the number of Lakes is 142. Counting the number of lakes in Chapter 4 resulted 145 lakes and reservoirs. The document should be consistent. Why isn't the Great Salt Lake identified as a lake or reservoir? If it is a lake or a reservoir it would bring the count to 146.	Text clarification	The 137 is referring to previously identified freshwater "priority lakes". These lakes receive consistent, programmatic monitoring, but assessments for the IR are not necessarily restricted to only these lakes. The number of lake AUs assessed in the IR can change depending on data availability and AU definitions. Language clarifying this issue has been added to chapter one. The 142 AU count in chapter one, figure 4, includes the four Great Salt Lake AUs and both Utah Lake AUs. Clarification regarding the inclusion of Great Salt Lake AUs has been added to the figure caption. Removing the four Great Salt Lake AUs and merging the two Utah Lake AUs in this figure would result in 137 lakes, however to avoid confusion the reference 137 lakes has been changed to "all" lakes on page 13. The table in chapter four also includes all four Great Salt Lake AUs and both Utah Lake AUs. The chapter 4 table in the draft IR also included an additional three waterbodies (small, community swimming or fishing ponds) that were assessed only for E. Coli and for which AUs have not yet been defined, resulting in a total of 145 assessments in the draft IR. Assessments for these undefined AUs have been removed from the final IR chapter 4 table for clarity.
I	308	1	Chapter 1 page 14 Figure 4 sum of streams count is 769 yet the count of streams in Chapter 3 is 767. Which two streams are missing?	Corrected error.	DWQ will recalculate AU counts and correct this error in the final draft.
I	309	2	What is Table 13 mentioned in Chapter 2 page 90?	Edits made to Chapter 2	The reference has been changed to Table 12.
I	310	4	Chapter 4 page 11 of 16 lists Assessment Unit ID UT-L-14060004-004_00 Lake Canyon Lake, Impaired Parameter arsenic, Dissolved list the IR cycle first listed as "2106". Most likely this should be "2016".	Edits made to Chapter 4	The recommended edit has been made to the document.
I	311	5	Chapter 5 Table 1. "WHO recommended thresholds of human health risk for cyanobacteria, microcystin-LR and chlorophyll a" should replace Chapter 2 Table 10. "World Health Organization thresholds of human health risk associated with potential exposure to cyanotoxins" because it is more complete.	None	The comment does not provide a specific rationale for why the suggested change would be more accurate or improve clarity of the table, so no changes were made. DWQ considers the current table to be an accurate description of these thresholds.
I	312	5	The conceptual diagram (Figure 1. Chapter 5) should utilize all three characteristics of a HAB (speciation, cyanobacteria cell counts, and cyanotoxins,) to claim it really is a harmful algal bloom. Otherwise it is just an algal bloom, a plant, and has no health risk to the public. An example is green algal blooms which have not been found to be toxic to date. Add algae speciation as a primary indicator. Chlorphyll-a concentration can continue to be a supplemental indicator.	None	Please see comment response Appendix A, sections 2, 3, and 6, for responses to this comment.
I	313	2	<u>REFERENCES</u> Chapter 2 page 37 references Ostermiller et al. 2014 and points to the UDWQ's website for updates on this document. I went to the website and found several references to Ostermiller. Please be specific to this reference. Chapter 5 page 21 references Bolland 1974 but has no reference in the literature cited. I was able to obtain the reference from Mr. Vander Laan. The reference should be included in the Literature cited.	Edits to webpage/document	The recommended edit has been made to the document.
I	314	1, 3	<u>Stream Mileage</u>: Stream Mileage Calculation is suspect if two streams are not listed in Chapter 3 in the summary Chapter 1 page 14. The same could be said of the lake and reservoirs acres.	Stream miles / acreage recalculated for final	This comment does not specify which 2 streams are not listed in Chapter 3. The AU counts for each assessment category are shown in Chapter 1, Figure 4 and sum to 769 total AUs. The comment asserts there are 767 AUs listed in Chapter 3 but it is not known how that count was obtained. The worksheet tab "Draft2016_UTAssessmentSummaries" in the file chapter-3-all-river-and-stream-asssessments-draft2016ir-v3.xlsx shows 750 river AUs and 19 waterbodies described as undefined AUs. Added together, there are 769 in the summary tab. It is not known how the comment provider arrived at the 767 streams. Due to public comments and reviews of 2016 assessments, DWQ staff are currently re-evaluating the Integrated Report summary information.
I	315	2	<u>Biological Assessment</u>: The introduction of the empirical model for Biological Assessments compared to the historically used chemistry and associated standards protective of aquatic organisms needs additional time for comment. The River Invertebrate Prediction and Classification System (RIVPACS) and the observed over the expected (O/E) looks like a clever and useful tool. However, my conversation with other experts express concern about listing Assessment Unit's (AU) as impaired using only this screening technique. The sample size listed in Table 9 page 57 seems	None	Please reach out to our Biological Assessment Program Coordinator, Ben Holcomb, to schedule a time to discuss our methodology.

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			like a very low threshold, it barely meets the Student T statistical criteria. I request additional time to learn of this Biological Assessment. A discussion would be helpful with UDWQ and others to adequately vet this new technique.		
I	316	2	Field Method Overview: The "Surface samples are collected from a depth of 0.5 meter." This portion of this section is in conflict with the "Standard Operating Procedure for Collection of Phytoplankton Samples During Harmful Algal Blooms" (SOP Revision 2, August 3, 2015). The SOP surface grab sample in part states "tilting the bottle parallel to the water surface with the goal to capturing only the top 1-2 inches of the surrounding surface water/scum". Similar conflicts exist with the composite sample at two times the depth of the Secchi disk reading listed in the 2016 IR and the SOP sampling at elbow-depth.	None	The samples collected at 0.5 meter depth are for water chemistry surface samples. The depth integrated phytoplankton samples taken as a composite of two times the Secchi depth to the surface are used for aquatic life use assessments under Tier II assessment methods. Samples collected for HAB recreational use assessment follow the HAB SOP which includes sampling methods for both depth integrated samples and surface scum samples that are consistent with WHO HAB guidance. Please also see the response to HAB assessment methods comments section 7 for more information.
I	317	2	Harmful Algal Blooms (HAB) Defined: The World Health Organization (WHO) uses speciation, cell count and toxicity to determine HAB. ***In most cases, the identification of an algal or cyanobacterial species is not sufficient to establish whether or not it is toxic, because a number of strains with different toxicity may belong to the same species. As a consequence, in order to ascertain whether the identified species includes toxic strains, there is a need to characterize the toxicity.*** The World Health Organization used Microcystis species and the toxin microcystins to develop their guidelines. (WHO 1998) Microcystins is responsible for most incidents of toxicity in most countries. Due to the significant cost for toxin testing, the cell count is an inexpensive alternative to toxin testing. The UDWQ has recently obtained a method that uses test strips to screen the toxins Anatoxin-a, Cylindosperm-opsin, and Microcystin at 10 µg/L. This is a great technology development; this indicator method should be vetted against other methods.	None	DWQ agrees that the toxin test strips may provide a significant improvement in the ability to rapidly detect potential toxins and that appropriate usage of this tool will require continued validation against other HAB monitoring and assessment methods. Also, please see comment response Appendix A, sections 2 and 3, for additional information relevant to your comment.
I	318	2	HAB Sampling: The sampling of HAB in the UDWQ's standard operating procedure (SOP) seems to selectively sample the source. The whole Utah Lake is not being sampled. Selective sampling screening includes noticing evidence of potential bloom or where potential exposure is greatest such as shorelines, especially in areas that are frequented by recreationists (SOP Revision 2, August 3, 2015). This is a good thing as it gives the public the best information available. It is noted that Oregon had about 15 or more recreational health advisories (from cell count only data) each year which was causing undue strain on the recreational use of their water bodies. The Oregon Health Authority (OHA) now uses toxicity to determined public risk because cell count only data caused undue economic burden on water recreation-related tourism. The Oregon recreational health advisories are currently about 9 each year based on toxic data. Their paper does not mention whether it was the water column or scum that they sampled, however, in a personal conversation with the author (Farrer 2015) he confirmed the testing of the scum to best protect the public. The World Health Organization provided a nice visual summary of algal bloom concentration in Figure 8.1 (WHO 2003). It is included here to show the way samples could be collected to best protect the public as well as showing why the differences exist in a large water body, such as Utah Lake. For example, initial algae cell count in a water body shows the cell count at 100,000 in about 4 meters of water resulting in moderate risk. Algae then floats, concentrating by a factor of 100 at the surface (4 cm or 1.6 inch) resulting in high risk. Then the wind blows the algae concentrating it by a total factor of 1,000 on the shore resulting in a very high risk. It would be of interest to know the approximate size of the accumulated mat on the shoreline. The samplers could also take note of the shoreline mat size. While looking into sampling, I noted that the UDWQ did not have a sampling protocol until August 3, 2015. This gives rise to the question what procedure was followed to sample 2014 data collected in Chapter 5 of the 2016 Integrated Report. Pictures in Chapter 5 clearly show the sampler taking samples without gloves and skimming off the surface. It is also noted that the note from the Microbiologist reporting data for five samples taken 10/22/14 had a comment: *I'm very curious to see what values the other lab is obtaining. If they are significantly higher, we may need to re-examine our protocol and sonication process*. I don't suspect lab significant error. There is a need for additional	None	Please see comment response Appendix A, sections 7 and 8, for responses to this comment. Also, thank you for identifying the Farrer 2015 paper. It provides a well thought out review of several of the pros and cons of cell count versus toxin based monitoring, assessment, and health warnings. For reasons described in comment response Appendix A, sections 2 and 3, DWQ has concluded that cyanobacteria cell counts are a scientifically defensible method for HAB based recreational use assessments. However, DWQ also agrees that cyanotoxin monitoring is an important component of both use assessments and health advisories and continues to expand our ability to monitor toxin concentrations. Finally, regarding the lab manager's comment about result comparisons, Utah Lake cyanotoxin samples from 2014 were sent to two separate labs that employ different methods for preparing samples and measuring cyanotoxins. The sample with the highest recorded microcystin concentration identified in the IR was analyzed by two independent laboratories with two different methods. This sample exceeded the maximum quantification limit for microcystin of one laboratory, demonstrating that this sample had concentrations at least as high as 284 ug/L. The second lab was able to quantify this concentration as 730 ug/L.

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			technical and financial support. The HAB's should be reviewed more to determine the best sampling, testing and public notification methods. (*compiler's note: figures not copied to this template*)		
I	319	2	HAB Trigger: The Utah Lake algal bloom starting July 14, 2016 triggered the UDWQ's decision making guide resulting in the local Health Department sufficiently alerting the public of the Harmful Algal Blooms. Nearly all I talk to now think Utah Lake is toxic. The narrative and explanation in Chapter 2, Chapter 5, and the "Utah Guidance for Local Health Departments Harmful Algal Blooms and Human Health" have set a very conservative approach. I think the risk level adopted by UDWQ is unwarranted using only cell count. UDWQ seems to understand the importance of toxicity when they state in Chapter 2 page 60 of the 2016 IR "risk when exposed to algal toxins through skin contact, inhalation, or ingestion". From the papers I have read the recreational health risk is more like an allergy (WHO 2003, WHO 1998, Farrer 2015, Cronberg 1999, Hudnell 2005). The major risk is through ingestion, not skin contact or inhalation. The toxins are water soluble and do not penetrate the skin (WHO 1998). The UDWQ is putting additional caution on top of the 1000 safety factor already accounted for by the World Health Organization for Microcystin in drinking water and a 20,000 safety factor for recreational use. Cyanobacteria produce compounds in their cell wall when exposed to sensitive or allergic individuals can cause skin rashes (Farrer 2015). Even the World Health Organization describes it "Bathing suits and particularly wet suits tend to aggravate such effects by accumulating cyanobacterial material and enhancing disruption of cells and liberation of cell content. It is probable that these symptoms are not due to recognized cyanotoxins but rather to currently largely unidentified substances." (WHO 2003). The reported instances of illnesses are few, but, because they are difficult to diagnose, such illnesses may in fact be more common than has been reported (WHO 1998). No human deaths have been documented, to date, due to cyanobacterial (WHO 1998). However, I did find a paper that reported 60 human deaths when dialysis water was contaminated with Microcystin-LR (Cronberg 1999). Animal deaths have been documented, including two dog deaths during the Oregons six year study (Farrer 2015). It is noted that the dog deaths at Utah Lake Lindon Harbor listed in Chapter 5 of the 2016 Integrated Report died from a heart attack and a tumor. They did not die because of cyanobacteria or cyanotoxins (Veterinarian report). It has been my experience in the laboratory that living organisms can have an accuracy within one order of magnitude. There are different kinds of variables to account for this uncertainty, error, deviation, or safety factor (however named). For algal blooms, there is interspecies variability, sampling, and laboratory limitations such as analyst and dilutions. Counting one cell could as well be ten. This continues to be the case for 10 to 100, 100 to 1,000 etc. For example cell count for one sample could be 300 another sample from the same location same time could be 700. This is natural random variation in the distribution of the live organism and not the laboratory performance. The lab typically performs quality control to account for this uncertainty. For example, since live cell count distributions are not necessarily symmetrical and rarely fit a normal (bell shape) distribution curve, a log-normal distribution curve may be used to determine precision (Standard Methods 22nd ed.) Escherichia coli (E. coli) is a live organism. E. coli samples use geometric means instead of averages to account for the distribution variations. E. coli recreation assessment is described in detail (Chapter 2 page 39 to page 44). HAB's could be handled in a similar manner after a healthy public discussion. For example, testing during the recreation season from May 1 through October 31. This should be done with or without algal blooms present. It has been noted that cyanotoxins can be present even without algal blooms (Coronberg 1999). The change from cell count to toxins would be needed. The strip test would be a good indicator with confirmation by other quantitative means. I don't know if using this criteria would list Utah Lake as being impaired but it seems to be a reasonable approach. It looks like the World Health Organization has also taken this into account by putting a 1000 safety factor (uncertainty) for drinking water, accounting for 100 for intra- and interspecies variation and 10	None	Please see comment response Appendix A, sections 1-4, for responses to this comment.

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			for limitations in the database (WHO 1998). Then WHO added an additional 20 safety factor for recreational use (Chapter 5 Table 1). The end result is a 20,000 recreation safety factor mentioned earlier. The Water Quality Health Advisory Panel probably needs to meet again and discuss some of the thoughts mentioned above. My personal communication with one of the committee members (Theron Miller) said he missed the importance of the "Toxic" part of the HAB equation. Taking the above mentioned thoughts would minimize false closing of the lake when toxins are not present. This economic/public health issue has been address before in Oregon (Farrer 2015).		
G	320.1	2	HAB Nutrients: I have heard the different opinions regarding the algal blooms. On one hand Dr. Lavere Merritt (retired BYU professor) has stated that there is enough phosphorus in the natural environment to feed the algal blooms. Alternatively, UDWQ say that Utah Lake needs to limit its nutrients initiating the Technology-Based Limits limiting total phosphorus to less than 1.0 mg/L and total inorganic nitrogen to less than 10 by 2020 and 2025 respectively.	None	The issues raised here fall outside the scope of the IR in a couple of respects. First, while DWQ sometimes lists the cause of impairments, particularly in the case where a numeric criterion has been violated and the pollutant of concern is readily identifiable, this is not the case with the HAB impairment in Utah Lake. DWQ is conducting a collaborative research effort in Utah Lake that will identify, among other things, the role of macronutrients (e.g., nitrogen and phosphorus) in determining the magnitude, duration and frequency of HABs in Utah Lake, and to the extent that nutrients contribute to HABs, the importance of internal nutrient cycling within the lake. While questions such as these are important to address, their answers do not change the fact that HABs have affected recreation on Utah Lake, which DWQ interprets to be a violation of its recreational uses. Second, the technology-based phosphorous effluent limit is similarly unrelated to the Utah Lake HAB impairment decision. The technology-based limits, like all technology-based limits are not based on the water quality required to maintain a designated use. Instead these limits are intended to provide a "floor" for pollutant discharges based on "the best available technology economically available…, which will result in reasonable progress toward the national goals of eliminating the discharge of all pollutants" (33 USC §1311(b)(2)(A)). One of the principle reasons for the technology-based effluent limits passed by Utah's Water Quality Board is to avoid ongoing accumulation of phosphorus while investigations are conducted to determine if additional nutrient limits are necessary to protect downstream uses. This is important because Utah's population is rapidly growing and commensurate phosphorus increases can be expected unless limits are put in place due to the persistent of phosphorus in the environment. The technology-based nutrient effluent limits passed by Utah's Water Quality Board are for phosphorus, not nitrogen (UAC R317-2-3.3). While DWQ originally proposed a nitrogen limit of 10 mg/L to be implemented by 2025, this was replaced with voluntary optimization of plant operations to minimize total inorganic nitrogen through operational changes, a capital construction project, or both (UAC R317-1-3.3(D)).
G	320.2	2	It seems logical to me that if you feed the algae it will grow. I personally have seen this with the Dunaliella algae in the Great Salt Lake. We were harvesting the Dunaliella for its beta carotene content. It was important to have a food source (nutrients: phosphorus and nitrogen). Without the food our harvest would be low. It is also noted that the brine shrimp (sea monkeys) in the Great Salt Lake prefer to eat the Dunaliella as a food source too. Great Salt Lake Brine Shrimp Cooperative, Inc. has over 60% of the world's supply of brine shrimp. Brine Shrimp is used as fish food. I am from the understanding that the nutrients are helpful for providing life downstream. If there is no basic food (nutrients: nitrogen & phosphate), then no phytoplankton (algae), then no zooplankton, then no fish or birds. But we will have clean water to recreate and drink. Utah is a wonderful place for birds to stop and eat, weather migrating or not, from the rich producing wetlands full of food from nutrients. Excess nutrients produces excess algae produces algal blooms. The adaptive approach adopted by the State of Utah (P mg/L < 1 and TIN < 10 mg/L by 2025) is an attempt to control algae blooms by controlling excess nutrients.	None	The specific role of nitrogen and phosphorus and appropriate limits in controlling algal blooms is outside of the scope of this IR because this requires subsequent investigations that are conducted through standards development and/or TMDL processes, which are governed under entirely different rules and regulations (33 USC §1313(d)(1)(C); 40 CFR §1313(d)(1)(C)). While it is true that nutrients are necessary to support all life, it is also true that excessive nutrients can have deleterious consequences throughout food webs as well (Ghadoviani et al. 2003, Shumway et al. 2003, Gobler et al. 2008, Havens 2008, Lehman et al. 2010).

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G	320.3	2	Sweden has a lake (Ringjon) similar to Utah Lake. They saw an increase in algal blooms in 1940 from increased nutrient supply and went to task to eliminate it. They decrease 30 tons of phosphorus loading per year to 10 tons per year (1980). They removed cyprinid fish (1988 to 1992) and saw increased water transparency. Then in 1994 and 1995 the blue-green algal blooms still appeared with toxin production at its highest in July. Their conclusion "It appears that there is no relation between the trophic state of the lake and algal toxicity". (Cronberg 1999) Is this because there is enough natural occurring phosphorus in atmospheric deposition as seen in other world locations? There is supporting information from the atmospheric deposition affecting the annual percentage of a lake's total phosphorus load. The range is from 8% Lake Biwa, Japan to 75% in the Rainy River Catchment, Canada and USA (IJC 2014). This is significant if Utah Lake is similar to the lakes reference in this document. If it is, then the algal blooms will continue even if the point sources remove all the nutrients from their discharge.	None	Thank you for the comment and the literature reference, but the determination of appropriate restoration goals and the relative importance of atmospheric deposition relative to other sources is evaluated through the TMDL process and is therefore outside of the scope of the IR. The Cronberg (1999) study is interesting and highlights a couple of things worthy of clarification. First, while several commenters have suggested that DWQ aims to eliminate HABs in Utah Lake, the agency acknowledges that this may not be possible, or may take years or even decades to achieve. However, even if the Utah Lake Water Quality Study finds such complications, it would not eliminate DWQ's responsibility to implement water quality improvements that would decrease the frequency or magnitude of these blooms, or alternatively preventing them from getting worse as Utah's population continues to grow. A second point that can be gleaned from this paper is the temporal variability of cyanotoxin production. While conditions causing cyanobacteria to produce toxins remains an active area of research, there is increasing evidence that toxin production is related to their growth rates, which is related directly or indirectly to nitrogen and phosphorus concentrations (Davis et al. 2010, Nellan et al. 2013, Burford et al. 2014).
I	320.4	2	Another concern is an unintended consequences. If the nitrogen is removed as part of the nutrient removal program the blue-green (toxin producing) algae will dominate green algae because most blue-green algae can fix nitrogen from the air and green algae can't.	None	The relative role of nitrogen and phosphorus in determining the magnitude, duration or frequency of HABs is part of the TMDL process and is outside the scope of this IR. While it is true that cyanobacteria can be favored over other phytoplankton when concentrations of nitrogen are high relative to phosphorus, this is not always the case (Downing et al. 2001, Paerl 2008, Lewis et al. 2011, Kolzau et al. 2014, Xu et al. 2014). Moreover, a shift to these potentially favorable conditions would only occur if nitrogen concentrations were reduced without a commensurate decrease in phosphorus and the amount of phosphorus reductions that are needed to control cyanobacteria can be dependent of the amount of available N in a lake ecosystem (Lewis et al. 2008, Paerl et al. 2016).
I	322	4	Provo Bay Wetland: Provo Bay is more identified as a wetland. It is inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Provo Bay water level 2 out of the last 17 years is so low (1 to 5 inches) no recreation is going on. See Theron Millers Utah Lake and Tributaries Provo Bay Listing comments.	None	Please see comment response Appendix A, section 11, for a response to this comment. In addition, listings on Provo Bay are for aquatic life impairments, not recreational use impairments.
I	323	2	Carlson's Trophic State Index (TSI): The use of the Carlson TSI is one tool used to provide information as to the state of an AU. Dr. Carlson has stated in his own paper the sample size was too small to illustrate the total variation in the background attenuation coefficient (Carlson 1980). He also said *it is apparently impossible to obtain an accurate biomass-based classification using either transparency or total phosphorus in turbid lakes and reservoirs* (Carlson 1991). His discussion to try to provide another tool to classify AU's has merit. UDWQ should collect more data as suggested by Dr. Carlson. Impairment should not be listed by TSI alone.	None	A chlorophyll-a based TSI is part of DWQ's Tier II assessment methods which are used as supporting information for Tier I assessment decisions or to identify lakes with potential trophic status related impairments for which insufficient data currently exist to fully assess. None of the lakes on the 303(d) list have been identified as not supporting designated uses based on Tier II methods or TSI values alone. In addition, for precisely the issues identified in this comment, (e.g. site-specific variation in algal responses to nutrients or light attenuation by non-algal turbidity), the Tier II assessment methods rely exclusively on a chlorophyll-a based TSI value. Secchi depth or total phosphorus based TSI values are not currently used in the assessment process. However, they are calculated for all lakes and reservoirs and sometimes compared to chlorophyll-a TSI values as an interpretative tool as described in Chapter 2 under the heading, "Carlson's Trophic State Index". It is unclear what additional data the commenter suggests be collected.
I	324	5	<u>2016 INTEGRATED REPORT CHAPTER 5 COMMENTS</u> I think the HAB indicators for recreational use should be revisited as mentioned previously in my comments.	None	Please see comment response Appendix A, sections 1, 2, 3, and 6, for responses to this comment.
I	325	5	Recreational use is expected to increase as mentioned by UDWQ but Figure 2 clearly shows a 40% reduction in 2014 and 2015. This could be due low water levels and possibly to the UDWQ's guidance document that puts undue fear about Utah Lake. Toxins should be the driving indicator as previously mentioned. All the Tables and Figures not exceeding the World Health Organizations recommended 20 mg/L are undue warnings/cautions. Again sampling should continue as previously mentioned. Take note that others have noticed toxins without visible algae. It is again recommended to test the recreation waters for toxins during the recreational months.	None	Please see comment response Appendix A, sections 1-3, for responses to this comment.
I	326	5	Cyanotoxins in Utah Lake outlet should be tested on a regular basis. As mentioned previously toxins can be present with and without algal blooms. Data should be collected year round to have sufficient information to support the Jordan River 1C drinking water classification. It is noted that	None	UDWQ is developing a harmful algal bloom monitoring network that will ultimately evaluate cyanobacteria and cyanotoxins at the Utah Lake outlet to the Jordan River.

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			Walt Baker (UDWQ Director) in the September 6, 2016 Provo City Council work session noted Jordan River as a drinking water source and that Utah Lake would not be held to the 1C standard.		
I	327	5	The Utah lake dog deaths section show the blue-green algae fear/biases of UDWQ. For example the dead dogs section says two dog deaths were potentially linked to algal toxins during the October 2014 HAB events in Utah Lake. The Veterinary report ruled out blue green algae toxins as the cause of death which is later recognized. UDWQ does not accept the data that blue-green algae is not responsible for the dog death. This is an example where observation does not prove cause.	None	Please see comment response Appendix A, section 4, for a response to this comment.
I	328	5	The explanation of not needing two monitoring cycles are no longer required should not apply to Utah Lake. The increased awareness and the budget increase should allow for data collection to properly list Utah Lake.	None	DWQ submits an updated IR on a two year cycle. However, the IR is based on six full years of data. Although some lakes may only be sampled once every six years, many high priority lakes including Utah Lake, are sampled much more frequently and at multiple locations. DWQ is obligated to assess all readily available data in the IR, including the HAB related data collected in 2014. These data identify an impairment of the recreational use. DWQ continues to collect HAB related data in Utah Lake, including during the major bloom events of 2016, to support the HAB assessment process. Although not included in the 2016 assessment, data collected during the summer of 2016 further confirm the appropriateness of the recreational use impairment decision in the 2016 IR.
I	329	NA	Other Chapters not reviewed due to time constraints.	None	No response.
I	330	NA	CONCLUSION It is noted that UDWQ sees the need for additional Utah Lake research with the request from the Utah Water Quality Board for $1,000,000 which was granted. The deficiencies mentioned in my comments and recognition of UDWQ need for additional Utah Lake research the listing of Utah Lake impaired for HAB and Provo Bay should be postponed for at least another Integrated Report cycle. It is my hope that Provo City can work with UDWQ in a cordial way that will result in a healthy ecology and clean water.	None	The DWQ is required to assess the support of all beneficial uses if the sufficient data exists to do so. While the Utah Lake Study will continue to fill known data gaps and ultimately develop numeric nutrient criteria for Utah Lake and Provo Bay, the DWQ is obligated to independently assess water quality standards if sufficient data exists to do so.
J	331	2	Salt Lake City Department of Public Utilities (SLCDPU) Comments SLCDPU encourages the DWQ to continue to conduct research regarding HABs in Utah Lake, Farmington Bay, and other Waters of the State. The assessment methods used by DWQ are based on World Health Organization (WHO) criteria; cell counts. As evidenced by the 2016 Utah Lake HAB, cell counts as well as toxin data should be used to assess the severity of and to inform public health decisions regarding HABs. SLCDPU will continue to be an active stakeholder regarding HABs along the Wasatch Front and will assist the DWQ as possible.	None	Thank you for your comments and for SLCDPU's continued collaboration on water quality issues including HABs. Please see comment response Appendix A, sections 1-3, for responses to comments regarding the use of cell counts and toxins in HAB assessment.
J	332	3	SLCDPU encourages the DWQ to review data to ensure that a representative number of samples, collected within a representative time period, have been evaluated prior to assigning an impairment or TMDL. For example, City Creek and tributaries from the filtration plant to the headwaters is listed as impaired for dissolved cadmium. SLCDPU would like to review the data regarding this listing to ensure an adequate number of samples were collected and evaluated and that an impairment exists. SLCDPU would also consider assisting with additional sampling as possible.	None	The individual data files that comprised the assessment of rivers and streams can be found on the DWQ website (http://deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/rsdatafiles2016.htm)
K	333	NA	The Utah Department of Agriculture and Food (UDAF) appreciates the opportunity to review the 2016 Integrated Report. We recognize the tremendous effort it takes to collect and analyze the data necessary to create this report. UDAF understands the vital importance of water to the agriculture industry. UDAF has a shared interest with the Division of Water Quality (DWQ) to protect our water resources. With that shared interest, UDAF has a few concerns with the Integrated Report.	None	DWQ has provided responses to each of the concerns raised in your letter in subsequent comment responses.
K	334	2	In particular, UDAF is concerned with how the report deals with the issue of sediment. DWQ removed numeric criteria for sediment in the early 2000's because it was too subjective, depending on the water body and what time of year the monitoring was done. Yet, even with the removal of the numeric criteria, DWQ continues to list water bodies as impaired for sediment.	Out of Scope	DWQ agrees with UDAF on the challenges to properly assess the impact of sediment on Utah's waters. For that reason, DWQ removed the sediment criteria from the water quality standards over a decade ago. Although DWQ still monitors waters for Total Suspended Sediments (TSS) no additional new listings have been added for that parameter for some time. The impairments that exist in the IR originated from historic

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			UDAF recognized that sediment is a concern. Sediment can transport nutrients, heavy metals, E.coli and other pollutants. However, there remains the question of how DWQ will use the narrative standard to list a water body. What is the process for developing a narrative standard TMDL specifically for sediment? What monitoring methods will be used? What will the monitoring plan for sediment require? These are unanswered questions that concern UDAF when discussing the implantation of TMDL for sediment based on narrative standard.		listings which predate the removal of the sediment criteria from the standards. DWQ has yet to develop a method for interpreting the narrative water quality standards for sediment. If addressed, this would be accomplished through the revision of the assessment methods prior to the 2018 IR. We encourage you to submit comments and recommendations on the interpretation of narrative standards for sediment at that time.
K	335	2	UDAF continues to be concerned with listing waters as impaired do to E.coli. We have noticed an increase in listings relating E.coli. As UDAF has stated in previous comments, the state would be better served if water bodies with high E.coli tests could first be reviewed by stakeholders before being place on the listing cycle. Engagement with communities could result in best management practices being developed and implemented without going through the costly TMDL process. This process would increase stakeholder participation while at the same time providing a savings to state resources.	None	This topic is addressed in Chapter 1 of the Integrated Report under the headings Clean Water Act 305(b) Reporting Requirements, and the Clean Water Act 303(d) Reporting Requirements which state that DWQ is required to monitor the water quality of surface waters and report on the status of these waters in a biennial report that is submitted to EPA. DWQ agrees that some listings are best addressed through alternative mechanisms rather than through TMDL development. DWQ has identified a group of listings that will be addressed through alternative mechanisms (straight to implementation, site specific standards, etc.) in the 303(d) Vision submitted to EPA in 2016.
K	336		UDAF continues to be concerned with the quality of the data being used for listing purposes. While we appreciate the public's participation in provided data related to water quality, all data provided to DWQ should be reviewed and verified by DWQ for accuracy. This is especially true when data is being used to determine the listing of a water body. No water body should be listed without data being verified independently by DWQ.	None	As part of DWQ's Integrated Reporting process, and described in both the Draft Assessment Methodology and the IR chapter on 303(d) Assessment Methods (chapter 2 in 2016 IR) documents, data validation and verification of internal and external data are key elements of Utah's water quality assessment. Conformance of all data packages to data quality requirements are explicitly described in data type-specific Data Quality Matrices located on DWQ's IR website (http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/callfordata.htm) and adherence to these criteria is verified by use of the Acceptance Form for submitted data.
K	337	NA	Again, UDAF appreciates all of the effort that has been expended in the development of this report. UDAF looks forward to continuing our partnership to protect our water resources. We hope to continue offering solutions that will help improve water quality will at the same time saving valuable state resources.	None	DWQ looks forward to partnering with UDAF on future assessment and water quality improvements.
L	338	7	Page 4, last sentence 2nd paragraph - "assessment" is misspelled	Edits made to Chapter 7	The recommended edit has been made to the document.
L	339	7	Page 5, 1st sentence under Dissolved Oxygen header - "opportunity" is misspelled	Edits made to Chapter 7	The recommended edit has been made to the document.
L	340	7	Page 6, 3rd sentence under Quality Assurance: Screening Raw DO Data header - remove the word "consiare"	Edits made to Chapter 7	The recommended edit has been made to the document.
L	341	7	Page 12, 1st sentence, 2nd paragraph under 3300 SOUTH MONITORING LOCATION header - the value of 4.09 mg-DO/L/day should actually be 10-12 mg based on Figure 5.	Edits made to Chapter 7	The referenced sentence should have said that the average diel variation at this site was 4.09 mg/L. The text has been changed to make this clearer to the reader.
L	342	7	Page 25, 3rd sentence under DRAFT SUPPLEMENTAL SUMMARY STATISTICS header - replace the word "if" with "of" as follows "... to identify sites where daily variation is of potential concern."	Edits made to Chapter 7	The recommended edit has been made to the document.
M	343	3	The Central Utah Water Conservancy District (CUWCD) would like to comment on the Draft 2016 Integrated Report, recently released by the Division of Water Quality (UDWQ). Our comments specifically concern the listing of Sixth Water Creek and tributaries except Fifth Water and First Water Creeks and tributaries from confluence with Diamond Fork Creek to headwaters as being impaired for dissolved selenium. The selenium that is present in Sixth Water Creek is naturally occurring, the source being ground water that seeps into the Strawberry Tunnel (tunnel make) and flows through the Strawberry Tunnel Outlet into Sixth Water Creek. The flow of tunnel make is approximately 5-7 cubic feet per second (cfs). Strawberry Reservoir water deliveries made through the Strawberry Tunnel typically provide an additional 20-25 cfs, and dilute the naturally-occurring selenium to levels that do not exceed the water quality standard. The sample from Strawberry Tunnel Outlet that was collected on October 6, 2009 was collected during a	Change in Assessment Category	DWQ has reflected the outlined circumstances in its assessment and removed data just below the Strawberry Tunnel for its assessment of Sixth Water Creek. The resulting assessment decision for the AU is now Category 3 (insufficient data to make an assessment).

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			temporary tunnel shut down and consisted solely of tunnel make. This flow condition is rare and does not represent normal operating conditions. Flows are delivered via the Strawberry Tunnel to meet the minimum streamflows required under the Central Utah Completion Act (CUPCA, PL 102-575, as amended). The tunnel is only shut down for brief timeframes (eg., 2 days) for maintenance per a 5-7 year period, as committed to in the 1999 Diamond Fork System Final Supplement to the Final Environmental Impact Statement. A plot of flow releases through the Strawberry Tunnel for the 2008-2014 assessment period is shown in Figure 1. As evident in the plot, it is very rare for flow releases through the tunnel to drop below 18 cfs. A percentile analysis indicates that flow exceeds 18 cfs more than 99% of the time. Therefore, we believe the October 6, 2009 sample should be considered non-representative and an "extreme event" under the UDWQ's 303(d) assessment methods. Other than the October 6, 2009 sample, there is only one exceedance of the chronic selenium standard of 4.6 ug/L in the dataset from May 2008 to November 2014. Because of these considerations, CUWCD believes that Sixth Water Creek should not be included on the 303(d) list as being impaired for dissolved selenium.CUWCD, in cooperation with the Utah Reclamation Mitigation and Conservation Commission, Utah State University, and many other stakeholders, is currently conducting an in-stream flow study for the Diamond Fork Creek watershed. As part of this study, dissolved selenium is being monitored at Strawberry Tunnel Outlet and at two additional downstream sites on Sixth Water Creek. This data will help ensure that Sixth Water Creek will continue to meet its designated beneficial uses. For further information and data from Sixth Water Creek please contact Michael Rau. miker@cuwcd.com, 801-221-0192 x210.		
M	348	4	The Central Utah Water Conservancy District (CUWCD) would like to comment on the Draft 2016 Integrated Report, recently released by the Division of Water Quality (UDWQ). Our comments specifically concern the listing of Jordanelle Reservoir as being impaired for pH. We believe that the low pH values that have been recorded as field data in Jordanelle Reservoir are not accurate. The water quality sonde that is used to measure pH seems to read artificially low at times, especially at significant water depth. Though we do not understand the cause of the inaccuracy, when the field data is compared with corresponding lab values from the same samples, there is a clear discrepancy. See Table 1 for a comparison of such data from 2013. CUWCD has investigated this issue further by taking pH readings at various depths in Jordanelle Reservoir, and subsequently taking readings from samples from the same depths, immediately after they were collected and brought to the surface. The pH values that were measured in situ were progressively lower as depth increased, with the lowest measured value being 4.98. All samples that were brought to the surface measured between 7.3 and 7.5. This shows a discrepancy very similar to what we see with the lab data shown in Table 1. Based on the information we have, we believe that Jordanelle Reservoir should not be listed as impaired for pH. We are working with the sonde manufacturer to understand and remedy the issue. We have also implemented additional QA/QC steps so that we can catch and investigate potentially erroneous field data before it is uploaded to the AWQMS database.	None	Due to known differences observed between laboratory and field measured pH values, DWQ's assessment methods rely on in-situ field measured pH for determining use attainment. Field measurements of pH are generally considered more accurate than laboratory measurements due to the degassing and other chemical changes that occur in the process of taking, transporting, and analyzing a water quality sample. These changes can significantly alter pH values. Similarly, samples taken at depth can degas on their way to the surface and result in significant changes in pH, particularly in instances where carbon dioxide is degassed from a sample, pH may increase from acidic to relatively neutral. In addition, the pH exceedances in profiles from Jordanelle Reservoir follow annual and seasonal patterns that would be unlikely to occur with a pH probe failure. For these reasons, DWQ is maintaining the pH listing for Jordanelle Reservoir in the 2016 IR. If further investigation clearly determines these data to be the result of a probe failure, this listing could be removed in a future IR.

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N	349	3	Format of Assessment Summary Pages- The format used for the rivers and streams of starts with the Management Unit that are Not Supporting, Insufficient Data, No Evidence of Impairment, and Supportive is useful but very confusing for the untrained person to glean information from. The regular guy who is checking the condition of his favorite place to fish, for example the Weber River, has to scan through three pages of information to track the various segments of the river. I suggest listing all segments together sequentially for a river or stream then, at the end of that management unit, have a tally of the number falling into each of the categories on the last page for that Management Unit. The proposed format would help individuals and groups see the overall condition of a specific river quickly, if it is too difficult to find the information they want they will give up and you will lose your audience. The written parts of the report appear to be for the public but the Assessment Summary is not user friendly. I know that the basis of the Integrated Report is collecting information and passing it on to the EPA. Overall this is a scientific endeavor to generate a report on the condition of Waters of the State but it is also seen and used by the public and various governmental agencies. Perhaps there is a format that would meet both needs. Maybe there needs to be a non-scientific version for the public.	None	Given that there is an abundance of information summarized in the IR, DWQ decided to place the waters not supporting designated uses first in order in the table with the anticipation that stakeholders and staff are most interested in the assessment of waters not supporting designated uses. In addition, these waters not supporting designated uses comprise the 303(d) list which is a discreet requirement of the CWA and our report to EPA. The report is also searchable by name, so the user can search the document for a specific waterbody and go directly to that section. Given our time restrictions, we are unable to modify the format of the report at this time. However, DWQ strives to improve the content and format of the IR and will take your recommendations into consideration when developing the 2018 IR format.
N	350	3	Use of Overall Score- As I look through the listings of various river and streams I am confused as to the real "health "of a specific water body. The Provo River, Weber River and Sevier Rivers have intermixed listings and it is difficult for me as the "average Joe" to understand what it all means, especially if I am not familiar with that specific waterbody. Perhaps an "overall" scoring system would be beneficial for communicating this information with the public. For example the Weber River is listed as "No Evidence of Impairment" in sections 2 & 4, "Supporting" in sections 9 and 11, "Not Supporting" in sections 1, 3, 6, 7, and 8, and "Insufficient Data" for sections 5, 10, and 12. What does that mean? Perhaps a score of 85 with footnotes about phosphorus and algae blooms in and above Echo Reservoir and temperature, pH, Ecoli and 0/E in the lower reaches. Another example of a very confusing listing is the Sevier River which has listings all over the place could get a score of 60 with footnotes about issues in key locations. The Jordan River might score a 70 with comments about high suspended solids, temperature and Ecoli overall with low DO in the lower reaches during late summer. The Provo River has several segments not listed (see the following comment on section 3 of the Provo River) but might score a 92 with footnotes of where improvements can be made such as low DO and 0/E in section 1 and E coli below Deer Creek Reservoir. In short an overall scoring system could work well in communicating this information to the general public.	None	DWQ is required to place waterbodies into categories defined by DWQ and EPA. These are outlined in Table 1 of Chapter 2. With the exception of having flexibility of creating sub-categories, DWQ is limited and required to report on only the 5 main numeric assessment categories outlined in the table. However, DWQ is exploring the development of a Water Quality Index that would summarize the number of impairments, frequency and magnitude of water quality standard exceedances, and nature of the impairments. Such an index would provide a score similar to that which the commenter has suggested. As we move forward with this effort, we will ensure that the public has an opportunity to comment on the index methodology.
N	351	2	Segment 3 of the Provo River- It does not appear that segment three of the Provo River UT16020203- 003 is included in the Assessment Summary. Information can be found in the Assessment Summary Data Files but not in the Assessment Summary itself.	Edits to Chapter 3	A correction has been made to the Assessment Summary Report in the 305(b) table. Provo River -3 (Provo River UT16020203-003) now appears in the Assessment Summary as Category 3.
N	352	2	Powell Slough Description- The Assessment Unit Description of Powell Slough UT16020202-010 has its location somewhere along the American Fork River from Utah Lake to the Mouth of American Fork Canyon. Powell Slough is the receiving water for Orem City's wastewater treatment plant, roughly 5 miles from where the American Fork River discharges into Utah Lake and Powell Slough itself flows into Utah Lake. I think the description needs to be amended to better describe its location.	Corrections made	In summary, the public comment noted that the description for Powell Slough was inaccurate. The description for Powell Slough (UT16020201-010) in the Draft 2016IR was, indeed, in error because it described American Fork (UT16020201-016) AU. Upon further review, the description for American Fork was missing from the Draft 2016IR. To solve both problems, the erroneous description for Powell Slough was corrected as "Powell Slough state waterfowl management area" and the description for American Fork was added.

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N	353	2	Listing Jordan River Segment 5 as Impaired for Temperature. South Valley WRF is currently working with DWQ to investigate whether segments 5, 6, and 7, are properly designated as a cold water fishery. The beneficial listing as a cold water fishery has a maximum temperature of 20 degree Celsius. Dr Nielsen's from USU completed a temperature study back in 2011 for DWQ which showed that the temperature of the river through summer months averages around 23.S degrees C. Her study included modeling for increasing the shading along the river which demonstrated that shading would not adequately reduce the temperature to keep the river below the maximum limit for the designation. Also in early 2016 DWQ contacted the Division of Fish and Wildlife about whether or not a population of cold water fish existed in this stretch of the Jordan River. The Divisions response was that there were not any cold water fish species in those segments of the river. Additional temperature information is being collected by South Valley WRF and Jordan Basin WWTP to support the summer effluent and river temperatures. The data supports changing the designation from a cold water fishery to a warm water fishery which will negate the current listing for temperature.	Out of Scope	This comment is not within the scope of the IR. Performing and adopting a Use Attainability Analysis for the segments indicated would require a change to water quality standards (UAC R317.2). We encourage you to bring this recommendation to the Water Quality Workgroup during the Triennial Review.
N	354	2	Listing Jordan River Segment 5 as Impaired for Total Dissolved Solids (TDS). The majority of the TDS seen in the Jordan River comes from Utah Lake whose water level is managed by a dam structure on the north end of the Lake. Water entering the Jordan River from Utah Lake is high in TDS and is usually over the irrigation threshold due to evaporation and concentration of solids in the lake. The amount of precipitation and management of the dam greatly affect the lake level and the amount of TDS entering the river. This situation lends itself to a UAA due to the "irreversible condition" which exists as defined in 40 CFR section 131.IO(g) condition 4, which states, "a hydrologic modification which preclude the attainment of use and it is not feasible to restore the water body to its original condition or to operate such a modification in a way that would result in attainment of the use". Again developing a UAA for the Jordan River would remove it from the impaired list.	Out of Scope	This comment is not within the scope of the IR. Performing and adopting a Use Attainability Analysis for the segments indicated would require a change to water quality standards (UAC R317.2). We encourage you to bring this recommendation to the Water Quality Workgroup during the Triennial Review.
N	355	2	Listings where an Analyte Spontaneously Disappears in the Adjacent Downstream Segment- There are at least 20 instances in the summary where actionable levels of either a metal, phosphorus, pH or 0/E "disappears" in the adjacent downstream segment. From reviewing the segment descriptions, it appears that the changes in segments correspond to something along the river such as a diversion structure, bridge, or other physical reference point, location of a damn, or entrance of a tributary. It is understood that conditions can change dramatically in a short distance especially on either sides of a damn or tributary. It is also understood that some metals like zinc and lead are readily scavenged by microorganisms however other metals like selenium, arsenic, aluminum and boron are not readily scavenged and should continue downstream (EPA. 1982. Effluent Guidelines Division, Fate of Priority Pollutants in Publicly Owned Treatment Works - Final Report. Vol. 1. EPA 440/1-82/303. Washington, DC.: U.S. Environmental Protection Agency). As this is not occurring in many listings it raises questions that the segment is listed improperly. These questionable segments would be better represented being assigned a category 3, needs more data. A few examples from the Assessment Summary are listed here and a complete list will be attached; Jordan River section 6 has been listed for selenium while the segments above and below are not listed for this analyte. Jordan River section 8 is listed for arsenic while Utah Lake above and section 7 below are not listed for arsenic. Jordan River section 3 is listed for Phosphorus while 2 and 4 are not. The Escalante River Upper is impaired for 0/E and TDS while the lower Escalante is listed as Supporting. TDS would also be expected to continue downstream from the upper section into the lower section. Kanab Creek section 2 is listed for Boron and Selenium while section 1 is not listed for these parameters. The Sevier River sections 2, 3, 17, 22, and 24 are listed for phosphorus while sections 1, 6, 7, and 20 are not. Sections 8 and 27 are supporting and 14 is listed as No Evidence of Impairment. The rest of the section of the Sevier River 5, 9, 10, 11, 12, 13, 15, 16, 18, 19, 21, 23, and 26, are listed as Insufficient Data. Again Phosphorus impairment intermixed with no phosphorus and/or supporting or no evidence of	Out of Scope	DWQ currently performs its assessment in accordance with its Assessment Methodology which does not take into consideration evaluations of hydrologic modifications or ecosystem processes on pollutant levels. Given that DWQ is required to report on the status of all waters of the state, these investigations would not be feasible within the context of the IR. Without additional studies or data, DWQ will not place waterbodies that are not supporting designated uses in Category 3. Rather, once additional data are collected or studies performed, DWQ will review any proposed listing changes based on a more detailed analysis of additional data and hydrology. Such an analysis could allow DWQ to place the water into Category 4C.

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			impairment. The Sevier River is a good candidate for a UAA due to the physical impairment to the river such as dams and diversion structures as per conditions listed in 40 CFR 131.10, condition #4. The Weber River section 7 is listed for phosphorus while section 6 is not.		
O	356	2	We support and agree with the Division of Water Quality's (DWQ) recognition of the unique character of Great Salt Lake (GSL) and the fact that the hypersaline condition of GSL causes significant differences in nutrient dynamics, uptake, assimilation and other biological responses to nutrients than are observed for fresh water, marine, or even other saline lakes. We further support the Divisions position that 303(d) assessment be deferred for two years with regard to GSL until further scientific information can be collected and evaluated. Submitted by Thomas Bosteels, Great Salt Lake Brine Shrimp Cooperative, Inc.	None	Thank you for your comment.
O	357	2	Opportunity for public comments on assessment methods for GSL: We want to ensure that, as assessment methods are developed for GSL, we be kept informed and notified and that the opportunity be available for public comment before implementation of assessment methods.	None	As with the 2016 IR, assessment methods will continue to be made available for public comment in future IRs. Updates for the IR process, including calls for public comment, are posted to DWQ's website at http://deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/index.htm .
O	358	2	Risk associated with the five (5) distinct subclasses (5A-5E) of GSL: We strongly support that GSL be assigned its own designated use class (Chapter 2 page 72). We further understand that DWQ divides GSL into 5 subclasses (5A-5E) as a result of the embayments and unique characteristics of the sub classes. However, the integrated report fails to emphasize the importance of the interconnections of the various bays of GSL. Treating sub classes of GSL independently of each other is likely to result in severe consequences to the biological integrity of GSL as a whole. We believe that specific assessment methods being developed for GSL need to take into consideration the interconnections of the various bays of GSL and the influences these connections have on biotic responses.	None	DWQ agrees that connections between the various bays of Great Salt Lake are an important consideration for the ecosystem as a whole. However, DWQ is obligated to make use attainment assessments on an assessment unit basis in the IR. These are conducted by assessing readily available data against water quality benchmarks applicable to each assessment unit. Interactions among bays of Great Salt Lake will continue to be important considerations in the development of water quality standards for Great Salt Lake and any additional studies that may result from future use attainment assessments in Great Salt Lake.
P	359	3	Thank you for the opportunity to comment on Utah's Draft 2016 Integrated Report (IR). The detailed presentation on how the assessments were completed and the impairments determined was beneficial. The information provided in the IR will be a useful reference as the Navajo Nation also evaluates whether or not to list the San Juan River and tributaries as impaired.The following comments from the Navajo Nation EPA Water Quality/NPDES Program (NNEPA WQP) focus on the assessment units either adjacent to or on the Navajo Nation: AU UT14080203-007 (Montezuma Creek from San Juan River to Verdure Creek) Beginning at the San Juan River confluence, the first 16.5 miles of Montezuma Creek flows entirely on the Navajo Nation. In addition, the creek crosses on and off the Navajo nation for 2.5 of the next 4.5 miles upstream. Although NNEPA WQP has granted Utah Division of Water Quality (DWQ) permission to sample on the Navajo Nation and use the data collected to make impairment decisions, it has not granted permission to list Navajo Nation waters as impaired. Please remove all reaches of Montezuma Creek that flow through the Navajo Nation from the proposed 303(d) list. NNEPA WQP has sampled Montezuma Creek approximately 4.5 miles upstream from the confluence and is willing to share these data with DWQ upon request to assist in making impairment decisions.	Edits to Chapter 3	DWQ has reflected the recommended changes in the IR by defining the assessed portions of McElmo Creek and tributaries as those segments solely within the jurisdiction of the State of Utah. DWQ will need to pursue a rule change to modify the description of the assessment unit in R317-2. This will be considered during the 2017 Triennial Review.
P	360	3	AU UT14080205-001 (San Juan River from Lake Powell to confluence with Chinle Creek)NNEPA WQP supports DWQ's proposed listing of the San Juan River as impaired for the warm water aquatic life use in this assessment unit (AU). Note that the Navajo Nation boundary is at mid-channel from elevation 3720' upstream to the AU boundary. Please indicate that the impairment listing only applies to that part of the San Juan River that is outside of Navajo Nation jurisdiction. NNEPA WQP has conducted limited monitoring of the San Juan River in this AU just upstream from the bridge at Mexican Hat. These data are available upon request to assist DWQ in making impairment decisions.	Edits to Chapter 3	DWQ has reflected the recommended changes in the IR by defining the assessed portions of San Juan River as the part of the river that is within the jurisdiction of the State of Utah.
P	361	3	AU UT14080201-009 (San Juan River from the confluence with Chinle Creek to the Confluence with Montezuma Creek) NNEPA WQP supports DWQ's proposed listing of the San Juan River as impaired for the warm water aquatic life use in this AU. Note that the Navajo Nation boundary is at mid-channel for the entire length of this AU. Please indicate that the impairment listing only applies to that part of the San Juan River that is outside of Navajo Nation jurisdiction. NNEPA	Edits to Chapter 3	DWQ has reflected the recommended changes in the IR by defining the assessed portions of San Juan River as the part of the river that is within the jurisdiction of the State of Utah.

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			WQP has conducted monitoring of the San Juan River in this AU at the US 191 bridge near Bluff. Monitoring has also occurred just downstream from the Phillips Camp Road bridge in Montezuma Creek, UT. These data are available upon request to assist DWQ in making impairment decisions.		
P	362	3	AU UT14080204-001 (Chinle Creek and tributaries from confluence with San Juan River to headwaters)This entire AU is on the Navajo Nation. Please remove it from the IR.	Edits to Chapter 3	DWQ has reflected the recommended changes in the IR by removing the assessment of Chinle Creek and tributaries from the IR. DWQ will need to pursue a rule change to modify the description of the assessment unit in R317-2. This will be considered during the 2017 Triennial Review.
P	363	3	AU UT14030005-006 (McElmo Creek and tributaries from the confluence with San Juan River to Utah-Colorado state line) McElmo Creek flows entirely on the Navajo Nation within Utah. Most tributaries in Utah are also entirely on the Navajo Nation. Please remove those waterbodies within Navajo Nation jurisdiction from this AU.	Edits to Chapter 3	DWQ has reflected the recommended changes in the IR by defining the assessed portions of McElmo Creek and tributaries as those segments solely within the jurisdiction of the State of Utah. DWQ will need to pursue a rule change to modify the description of the assessment unit in R317-2. This will be considered during the 2017 Triennial Review.
P	364	3	AU UT14080201-005 (Recapture Creek and tributaries from confluence with San Juan River to USFS boundary, except Johnson Creek)There is about a three mile stretch of Recapture Creek where the Navajo Nation boundary is at mid-channel. This begins at the north boundary of Section 36, T39S, R22E, and ends at the north boundary of Section 19, T39S, R23E. Please remove the portion of this creek and any tributaries or portions thereof that fall within Navajo Nation jurisdiction from your assessment unit.	Edits to Chapter 3	DWQ has reflected the recommended changes in the IR by defining the assessed portions of McElmo Creek and tributaries as those segments solely within the jurisdiction of the State of Utah. DWQ will need to pursue a rule change to modify the description of the assessment unit in R317-2. This will be considered during the 2017 Triennial Review.
Q	365	4	Cyanobacteria Counts as a Means of Listing: We note that the Division of Water Quality (DWQ) has used cyanobacteria cell counts as a parameter to list Utah Lake. We believe this is inappropriate for three reasons. First, we believe that the use of the screening cell count of 100,000 cells of cyanobacteria creates a de facto water quality standard. On EPA's website it states "Section 303(d) of the CWA, requires states to identify waters within their state where current pollution control technologies alone cannot meet the water quality standards set for that waterbody" (https://www.epa.gov/tmdl/i mpaired-waters-and-trndls-statute-and-regulations). While the cell count method was identified in the Integrated Report as an assessment method, we believe that before it can be used for listing it must first go through rule making and appropriate public comment periods before it can be used as a standard. Secondly, we believe that the use of cell counts alone as a listing method ignores the concern for toxins since it does not include a toxin level associated with the cell count. The 1999 WHO guidance quoted in the 2016 Integrated Report states, "Public health concern regarding cyanobacteria centers on the ability of many species and strains of these organisms to produce cyanotoxins" (WHO Section 1.3). If toxins are the primary area of concern when evaluating cyanobacteria, then toxins should be the primary measurement for impairment. As demonstrated in the 2016 cyanobacteria bloom on Utal1 Lake (http://deq.utah.gov/Pollutants/H/harmfulalgalblooms/bloom-2016/utah-lake-jordan-river/index.htrn) the toxin levels in the whole water samples did not exceed the WHO screening level of 20 ug/L. Only surface sewn samples exceeded the screening value. We maintain that listing of Utal1 Lake should be based on whole water toxin concentrations exceeding 20 ug/L. Third, if samples for listing include surface scum areas, we believe that only the areas where surface scum accumulates should be listed. In addition to the reasons stated above we also question the statement on Pg. 21 of the Integrated Report - Chapter 5 where it states that, "Although cyanobacteria are naturally present in many temperate waters, including Utah Lake, the concentrations of cyanobacteria in large blooms in Utah Lake appear to have increased." We are aware from antidotal statements and our own personal knowledge that significant blooms have occuned in the past similar to the 2014 or 2016 blooms. If evidence exists that demonstrates that blooms are increasing in severity, we would like to see it. At the August 24, 2016 Water Quality Board Meeting, a DWQ staff member presented a summary, to date, of the July, 2016 algal bloom occurring in Utah Lake, stating that it was the largest bloom so far. An aerial slide of the bloom was shown to the board. Later, during the same meeting, a second DWQ staff member giving a slide presentation, showed an aerial slide of the September 2006 algal bloom on Utah Lake which was obviously much larger. To us, this demonstrates the lack of knowledge for listing the entire lake as impaired at this time. Since phosphorous levels in POTW discharges has gone	None	Please see comment response Appendix A, sections, 1, 2, and 3, for responses to this comment.

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			down in the past several years from Timpanogos and Orem, it does not seem logical that phosphorus alone is driving increasing blooms as the IR infers.		
Q	366	4	Listing of Utah Lake for Phosphorus: Although a phosphorus TMDL for Utah Lake is in progress, we continue to maintain that the use of phosphorus only as listing criteria is inappropriate. In R31 7-2 phosphorus is listed as an indicator. If DWQ wishes to use it as criteria, then it should be approved through the rule making process as an indicator. We recognize that DWQ has recently recognized this and is now proceeding to look for scientific justification for an in-lake phosphorus standard. After reviewing Section 5 of the Integrated Report, the selective use of sampling appears to be a significant basis for the impairment declaration for Utah Lake. There are several issues that the Utah Lake sample collection sites raise. Specifically, Chapter 2: 2016 303(D) Assessment Methods do not address how sampling should be conducted and where samples are obtained. Sampling on any water body where cyanobacteria occurs can be biased based on where the sample is obtained.	None	A decision to remove the phosphorus listing that originated in the 2002 Integrated Report will require a demonstration that the lake is fully supporting its uses and that nutrients are not contributing to impairments. The Utah Lake Water Quality Study will determine whether nutrients, and phosphorus in particular, are contributing to beneficial use impairments in Utah Lake. Until that study is complete and there is evidence to demonstrate otherwise, DWQ must maintain listings from prior Integrated Report cycles. Also, please see comment response Appendix A, section 7, for additional information relevant to this comment.
Q	367	4	Adaptive Management: The District (TSSD) supports the use of adaptive management as a means for managing water quality in Utah Lake. The istrict believes any changes relative to Utah Lake be done on a quantifiable basis to protect beneficial uses and not subject the discharges to the lake with undue expense. DWQ supports the adaptive management approach as stated on their website explaining the Division's goal to protect Utah's waters for their beneficial uses. In closing, TSSD funds and suppmts research on Utah Lake to gain knowledge of this particular ecosystem and the development of specific standards for the lake. Answers should help determine if cyanobacteria needs to be, or can be controlled. The District believes an adaptive step of 1 mg/L phosphorus for an effluent limit is sufficient to protect Utah Lake and avoid any degradation for years to come.	None	Please see comment response Appendix A, section 13, for a response to this comment.
R	368	2	I would like to thank UDWQ for extending the timeline for written comments on their 2016 IR draft. UDWQ has done a tremendous job in trying to evaluate and protect Utah's valuable water resources and it is reflected in this draft. However, I have some comments that may prove helpful in the next revision of the draft and in particular on how biological evaluations are presently being conducted. Hopefully UDWQ is in the process of revising their biological assessment program to better reflect the state of science and address the pitfalls of reliance on RIVPAC O/E models.	None	DWQ and the primary scientific literature disagree with your opinion about the effectiveness of using O/E models for evaluating stressor disturbance (e.g., please review: Hawkins, C.P. 2006. Quantifying biological integrity by taxonomic completeness: its utility in regional and global assessments. Ecological Applications 16(4): 1277-1294). While such technical disagreements are an inevitable and necessary part of scientific discourse, DWQ genuinely appreciates stakeholder input and incorporates as many recommendations as possible into our water quality programs.
R	369	2	In addition, I am enclosing two draft technical reports that I submitted to the Jordan River/Farmington Bay Water Quality Council: 1. "Is reliance on a single bioassessment metric for assessing water quality in Utah's rivers and streams prudent?". 2. "Real and Perceived Macroinvertebrate Assemblage Variability in the Jordan River, Utah can Effect Water Quality Assessments". Please consider these two attachments as more detailed, integral parts of my comments on the draft.	None	We will consider these submissions as we revise our assessment methods for the 2018 Integrated Report.
R	370	2	Critique of Pilotto et al 1997,"Health effects of exposure to cyanobacteria (blue- green algae) during recreational water- related activities." Technical Memo September 7, 2016 To: Jordan River/Farmington Bay Water Quality Council Salt Lake City, UT By David C. Richards, Ph. D. OreoHelix Consulting Vineyard, UT Phone: 406.580.7816 Email: oreohelix@icloud.com	None	Research regarding the health effects of exposure to cyanobacteria continues to evolve, and DWQ appreciates your contribution to this discourse. Also, please see comment response Appendix A, section 1, for additional information regarding your comment.
R	371	2	Attachement 2 Over-Reliance of O/E models for Assessing Water Quality in UT Version 1.4 Is Reliance on a Single Bioassessment Metric for Assessing Water Quality in Utah's Rivers and Streams Prudent? Draft Technical Report August 28, 2016 To: Jordan River/Farmington Bay Water Quality Council Salt Lake City, UT By David C. Richards, Ph. D. OreoHelix Consulting P. O. Box 996 Moab, UT 84532 Phone: 406.580.7816 Email: oreohelix@icloud.com	None	We will consider these submissions as we revise our assessment methods for the 2018 Integrated Report.
R	372	2	Appendix 3 OreoHelix Consulting Version 1.1 Real and Perceived Macroinvertebrate Assemblage Variability in the Jordan River, Utah can Effect Water Quality Assessments Draft Technical Report August 27, 2016 To: Jordan River/Farmington Bay Water Quality Council Salt Lake City, UT By David C. Richards, Ph. D. OreoHelix Consulting Phone: 406.580.7816 Email: oreohelix@icloud.com Macroinvertebrate Assemblage Variability in Jordan River, UT and	None	We will consider these submissions as we revise our assessment methods for the 2018 Integrated Report.

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			Water Quality Assessments		
R	373	1	Figure 4. Page 14. Comment: Eliminate the colored boxes at the bottom of the figure. They distract the reader into thinking the columns are assessment categories and not the rows.	None	We will consider format changes for 2018.
R	374	2	Page 37. Addressing Nitrogen and Phosphorus. Comment: Too little nutrients in a waterbody particularly phosphorus can lead to nuisance algal blooms such as Didymosphenia geminata (Didymo = 'rock snot'). There is a large amount of literature supporting this and UDWQ has been informed of this at several technical committee meetings. In addition, many beneficial uses such as waterfowl, fisheries, phytoplankton, zooplankton, benthic invertebrates, and even the resource extractive brine shrimp industry in GSL depend on an ample supply of nutrients in the system. Too few nutrients could easily reduce primary and secondary productivity in the "food chain". More nutrients may be needed under certain conditions and waterbodies. Comment: In the third full paragraph you cite Ostermiller et al. 2014 but it is not in the Literature Cited section of Chapter 2. This appears to be an important reference. Perhaps it is the document you are directing readers to on the DWQ website?	None	Although these comments are important considerations as Utah's nutrient reduction program continues to develop, they fall outside the scope of the current IR. The support of healthy ecosystems is among the central aims of the nutrient reduction program and DWQ is aware that both too few and too many nutrients can have deleterious effects to aquatic food webs. DWQ is also aware of the special case of Didymosphenia blooms in streams and agrees that this is a potential threat to aquatic life uses that is worthy of consideration. However, the suggestion that blooms of this filamentous diatom are caused by low nutrients is a gross over simplification because hydrologic conditions, temperature, and N:P ratios also play important roles in the establishment of these blooms. As the commenter suggests, the special case of Didymosphenia highlights the importance of incorporating flexibility in the nutrient reduction program to accommodate atypical conditions. The missing citation has been added to the IR, thank you for pointing out the inadvertent omission.
R	375	2	Page 50. Biological Assessments. First sentence. Comment: In addition to protecting cold and warm water fish species, Utah's beneficial use also requires the protection of non-game fish and other aquatic life not just those necessary in the food chain. There is a major difference between "other aquatic life" and "those necessary in the food chain". In addition, the term food chain has not been used in ecology for several decades. The correct term is 'food web'. This misuse of terminology reflects the antiquated unrevised definitions of beneficial use in light of advances in our understanding of ecology and its continued use could negatively reflect on the departments understanding of modern ecological concepts. Utah's beneficial use also protects waterfowl, shore birds, other water-oriented wildlife and the organisms on which they depend. I did not see a discussion on these groups of animals in the Biological Assessments section, nor on any group of fishes including, cold water, warm water or non-game. Other states incorporate fish IBIs. Is UDWQ planning on developing fish or bird IBIs?	None	Changing the definition of beneficial uses is out of scope for the Integrated Report. Your recommendation should instead be directed towards DWQ's Standards Triennial Review which begins January 1, 2017. Nonetheless, the use of "food chain" in Utah's Water Quality Standards is reflective of the fact that these rules were originally passed in the 1970's, when the term was generally accepted in the literature. DWQ has long acknowledged the desire to refine Utah's designated uses. However, such changes are not trivial and other water quality priorities have taken precedence over these revisions.
R	376	2	Page 51. First sentence in 3rd paragraph. Comment: You introduce a term, "biological integrity" without a definition. There are many definitions of biological integrity most of which UDWQ is cursorily familiar with. From previous conversations that I have had with UDWQ it appears UDWQ personnel are using a very simplified definition to fit agenda needs, i.e. bioassessment output. Biological integrity is not a measurable attribute but an abstract idea, similar to "human health". There is no one measure of biological integrity (particularly O/E) just as there is no one measure of human health. I often use the analogy of visiting a doctor and the only measure the doctor uses to assess my health is body temperature. If the physician only used this one measure to assess my health I would immediately seek another more qualified one, and eventually in all likelihood the physician would lose his/her license. Just a reminder; bioassessments do not quantify integrity, they are only an indicator.	None	At this time, DWQ has identified the RIVPACS O/E index approach as the most scientifically defensible method for performing bioassessment. Alternative biological assessment methods would require the same level of technical review and documentation that has been completed for the currently employed methods.
R	377	2	Page 51. Last sentence in 3rd paragraph. Comment: I don't think using a single taxa richness based metric, RIVPACS O/E would constitute a robust index of biological integrity. It is only one metric that does not address anything other than richness and apparently does not do an adequate job of that (See Attachments). There is also no reason to make a 'robust IBI' easily interpretable. Ecological interactions between dozens of organisms and their responses to human caused impairment are anything but easily interpretable. RIVPACS O/E models themselves are not easily interpretable. By using the term 'robust' you are misleading the public.	Added citations	O/E is more than richness. It is sensitive to shifts in composition. Based on substantial stakeholder input, DWQ believes it is important that indices be easily interpretable. Ecological interactions can be complex, but assessment tools need not try to expose all of the complexity. From an aquatic life use support context, DWQ assesses whether a waterbody is not supporting aquatic life uses. O/E is not biological integrity but an important aspect of it. Other measures such as indices based on tolerances are not measures of overall biotic integrity either. Most invertebrate-based indices are strongly correlated with one another, so they do tend to capture the same signals (e.g., please review: Hawkins 2006 and Hawkins et al. 2010). The text has been updated to include these citations. It may be important to point out that O/E, MMI, etc., are indices of an ecological endpoint (biological integrity) that is otherwise very difficult to measure in full. To conduct detailed, full evaluations of ecological structure and function everywhere is unrealistic for a biannual state-wide assessment process.

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R	378	2	Page 51. River Invertebrate Prediction and Classification System Models. 2nd paragraph. Comment: The three western state the IR uses to support their use of RIVPACs, Colorado, Montana, and Wyoming also include dozens of other metrics needed to address ecological complexities. These states use RIVPACS as just one in their suite of metrics with no special weight given to RIVPACS. Thus there is no justification for only using RIVPACS O/E in UDWQ bioassessment program. Please see the attached reports that discusses this further.	None	The justification is that RIVPACS models tend to be more precise and often more responsive to known stressors than other indices (e.g., please review Hawkins 2006, Hawkins et al 2010). Further, only one of the states the commenter identifies, Montana, uses additional metrics in support of O/E, but that process is used to assess sediment pollution specifically. DWQ's use of O/E is applied more broadly to the full suite of anthropogenic stress.
R	379	2	Page 52. First paragraph. Comment: O/E absolutely does not quantify loss or local extinction of taxa. It only quantifies the failure to observe predicted taxa using limited sampling effort. In many cases, taxa were not lost, they just weren't found. These statements suggesting that local extinctions have occurred are highly misleading to Utah's citizens and suggest that UDWQ personnel do not have a full understanding of the RIVPACs models. Please review the attached reports for additional comments of this critically important concern, particularly the section, "Misinterpretation of O/E' in the Discussion.	Revised methods text	The text has been revised to better describe O/E score to biodiversity.
R	380	2	Page 52. 2nd paragraph Comment: Although O/E may have an intuitive biological meaning, there are so many assumptions, generalizations, and errors associated with derivation of results that its accuracy in assessing loss of taxa and impairment is highly questionable. There are several other diversity metrics in use throughout the world that are much simpler to derive and interpret than RIVPACS O/E. These metrics can easily substitute for O/E or at least supplement it. For example, richness and evenness are better indicators than O/E for several reasons, 1) they are not confounded with other models (e.g. PRISM, a costly and proprietary model that is not transparent except for those who can afford to pay for its use), 2) they are independently verifiable, and 3) they allow assessment of change at local-scale due to point source impacts. Please see section, "Additional Bioassessment Metrics in Use" in the Discussion in the attached draft report.	Added citations	DWQ is authorized by R317-2-7.3.c. to use quantitative biological assessment methods which are "documented methods that have been subject to technical review and produce consistent, objective and repeatable results that account for methodological uncertainty and natural environmental variability." Alternative biological assessment methods would require the same level of technical review and documentation that has been completed for the currently employed methods. Diversity measures were abandoned long ago by the ecological assessment community because they are strongly influenced by natural setting and are not easily interpretable. In that sense, they are not at all substitutable for O/E, which attempts to parse out natural signals from stressor signals. Please review Hawkins and Carlisle 2001 for an example that shows how O/E is superior to plain taxa richness. Additionally, 1. PRISM data are not proprietary and are freely available. They have been independently tested and validated. They are used by a very large community of scientists across a wide range of disciplines and are continually updated and corrected, 2) any O/E model is independently verifiable, 3) O/E can be used for point source assessments and sometimes must be used to avoid pseudoreplication issues when BACI designs cannot be implemented.
R	381	2	Page 53. First complete paragraph. Comment: There apparently are no direct, real world, reference site(s) to compare with Jordan River, Green River, Colorado Rivers, or any stream or river in UT. Only generalized, regionwide, summary, and averaged hypothetical reference sites. For example, the Jordan River's source is Utah Lake, a shallow remnant of Lake Bonneville and its terminus is the Great Salt Lake. Historically the Jordan River had a wide meandering braided channel that migrated across its valley. These conditions make the Jordan River a truly unique river and I assume there is no real world reference river in the state only reference conditions based on averaged watershed values. The Green River downstream of Flaming Gorge Reservoir should not be considered a reference site if UDWQ has chosen to do so. The Green River is a highly regulated river and does not resemble its condition prior to construction of the dam. Of course, the Colorado River does not have any other river(s) to compare with in Utah and no hypothetical reference rivers and "E" scores should be used on such a national treasure. Also, was the same "E" in the O/E model used for the entire length of the Jordan River? Hopefully not. Obviously, the Jordan River habitat changes from its upstream sections to downstream and the macroinvertebrates reflect this change. Using the same 'E' for the entire Jordan River would be cause for concern. It would be helpful if the final IR included a table of reference streams used to develop O/E and an appendix with additional model values including "E" taxa.	None	Each stream and river segment is unique; not just the Jordan River. RIVPACS uses real reference site data to estimate the most probable set of taxa that would occur at a given stream. In this sense, the model is heavily weighting reference sites that are physically/chemically similar to the assessed site when estimating the taxa that should occur (E). E is more than some general, hypothetical community that applies everywhere (unless a null model is used). Of course, larger rivers offer more of a challenge to assess because they are more regional rather than isolated to a state. DWQ's model incorporates reference river locations from the intermountain west rather than being limited to Utah-based locations. In addition, DWQ runs a chi-square test to ensure that each assessed site fits within the bounds of the model. Sites that fail this test are not used in the assessment. For example, the Jordan River sites passed that test and were appropriate for this model and assessment.
R	382	2	Page 53. 2nd complete paragraph. Comment: Calculating 'E' using a probability of capture (Pc) of >50% is extremely problematic and results in a poor assessment of biological integrity. Taxa with Pcs < 50% are likely the most sensitive taxa and the very taxa that respond to impairment more that those with Pc > 50%. The statement that "Using a Pc limit set at greater than 50% typically results in models that are more sensitive and precise, which results in a better ability to detect biological stress" is based on two relatively limited studies that evaluated precision using their own methods, i.e. circular reasoning and these were hardly typical. UDWQ is setting a	Added citations	With a few exceptions, O/E based on Pc >0.5 is more sensitive and precise than O/E based on all possible taxa (Pc >0). The reason is that common/core taxa that are characteristic of a given stream are typically the ones that are most sensitive to anthropogenic alteration at that site. Due to these scientific facts supported in peer-reviewed, scientific literature, most States and countries use Pc >0.5. A suite of research citations that evaluated different Pc thresholds in different contexts has been added to the text in Chapter 2 of the Final 2016 Integrated Report.

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			precedent by using Pc > 50% based on results that are not solidly supported in the literature and not established scientific fact but based on a vague ill-defined term in the two studies, 'sensitivity'. Please review section, RIVPACS O/E 'Probability of Capture' is Problematic' in the Discussion in the attached report for more discussion on Pc.		
R	383	2	Page 54. Table 8. Comment: These predictor models are mostly watershed based. It is highly commendable that UDWQ is assessing biological integrity at the watershed level rather than at the region wide level which it has done in the past. By assessing biological integrity at the watershed level more accurate and precise conclusions will be made. However, watershed averages are just that, averages. Macroinvertebrate assemblages can easily change from the top of a watershed to the bottom and an average value likely will not capture those responses. In addition, I solicited comments from Mr. Brett Marshall, River Continuum Concepts, Manhatten, MT a leading authority on bioassessments. To summarize his comments: a. As I discussed earlier, PRISM models are proprietary black box and as such are not independently verifiable and thus are scientifically invalid. The scientific method requires the possibility of independent validations. PRISM models are not reproducible or transparent, which as we all agree, is what we are all striving for. b. PRISM models rely on historic data (e.g. most of the climate data metrics in Table 8). "Clearly the past has absolutely nothing to do with the macroinvertebrates collected next year. Similarly, the average of multiple years has nothing to do with invertebrate assemblages that are mostly multivoltine or univoltine. Their lives are shaped only by the conditions in the years during which they lived... not over multiyear averages. Variables in Table 8 had nothing to do with environmental conditions during the time when the sampled invertebrates lived. This introduces an unmeasurable and significant error to every Pcs calculated and prevents the use of field data, which would be site specific. It may have been useful in developing regional models... but it has no place in continued assessment/monitoring and should never be used. Only field measurements should be used". c. PRISM data errors are also spatially derived mostly for miss use of regional models to monitor local scale changes. These models will complicate every O/E assessment conducted anywhere that there are natural gradients, introducing error in every local assessment including all of the assessments included in the IR.	Revised methods text	Contrary to the misunderstanding by the commenter, site-specific, GIS-based predictor variables are used to develop RIVPACS models rather than regional watershed means. The spatial resolution for these predictor variables is 800 m which makes the assessment at reach segment scale rather than watershed. The text of the methods have been updated to clarify this issue. DWQ has conducted biological assessments since the 2008 IR using the same site-specific approach. DWQ relies on peer-reviewed scientific literature to develop the most updated, cost-effective water quality assessments. With all due respect to the comments from the outside source: a) PRISM data are not proprietary and are freely available. They have been independently tested and validated. They are used by a very large community of scientists across a wide range of disciplines and are continually updated and corrected. b) For any given stream, the past is the best predictor of what should be there; long-term data show that community composition is stable. In fact, if bioassessment programs had historical data for all streams, predictive models would be unnecessary.
R	384	2	Page 55. First paragraph. Comment: Using updated models that accept data from first to eighth plus order rivers and stream at all seasons and a coarser taxonomic resolution can only reduce UDWQ's ability to detect impairment. Macroinvertebrate assemblage composition changes from season to season. An example of coarser taxonomic resolution effects would be the genus Baetis and family Baetidae (mayfly family). Both phylogenetic levels have species that can occur from the coldest headwaters to warmer lowland rivers and even in wetland ponds. Also, the primary goal is to improve biological integrity or the 'full suite of naturally occurring taxa that occur in a site'. Coarser taxonomic resolution eliminates this ability. Member of invertebrate families occur in almost all streams, from headwaters to valleys and often across all of North America. It is not possible to measure the integrity of a stream based on coarse taxonomic resolution.	None	O/E is an effective indicator of biological condition. The primary goal of this tool for water quality management is to discover whether the aquatic life use is supported. A relatively large amount of literature empirically shows that the use of coarse (family) taxa can often provide similar assessment scores as fine level taxonomic resolution in O/E models. There are many states that use just family level data. There are tradeoffs in use of fine versus coarse taxonomic resolution data. Coarse data are more easy to model (more precise) but use of fine resolution data may produce more responsive indices. Please review Hawkins 2006 to understand a few good examples of these tradeoffs. DWQ's model is perhaps less sensitive, but more precise while also providing the cost effectiveness of incorporating water quality partner collected invertebrate data; creating critical efficiency of DWQ's resources.
R	385	2	Page 56. Last sentence. Comment: The use of the 10th and 5th percentiles of reference site thresholds is completely arbitrary. The assessment categories need to be based on actual field measures of beneficial use and then those field derived percentiles used. For example, if the designated beneficial use is to support foraging waterfowl, then that threshold should be used. It appears that the 10th and 5th percentiles were not 'devised' by UDWQ but arbitrarily chosen.	None	Thresholds are derived based on an understanding of model error (which is based on actual field measures) and the specific values represent an attempt to balance type I (false positive) and type II (false negative) errors. This is a common dilemma for any regulatory agency in general and perhaps more so with those using biological data. DWQ has stated in the chapter the cost-benefit of ensuring that type I and II errors are appropriately balanced and not arbitrarily set.
R	386	2	Page 58. Assessment of Lakes and Reservoirs Comment: It is well known that lakes and reservoirs are ecologically dissimilar. They should not be combined and compared using the same assessment criteria.	None	Although DWQ agrees that there are important distinctions between natural lakes and man-made reservoirs, there are also numerous similarities in physical and ecological processes, as well as shared beneficial uses, that make similar standards and assessment methods appropriate. Specific suggestions for differentiating assessment criteria between reservoirs and natural lakes can be submitted during the 2018 IR assessment methods public comment period.

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R	387	2	Page 71. Last paragraph. Last sentence. Comment: All lakes eventually evolve into 'eutrophic conditions'. This is called lake succession and is inevitable. There is a big difference between eutrophic condition and eutrophication. The sentence should state, "......cyanobacteria may be indicative of 'eutrophication', not 'eutrophic condition'.	Text clarification	The text of this section has been clarified to "eutrophication".
R	388	5	Harmful Algal Bloom Assessment. Page 12. First sentence. Comment: Utah Lake is no longer a functioning natural lake. It is considered a shallow, eutrophic, irrigation reservoir. Therefore, assessments and in particular, bioassessments should treat it as such. The same assessment methods and standards that UDWQ applies to natural lakes should not apply to Utah Lake.	None	The DWQ does not currently have independent assessment methodologies for natural lakes and hydrologically controlled reservoirs. The current Integrated Report methodology does not differentiate beneficial uses, standards, or assessment methods between these two waterbody types. Although DWQ agrees that there are important distinctions between natural lakes and man-made reservoirs, there are also numerous similarities in physical and ecological processes, as well as shared beneficial uses, that make similar standards and assessment methods appropriate. Specific suggestions for differentiating assessment criteria between reservoirs and natural lakes can be submitted during the 2018 IR assessment methods public comment period.
R	389	5	Page 12. Recreational Uses in Utah Lake. First paragraph. Comment: "....more recently, swimming and wading". If UDWQ reviews the Utah Lake Legacy book and video on YouTube, it will be clear that Utah Lake was historically used for swimming and not just recently.	Text clarification	DWQ has removed the phrase "and more recently," on Page 12 paragraph 2 in Chapter 5.
R	390	5	Page 12. Recreational Uses in Utah Lake. 2nd paragraph. Comment: The average number of visitors to Utah Lake State Park is not 253,599. That is the average number of visits. The park does not count the number of people in a vehicle and does not count how many visits a visitor comes to the park. In "Figure 2. Number of visitors to Utah Lake State Park....", it appears that there was a sharp decline in visitors starting in 2013. However, in the sentence above the figure the report states that 'the number of people recreating on Utah Lake is expected to increase". These are two differing interpretations of recreational trends on Utah Lake. This needs to be reconciled.	None	DWQ interprets the visitation data presented in Figure 2 as the number of visitors, not the number of visits. This is interpretation is further supported by the Utah Department of Natural Resources publication for Utah Lake. http://stateparks.utah.gov/stateparks/wp-content/uploads/sites/26/2015/03/utah-lake-web.pdf where it is stated "336,952 individuals visited Utah Lake State Park in 2009". This number is consistent with the number of visitors presented in Figure 2. While Utah Lake visitors are expected to increase with population growth, the decline in visitation between 2013 and 2014 presented in Figure 2 cannot be considered in the same context. The visitation decline demonstrated in Figure 2 may be the result of factors not related to population growth. For example, factors like low lake levels and the presence of harmful algal blooms may be the driving factor for decreased visitation.
R	391	2	My overall conclusion is that the UDWQ 2016 Draft IR is heavy on numeric -criteria –based-measures such as DO, but very weak on how these metrics actually relate to biological integrity the real measure of water quality as mandated by the Clean Water Act or even to recreational use.	None	This comment is out of scope for this document and should instead be directed towards DWQ's Standards Coordinator to discuss numeric and narrative standards development and how they are used in the assessment process to assess use support. DWQ encourages you to bring recommendations when assessment methods are revised for the 2018 IR and to the Water Quality Workgroup during the Triennial Review.
R	392	2	Finally, there seems to be no clear scientific or otherwise causal link between the numeric based metrics and the 'beneficial uses' particularly biological, that they are supposed to evaluate.	None	The biological assessment process is based on Utah's Narrative Water Quality standard. Applicability of the narrative standard is not dependent on the specific beneficial uses ascribed to an individual waterbody. Suggested changes for beneficial uses and related water quality standards are out of scope of the Integrated Reporting process and should instead be directed towards DWQ's Standards Triennial Review which begins January 1, 2017.
S	393	3	Salt Wash, Arches National Park (Assessment Unit ID UT14030005-007). Salt Wash is proposed for listing due to high levels of total dissolved solids (TDS). We expect that high TDS levels in this stream are attributable to natural sources, given the geologic characteristics of the watershed.	Out of Scope	Identification of sources of pollution is not part of the Assessment Methods of the IR. Sources will be determined as part of the TMDL or related source assessments.
S	394	3	Salt Creek. Canyon lands National Park (Assessment Unit ID UT14030005-016). Salt Creek is proposed for listing due to high selenium concentrations, evidently on the basis of previous water monitoring conducted by the National Park Service (NPS) at Little Spring in Little Spring Canyon. This canyon does drain to Salt Creek, but perennial flow extends downstream from the spring for less than 0.5 miles, and the perennial flow does not connect with Salt Creek. Only during flash-flood events (intermittent flow) does surface water from Little Spring Canyon connect with Salt Creek. For this reason, it would seem inappropriate to include Salt Creek on the state's list of impaired waters on the basis of data collected at Little Spring.	None	Based on the comment, DWQ has identified a discrepancy in Chapter 3 and has placed the AU into Category 3 for the final report. The reviewer is correct that the waterbody type is a spring and should not , based on the Assessment Methods for evaluating springs and seeps, determined a category 5 for the AU for selenium.
T	395	4	Provo City requests that the Utah DEQ delay action on regulations for water reclamation plants that discharge into Utah Lake. The proposed regulations are based on broad conclusions being drawn from the limited data presented in the Department's Integrated Report. The data collected for, and presented in, the Integrated Report is inadequate without further scientific studies and	None	Please see comment response Appendix A, sections 12 and 13, for responses to this comment.

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			vetting by the scientific community to conclude that the quality of Utah Lake will be significantly improved by the proposed regulations. Due to these inadequacies, the significant and costly changes to reclamation plants required by the proposed regulations are not justified at this time. If the necessary additional scientific research does eventually support standards and regulations that require infrastructure changes in order to make justifiable improvements in the quality of Utah Lake, Provo requests that affected entities be allowed adequate time to appropriately budget for the required changes. The Provo City Recorder shall transmit duly authenticated copies of this resolution to the Utah Department of Environmental Quality, the Utah Lake Commission Governing Board, the Governor of Utah, the members of the Utah Senate and House of Representative who represent Utah County, and to the news media of Utah. This resolution shall take effect immediately.		
U	396	2	Utah's 2016Irlegrated Report Assessment Methods (2016 Draft, Chapter 2) include new, more restrictive assessment procedures for addressing whether nitrogen and phosphorus are causing violations of the state narrative criteria (2016 Draft, Chapter 2 at37,74-75). This is considered the state's "narrative criteria implementation methodology" which EPA indicates may be set forth in 303(d) listing guidance. DEQ previously had a methodology for determining whether or not nutrient impairments of state waters was occuning. This methodology was used to designate waters as nutrient impaired (i.e.,inviolation of narrative standards) (2014 CALM). These new assessment procedures constitute a new or revised water quality standard under the Clean Water Act.1 Specifically, the new assessment procedures constitute a new or revised water quality standard if: 1. It is a legally binding provisions adopted or established by State law, and 2. The provisions address designated uses, water quality criteria to protect designated uses, and/or antidegradation requirements for waters of the United States, and 3. The provisions express or establish desired conditions (e.g., uses, criteria) or instream levels of protection for waters of the United States immediately or mandate how it will be expressed or established in the future, and 4. The provisions establish a new water quality standard or revise an existing water quality standard.	None	While the commenter correctly identifies several water quality standard conditions, DWQ respectfully disagrees that the use of numeric translators of narrative criteria for assessment decisions qualifies as a condition. Water Quality Standards explicitly include both numeric and narrative criteria (40 CFR 131.3(b)). Several parts of the Clean Water Act call for states to translate narrative criteria to numeric thresholds—or other objective decision rules—for purposes of implementing different regulatory functions (e.g., 40 CFR §122.44(d)(1)(vi)). In fact, it is difficult to understand how the narrative criteria could be implemented without being arbitrary and capricious without such translations. Utah has a Narrative Standard (UAC R317-2-7.2) that has been approved by EPA. While it is true that assessment methods require the state to tie them to an "applicable standard", it is also true that this does not preclude states from translating the narrative to numeric values for purposes of making water quality assessments. Utah's rules preclude DWQ from publishing the specific pollutants responsible for such assessments (UAC R317-2-7.2(d)), however this requirement does not prevent DWQ from identifying an impairment, which would prompt the more intensive investigations necessary to address a water quality problem. For any impairments that are identified, DWQ would proceed with TMDL development, which would include an evaluation of water quality targets for pollutants that are "preventing or [is] expected to prevent attainment of water quality standards" (40 CFR §130(c)(1)(ii)). In some cases, DWQ may decide to promulgate these water quality goals as site-specific standards, in which case they would be subject to the rules and regulations associated with changes to water quality standards, but this is well down the regulatory path from the initial impairment decision.
U	397	2	The 2016 Draft Assessment Methods amend the prior methodology, meet all of the listed thresholds and, in effect, establish new water quality standards for harmful algal blooms measured as cyanobacteria cell counts. New water quality standards are required to undergo rulemaking and cannot be imposed by the State in this manner.	None	Please see comment response Appendix A, section 12, for a response to this comment.
U	398	2	Any new requirement that has the same effect as a water quality standard must be published as a proposed water quality standard for public review and comment and be submitted to USEPA for review. 40 CFR 131.20 and I3 1.2l. That has not occurred in this case. Consequently, the use of the algal bloom thresholds in the Assessment Methods should be deferred until the proper rulemaking prerequisites have been followed and EPA has approved the use of these new water quality criteria.	None	Please see comment response Appendix A, section 12, for a response to this comment.

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U	399	2	i. Addressing Nitrogen and Phosphorus The 2016 Draft Report discusses the use of screening values as the basis for identifying water quality impairments (i.e., narrative criteria violations) associated with nitrogen and phosphorus (2016 Draft, Chapter 2 at37-38). The text in this section of the report notes that DV/Q anticipates publishing and seeking public comment on draft procedures for conducting nutrient- related assessments such as using screening values for percent saturation of dissolved oxygen, with high daytime values above II0% saturation potentially indicating concerns with nighttime minimum dissolved oxygen. Waters listed as "impaired" based on these criteria will require nutrient load reductions either when a TMDL is developed or at the time of permitting. Comment These procedures have serious regulatory implications and the identified numeric values are the "applicable standard" when interpreting the narrative criteria. Therefore, these numeric values should not be used as bases for listing waters as impaired until they have been vetted through a peer review process and issued for public notice and comment. Under federal law, the State may not use new narrative criteria as "applicable standards" until USEPA approval occurs. (40 CFR I3I.2I).	None	Nutrient-specific assessment methods are intended to be an intrinsic part of Utah's Adaptive Management nutrient reduction strategy. EPA has afforded states with some flexibility with respect to the development and implementation of their nutrients reduction programs provided that they demonstrate progress. One critical step is the development of processes for the identification and prioritization of waters with nutrient-related problems. The assessment methods, once developed, are intended to help DWQ fulfill this requirement. DWQ provides an opportunity for public comment on all assessment methods, and any proposed methods for nutrients would undergo similar review. Water Quality Standards explicitly include both numeric and narrative criteria (40 CFR 131.3(b)). Several parts of the Clean Water Act call for states to translate narrative criteria to numeric thresholds—or other objective decision rules—for purposes of implementing different regulatory functions. Utah has a Narrative Standard (UAC R317-2-7.2) that was approved by EPA. While it is true that assessment methods require the state to tie them to an "applicable standard", it is also true that this does not preclude states from translating the narrative to numeric values for purposes of making water quality assessments. Utah's rules preclude DWQ from publishing the specific pollutants responsible for such assessments (UAC R317-2-7.2(d)), however this requirement does not prevent DWQ from identifying an impairment, which would prompt the more intensive investigations necessary to address the water quality problem.
U	400	2	ii. Lake and Reservoirs (2016 Draft, Chapter 2 at 58) ^. Tier I Assessment In its assessment of lakes, DWQ indicates that it is using targeted monitoring and atiered approach to ensure public health protection from potential harmful algal blooms (2016 Draft, Chapter 2 at 58-59). Tier I consists of evaluations of Drinking'Water and Recreational Use Support. "DV/Q will use the recommendations by the World Health Organization to guide this assessment." (2016 Draft, Chapter 2 at 59). The World Health Organization (WHO) recommendations (Guidelines for safe recreational water environmenfs; WHO, 2003) are based on aggregate cyanobacteria cell counts for thresholds of human health risk associated with potential exposure to cyanotoxins (generally via ingestion) and are summarized in the table below from the 2016Draft. (Table 10 at Chapter 2 af 60). As noted above, the identified numeric values are the "applicable standard" when interpreting the narrative criteria. Therefore, these numeric values should not be used as bases for listing waters as impaired until they have been vetted through a peer review process, been issued for public notice and comment, and approved by USEPA. However, as discussed in the WHO Guidelines, the human health concern is attributed to cyanotoxins, not cyanobactena counts or chlorophyll-a concentration. Cyanobacteria count is a step removed from cyanotoxin and should not be used as a proxy. Moreover, chlorophyll-a concentration is further removed from cyanotoxin concentration and cannot be used as a proxy for use impairment. Chlorophyll-a concentrations can be elevated without a cyanobacteria bloom if other forms of algae are responsible for the elevated chlorophyll-a concentration. Under this circumstance, there is no possibility of exposure to excessive levels of cyanotoxin and uses are not impaired.	None	Please see comment response Appendix A, sections 2, 3, 6, and 12, for responses to this comment.

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U	402	2	o Drinking'Water Use Support The 2016 Draft (Chapter 2 at 59-60) uses the WHO threshold values as the basis for evaluating Drinking Water Use Support and Recreational Use Support as part of its Tier I Assessments. With regard to drinking water use protection, the 2016 Draft notes that excessive growth of cyanobacteria can also lead to taste and odor problems, which increases drinking water treatment costs. [n some instances, sources of drinking water may need to be temporarily excluded from the water supply until a cyanobacteria bloom subsides. Some species of cyanobacteria can produce cyanotoxins that are harmful to people and other animals (2016 Draft, Chapter 2 at 59). Other forms of phytoplankton do not pose this threat. Comments In-lake cyanobacteria cell counts have no direct relationship to drinking water uses, as such uses occur "after" treatment, as mandated by the Safe Drinking Water Act, Surface Water Treatment Rules. There is no explanation of how treatment reduces these compounds. Moreover, a use is not impaired merely because the cost for treatment increases. By federal law, all surface waters must be extensively treated prior to use in a public water system. Potable water supplies continually monitor and adjust treatment in response to raw water quality and changes in the cost to provide treatment do not prevent such use. It is not apparent that, in Utah, cyanobacteria levels cause any significant increase in surface water treatment needs or costs. Consequently, asserting "use impairment" due to this cause is speculative. The presence of cyanotoxins in a drinking water supply is a concern if treatment cannot remove the toxins to an acceptable level. Since not all cyanobacteria produce toxins and those that can produce toxins do not always produce toxins, it would seem that using cyanobacteria cell density is not the appropriate metric. Drinking Water Use Support should be based on meeting specific cyanotoxin thresholds in the potable water supply, after treatment, as suggested by USEPA. USEPA's webpage for Guidelines and Recommendations for Harmful Algal Blooms, cyanobacteria and cyanotoxins begins with an acknowledgment that "fc]urrently there are no U.S. federal water quality criteria, or regulations for cyanobactena or cyanotoxins in drinking water under the Safe Drinking 'Water Act (SDWA) or in ambient waters under the Clean Vy'ater Act (CWA)" despite decades of awareness of the potential health impacts.2 As of the last webpage update on March 15,2016, EPA expects to release draft ambient water quality criteria for cyanotoxins for the protection of recreational activities in freshwater in Fall2016. EPA has developed Health Advisories (HA) for cyanotoxins (e.g., microcystins and cylindrosperopsin) but not cyanobacteria cell counts. Similarly, EPA has developed Health Effect Support Documents (HESD) for cyanotoxins (e.g., microcystins, cylindrospermopsin, and anatoxin-a) but not cyanobacteria cell counts. While it should seem obvious, drinking water uses cannot apply to Great Salt Lake since it has no such use. Such uses to be protected should apply, if at all, at the point of water intake. Lastly, it should be noted that drinking water use is not a CWA Section 101(a) use that must be protected under the Clean'Water Act. It is separately regulated under the Safe Drinking 'Water standard or impairment.	None	Assessments for HABs are based on the presence of conditions conducive to the production of cyanotoxins or other compounds that may negatively impact drinking water or recreational users. DWQ assesses surface waters that are used as drinking water supplies, not finished drinking water. Therefore, 1C assessment methods do not consider whether technologies of individual treatment facilities are capable of removing cyanotoxins or other HAB related compounds. Waters assessed for the support of the Class 1C use are classified as 1C. Taxonomic succession within a bloom is common, so even if current cyanobacteria are not known to be toxin producing, known toxin producers may subsequently occur. Great Salt Lake does not have Class 1C, and was not assessed for Class 1C use (or any other use in the 2016 IR). The IR assesses all designated uses for which data are available. Utah has both Class 1C and Class 4 that are not Clean Water Act 101(a) uses. DWQ's methods for assessing support of 1C are supported by drinking water suppliers and the State Division of Drinking Water.
U	403	2	o Recreational Use Support Assessment V/ith regard to recreational use support, the 2016 Draft (Chapter 2 at 60) notes that human health can be put at risk when exposed to algal toxins through skin contact, inhalation, or ingestion. This exposure pathway exists through multiple methods of recreation in lakes such as boating, water-skiing, and swimming. Recreational uses are considered supported if cyanobacteria cell counts are less than 20,000 cells/ml. Uses are not supported if cyanobacteria cell counts are greater than 100,000 cells/ml for more than one sampling event and/or other narrative indicators suggest an impairment of recreational uses (e.g., chlorophyll-a). If there is one exceedance greater than 20,000 cells/ml, the data are considered insufficient to determine whether the uses are attained. The referenced use-support and use-impairment targets, once again, come directly from the V/HO Guidance. The basis for these target concentrations of cyanobacteria cell counts is discussed in the WHO Guidance (See, Attachment 1). The Guidance provides specific rationales for the assignment of adverse health effects associated with cyanobacteria cell counts in Table 10 from the 2016Draft. The use of	None	Please see comment response Appendix A, sections 1, 2, 3, for a response to this comment.

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			cyanobacterial cell counts as a metric for determining recreational use support, based on the WHO Guidance, is inappropriate for the following reasons.		
U	404	2	The low risk threshold (<20,000 cyanobacterial cells/ml) is based on a single study (Pilotto et a1.,1997). The scientific defensibility of this study and underlying assumptions need to be carefully reviewed, not simply accepted. Additional support is necessary if the DWQ wishes to propose this threshold as the basis for determining use attainment. Moreover, D'WQ must make public notice that it intends to use this numeric threshold and provide the public with the opportunity to review the supporting data and comment on the efficacy of the threshold as a basis for making such assessments.	None	Please see comment response Appendix A, introduction and sections 1 and 12, for responses to this comment.
U	405	2	As discussed in the 2016Draft. the intended protection is based on exposure to algal toxins via ingestion, but the basis for the WHO recommendation is not cyanotoxin exposure but skin irritation ("the irritative or allergenic effects of other cyanobacterial compounds..."). Water quality standards for other parameters, necessary to ensure recreational use protection, are based on protection from significant health impacts (e.g., significant illness, cancer). It is not apparent how one effect translates to the other, or the severity of the skin irritation, should it arise.	None	Although WHO guidelines are based in part on expected ingestion rates of cyanotoxins, they are also based on epidemiological studies identifying relationships between cyanobacteria or cyanotoxins and negative health effects such as gastrointestinal distress, headaches, and other symptoms. These types of symptoms are considered to constitute a recreational use impairment when caused by fecal pollution (E. Coli).
U	406	2	As described in the WHO Guidance, the moderate risk cell concentration range of 20,000 - 100,000 cells/ml represents a threshold for recreational users to reach a dose of microcystin that meets the tolerable daily intake for drinking water, previously described as a level that would be safeþr continuous consumption over a lifetime. As described, this is equivalent to a "no obseryed effect" threshold and would be more appropriate as a recreational use attainment threshold. However, for this to be an appropriate threshold, a swimmer would need to swim every day in a cyanobacteria bloom that produces microcystin and swallow 100 mL of such lake water every day over a lifetime. This level of exposure does not seem plausible. Alternatively, for a "single day"exposure concem, the effect from ingestion would need to be documented as acute (i.e., short term serious adverse health impact) which is not demonstrated in the underlying reports. Consequently, this threshold requires public review and comment.	None	The epidemiological studies cited in chapters 5 & 6 and in the HAB methods comment response document (Appendix A) section 2 support the current 100,000 cell/mL threshold. WHO confirmed the protectiveness of this threshold through estimations of potential ingestion. The WHO thresholds were explicitly derived for recreational uses, not drinking water uses. Thresholds derived by assuming only a single day of exposure would not be protective of recreational uses for multi-day recreators.
U	407	2	The use impairment threshold, >100,000 cyanobacteria cells/ml, is discussed in the WHO Guidance as a cell density that can result in the formation of a scum layer, with the remaining assessment discussing the potentially severe health effects associated with scums. The scum layer may contain cyanobacteria cell concentrations a thousand times higher (100,000,000 cells/ml) than the ambient water concentration. The risk of incidental water consumption associated with the scum layer is not the same as the risk associated with full body contact. Consequently, the impairment threshold is not supported by the evaluation.	None	The 100,000 cell/mL threshold is based on the likelihood of scum formation which was identified by WHO as a primary concern for potential negative human health impacts. Therefore both the presence of scums or cyanobacteria at concentrations that can form scums (i.e. > 100,000 cells/mL) is evidence of recreational use impairment.
U	408	2	The WHO Guidance notes that health outcomes depend upon cyanobacteria density, type of cyanobacteria present, and duration ofexposure, none ofwhich are addressed in the 2016 Draft or fully explained in the WHO Guidance. EPA criteria guidance emphasizes that concentration, frequency, and duration of exposure are key components that must be assessed to properly establish a defensible V/QS. These factors need to be adequately considered in evaluating whether the proposed threshold is appropriate.	None	DWQ agrees that cyanobacteria density, taxonomic composition, and exposure duration are all potentially important components of HAB exposure and recreational use assessment. However, not all of these factors have been fully quantified in the scientific literature, so assessment methods cannot yet incorporate them. Therefore, the current HAB assessment methods are based on epidemiological studies identifying the potential for negative human health effects based on exposure to cyanobacteria densities exceeding 100,000 cells/mL.
U	409	2	The concern regarding cyanotoxin exposure and possible health impacts is replete with unsupported assumptions and compounded worst case guesses (see emphasis in text from V/HO Guidance in Attachment 1). The use of these assumptions in determining a water quality criterion clearly requires a scientific peer review to ensure that it is appropriate for criteria application.	None	Please see comment response Appendix A, sections 1 and 12, for responses to this comment.

Letter	Comment Number	Chapter Number	Public Comment	Action	Agency Response
U	410	2	Attachment 1 WHO Guidance on Cyanobactena Cell Counts (Guidelines for sofu recreational wqter environmenls, World Health Organization, 2003) Relatively low probability of adverse heqlth effects (<20,000 cyanobacterial cells/mL) For protection from health outcomes not due to cyanotoxin toxicity, but rather to the irritative or allergenic effects of other cyanobacterial compounds, a guideline level of 20 000 cyanobacterial cells/ml (corresponding to 10pg chlorophyll-a/litre under conditions of cyanobacterial dominance) can be derived from the prospective epidemiological study by Pilotto et al. (1991). Whereas the health outcomes reported in this study were related to cyanobacterial density and duration of exposure, they affected less than 30% of the individuals exposed. At this cyanobacterial density, 2* 4t g microcystin/litre may be expected if microcystin-producing cyanobacteria are dominant, with l0pg/litre being possible with highly toxic blooms. This level is close to the WHO provisional drinking-water guideline value of lpg/litre for microcystin- LR (WHO, 1998), which is intended to be safe for lifelong consumption. Thus, health outcomes due to microcystin are unlikely, and providing information for visitors to swimming areas with this low-level risk is considered to be sufficient.	None	Please see comment response Appendix A, introduction, sections 1-3 and section 9, for responses to this comment.
U	411	2	(V/HO Guidance at 149) Moderate probability of adverse health effects (20,000-100,000 cyanobacterial cells/mL) At higher concentrations of cyanobacterial cells, the probability of irritative symptoms is elevated. Additionally, cyanotoxins (usually cell-bound) may reach concentrations with potential health impact. To assess risk under these circumstances, the data used for the drinking-water provisional guideline value for microcystin-LR (V/HO, 1998) may be applied. Swimmers involuntarilv swallow some water while swimming. and the harm from ingestion of recreational water will be comparable to the harm from ingestion of water from a drinking-water supplv with the same toxin content. For recreational water users with whole-body contact (see chapter l), ꬶ swimmer can exoect to ineest 100-200 ml of water in one session. sailboard riders and waterskiers probably more. A level of 100 000 cyanobacterial cells/ml (which is equivalent to approximately 50pg chlorophyll-a/litre if cyanobacteria dominate) represents a guideline value for a moderate health alert in recreational waters. At this level, a concentration of 20mg microcystin/litre is likelv if the bloom consists of Mrcrꬶcysfis and has an average toxin content of 0.2 pglcell, or 0.4pg microcystir/mg chlorophyll-a. Levels may be approximately double if Planktothrix agardhii dominates. With very high cellular microcystin content, 50*100pg microcystin/litre would be possible. The level of 20pg rnicrocvstinꞁlitre value concentration for microcvstin-LR in drinkins-water (WHO. 1998) and would result in consumption of an amount close to the tolerable dailv intake ITDfl for a 60-ks adult consumine 100 ml of water while swimmins (rather than 2 litres of drinkins-water). However, a 15-kg child consumine 250 ml of water during extensive playing could be exposed to 10 times the TDL The health risk will be increased if the person exposed is particularlv susceptible because of" for example. chronic henatitis B. Therefore, cyanobacterial levels likely to cause microcystin concentrations of 2Opgllitre should trigger further action. Non-scum-forming species of cyanobacteria such as Planktothrix agardhii have been observed to reach cell densities corresponding to 250pg chlorophyll-a/litre or even more in shallow water bodies. Transparency in such situations will be less than 0.5 m measured with a Secchi disc. Planktothrix agardhii has been shown to contain very high cell levels of microcystín (1*2pg microcystin/rng chlorophyll-a), and therefore toxin concentrations of 200-400ꞁrg/litre can occur without scum formation. An additional reasoꞁr for increased alert at 100 000 cells/ml is the potential for some frequentlv occurring cvanobacterial species (particularlv Mrcrocyslis spp. and lnøꞁtøerrø spp.) to form scums.	None	Please see comment response Appendix A, sections 1, 2, 3, for a response to this comment.

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U	412	2	(WHO Guidance atl49 - l5l)(Emphasis added) High probability of adverse heølth effects (> 100,000 cyanobacterial cells/mL) Abundant evidence exists for potentially severe health outcomes associated with scums caused by toxic cvanobacteria. No human fatalities have uneouivocallv associated with cvanotoxin ingestion during recreational water activities, although numerous animals have been killed by consuming water with cyanobacterial scum material. This discrepancy can be explained bv the fact that animals will drink greater volumes of scum-containing water in relation to their bodv weight. whereas accidental ingestion of scums by humans during swimming will typically result in a lower dose. Cyanobacterial scums can represent thousand-fold to million-fold concentrations of cyanobacterial cell populations. Calculations suggest that a child plaving in Mrcrocyslis scums for a protracted period and ingesting a significant volume could receive a lethal dose, although no reports indicate that this has occurred. Based on evidcnce that a lethal oral dose ofmicrocystin- LR in mice is 5000*11 600pg/kg body weight and sensitivity between individuals may vary approximately lO-fold, the ingestion of 5-50 mg of microcystin could be expected to cause acute liver injury in a 10-kg child. Concentrations of up to 24 mg microcystin/litre from scum material have been published (Chorus & Fastner, 2001). Substantially higher enrichment of scums-up to gelatinous consistency-is occasionally observed, of which accidental ingestion of smaller volumes could cause serious harm. Anecdotal evidence indicates that children" and even adults. mav be attracted to play in scums. The presence of scums caused by cyanobacteria is thus a readily detected indicator ofa risk ofpotentially severe adverse health effects for those who come into contact with the scums. Immediate action to control scum contact is recommended for such situations. (WHO Guidance at 151 - 152)(Emphasis added)	None	Please see comment response Appendix A, sections 1, 2, 3, for a response to this comment.
U	413	2	The potential dose of cyanotoxin associated with recreational uses - where ingestion is minor - cannot be compared with continuous exposure over a lifetime from drinking water ingestion. Thus, for waters where full body contact recreation cannot occur (e.g., very shallow water), the proposed criteria should not be applicable. These thresholds should not apply to kayaking or boating (recreational activities occurring above the water surface) as the potential for dermal exposure would be minimized in comparison with full body contact.	None	A Use Attainability Analysis would be required to modify the Class 2A or 2B uses to remove primary contact recreation and is beyond the scope of the IR. Please see comment response Appendix A sections 10 and 11 for more information.
U	415	2	The proposed chlorophyll-a target is not scientifically defensible, as chlorophyll-a is not a good indicator of the presence or concentration of cyanotoxins, and should be removed from the proposed criteria.	None	Please see comment response Appendix A, section 7, for a response to this comment.
U	416	2	For these reasons, the recommended cyanobacteria cell density thresholds need to be peer reviewed and presented to the public for review and comment before it is used to assess recreational use impairment.	None	Please see comment response Appendix A, sections 12 and 13, for responses to this comment.

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U	418	2	Tier II Assessments are described as "weight of evidence" criteria that consider three types of data to assess compliance with Utah's narrative standard. (See, 2016 Draft, Chapter 2 at 68 et seq.). These types of data are: 1. Increasing TSI trend over the long-term period (-10 years) or a TSI-Chl-a greater than 50; 2. Water-quality based fish kills or winter DO measures not meeting the criterion when measured; and, 3. Evaluation of Phytoplankton community. Carlson's TSI estimates are calculated for Secchi depth, total phosphorus concentration, and chlorophyll-a. These are treated as independent indicators and are not averaged. The TSI for chlorophyll-a is calculated using the following formula: TSI-Clhl-a: 9.81 In (Chl-a) + 30.60, where Chl-a concentrations in irgll Back-calculating the chlorophyll-a concentration that results in a TSI > 50 yields a chlorophyll-a concentration>J .2 pgll. The TSI is evaluated for the period from May through September. Figure 17 (2016 Draft, Chapter 2 at69) indicates that a single exceedance of the TSI-Chl-a, combined with a phytoplankton community dominated by cyanobacteria, is sufficient to characterize a water as impaired. It is not clear whether the data collected are averaged over the reporting cycle (May - September) and then a TSI is calculated, or if a TSI value is calculated for each sample and the results are averaged, or if TSI values are independently considered for individual samples.	None	Tier II criteria are used as supporting information for tier I assessment decisions or to identify lakes with potential trophic status related impairments for which insufficient data currently exist to fully assess. None of the lakes added to 303(d) list in 2016 have been identified as not supporting designated uses based on tier II criteria alone. The tier II assessment process requires best professional judgment to determine data sufficiency and appropriate means for assessment. Where data richness allows, averaging TSI values over the growing season may be appropriate. In cases where fewer data points are available, individual values may be considered depending on their overall representativeness for the lake.
U	419	2	Assuming that individual TSI values are considered independently, the Tier II assessment of "not supporting" is overly stringent given that phytoplankton communities go through successional periods with periodic blooms occurring under natural conditions. Consequently, a measurement during a normal bloom could trigger an impairment listing that is not representative of the reporting cycle. If this is the case, the TSI is being treated as an acute water quality standard and is inconsistent with the underlying basis for the recommendations contained in the WHO Guidance. At a minimum, monthly measurements over the growing period (May through September) should be averaged to make an informed decision on the status of a lake.	None	Tier II criteria are used as supporting information for tier I assessment decisions or to identify lakes with potential trophic status related impairments for which insufficient data currently exist to fully assess. None of the lakes added to 303(d) list in 2016 have been identified as not supporting designated uses based on tier II criteria alone. In addition, the tier II criteria are an aquatic life use assessment. They are assessed independently of recreational use considerations, are not based on WHO guidance for harmful algal blooms, and are unrelated to the IR HAB assessment methods.
U	420	2	In describing the relatively low probability of adverse health effects, the WHO Guidance charactenzed a cyanobacteria cell count under 20,000 cells/ml as having a chlorophyll-a concentration of l0 itglL. The Tier II TSI-Chl-a threshold is triggered when chlorophyll-a concentrations are greater than7.2 pgll-. Since the V/HO Guidance notes that impairments are not expected for cyanobaclena cell counts under 20,000 cells/ml, equivalent to 10 pgll. chlorophyll-a, it is inappropriate to set the TSI-Chl-a threshold at a concentration that is tripped when a significantly lower chlorophyll-a concentration occurs.	None	The tier II criteria are an aquatic life use assessment. They are assessed independently of recreational use considerations, are not based on WHO guidance for harmful algal blooms, and are unrelated to the IR HAB assessment methods.
U	421	2	Finally, with regard to the phytoplankton community, DWQ intends to apply the cyanobacterial cell count thresholds from Tier I Lake Assessment for determining impairments due to harmful algal blooms as part of a narrative assessm ent (2016 Draft, Chapter 2 at 7 5). Comments Use of the WHO Guidance cyanobacteria cell count thresholds is inappropriate for the reasons discussed previously for the Tier I assessments.	None	Please see comment response Appendix A, sections 1, 2, 3, 6, and 7, for responses to this comment.
U	422	2	The WHO Guidelines recommend total phosphorus concentrations in the range of 0.01-0.03 itglL to prevent toxic accumulations of cyanobacteria (at 154). This range of TP concentrations exceeds the background levels observed in virtually all Utah surface water bodies. Chorus and Bartram (1999) (cited in the WHO Guidelines as the basis for the cyanobactenarecreational guidelines; at 150) presents a TP concentration target of 0.03-0.05 mglL as a concentration critical for limiting cyanobacterial biomass. Even assuming that the Guidelines' units are incorrectly reported and are supposed to be 0.01-0.03 mglL, the vast majority of if not all, Utah surface water bodies would still naturally exceed this level. Thus, one would conclude that the cyanobacteria blooms are naturally occurring and should not be considered use impairments under the Clean Water Act.	None	While DWQ's HAB assessment methods for determination of recreational use support are based, in part, on WHO guidelines, DWQ has intentionally not included the associated phosphorus concentrations as human health indicators. DWQ encourages the commenter to work with DWQ on the next version of the IR assessment methods or Utah's Water Quality Health Advisory Panel (http://deq.utah.gov/Divisions/dwq/health-advisory/index.htm) if they believe that phosphorus concentrations should be considered as an additional HAB indicator. However, DWQ's current thinking is that, at least in this context, the WHO general guidelines for phosphorus linkages are overly general and are best determined on a case-by-case basis once issues with cyanobacteria are identified. With respect to the importance of natural conditions on IR impairment decisions, this is an indirect linkage to IR decisions because it is largely addressed through changes in water quality standards or analyses that follow the listing of a waterbody as not supporting designated uses (please see DWQ's response to comment 423 for details).

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U	423	2	The Clean'Water Act does not regulate natural conditions, such as a plant growth occurring due to naturally occurring background TP concentration. Therefore, this range of TP concentrations is unattainable in Utah surface water bodies and cannot be regulated to control cyanobacteria under the CWA. Moreover, if these low levels of TP are able to promote cyanobacterial blooms, then these blooms should also be considered a natural condition not subject to regulation.	None	While DWQ agrees that natural conditions are important water quality considerations, such considerations are, at best, indirectly linked to IR decisions because they generally need to be rectified through a change in water quality standards using provisions specified in UAC R317-2-7.1(c) and the CWA. Although the CWA includes the interim national goal to achieve a level of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water (CWA § 101(a)(2)), this water quality goal includes the caveat "wherever attainable." The water quality standards regulation does not explicitly authorize adoption of criteria based on ambient data. Instead, 40 CFR § 131.11 more generally requires adoption of "water quality criteria that protect the designated use" based on "sound scientific rationale." It further specifies that States should adopt numeric criteria based on CWA § 304(a) guidance, CWA § 304(a) guidance modified to reflect site-specific conditions, or other scientifically defensible methods, and narrative criteria - or criteria based upon biomonitoring methods - where numerical criteria cannot be established or to supplement numerical criteria. However, the feasibility of remedying man-induced pollution is specifically addressed in the regulation at 40 CFR § 131.10(g)(3), which authorizes removal of a designated use where "human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place." Further, 40 CFR § 131.10(g)(1) authorizes use removal where "naturally occurring pollutant concentrations prevent the attainment of the use." Where there is interest in removing a CWA § 101(a)(2) use, or adopting a sub-category of a CWA § 101(a)(2) use that requires less-stringent criteria, a use attainability analysis must be completed (40 CFR 131.10(j)(2)). The demonstration necessary to conduct these analyses are data intensive. Resolution of an impairment identified in the IR is among the principle reasons for expending the resources to change a use, which makes identification of an impairment an integral part of regulatory processes intended to ensure that Utah's Water Quality Standards continue to be updated based on the best possible data and information.
U	424	2	The 2016 Draft (Chapter 5 at 21) discusses whether cyanobactena are naturally occurring in Utah Lake. The discussion indicates that cyanobacteria concentrations appear to have increased since pre-European settlement, but no data are presented to indicate when these concentrations increased, how much they increased, or why they increased. The available data need to be presented to the public and peer reviewed to assess whether HAB occuffence should be considered a natural occurrence or whether other conditions (e.g., hydromodification) are responsible for the apparent increase in cyanobacteria concentration in Utah Lake.	Added Citations	The IR includes citations for the two paleolimnology dissertations that DWQ used as evidence of long-term changes to the Utah Lake ecosystem. While determination of natural conditions falls outside the scope of the IR, questions related to trends in water quality and algal blooms will be part of the Utah Lake Water Quality Study, which will be conducted via an open and collaborative process with stakeholders and local decision makers.
U	425	3	The Rivers and Stream Assessments claim that the State Canal is not supporting designated uses due to exceedances of water quality criteria for total ammonia (2016 Draft, Chapter 3 at 24). This listing is incorrect and should be removed from the 303(d) list. Over the course of a year and a half, DWQ and the Jordan River/Farmington Bay Water Quality Council have traded letters concerning the need for more stringent total ammonia wasteload allocations for the Jordan River and State Canal. These letters and evaluations are incorporated here by reference and include the following: DWQ November 2014 Preliminary'Wasteload Allocations for Ammonia Preliminary WLAs for the five POTWs discharging to the Jordan River and State Canal were based on steady-state water quality modeling, with all POTWs on the Jordan River and State Canal discharging at their design flows and permitted loads. Council July 16, 2015 Letter to DWQ Comment that preliminary ammonia WLAs were unnecessarily conservative and request that a probabilistic model be used to develop the WLAs with consideration for EPA's updated 2013 water quality criteria for ammonia. DWQ November 5,2015 Response to Council DWQ presented revised WLAs using the 5-year average flows for the POTWs and steady-state modeling as a surrogate for probabilistic modeling. Analysis showed that load reductions were still required under current ammonia criteria. Council April 5, 2016 Letter to DWQ DWQ finally provided the water quality monitoring data for the Jordan River and State Canal, on February 8,2016, that served as the basis for the revised WLAs included in the November 5, 2015 letter. The WLA in the November 5, 2015 assessment paired measured upstream pH values for the Jordan River at the confluence with the State Canal and measured instream total ammonia	None	This comment is out of the scope of the Integrated Report. The IR does not take into consideration modeling approaches for wasteload allocations. We encourage you to provide comments on the application of wasteloads during the upcoming permit review process. In our letter from July 2016, we state "The assessment of whether the State Canal supports its designated aquatic life uses was conducted as part of the 2016 Integrated Report. The assessment followed standard methods and procedures utilizing DWQ data from a downstream sampling site at the boundary of the Farmington Bay Waterfowl Management Area. The draft 303(d) list of waterbodies not supporting designated uses identified the State Canal as not supporting designated uses due to exceedances of ammonia criteria." DWQ has followed our published assessment methods for purposes of evaluating State Canal for exceedances of ammonia criteria. Only data with paired pH and temperature values were used in the assessment. The assessment was not based on the broader dataset provided by JR/FBWQC because those data were provided without proper quality assurance documentation and did not have paired pH and temperature data for use in assessments. Please see response to comment # 427 for a summary of the data used in this assessment.

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			concentrations below the SDSD North WWTP to conclude that the ammonia criteria were exceeded. The April 5, 2016 letter presented an evaluation with ammonia concentration and pH predicted using steady-state mixing considerations, to show that current ammonia criteria are not exceeded based on current permit limits. DWQ July 7,2016 letter presents DWQ's response to the April 5, 2016 evaluations. In this letter, DWQ notes that "Due to diel fluctuation of temperature and pH, we decided to use the continuous sonde data upstream of the North Plant in order to get a more accurate estimate of the mean monthly temperature and pH. This was considered preferential to utilizing the concurrent instantaneous field measurement of temperature and pH at the downstream grab sampling site, which weren't always available." Based on this screening evaluation, DWQ concluded that the SDSD North discharge caused an exceedance of the state ammonia water quality criteria. "Rather than revisit the evaluation conducted for our November 2015 letter to you, we instead refer this matter to the public comment period associated with the issuance of the draft 303(d) list, upon which you are welcome to provide comments." With regard to the wasteload allocation evaluations presented in the Council's April 5, 2016letter, DWQ commented that the Council's WLA uses alternative methods and procedures, such as use of the 5-year average flows in the analysis, are not consistent with state regulations.		
U	426	3	As described in the July 7 ,2016, DWQ violated its own 2016 Draft procedures for evaluating total ammonia. Chapter 2 (at 49) describes how DWQ evaluates ammonia criteria for the purpose of assessing aquatic life use support: "if a field pH or temperature reading is unavailable, a correction factor cannot be made and the result value for ammonia will be removed from the assessment." DWQ used pH and temperature values upstream of the SDSD North WWTP to evaluate criteria compliance at the downstream sampling station. This assessment ignores the known influence of the discharge on pH and temperature and is contrary to the method that the Department said it would use in evaluating ammonia toxicity. The rationale for doing so, "due to diel fluctuation of temperature and pH", has no scientific merit. For this reason, alone, the listing should be removed and re-categorized as "insufficient information" to make a determination.	None	The commenter is correct in the citation of the Assessment Methodology. For the purposes of the 2016 IR analysis, DWQ staff did not substitute missing pH or temperature data from a surrogate location to perform assessments. All ammonia data for the referenced assessment unit were assessed with paired pH and temperature data. Original data files that generated the assessment can be found on the DWQ webpage (http://deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/rsdatafiles2016.htm). The listing in question was based on the monitoring location 4985490 (Farmington Wetlands State Chl @ WMA BNDY). A review of the ammonia data file will reveal that all of the results had paired temperature and pH at that site. This substitution you cite from the July 7th, 2016 letter was performed during the review of a wasteload allocation model in an effort to incorporate a robust dataset provided by JR/FBWQC without paired pH and temperature data. Comments regarding the WLA developed for the South Davis Sewer District facilities have been addressed in letters exchanged between the facility and DWQ during the permit renewal process. DWQ encourages JR/FBWQC to submit data including appropriate quality assurance documentation and paired pH and temperature data for consideration in in future assessments and wasteload allocation analyses.
U	427	3	Use of the 5-year average POTW flows for calculating WLAs was originally suggested by DWQ as a way to address the Council's request that probabilistic modeling be used to assess the need for more stringent ammonia WLAs. The DWQ response to the Council's April 5, 2016 letter, indicating that effluent limits for POTWs must be based on the design flow of the facility is more stringent that USEPA regulations and guidance, which explicitly allow for the use of probabilistic models to develop more accurate WLAs. As such, this requirement is contrary to Utah Code 19-5-105, which provides "no rule that the board makes for the purpose of the state administering a program under the federal Clean'Water Act or the federal Safe Drinking Water Act may be more stringent than the corresponding federal regulations which address the same circumstances." Consequently, the Council reiterates its request that future WLAs for ammonia limits in the Jordan River are based on probabilistic modeling. For these reasons, the impairment listing indicating that the State Canal is impaired for ammonia should be removed.	None	This comment is out of the scope of the Integrated Report. The IR does not take into consideration modeling approaches for wasteload allocations. Rather, the IR evaluates available water quality data against Utah's water quality standards. The listing for ammonia in the State Canal is based on three exceedances of Utah's Water Quality Standards that occurred on 12/1/2008 (ammonia of 8.41 mg/L; pH = 7.52; temp=12.12; chronic criteria for 3B and 3D uses = 4.29 mg/L), 4/6/2009 (ammonia of 6.63 mg/L; pH = 8.76; temp = 11.11; chronic criteria for 3B and 3D = 0.71 mg/L), and 7/13/2009 (ammonia of 2.67 mg/L; pH=8.2; temperature=23.84oC; chronic criterion for 3B and 3D uses = 0.98 mg/L). DWQ also reviewed the data provided by JR/FBWQC for ammonia in State Canal but did not assess these data as part of the 2016 IR because the data were submitted without a Sampling and Analysis Plan and do not included paired temperature and pH data. Nonetheless, this dataset includes additional occurrences of high ammonia concentrations in the State Canal. DWQ encourages JR/FBWQC to submit data including appropriate quality assurance documentation and paired pH and temperature data for consideration in in future assessments.
U	428	3	The Lake and Reservoir Assessments (2016 Draft, Chapter 4) show that Utah Lake is not supporting designated uses due to harmful algal blooms and total phosphorus. (Chapter 4 at 14) Comments The listing for impairment due to harmful algal blooms is premature since the assessment methodology for harmful algal blooms has not undergone peer review or public notice and comment.	None	Please see comment response Appendix A, introduction and section 12, for responses to this comment.

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U	429	4	The listing of Utah Lake as impaired by total phosphorus is inconsistent with the Methods presented in the 2016 Draft. Chapter 2 notes that the Department is developing comprehensive assessment methods to identify sites with nutrient-related problems, but these methods have not yet been published or approved. (Chapter 2 at37). Similarly, the Methods confirm that the Department does not have assessment methods to delist an assessment unit for phosphorus (Chapter 2 al88). Without having the necessary methods to list or delist a use impairment cause, the current impairment listing for total phosphorus is not defensible.	None	A decision to remove the phosphorus listing that originated in the 2002 Integrated Report will require a demonstration that the lake is fully supporting its uses and that nutrients are not contributing to impairments. The Utah Lake Water Quality Study will determine whether nutrients, and phosphorus in particular, are contributing to beneficial use impairments in Utah Lake. Until that study is complete and there is evidence to demonstrate otherwise, DWQ must maintain listings from prior Integrated Report cycles.
U	430	4	The WHO Guidelines recommend total phosphorus concentrations below 0.03 mg/L to prevent toxic accumulations of cyanobacteria. Utah Lake may naturally exceed this level. Consequently, cyanobacteria blooms may be naturally occurring and should not be considered use impairments under the Clean Water Act. More research is required to assess whether cyanobacteria blooms are a natural condition for Utah Lake. If this is the case, the lake should not be listed under Assessment Unit Category 5.	None	Whether or not cynoabacteria blooms or phosphorus concentrations greater than 0.03 mg/L are natural to Utah Lake is outside the scope for the Integrated Report. These questions will be addressed during the Utah Lake Water Quality Study. The classification of water quality impairments as natural conditions or the result of hydrological modifications is out of scope for the IR. Such a process requires a beneficial use change. The process for changing the beneficial uses requires a rule change that must be approved by the Water Quality Board and USEPA. Such a process can be initiated either during DWQ's triennial review process (http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/standards/triennialrev.htm) or through DWQ's water quality standards workgroup (www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/standards/subworkgroups.htm).
U	431	4	The impairment listing for Utah Lake for total phosphorus and hazardous algal blooms should be withdrawn pending adoption of rules, after peer review and public notice, to specify appropriate impairment thresholds for cyanobacteria and total phosphorus.	None	A decision to remove the phosphorus listing that originated in the 2002 Integrated Report will require a demonstration that the lake is fully supporting its uses and that nutrients are not contributing to impairments. The Utah Lake Water Quality Study will determine whether nutrients, and phosphorus in particular, are contributing to beneficial use impairments in Utah Lake. Until that study is complete and there is evidence to demonstrate otherwise, DWQ must maintain listings from prior Integrated Report cycles.
U	432	5	The impairment listing for Utah Lake for total phosphorus andhazardous algal blooms should be withdrawn pending adoption of rules, after peer review and public notice, to specify appropriate impairment thresholds for cyanobacteria and total phosphorus. D. Chapter 5: Narrative Standard Assessment of Recreational Use Support in Lakes and Reservoirs and Application to Utah Lake The 2016 Draft provides an expanded narrative standard assessment of recreational use support for Utah Lake (Chapter 5). This assessment is based on the harmful algal bloom (HAB) assessment method and the Tier II lake assessment method presented in Chapter 2 of the2016 Draft. (2016 Draft, Chapter 5 at 8). UDV/Q's HAB assessment method is based on an exceedance of 100,000 cyanobacteria cells per milliliter (cells/mL), an established indicator of human health risk. The assessment methods identify two exceedances of this indicator as a recreational use impairment. While cyanobacteria cell counts are the primary indicator for assessment purposes, two supplemental indicators are also used as confirmation of the primary indicator: cyanotoxin concentrations exceeding 20 itglL and algal growth measured as chlorophyll a concentrations exceeding 50 itgll- (Figure 1). The World Health Organization has defined thresholds for all three indicators that are associated with a low, moderate, high, and very high relative probability of acute human health effects in recreational waters (Table I). Exposure routes that may result in negative human health effects from HABs and cyanotoxins include dermal contact, inhalation, or ingestion of cyanobacteria or associated cyanotoxins. The discussions presented in Chapter 5 provide additional descriptions of the two supplemental indicators used as confirmation for the HAB indicator. Microcystin concentrations are used as confirmatory evidence of toxin producing algae that pose a human health risk to recreational uses. (2016 Draft, Chapter 5 at 11). The 50 irgll chlorophyll-a concentration is characterized as an indicator of increasing cyanobacterial dominance and has a positive relationship with cyanotoxin concentration. Based on the methodology described above and water quality samples collected in20l4, DV/Q assessed Utah Lake to be impaired for hazardous algal blooms. The data are summarized in Chapter 5 (pages 15 - 17). These data show HABs > 100,000 cells/ml for several stations (Lindon Harbor, State Park Harbor, and Lake outlet), one microcystin concentration > 20 itglL, and 33 chlorophyll-a concentrations > 50 itglL. The single microcystin concentration exceeding the indicator level was for a shoreline sample. "This sample was collected from a targeted location along the shoreline as	None	A decision to remove the phosphorus listing that originated in the 2002 Integrated Report will require a demonstration that the lake is fully supporting its uses and that nutrients are not contributing to impairments. The Utah Lake Water Quality Study will determine whether nutrients, and phosphorus in particular, are contributing to beneficial use impairments in Utah Lake. Until that study is complete and there is evidence to demonstrate otherwise, DWQ must maintain listings from prior Integrated Report cycles. Also, please see comment response Appendix A for additional clarification and responses to comments on HAB assessment methods and assessments.

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			recommended by Utah's HAB guidance to assess the highest risk of exposure at a point of potential recreational contact". (2016 Draft, Chapter 5 at 16)		
U	433	5	Use of the 100,000 cyanobactena celllmL concentration as a use impairment indicator should be peer reviewed and proposed as a use impairment threshold for public review and comment. The use of this threshold was discussed in comments on Chapter 2 and are applicable here. The phytoplankton water quality samples, used to assess exceedance of the HAB threshold concentration, were not collected in accordance with the specified method contained in the 2016 Draft (See, 2016 Draft, Chapter 2 at 58) and cannot be used to make an assessment concerning Tier I drinking water use support or recreational use support. The algal sample, which is analyzedfor taxonomic composition and primary production (chlorophyll a), is collected cts a composite samplefrom two times the depth of the Secchi disc reading to the surface up to a maximum of 2 meters.	None	The phytoplankton sampling methods referred to in the comment are used for aquatic life use assessments under tier II assessment methods. Samples for HAB assessment have been collected following Utah's HAB SOP. Please see the HAB methods comments response document section 7 for further information.
U	434	5	All of the samples illustrated in Chapter5-Figure 4 of the 2016Drcft. which exceeded 100,000 cells/ml, were collected at the surface and it is not apparent whether full body or secondary contact recreation is even possible in these locations. Consequently, the exposure thresholds upon which the human health threat is based cannot be assessed. Moreover, it is not apparent that the targeted sampling procedures used by DViQ are consistent with the procedures used in the WHO Guidance to set the threshold concentrations. WHO selected the 100,000 cells/ml threshold as a water column concentration that could promote the formation of dense scums at the surface, not a concentration of cyanobacteria in a scum layer.	None	Please see comment response Appendix A, section 7, for a response to this comment.
U	435	5	As discussed in Chapter 5, recreational exposure, including dermal contact, inhalation, and ingestion are all potential exposure routes for HABs (Chapter 5 at 9). We doubt that dermal contact and inhalation are significant exposure routes. For example, if dermal contact was significant, it is highly doubtful that DWQ staff collecting HAB scum samples in Utah Lake would risk exposure to high concentrations of toxic cyanobacteria. (See Figure 5, lower right panel, illustrated below).	None	Please see comment response Appendix A, section 1, for a response to this comment.
U	436	5	Cyanotoxin threshold of 20 ug/L is charactenzed as an acute human health value. This is not correct. The'WHO Guidance (at 151) states, The level of 20pg microcystin/litre is equivalent to 20 times the WHO provisional guideline value concentrationfor microcystin-LR in drinking-water (WIHO, 1998) and would result in consumption of an amount close to the tolerable daily intake (TDI) for a 60-kg adult consuming 100 ml of water while swimming (rather than 2 litres of drinking-water). As discussed above, the cyanotoxin threshold represents the allowable daily intake, every day, for a lifetime. This is not an acute exposure. The WHO Guidance further notes that such an exposure for a child would exceed the TDI, but we question whether the incidental consumption volume of 100 mL is appropriate for a scum layer that is confined to the surface of the water. Moreover, it is clear from the discussion that the exposure of concern is incidental consumption, not dermal contact or inhalation. Consequently, use of this supplemental indicator should be based on the ingestion only and the amount of incidental ingestion needs to be assessed for the scum layer if focused sampling, such as that conducted for this evaluation, is used in the future.	Text clarification	The phrasing, "acute human health effects" is based on an EPA interpretation of the WHO guidance (https://www.epa.gov/nutrient-policy-data/guidelines-and-recommendations). WHO guidance and DWQ's HAB assessment methods are based on the potential for both short and long-term effects, in accordance with the health effects identified by WHO (1999, 2003). This has been clarified in chapters 5 by removing the term, "acute," from this phrase.
U	437	5	Chlorophyll-a should be dropped as a supplemental indicator because the available data for Utah Lake confirm that chlorophyll-a concentrations greater than 50 pgll- routinely occur in the lake without HABs exceeding 100,000 cells/ml For example, HABs exceeding 100,000 cells/ml have not been detected in Provo Bay, even though 74o/o of all water quality samples show chlorophyll-a above 50 itglL. (2016 Draft, Chapter 5 at 15, l7).	None	Please see comment response Appendix A, section 7, for a response to this comment.
U	438	5	The assessment methods, primary indicator, and supplemental indicators require a scientific peer review to determine whether they are appropriate for making recreational use support determinations. Once such a peer review is completed, the assessment and indicator thresholds must be proposed for public notice and comment before they can be used to list any waterbodies as impaired.	None	Please see comment response Appendix A, introduction and section 12, for responses to this comment.

Letter	Comment Number	Chapter Number	Public Comment	Action	Agency Response
U	440	6	The2016 Draft provides an evaluation of HAB data in Farmington Bay (Chapter 6). In discussing potential routes of exposure to HABs in Farmington Bay, DWQ cited infrequent primary and secondary contact recreation, including air boating, kayaking, canoeing, hunting, and bird watching. (Chapter 6 at7).In assessing the available data, DWQ used the same indicators as those used for the formal HAB assessment of Utah Lake. (Chapter 6 at 8). Comments Use of the WHO Guidelines as the basis for evaluating recreational use impairment in Farmington Bay is improper because the routes of exposure in Farmington Bay are not relevant to the basis for the WHO Guidelines. The WHO thresholds are based primarily on incidental ingestion of waters containing elevated levels of microcystin. The primary exposure routes identified in Chapter 6 are dermal contact and potential inhalation. These exposure routes do not result in cyanotoxin doses consistent with the ingestion route. Consequently, the thresholds need to be reassessed.	None	The IR assesses readily available data against existing water quality standards in R317-2. Consistent with the Clean Water Act Section 101(2), recreational uses are presumed to be achievable. The recreational use classes assessed for the IR include Classes 2A and 2B (R317-2-6). Class 2A -- Protected for frequent primary contact recreation where there is a high likelihood of ingestion of water or a high degree of bodily contact with the water. Examples include, but are not limited to, swimming, rafting, kayaking, diving, and water skiing. Class 2B -- Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing. Exposures while kayaking or boating are expected to result in lower exposures than activities such as swimming or water skiing. However, both Classes presume full body contact. A Use Attainability Analysis is required to modify the Class 2B use to remove primary contact recreation. If the science evolves to support different assessment methods for assessing support of the recreational uses for Classes 2A and 2B, the methods will be revised.
U	441	6	Although the DV/Q claims it used the same indicators as those used in Utah Lake, when evaluating cyanotoxins, it treated nodularin as being identical to microcystin-LR. The basis for treating these different cyanotoxins interchangeably needs to be presented to demonstrate that such a change is appropriate.	None	Nodularin specific guidelines for recreational exposure have not yet been developed. However, the current state of the science suggests that nodularin and microcystin toxicities are comparable. The rationale for this assertion is fully described, including references to pertinent scientific literature, in Chapter 6 under the headings, "Harmful Algal Bloom Indicators, Cyanotoxin Concentration Indicators". The nodularin indicator has not been used to make assessment decisions in the 2016 IR. It has only been used to provide a benchmark comparison for Farmington Bay HAB data.
U	442	6	Threshold indicators for HABs and cyanotoxin concentration purported to impair recreational uses in Farmington Bay require peer review and public notice/comment to adopt regulations and procedures to make such assessments.	None	Please see comment response Appendix A, section 12, for a response to this comment.
U	443	7	F. Chapter 7: Utahs's Draft Assessment Methods for High Frequency Data and Pilot Application for the Jordan River The 2016 Draft provides draft assessment methods for high frequency data with application to dissolved oxygen measurements in the lower Jordan River (Chapter 7). As presented, these methods appear reasonable. However, the assessments presented for the lower Jordan River are preliminary and gaps in the available high frequency dataneed to be resolved. When DWQ assembles a complete data set, the data and evaluation should be presented to the public for review and comment prior to adoption.	None	DWQ appreciates the encouragement on the proposed assessment procedures. At present the lower Jordan River sonde platforms are maintained by JR/FBWQC. DWQ has no control over data gaps and must use all available data in order to make an assessment of water quality parameters on the lower Jordan River. In the future these data gap issues will continue to be filled. As with all IR assessments, the methods will be made available for public comments as they are finalized, as will the data and results used to conduct assessments in future IRs.
V	444	NA	Concerns for lack of data on American Fork Canyon River and tributaries I started a group called Protect and Preserve American Fork Canyon, now, 11,000 members. I have concerns for lack of data on water quality and protections (lack of protections) in American Fork Canyon. We know there are heavy metals upstream, we know there is a historic mining history and EPA interventions (partial), we know Snowbird has points of pollution (Mary Ellen Gulch) which have gone unaddressed or remediated. We know there is no heavy metals testing in drinking water in the canyon, yet 1.2M visits are made to the canyon. This is a potential huge liability. What is needed? EPA to come and do a full hazards analysis of heavy metals in the canyon and implementation of water protections measures be put in place, including testing of campground water, Snowbird to be ordered by EPA to remediate their mine tailings. Funding for DWQ to implement a plan to protect the water, not just tell the citizens it is not safe to use (Utah Lake Algae Bloom comes to mind). We know Snowbird is fiddling around in the portal of a mine adit and its possible there are tens of thousands of gallons of tainted water behind the earthen plug, again, no oversight from the state, we need the EPA to come in, this should be a CERCLA project. We are aware of Mountain Accord proposed land swaps in Big and Little Cottonwood Canyons, yet ironically about 300+ mines on private lands have not had any hazards analysis done and the public should not be encumbered by the resorts toxic tailings which can impair water. Again, no data or no one is in charge of gathering data to proactively protect watersheds. In my view, this is well above the expertise county or state entities. The EPA was the solution to remediation in Mineral Basin, now, their expertise and oversight is needed in Mary Ellen Gulch. Please include these ideas in the integrated report. (***Compiler note: 7 digital photo attachments not included here***) Mark Allen	Out of scope	Since the date of your comment DWQ has received notice that EPA Region 8 will be conducting a preliminary assessment of Mary Ellen Gulch under the authority of the CERCLA program. This is an important first step in assessing whether the site poses a threat to human health or the environment and is expected to completed by the fall of 2017.

Letter	Comment Number	Chapter Number	Public Comment	Action	Agency Response
W	445	NA	**American Fork Canyon** I have concerns for lack of data on water quality and protections (lack of protections) in American Fork Canyon. We know there are heavy metals upstream, we know there is a historic mining history and EPA interventions (partial), we know Snowbird has points of pollution (Mary Ellen Gulch) which have gone unaddressed or remediated. We know there is no heavy metals testing in drinking water in the canyon, yet 1.2M visits are made to the canyon. This is a potential huge liability and public health concern. What is needed? I would like to see the EPA to come and do a full hazards analysis of heavy metals in the canyon and implementation of water protections measures be put in place, including testing of campground water. It is fitting that Snowbird to be ordered by EPA to remediate their mine tailings. We know Snowbird is fiddling around in the portal of a mine adit and its possible there are tens of thousands of gallons of tainted water behind the earthen plug, again, no oversight from the state, we need the EPA to come in, this should be a CERCLA project. In my view, this is well above the expertise of our county or state entities and the EPA has the know how, track record and personnel to protect our canyon waters and public health. The EPA was the solution to remediation in Mineral Basin, now, their expertise and oversight is needed in Mary Ellen Gulch. The solution to pollution is not dilution, the solution to pollution in our canyons is simple, have the resorts clean up their mine tailings and stop the points of pollution onto public lands. Jon Geertsen	Out of scope	Since the date of your comment DWQ has received notice that EPA Region 8 will be conducting a preliminary assessment of Mary Ellen Gulch under the authority of the CERCLA program. This is an important first step in assessing whether the site poses a threat to human health or the environment and is expected to completed by the fall of 2017.
X	446	NA	**Concern for water quality in American Fork Canyon** I have concerns for lack of data on water quality and protections (lack of protections) in American Fork Canyon. We know there are heavy metals upstream, we know there is a historic mining history and EPA interventions (partial), we know Snowbird has points of pollution (Mary Ellen Gulch) which have gone unaddressed or remediated. We know there is no heavy metals testing in drinking water in the canyon, yet 1.2M visits are made to the canyon. This is a potential huge liability and public health concern. What is needed? I would like to see the EPA to come and do a full hazards analysis of heavy metals in the canyon and implementation of water protections measures be put in place, including testing of campground water. It is fitting that Snowbird to be ordered by EPA to remediate their mine tailings. We know Snowbird is fiddling around in the portal of a mine adit and its possible there are tens of thousands of gallons of tainted water behind the earthen plug, again, no oversight from the state, we need the EPA to come in, this should be a CERCLA project. We are aware of Mountain Accord proposed land swaps in Big and Little Cottonwood Canyons, yet ironically about 300+ mines on private lands have not had any hazards analysis done and the public should not be encumbered by the resorts toxic tailings which can impair water. Again, no data or no one is in charge of gathering data to proactively protect watersheds as pertaining to mine tailings and heavy metals in our canyonsowned by Ski Resorts. They should not have a free pass to pollute. In my view, this is well above the expertise of our county or state entities and the EPA has the know how, track record and personnel to protect our canyon waters and public health. The EPA was the solution to remediation in Mineral Basin, now, their expertise and oversight is needed in Mary Ellen Gulch. The solution to pollution is not dilution, the solution to pollution in our canyons is simple, have the resorts clean up their mine tailings and stop the points of pollution onto public lands. Shauna Hatch	Out of scope	Since the date of your comment DWQ has received notice that EPA Region 8 will be conducting a preliminary assessment of Mary Ellen Gulch under the authority of the CERCLA program. This is an important first step in assessing whether the site poses a threat to human health or the environment and is expected to completed by the fall of 2017.
Y	447	3	I, Janene Judd, just joined Protect and Preserve American Fork Canyon. Today, I found out that Utah County Commissioners gave away parts of American Fork Canyon to Snowbird ski resort. Subsequently, preliminary work at the purchased site is unearthing toxic waste. I am a Utah County resident of 63 years, and I want all development efforts to stop until the EPA completes testing on noted toxic sites, publishes the results, and starts monitoring subsequent activity in the area. Snowbird owners must be mindful that they are tampering with a major water shed that feeds into a separate, waterhungry county. I am already concerned about water quality of Tibble Fork Reservoir and the streams that flow into and from it.	Out of scope	Since the date of your comment DWQ has received notice that EPA Region 8 will be conducting a preliminary assessment of Mary Ellen Gulch under the authority of the CERCLA program. This is an important first step in assessing whether the site poses a threat to human health or the environment and is expected to completed by the fall of 2017.

Letter	Comment Number	Chapter Number	Public Comment	Action	Agency Response
Y	448	3	Snowbird needs to be monitored by the EPA as they deal with the mine tailings on the property they now own. There is evidence that Snowbird has done some exploring around the portal of a mine and released tainted water into our water supply. It is likely there are tens of thousands of gallons of tainted water behind a currently leaking earthen plug, potentially creating a huge hazard. And yet, the state seems to be ignoring the situation. We need the EPAthis should be a CERCLA project. The public should not be left with the burden of cleaning up the resort's toxic tailings as Snowbird's customers trample Utah County's wilderness and not even a penny of tax money coming our way.	Out of scope	Since the date of your comment DWQ has received notice that EPA Region 8 will be conducting a preliminary assessment of Mary Ellen Gulch under the authority of the CERCLA program. This is an important first step in assessing whether the site poses a threat to human health or the environment and is expected to completed by the fall of 2017.
Y	449	3	No one is currently in charge of gathering data to protect watersheds from mine tailings and heavy metals in our canyons owned by Ski Resorts. They should not have a free pass to pollute!! We need the EPA's expertise and oversight specifically in Mary Ellen Gulch. Please help us with this situation and add my comments to the "Integrated Report."	Out of scope	Since the date of your comment DWQ has received notice that EPA Region 8 will be conducting a preliminary assessment of Mary Ellen Gulch under the authority of the CERCLA program. This is an important first step in assessing whether the site poses a threat to human health or the environment and is expected to completed by the fall of 2017.
Z1	450	5	the lack of an adequate explanation about the obvious differences between cyanotoxins problems INSIDE of Utah Lake boat harbors versus the obvious lack of "demonstrated" problems outside of them	None	Please see comment response Appendix A, sections 7 and 8, for responses to this comment.
Z1	451	5	and the obvious reasons why the difference exists between the two VERY distinct conditions (protected versus unprotected) relative to the effects of wind disturbance, and the obvious influence of resulting turbidity in open water on algae production of any kind	None	Please see comment response Appendix A, sections 7 and 8, for responses to this comment.
Z1	452	3	the lack of an adequate explanation about the relationship between thunderstorm rain events and their influence on resulting low DO problems in the lower Jordan R.	Out of Scope	Identification of sources of pollution is not part of the Assessment Methods of the IR. Sources will be determined as part of the TMDL or related source assessments. We refer the commenter to the ongoing development of a dissolved oxygen TMDL for the Jordan River (http://www.deq.utah.gov/ProgramsServices/programs/water/watersheds/jordanriver/index.htm).
Z2	453	3	In reviewing the 2016 Integrated Report I noticed that Little Cottonwood Creek was listed for pH. I was interested in this because we treat Little Cottonwood Creek water here at the Little Cottonwood Water Treatment Plant. As I reviewed the data, two dates stood out to me. On 5/7/2012 high pH values (9.34-11.03) were reported for all sites measured and on 7/9/2012 low pH values (5.86 – 6.81) for all sites. This led me to review our data for Little Cottonwood Creek and neither our online instrument nor our daily grab results showed high pH values on 5/7/12 or low pH values on 7/9/12. Our grab sample results were 7.83 and 7.92 on 5/7/12 and 7/9/12 respectively. Online pH values were between 7.28 and 7.31 on 5/7/12 and between 7.33 and 7.53 on 7/9/2012	None	The listing decision you are commenting on was part of the 2012/2014 IR. The sites that exhibited water quality violations (5918870 and 5918920) were not sampled again within the period of record of the 2016 IR. At this time, we are unable to evaluate your data for inclusion in the 2016 analysis. However, we encourage you to submit your data during our 2018 call for data with supporting documention outlined therein for our evaluation and possible inclusion in the 2018 IR.
Z3	454	5	We remain incredibly disappointed by the ongoing delay in implementing water standards for Utah Lake, and also for Farmington Bay. Clearly these areas are highly impaired under Clean Water Act standards. There must be no more delays. Action must IMMEDIATELY be taken to solve these problems. The kinds of algal blooms experienced in 2016 and recent prior years are not normal and NOT the product of "natural conditions." These are growing population centers and the problem is not going to go away: (a) these areas will experience nothing but more and more pollutants (they should be called what they are and not referred to simply as "nutrients" which highly misleads the public an excess of a chemical in this context of eutrophication is called pollution and it is more than just "nutrients" that is causing the problem); (b) multiple Utah tree ring studies show that 1950 to 2000 was one of the wettest periods in the last 800 years and that we are returning to drier conditions the problems in connection with which will be greatly exacerbated by anthropogenic effects that are clearly happening at the same time as high population growth and extreme development activities continue to occur near and around these areas. The abuses to Utah Lake over the past 167 years have reached a final tipping point. Even by the mid1920' s, critical aquatic vegetation was already largely gone as a result of the practice of dumping raw sewage into the lake as well as from agricultural runoffs and other abuses. Newspaper articles from 1971 talk about returning Utah Lake to an enjoyable place to recreate, and there were meetings and there were studies and more talk. Yet here we are some 45 years later and the lake is in even worse shape. The current inadequate standards are the	None	Suggestions regarding changes to DWQ's nutrient reduction strategy and water quality standards are beyond the scope of the IR. Information regarding DWQ's nutrient reduction strategy, including contact information, is available here: http://deq.utah.gov/Pollutants/N/nutrients/index.htm. Suggested water quality standard changes can be submitted either through DWQ's triennial review process (www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/standards/triennialrev.htm) or through DWQ's water quality standards workgroup (www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/standards/subworkgroups.htm).

Letter	Comment Number	Chapter Number	Public Comment	Action	Agency Response
			reason that this most recent massive algal bloom has occurred, the worst ever observed on the lake. Utah Lake is a sick, highly polluted lake and northern Utah residents deserve better. Utah Lake health obviously impacts the Jordan River and the Great Salt Lake. Utah Lake as it is now being managed represents a significant health hazard to all residents of the Wasatch Front in northern Utah. Current delays calling for more study are inappropriate: action must be taken, and now. Actions must include: (a) Implementing total maximum daily load (TMDL) standards that have been delayed for far too long immediately; and (b) Taking additional immediate steps to require Utah (and Davis) County sewage treatment plants to remove nitrogen and phosphorous out of sewage water; (c) Becoming proactive and closely involved in helping to limit any further development and ESPECIALLY ROAD CONSTRUCTION around the Utah Lake (and the Great Salt Lake) including the massive proposed road construction currently in the process of being implemented (TransPlan40 proposals specifically with respect to Utah Lake), the toxic runoffs from which will greatly exacerbate attempts to return the lake to some minimum level of health, and to also protect the few remaining biodiverse wetland areas including areas already identified of conservation concern, and to work with other agencies and organizations to restore at least some of the wetland communities that used to exist around Utah Lake, which will also help to greatly improve water quality and human health and recreation values.Currently UDOT seems to be oblivious to the importance of contiguous, healthy wetland ecosystems and eutrophication consequences of their projects proximate lake, streams, river, springs, and underground water sources. You must become involved to make sure that roads are not built through our precious and few remaining wetland areas that help to act as filters and provide invaluable services for people and wildlife: part of the strategy to mitigate and avoid algal blooms MUST include consideration of a healthy wetland infrastructure. Air pollution and acid rain type issues no doubt are also at work which is why more roads and more cars and more polluted air will also work against effective solutions in the long term and we must come up with other solutions to Wasatch Front transportation which has a direct bearing on water quality. A parallel example (and there are of course many, many others) from example from Lake Champlain in Vermont: http://www.middlebury.edu/media/view/276855/original/final_compiled_small.pdf A quote from the above: "In a warming world, phosphorus loads are likely to increase, rather than decrease. With climate change, Vermont is likely to experience more frequent heavy storm events, with runoff and floods which can account for up to 95% of phosphorus loading (Stager and Thill 2010). Climate change will likely increase precipitation across the board; Vermonters will see more winter rains rather than snow." (see bottom of page i) We can expect similar impacts here and that phosphorous loads will continue to increase. Road and other construction and loss of wetlands with integrity will add to the existing eutrophication problems that clearly exist at Utah Lake and which is acknowledge by many sources including this 2014 report at Utah Lake http://utahlake.gov/cautiondangerousalgaebloomatutahlake/ And that was two years ago. No more delays. Please take action. Implement TMDL now as a first step.		

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Appendix A – Joint Comment Responses

INTRODUCTION:

DWQ received numerous public comments on the 2016 Integrated Report (IR) regarding current recreational use assessment methods for harmful algal blooms (HABs), nutrient management strategies, and currently defined beneficial uses and water quality standards for Utah Lake and Farmington Bay. DWQ is electing to respond jointly to these frequently received comments in the interest of clarity and transparency. Summaries of these comments are provided herein. Please refer to the original public comment documents or the comment response matrix posted on DWQ's website (www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/currentIR2016.htm#comment) for the full context of all comments.

DWQ's recreational use assessment methods for HABs (hereafter HAB assessment methods) are distinct from the HAB health response and advisory procedures (hereafter HAB health advisory procedures) developed and implemented by the state and local health departments, respectively. DWQ's HAB assessment methods are used to assess water quality and support or impairment of recreational uses. HAB health advisory procedures are used by local health departments, in cooperation with DWQ, to respond to specific HAB events and distribute health advisories for waterbodies as appropriate. Although these two processes may come to similar conclusions in some cases, in other cases, they may not. Because the IR is an assessment of water quality and use attainment, the responses in this document address comments on the HAB assessment methods.

DWQ's HAB assessment methods are based on Utah's Narrative Water Quality Standard. The Narrative Standard identifies conditions such as unnatural deposits, scum, color and odor nuisances, conditions which have undesirable effects on aquatic life, and concentrations of substances which may produce undesirable human health effects as violations of water quality standards (UAC R317-7.2). The Narrative Standard speaks to a broad range of undesirable conditions, but the potential for negative human health effects and the formation of algal scums are of primary consideration for DWQ's HAB assessment methods.

DWQ also received several more general comments regarding the use of narrative standard indicators in assessments, currently defined beneficial uses for Farmington Bay and Utah Lake, and nutrient management strategies. Although these comments are not specifically about HAB assessment methods, they are generally related to HAB assessments and analyses in the 2016 IR. Therefore, they are also included in this document.

HAB Assessment Method Comment Responses

1. HAB exposure routes and human epidemiology studies:

SUMMARY OF PUBLIC COMMENTS:

1. Inhalation and dermal contact are not significant exposure routes for cyanobacteria or cyanotoxins.
2. The human epidemiology studies linking human health effects to cyanobacteria or cyanotoxin exposure are not strong enough to use as a basis for an assessment method.

DWQ RESPONSE: In the 2016 IR, DWQ identified ingestion, dermal contact, and inhalation as possible exposure routes to cyanobacteria and cyanotoxins. Much of the science regarding HABs has focused on the ingestion exposure route, and the potential health effects of inhalation or dermal contact can be difficult to quantify. However, DWQ's assertion that inhalation is a potential exposure routes to HABs of cyanotoxins is consistent with interpretations from EPA (2015) and WHO (2003) and is supported by current science (reviewed by Drobac et al., 2013). Similarly, WHO (1999; 2003) clearly identify the dermal effects of mild to severe dermatitis associated with exposures to cyanobacteria cells. These dermal effects would likely prevent people from knowingly recreating in the affected waters and thereby constitute impairment. The current state of the science does not support assessment methods that differentiate between the potential exposure pathways. Therefore, DWQ's HAB assessment methods are based on levels of recreational exposure to HABs that have been associated with negative health effects.

In developing and applying the HAB assessment method, DWQ thoroughly reviewed available HAB epidemiology studies. As with all scientific research, each of these studies has individual strengths and weaknesses. However, the collective body of literature clearly identifies a link between HABs and potential human health effects. This conclusion is consistent with interpretations from Utah Department of Health, local health departments, WHO, EPA, CDC, and a number of state and international management agencies. DWQ has modified our sampling protocols to reflect these concerns by implementing safety procedures and personal protective equipment that minimize exposure to cyanobacteria during sampling including the use of gloves, other skin protection, and the use of respirators as appropriate.

2. The use of cyanobacterial cell counts or cyanotoxins in HAB assessment:

SUMMARY OF PUBLIC COMMENTS:

1. The use of cyanobacteria cell counts to assess support or impairment of the recreational use is inappropriate. Cell counts do not always predict cyanotoxin concentrations. Cyanotoxin concentrations are a more appropriate means for assessing beneficial use support or impairment based on HABs. Other states incorporate cyanotoxins as a primary assessment method and DWQ should follow those examples.
2. There are several ways that DWQ's HAB methods could be improved, but the methods and resulting HAB assessments in the 2016 IR are generally appropriate.

DWQ RESPONSE: Although there are several potential means for assessing water quality impairments resulting from HAB occurrence, DWQ has concluded that the use of cyanobacterial cell counts as a primary recreational use assessment indicator is scientifically defensible and appropriate. Cell counts are also recommended as the primary measure in Utah's HABs health advisory procedures.

In developing the HAB assessment methods, DWQ carefully reviewed methods from other states for both water quality assessment and human health warnings. Methods in other states are mixed and range in level of focus on cyanobacteria, cyanotoxin concentrations, measures of general algal growth, or combinations of these factors. Although there are several potential methods for assessing the occurrence of HABs, DWQ has identified total cyanobacteria cell counts as the most appropriate for protecting recreational uses. The cyanobacteria cell count indicator is not based on the ability to predict concentrations of specific cyanotoxins. It is intended to identify conditions where negative human health effects may occur due to cyanobacteria or cyanotoxin exposure, and is based on epidemiological studies that identify these relationships. The rationale for considering this to be the most appropriate assessment method is further described below and in response Nos. 1 and 3 in this document.

DWQ agrees that cyanotoxins are also an important component for HAB assessment and may incorporate toxin concentrations as a primary indicator in future assessment methods. The potential health effects of cyanotoxins are well established, and the presence of cyanotoxins in a waterbody is a clear concern. However, given the current science, a toxin-only assessment approach would be inadequate for protecting the recreational use due to the high potential for false negative assessments. There are several reasons for this position including:

1. Currently, there is a significant level of uncertainty in measuring and interpreting cyanotoxin concentrations. This uncertainty arises from several issues, including; numerous congeners of unknown toxicity for some toxins, a lack of standard analytical methods for quantifying toxin concentrations, and difficulty in interpreting non-detect values for cyanotoxins due to highly unpredictable variation in toxin production and breakdown in the environment (Ressom et al., 1994).

2. Cyanobacteria are associated with the production of numerous potential toxins and toxin congeners, and it is unlikely that all types of potentially harmful cyanotoxins have been identified (WHO 2003, Otten and Paerl 2015). For instance, over 85 variants of microcystin, the most extensively studied cyanotoxin, have been identified, each with varying degrees of toxicity (Rastogi et al., 2014). Even among known or suspected toxins, the health effects of many remain unknown or poorly understood (Manganolli et al., 2012, Drobac et al., 2013). The potential for the occurrence of unknown toxins or congeners means that a toxins-only assessment may be inadequately protective of recreational uses.

3. Negative human health effects from recreational exposure to cyanobacteria blooms in the absence of detected cyanotoxins have been documented (Pilotto et al., 1997, Stewart et al., 2006b, Levesque et al. 2014, Lin et al., 2016). This is further supported by DWQ's experience with cyanobacteria blooms in Utah Lake during summer 2016. Although measured toxin concentrations through this event were generally low (except at specific times and locations) over 160 recreationists exposed to the bloom reported adverse health effects consistent with

cyanobacteria exposure including vomiting, diarrhea, nausea, headache, and skin and eye irritation. Although it is unclear whether these health effects resulted from irritation caused by cyanobacterial cells, unknown cyanotoxins, known cyanotoxins that went undetected, or other causes, this experience highlights the potential inadequacy of relying on cyanotoxin concentrations alone for assessment purposes.

For the reasons described above, DWQ considers the presence of cyanobacteria in concentrations with the potential to produce toxins at concentrations harmful to human health to be the most reliable available indicator for assessing water quality. However, DWQ does agree that cyanotoxin benchmarks should be a more formal part of future HAB assessments. Beginning in 2016, toxin samples are being routinely collected and analyzed through the course of HAB events and DWQ is undertaking efforts to improve the accuracy and timeliness of toxin results. Ultimately, toxin concentrations will be integrated into HAB assessment methods as the state of HAB science continues to improve and availability of health guidelines allows.

3. The use of total cyanobacteria cell counts versus cell counts of "potentially-toxic" taxa

SUMMARY OF PUBLIC COMMENTS: DWQ's cell count indicator for HAB assessment should be based only on "potentially-toxic" taxa which may be a more useful measure of recreational use support or impairment than total cyanobacteria.

DWQ RESPONSE: DWQ's application of the cyanobacteria cell count threshold is consistent with WHO guidelines which are not taxon-specific, except for deriving the link between cell densities and a single cyanotoxin, microcystin. WHO guidance explicitly identifies that, "It is prudent to presume a toxic potential in any cyanobacterial population." The WHO guidance goes on to say, "For practical purposes, the present state of knowledge implies that health authorities should regard any mass development of cyanobacteria as a potential health hazard."

Differentiating between blooms of non-toxic and potentially toxic-cyanobacteria is currently problematic. This difficulty is due to the numerous potential toxins and congeners associated with cyanobacteria (WHO 2003, Otten and Paerl 2015), the recombinant nature of cyanobacteria resulting in the potential for gene transfer between toxic and non-toxic strains (Otten and Paerl 2015 and citations within), and the potential health effects of cyanobacteria cells themselves (Rastogi et al., 2015).

Finally, blooms of known cyanotoxin producing taxa (for example, Nodularia, Microcystis, Aphanizomenon, Dolichospermum) exceeding cell densities of 100,000 cells/mL have been observed in both Utah Lake and Farmington Bay. For example, HAB samples from Utah Lake in 2014 were comprised primarily of two cyanobacteria genera, Aphanizomenon and Dolichospermum. Dolichospermum, a known potent toxin producer was the dominant taxon in three of the five samples that exceeded the 100,000 cell/mL indicator and form the basis of the Utah Lake listing decision in the 2016 Integrated Report. In two of these samples, Dolichospermum densities exceeded 200,000 cells/mL. Similarly, in Farmington Bay, Nodularia, known to produce the cyanotoxin Nodularin, frequently dominated the algal assemblage and exceeded the 100,000 cell/mL indicator alone. Therefore, the use of potentially-toxic taxa cell counts instead of total cyanobacteria cell counts would not affect the Utah Lake 303(d) non-attainment listing or fundamentally alter the interpretation of the Farmington Bay analysis.

These methods may be adjusted as additional information and methods for differentiating among toxic and non-toxic taxa become available.

4. Dog deaths associated with Utah Lake HABs:

SUMMARY OF PUBLIC COMMENTS: DWQ's interpretation and presentation of the two dog deaths that have been associated with the Utah Lake HAB events of 2014 is unfair or inaccurate. This section should be removed from the 2016 IR.

DWQ RESPONSE: The discussion regarding the dog deaths in the 2016 draft IR did not contribute substantively to assessment decisions. However, it does accurately describe these events and fully reflects the level of uncertainty associated with linking animal mortalities to HABs. The sensitivity and vulnerability of canines to cyanotoxins is well-understood (Edwards et al., 1992, Guger et al., 2005,Wood et al. 2007, Backer et al., 2013). The US Center for Disease Control (CDC) suggests that dogs could be useful sentinels of cyanotoxin risk to humans (Backer et al., 2013). Many veterinarians are not trained to identify the effects of cyanotoxins, which is why the CDC has allocated considerable resources to develop materials to better inform the veterinary community to identify and report cyanotoxin health problems in dogs (e.g. www.cdc.gov/habs/pdf/habsveterinarian_card.pdf). Nevertheless, attributing animal mortalities to HAB events with absolute certainty is often not possible given the resources and expertise required for conducting the requisite tests. As a result, causal certainty is generally an unrealistic expectation for interpreting these types of events. However, both dog deaths associated with the Utah Lake 2014 HAB showed evidence of cyanobacteria exposure and exhibited symptoms consistent with exposure to HABs or cyanotoxins (Ressom et al., 1994). This led scientists at both DWQ and the Utah Department of Health to conclude that HAB exposure is likely the sole or contributing cause of death in these animals. Therefore, DWQ is maintaining this section in the final 2016 IR.

5. **Assessment benchmarks for multiple cyanotoxins**

SUMMARY OF PUBLIC COMMENTS: DWQ has only used one benchmark for a single cyanotoxin, microcystin, in interpreting HAB events, but multiple types of toxins are known to exist. DWQ should develop and implement assessment methods or water quality standards for other cyanotoxins. Benchmarks developed by other regulatory agencies may provide a good starting point for developing these benchmarks for Utah.

DWQ RESPONSE: DWQ agrees that several classes of cyanotoxins potentially threaten recreational and aquatic life uses. In fact, five unique cyanotoxin types have been detected in Utah waterbodies. However, guidance on safe levels for recreational exposure is only readily available for microcystin, the most broadly studied cyanotoxin. The lack of clear scientifically-based guidelines for the other cyanotoxins is one of the reasons DWQ's current HAB assessment methods rely primarily on the cyanobacteria cell count indicator. DWQ is actively engaged in improving the ability to detect and assess cyanotoxins and may further incorporate toxin concentrations as an indicator in future assessment methods as appropriate guidance for multiple toxin types become available or can be developed by DWQ. However, the development of additional cyanotoxin benchmarks will require significant time and effort and will likely compliment rather than replace the cell count based assessment methods. Discussion regarding appropriate benchmarks for multiple cyanotoxins is welcomed through stakeholder engagement in DWQ's HAB program (http://deq.utah.gov/Divisions/dwq/health-advisory/harmful-algal-blooms/index.htm) and Water Quality Health Advisory Panel (http://deq.utah.gov/Divisions/dwq/health-advisory.htm).

6. Use of chlorophyll *a* threshold in HAB assessment methods:

SUMMARY OF PUBLIC COMMENTS: DWQ's use of a chlorophyll *a* indicator value of 50 µg/L as part of the HAB assessment methods is an inappropriate means for assessing whether a cyanobacteria bloom has occurred.

DWQ RESPONSE: DWQ agrees that chlorophyll *a* concentrations alone are not necessarily indicative of the occurrence of an HAB event. For that reason, the chlorophyll *a* indicator is only used as a supporting indicator in the IR, and assessment decisions have not been based solely on the chlorophyll *a* threshold. The chlorophyll *a* indicator as used in the IR is not intended to assess whether individual HAB events have occurred in a waterbody. Instead, this indicator is intended to provide supporting information regarding the overall productivity of a waterbody and its underlying potential for HABs. Elevated lake productivity, as measured by chlorophyll *a*, has been associated with an increased probability of occurrence for cyanobacteria or cyanotoxins (Downing et al., 2001, Rogalus and Watzin 2007, Lindon and Heiskary 2009, Yuan et al., 2014). Additional statements clarifying the use of the chlorophyll *a* indicator have been added to Chapters 5 and 6.

7. HAB assessment sample types:

SUMMARY OF PUBLIC COMMENTS: DWQ's use of surface scum and targeted location samples for HAB assessments is inappropriate and not representative enough for recreational use assessments. The HAB sampling methods should be clarified in the IR and made available for public comment prior to use.

DWQ RESPONSE: A sampling process that captures the occurrence or potential occurrence of cyanobacterial surface scums is consistent with WHO guidelines which clearly associate the potential for negative human health effects with the formation of surface scum layers and cyanobacteria cell counts exceeding 100,000 cells/mL in areas where recreational contact may occur.

HAB sampling for cell counts commonly includes both surface scum grab samples and integrated water column samples. These samples may be collected at routine monitoring locations, targeted towards recreational access points, or targeted to areas where blooms are visible. One of these types of samples is not necessarily better or more accurate than the other; instead, they provide different types of information regarding the potential health risk posed by cyanobacteria in a waterbody. In particular, surface samples collected at recreational access points represent the most immediate potential exposure to recreational users, and are therefore appropriate for assessing recreational use attainment.

The samples collected during the October 2014 HAB events on Utah Lake identified surface scum formation and cyanobacteria cell counts exceeding 100,000 cells/mL in three unique locations around the lake; two harbors (Lincoln Harbor and State Park Harbor), and one open water location (near the lake outlet). The spatial distribution of these exceedances suggests that these samples were representative of conditions occurring in several parts of the lake.

Sampling methods for specific parameters are developed independently of the IR, and a full description of all sampling methods for all parameters is beyond the scope of the IR. After the HAB that occurred in 2014 at Utah Lake, DWQ, in consultation with Rushforth Phycology and the Utah Department of Health, developed the Standard Operating Procedure (SOP) "Recommended Standard Procedures for Phytoplankton collection to detect Harmful Algal Blooms" that was introduced in July 2015 and finalized in May, 2016. The SOP was vetted by the Water Quality Health Advisory Panel and the HAB communication Group. It was presented at the Conference of Local Environmental Health Administrators and was posted on DEQ's website at http://deq.utah.gov/Divisions/dwq/health-advisory/harmful-algal-blooms/docs/SOP-HAB-Phytoplankton-Samples-2016.pdf. The procedures used in 2014, for both surface and integrated samples, were consistent with the procedures developed in response to that event and were adapted from published methods used by other states. The current sampling procedures also include guidelines for personal protective equipment to minimize exposure to potentially harmful cyanobacteria or cyanotoxins including gloves, skin covering, eye protection, and breathing protection.

8. Applicability of Utah Lake HAB listing to the lake as a whole:

SUMMARY OF PUBLIC COMMENTS: The Utah Lake AU should be split so that the HAB impairment listing for Utah Lake is only applied to the specific marinas or beaches where HAB indicators have been exceeded.

DWQ RESPONSE: DWQ has not split the AU for Utah Lake (portions other than Provo Bay) and has applied the recreational use impairment listing to the entire Utah Lake (portions other than Provo Bay) AU for three reasons: 1)The marinas and beaches around Utah Lake are not clearly distinct waterbodies and therefore do not warrant an AU split; 2) the occurrence of HABs has been observed lake-wide in Utah Lake (portions other than Provo Bay) AU; and 3) recreational closures to primary recreational access points can constitute an impairment to the recreational uses of a lake as a whole.

Assessment units are typically defined by hydrologic features (that is, a confluence with a major tributary or a hydrologically distinct bay of a lake) or on use designations (that is, a drinking water intake or agricultural diversion). Marinas and beaches around Utah Lake such as Lindon Marina and the Utah Lake State Park Harbor are not clearly distinct waterbodies and have the same beneficial uses and therefore have not been split into individual assessment units.

The 2014 HAB events identified exceedances of the cyanobacteria cell count indicator in three unique locations of Utah Lake including two protected marinas (Lindon Harbor and Utah Lake State Park Harbor) as well as an open water site near the outlet of the lake. The widespread occurrence of these exceedances indicates that HAB events can be a lake-wide phenomenon. The lake-wide nature of these events was further confirmed by the HAB events that occurred during the summer of 2016 where exceedances of the cyanobacteria cell count indicator were observed throughout the lake including in open water sites and protected locations. This event and past experiences on Utah Lake have also demonstrated the potential for rapid movement of potentially harmful accumulations of cyanobacteria in numerous locations around the lake, again suggesting HABs are a lake-wide issue.

Health departments working under their HAB health advisory procedures may choose to provide warnings or enact closures on specific portions of a lake as appropriate. However, recreational use impairments and access closures, even if only occurring in prominent recreational access, have clear negative impacts on recreational uses in the lake as a whole.

9. HAB assessment methods and health warning procedures:

SUMMARY OF PUBLIC COMMENTS: DWQ should use different methods for performing beneficial use assessments for HABs than are used for providing health warnings for recreational uses. Although cyanobacteria cell counts may be appropriate for providing health warnings, cyanotoxin concentrations would be more appropriate for making beneficial use support or impairment decisions.

DWQ RESPONSE: DWQ agrees that water quality assessments and health warnings have different objectives which may result in different methods. Although DWQ provides support to local health departments in developing HAB response plans and distributing human health warnings, policies regarding the warning levels and recreational access closures are ultimately determined by local health departments. These processes have different objectives and may at times reach different conclusions. However, health advisory procedures and assessment methods for HABs are inherently related because recreational use support assessments may also take recreational access closures into account as a narrative standard indicator in determining recreational use support or impairment. Recreational use restrictions based on water quality concerns by definition affect the ability of recreational users to use the water body. Therefore, recreational uses are not being fully supported in a waterbody that has experienced use restrictions due to water quality conditions such as HABs.

Due to the reasons described in responses to other comments in this document (response Nos. 2 and 3), DWQ maintains that the most appropriate method for assessing use support or impairment with regard to HABs is the use of a cyanobacteria cell counts.

Beneficial Use, Narrative Standard Indicator, and Nutrient Management Strategy Comment Responses

10. Farmington Bay Beneficial Use:

SUMMARY OF PUBLIC COMMENTS: The beneficial uses currently ascribed to Farmington Bay should undergo re-examination and further discussion. Aquatic life and recreational use support in Farmington Bay may be conflicted. HABs that may negatively affect recreational uses may also positively or negatively affect aquatic life uses. And the current occurrence of HABs in Farmington Bay may either be a natural condition or the result of hydrological modification as a result of causeway construction.

DWQ RESPONSE: In the IR, DWQ is required to assess beneficial uses as currently designated to waters in Utah. Farmington Bay currently is protected for "Infrequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain," (UAC R317-2-6). DWQ has not assessed the uses in Farmington Bay in the 2016 Integrated Report. DWQ intends to determine if the HAB assessment methods applied to freshwater lakes is appropriate for Farmington Bay for the 2018 Integrated Report. As assessment methods are developed for Farmington Bay, DWQ will consider the relationship between cyanobacteria and both the recreational and aquatic life uses.

The classification of water quality impairments as natural conditions or the result of hydrological modifications is out of scope for the IR. Such a determination is made either through studies associated with a TMDL on the impaired water or through a Use Attainability Analysis. The process for changing the beneficial use of Farmington Bay requires a rule change that must be approved by the Water Quality Board and EPA. Such a process can be initiated either during DWQ's triennial review process (www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/standards/triennialrev.htm) or through DWQ's water quality standards workgroup (www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/standards/subworkgroups.htm).

11. Provo Bay classification and uses:

SUMMARY OF PUBLIC COMMENTS:

1. Discharge compliance and tributary monitoring data suggest impairments for ammonia and pH identified in Provo Bay result from natural conditions or internal processes.

2. The newly identified Provo Bay portion of Utah Lake assessment unit (AU) may be more properly classified as a wetland than a lake for standards and assessment purposes.

DWQ RESPONSE: Assessments for the IR are based on in-waterbody conditions and do not consider monitoring conducted at discharge compliance points, internal processes, natural conditions or tributary inflows. These factors are considered in a TMDL study that is conducted after the waterbody has been listed on the 303(d) list as impaired. The Provo Bay AU split was based on both the hydrologic distinctness of Provo Bay from the rest of the lake and apparent differences in water quality. Splitting these AUs allowed DWQ to apply more accurate assessments to both the Provo Bay AU and the Utah Lake AU.

DWQ is obligated to assess support of currently defined uses using all readily available data for a waterbody. Because the Provo Bay portion of Utah Lake has previously been assessed using standards and assessment methods applied to Utah Lake and lakes as a whole, the new Provo Bay AU has also been classified as a lake AU at this time. Changes to the uses and standards applied to this AU are beyond the scope of the IR. Suggested changes to standards and beneficial uses can be made either during DWQ's triennial review process (www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/standards/triennialrev.htm) or through DWQ's water quality standards workgroup (www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/standards/subworkgroups.htm). Utah does not currently have a defined set of beneficial uses and water quality standards for wetlands. Stakeholder engagement in the wetland use and standards development process is welcome through DWQ's Wetlands Program (http://www.deq.utah.gov/ProgramsServices/programs/water/wetlands/index.htm).

12. Assessment methods and water quality standards:

SUMMARY OF PUBLIC COMMENTS: DWQ's HAB assessment method effectively establishes a water quality standard and must undergo additional review and rule making. These methods should undergo peer review.

DWQ RESPONSE:
The HAB assessment methods are derived from Utah's Narrative Water Quality Standard (UAC R317-7.2). Water Quality Standards explicitly include both numeric and narrative criteria (40 CFR 131.3(b)). Several parts of the Clean Water Act call for states to translate narrative criteria to numeric thresholds—or other objective decision rules—for purposes of implementing different regulatory functions (for example, 40 CFR §122.44(d)(1)(vi)). In fact, it is difficult to understand how the narrative criteria could be implemented without being arbitrary and capricious without such translations. Utah has a Narrative Standard (UAC R317-2-7.2) that has been approved by EPA. While it is true that assessment methods require the state to tie them to an "applicable standard", it is also true that this does not preclude states from translating the narrative to numeric values for purposes of making water quality assessments. Utah's rules preclude DWQ from publishing the specific pollutants responsible for such assessments (UAC R317-2-7.2(d)); however, this requirement does not prevent DWQ from identifying an impairment, which would prompt the more intensive investigations necessary to address the water quality problem. For any identified impairment, DWQ would proceed with TMDL development, which would include an evaluation of water quality targets for pollutants that are "preventing or [is] expected to prevent attainment of water quality standards" (40 CFR §130(c)(1)(ii)). In some cases, DWQ may decide to promulgate these water quality goals as site-specific standards. In such a case, they would be subject to the rules and regulations associated with changes to water quality standards, but this is well down the regulatory path from the initial impairment decision.

Implementing a peer review process for assessment methods is beyond the scope of the integrated report. However, as described in this document (response Nos. 1-3), the WHO HAB guidelines and DWQ's HAB assessment methods are based on peer-reviewed scientific studies and reviews.

13. Postpone listing Utah Lake and use an adaptive management approach for nutrients

SUMMARY OF PUBLIC COMMENTS: The recreational use impairment decision due to HABs on Utah Lake is premature and should be delayed or removed. Utah Lake could be assessed as Category 3, insufficient data. Nutrients and HABs could be managed through an adaptive management process without water quality assessments and impairment listings. Nutrient reductions suggested in the IR may have unintended ecosystem consequences.

DWQ RESPONSE: The objective of the IR process is to evaluate existing and readily available data against water quality standards and assessment methods, as appropriate, for the designated uses of each water body. The IR is conducted independently of recommended pollution reduction strategies or adaptive management choices. The relative merits of different management strategies are considered part of the TMDL and implementation planning processes that follow the listing of a waterbody as not attaining applicable standards . Under current HAB assessment methods, readily available data for Utah Lake identify that the lake's recreational use is not being attained, and therefore, a listing for HAB exceedances has been included on the 2016 303(d) list. Stakeholder feedback and recommendations for nutrient pollution reductions or adaptive management strategies are welcomed through DWQ's nutrient program (http://deq.utah.gov/Pollutants/N/nutrients/index.htm). Stakeholder engagement on Utah Lake specifically is welcomed through DWQ's ongoing Utah Lake study program (http://www.deq.utah.gov/locations/U/utahlake/utahlake.htm).

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