CALIFORNIA Water Boards

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Lake Tahoe Nearshore Water Quality Protection Plan

Draft

January 2014

Executive Summary

In October 2013 the Desert Research Institute released the Lake Tahoe Nearshore Evaluation and Monitoring Framework Report (Report) (NeST 2013). The Report presents a conceptual understanding of the processes of the nearshore environment, assesses the heterogenic nature of the nearshore, highlights the lack of raw information available to characterize the environmental status of the Lake Tahoe nearshore, and identifies that current agency implementation efforts will benefit the nearshore environment.

The Lake Tahoe Nearshore Water Quality Protection Plan (Plan) outlines the Lahontan Regional Water Quality Control Board's (Lahontan Water Board) response to the changes in the Lake Tahoe nearshore environment as informed by the Report. Based on the Report findings and recommendations, the Lahontan Water Board will

(1) establish an integrated nearshore monitoring plan to track environmental change in the nearshore,
(2) continue implementing programs to reduce pollutant discharges to the nearshore,
(3) assess areas of heightened environmental change,
(4) adopt new water quality standards as needed to protect nearshore water quality, and
(5) adapt regulatory approaches as new information becomes available.

In establishing and maintaining nearshore water quality protection policies, the Lahontan Water Board will continue to coordinate with other government agencies. Because available resources are insufficient to fully implement all recommendations, a dedicated fund source must be found to adequately protect and enhance Lake Tahoe's precious nearshore. The Plan also serves as response to a request in the 2013-2013 Budget Bill specific to the Lahontan Water Board's approach to the nearshore.

Background

The Lake Tahoe nearshore is the portion of the lake in close proximity to the shoreline. It is the area of the lake that people interact with most when viewing the lake from the shore, wading, swimming, enjoying paddle sports, and much of the recreational boating activity. The Report defines the nearshore as the part of the lake from the shoreline to 350 feet offshore, or to a depth of 69 feet, whichever is a greater area (Figure 1). In parts of the shoreline where there is a shelf present the nearshore can extend far beyond 350 feet from shore before the depth reaches 69 feet (Figure 2).

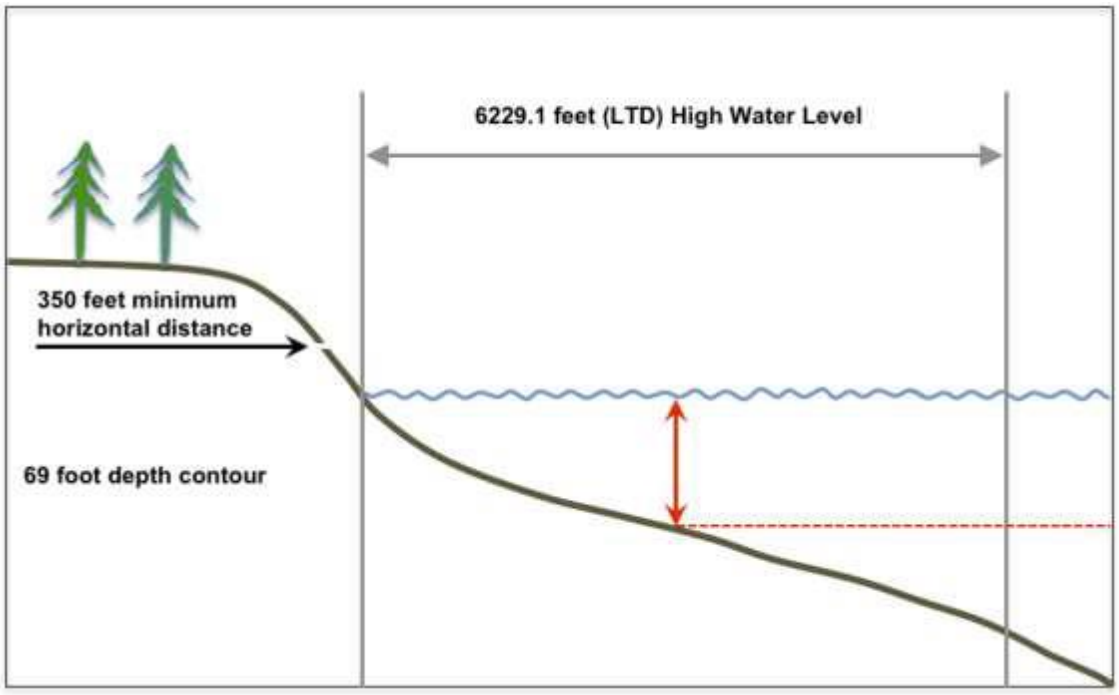

Figure 1. Definition of Lake Tahoe nearshore for purposes of monitoring and assessment (NeST 2013)

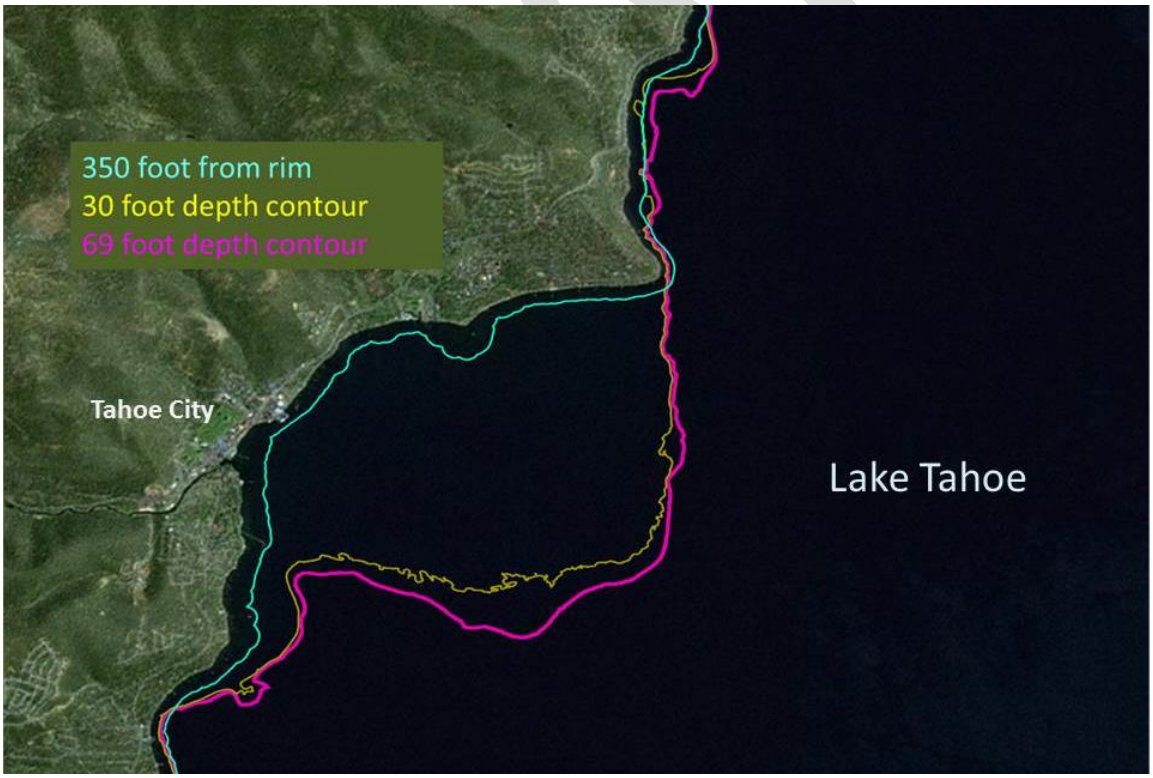

Figure 2. Nearshore area variation due to depth (NeST 2013)

The public and natural resource agencies have observed changes to the nearshore waters and the lake bottom. The anecdotal reports include observations of increased algae growth, increased presence of invasive species, and a reduction in nearshore clarity. Figures 3-5 illustrate some of the observed nearshore conditions. The California Water Quality Control Board, Lahontan Region (Lahontan Water Board), Nevada Division of Environmental Protection (NDEP), the Tahoe Regional Planning Agency (TRPA) and the United States Environmental Protection Agency (USEPA) (hereafter referred to as "nearshore agencies"), initiated the nearshore evaluation work documented in the Report to better understand current nearshore conditions, assess how best to monitor change in the future, and establish the desired conditions and resource management objectives for the nearshore environment.

The Report is the first attempt to examine the state of knowledge of the nearshore and establishes a baseline understanding of the Lake Tahoe nearshore environment. The Report includes:

- Nearshore Definition
- Nearshore Desired Condition Statement
- Evaluation of Existing Water Quality Standards for the Nearshore (CA, NV, TRPA)
- Framework for a Nearshore Monitoring Plan
- Evaluation of Recommended Monitoring Metrics
- Conceptual Model of Nearshore Influences and Processes (what affects the nearshore condition)
- Indicator Framework Narrative
- Annotated Bibliography of nearshore research

<u>Key Report Findings</u>

- The nearshore is a heterogeneous environment. It is not well mixed. The factors affecting one part of the nearshore may differ substantially from those affecting the nearshore at a different part of the lake. As a result the water quality and environmental condition of the nearshore differs from place to place.
- The nearshore environment often reacts slowly to environmental changes. To be successful, efforts to restore and maintain the Lake Tahoe nearshore must be long term and sustained.
- There are many existing water quality standards that apply to the nearshore of Lake Tahoe. The Report analyzed 62 standards identified by the Lahontan Water Board, the TRPA and NDEP applicable to nearshore water quality. The Report lists 23 of these as "important" or "relevant" for nearshore management, and 18 of these as "important" or "relevant" for nearshore monitoring (Attachment 1).
- The Report identified the elevated nutrient concentrations (primarily phosphorus and nitrogen), along with increased sediment inputs and aquatic invasive species threats as the primary drivers of change in Lake Tahoe's nearshore environment.
- There is overlap between the pollutants of concern addressed by the Lake Tahoe Total Maximum Daily Load (TMDL) assessment and the factors influencing the nearshore. Current water quality improvement efforts within the Lake Tahoe basin will help protect the nearshore.

- There are relatively little data for many of the nearshore monitoring metrics, though the data that does exist is generally of high quality. A comprehensive lake-wide nearshore monitoring plan must be developed to effectively assess nearshore status and trends.

Figure 3. Periphyton at Burnt Cedar Beach, Incline Village ***Credit: Sierra Sun***

Figure 4. Eurasian watermilfoil, an invasive macrophyte, Emerald Bay State Park, before and after treatment to remove the invasive weeds ***Credit: California State Parks***

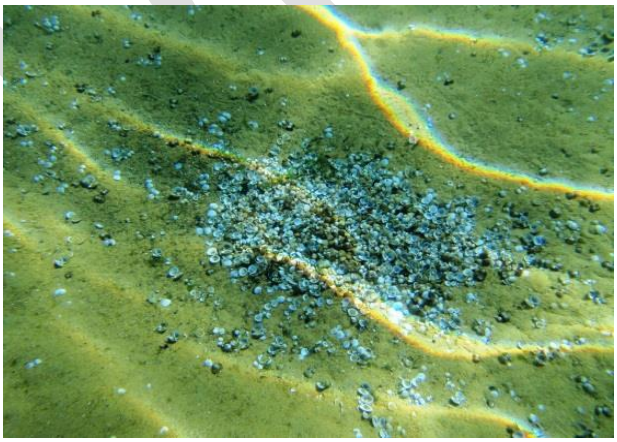

Figure 5: Invasive Asian clam shells on the bottom of Lake Tahoe

Nearshore Water Quality Protection Plan

In response to the nearshore Report findings and growing stakeholder concern about observed nearshore environment changes, the Lahontan Water Board is pursuing a multi-faceted nearshore water quality protection plan (Plan). The Plan includes measures to develop a functional monitoring plan to track change in the nearshore environment, continued implementation of established programs to address the factors influencing the nearshore, determine if additional standards are warranted, and an evaluation of localized "hotspots" where nearshore change has been clearly documented. The Plan will also take actions to better understand how climate change variables are influencing environmental parameters in the nearshore.

1. <u>Establish and implement an integrated nearshore monitoring plan.</u>

   Current monitoring efforts funded by the Lahontan Water Board include monitoring of two phytoplankton related metrics (algal growth potential bioassays that measure biostimulatory content of nutrients in the water and enumeration and identification of phytoplankton species in the water column) and periphyton quantification. The Water Board is working cooperatively with the nearshore agencies to develop a more comprehensive nearshore monitoring program that will incorporate water quality, water clarity, and biological community status monitoring in addition to the parameters already measured. Monitoring plan implementation will enable the agencies to characterize nearshore environmental conditions, track changes in key environmental indicators, and identify nearshore areas that warrant further investigation.

   The Report recommends ten important monitoring metrics to track nearshore health status:

   - Turbidity (cloudiness of the water)
   - Transmissivity (light penetration in the water)
   - Chlorophyll (an indicator of lake productivity)
   - Phytoplankton (floating algae)
   - Periphyton (attached algae – see Figure 3)
   - Macrophytes (vascular plants – see Figure 4)
   - Macroinvertebrates (see Figure 5)
   - Fish and crayfish
   - Toxicity
   - Harmful Micro-organisms

   Evaluating these ten metrics will allow resource managers to better understand the nearshore environment and determine if new and existing efforts to protect Lake Tahoe are successful in protection of the nearshore.

   - Schedule:
     - Draft monitoring plan - Fall 2014
     - Pilot monitoring plan implementation - 2014-2015 (as resources allow)
     - Ongoing data collection, analysis, and reporting - 2015-annually (as resources allow)

- Costs and Challenges:
    - A sustained nearshore monitoring effort is estimated to cost approximately $450,000 annually (see Attachment 2 for budget details). Currently available nearshore monitoring resources are estimated at $150,000/year, leaving an annual monitoring budget shortfall of roughly $300,000. Some cost efficiencies may be achieved if portions of the proposed ambient monitoring effort can be performed by Lahontan Water Board staff using its South Lake Tahoe laboratory.
    - Refining monitoring program methods - further work is needed to establish appropriate sample locations and frequencies and identify efficient monitoring parameters to limit monitoring program costs

2. <u>Continue implementing programs that benefit nearshore environmental quality</u>
   Programs that benefit nearshore water quality include Lake Tahoe TMDL implementation and the Lake Tahoe Aquatic Invasive Species Program (LTAIS). The Lake Tahoe TMDL was approved by the US Environmental Protection Agency on August 16, 2011 and emphasizes reducing fine sediment particles, nitrogen, and phosphorus inputs to the lake. These pollutants generally pass through the nearshore on their way to the deep waters of Lake Tahoe. Consequently, Lake Tahoe TMDL pollutant load reduction efforts will also reduce pollutant inputs that are the primary pollutants promoting turbidity and algae growth in the nearshore.

   Aquatic invasive species can have considerable impact on native species and the aquatic community structure. They also indirectly affect trophic status and in some cases may contribute to diminished clarity of the nearshore environment. The LTAIS Program addresses the threat of aquatic invasive species through prevention, early detection and control efforts. Outreach efforts and boat inspections have prevented new introductions of AIS, while control efforts are underway to address invasive macrophytes (Eurasian watermilfoil and curlyleaf pondweed) and Asian clams. Ongoing LTAIS Program implementation is crucially important for preventing the introduction of new and aggressive aquatic invasive species to Lake Tahoe and for reducing the extent of existing aquatic invasive infestations.

   Finally, the Lahontan Water Board supports TRPA Regional Plan elements and the Environmental Improvement Program that also protect and enhance the nearshore environment. In 2012, the Tahoe Regional Planning Agency approved amendments to its Regional Plan, including several requirements that will aid the protection of the nearshore. Updated policies on limiting fertilizer use, incentives for the removal and restoration of impervious surfaces on sensitive lands, an emphasis on restoring and protecting riparian areas, and promoting the reduction of vehicle miles traveled are all important elements for nearshore water quality protection. TRPA retained its existing nearshore clarity threshold standard and adopted two new nearshore related threshold standards to reduce extent and distribution of attached algae and aquatic invasive species.

- Schedule – Lake Tahoe TMDL, LTAIS, and TRPA Regional Plan implementation are ongoing
- Costs and challenges:
    - Local government partners lack funding needed to effectively achieve required Lake Tahoe TMDL pollutant load reduction targets. In particular, cost efficient and highly effective operations and maintenance actions are estimated at $4 million annually for regulated jurisdictions in California. Proposition 218 limits local government's ability to raise local revenue and federal and state grant funds generally don't allow for operation and maintenance expenditures.
    - The LTAIS Program faces an uncertain future if sustained funding is not found. Federal funding sources supporting the program are expected to expire after 2014, leaving an estimated shortfall of approximately $1.5 million annually.

3. Investigate nearshore hotspots

   The nearshore agencies have identified the need for geographically focused investigations of land uses and soils/geology to determine the causal factors affecting localized nearshore "hotspots" where elevated periphyton, increased turbidity, and/or high invasive clam populations have been measured. Controllable factors, such as proximity of impervious surface to the lake, sewer line exfiltration and uncontrollable factors such as climate change and geology may be responsible for observed conditions. The nearshore agencies have identified increased periphyton growth on the northwest shore (from Tahoe City south through the outlets of Blackwood and Ward Creeks) as an initial hotspot to begin causal assessment analysis. Pending available funds, the Lahontan Water Board will work cooperatively with other nearshore agencies to conduct targeted stormwater monitoring, land use assessment, groundwater monitoring, and sewer line infrastructure analysis coupled with nearshore condition monitoring to investigate the factors possibly responsible for the observed elevated periphyton growth.

   Following causal assessments monitoring and analysis, the Lahontan Water Board and other regulatory agencies in the Lake Tahoe region will be better suited to adapt current regulatory and implementation tools to address identified problems. Future causal assessment studies may target the invasive clam populations noted on the east shore in Marla Bay and areas of elevated turbidity along Lake Tahoe's south shore.

   - Schedule:
       - Targeted causal analysis for northwest shore periphyton growth – 2015 pending funds

   - Costs and challenges
       - Individual causal analysis studies are estimated at $250,000-$400,000 per investigation. Nearshore agencies are pursuing Nevada state grant funds to initiate the referenced periphyton study. Additional funds would be needed to support further causal assessment work.

4. Investigate climate change influence on nearshore water quality

   Climate change impacts on Lake Tahoe's nearshore environment are evident in elevated water quality temperature, changing species composition, and increased algal growth potential. The nearshore agencies are committed to better understanding the impacts of climate change and how those changes differ from locally controllable inputs and natural annual and seasonal environmental variability. Ongoing status and trend monitoring, along with the causal analysis studies will provide critical context for determining how the changing climate is influencing Lake Tahoe's nearshore environment.

- Schedule:
  - Initial status and trend monitoring to continue from 2014-2016
  - Causal analysis studies to be initiated in 2015, funds permitting.

- Cost and challenges:
  - Technical challenges associated with defining the scope, duration and cost of climate change study with an emphasis on assessing nearshore conditions.
  - Integrating existing data and the need for data collection
  - Securing funding for status and trend monitoring and causal analysis studies needed to support climate change assessment

5. Consider Nearshore-specific standards

   The Water Quality Control Plan for the Lahontan Region (Basin Plan) includes specific water quality standards for Lake Tahoe, including several that are important to the management of nearshore waters. The Report identified nine Basin Plan standards as important to nearshore water quality management, including standards for water clarity, phytoplankton growth, concentrations of biostimulatory substances, suspended materials, and biological indicators. These standards protect Lake Tahoe's clear waters and the biological community that lives in the nearshore. The biostimulatory substances, biological indicator and phytoplankton standards are designed to prevent algae growth from reaching nuisance status and impacting clarity. Additional data collection anticipated as part of the comprehensive nearshore monitoring work will provide the Lahontan Water Board additional information to assess compliance with existing nearshore-related standards and to take action to improve nearshore water quality where monitoring shows a violation of these standards.

   In assessing the need for new water quality standards, the Water Board must consider whether any proposed metric would provide added value over existing standards to monitor changes in the nearshore environment. Any new metric would need to be dynamic enough to reflect environmental change, yet static enough for consistent and meaningful measurement and be responsive to controllable inputs to allow for meaningful resource management input. The Lahontan Water Board must also consider the cost associated with standard development, including data collection and target setting, to determine if the expense related to developing a

new water quality standard would outweigh the benefit of applying resources to other actions to protect, improve, and maintain the nearshore environment.

Of the ten metrics recommended for monitoring in the Report, only one (periphyton) is identified as having sufficient data to support creation of a new numeric standard. The Lahontan Water Board Basin Plan currently includes a narrative water quality objective for biological indicators in Lake Tahoe that explicitly addresses the importance of controlling periphyton growth. The standard states:

> *For Lake Tahoe, algal productivity and the biomass of phytoplankton, zooplankton, and periphyton shall not be increased beyond the levels recorded in 1967-71, based on statistical comparison of seasonal and annual means.*

The Water Board may consider updating the above-referenced standard. Such an update is not, however, required for the Lahontan Water Board to assess relative nearshore conditions, nor is a numeric standard needed for the Water Board to target actions to improve nearshore condition.

Metrics other than periphyton do not have sufficient data available to support creation of new water quality standards. Although the monitoring plan framed in the Report is sufficient to track the environmental status and trends of nearshore water quality, collecting data to support standard development for parameters other than periphyton would require a more intensive and directed effort to ensure that any new numeric standard adequately accounts for natural environmental variability. A water quality sampling plan explicitly targeted at collecting data to support new standard development would need to be developed, funded, and implemented. As noted above, the Lahontan Water Board is committed to the ongoing collaborative work to develop and implement a comprehensive status and trend monitoring program. As data become available, the Water Board will continue to assess the need and value for revised and/or new water quality standards that explicitly address Lake Tahoe's nearshore environment.

- Schedule:
    - Limited periphyton monitoring - 2014-2016
    - Additional data collection for other parameters - 2016+ pending available funds

- Costs and challenges:
    - Insufficient data for establishing standards
    - Insufficient funding for a targeted standard-specific monitoring study - $200,000-$500,00 depending on selected metric and available data
    - Additional Water Board staff resources would be needed to develop an appropriate standard target and engage stakeholders in the standards development process – estimated at one full time personnel year

Assembly Bill 1464 (Chapter 21, Statutes of 2012)

California Governor Edmund G. Brown signed into law the Budget Act of 2012, which included a requirement that the Lahontan Water Board prepare a schedule for nearshore objectives based on the Report. Specific language from the law states:

> *The Lahontan Regional Water Quality Control Board shall, within 120 days of receipt of a scientific report on Lake Tahoe near-shore indicators, establish a schedule for the development and adoption of Lake Tahoe near-shore water quality objectives to improve Lake Tahoe near-shore water quality conditions along with a comprehensive implementation strategy describing the nature of actions and associated timelines that will be necessary to implement the plan or its component parts.*

This Lake Tahoe Nearshore Water Quality Protection Plan serves as a direct response to the above-referenced requirement.

Citation:

NeST 2013: Heyvaert, A.C., Reuter, J.E., Chandra, S., Susfalk, R.B., Schaldow, S.G. Hackley, S.H. 2013. Lake Tahoe Nearshore Evaluation and Monitoring Framework. Final Report prepared for the USDA Forest Service Pacific Southwest Research Station.

Attachment 1: Existing standards evaluation for nearshore relevancy. The 62 standards of the nearshore agencies overlap and cover 38 parameter categories (NeST 2013).

Table B-1. Existing Standards Potentially Relevant to the Nearshore of Lake Tahoe.

ID #	Parameter Category	Nearshore Management	Nearshore Monitoring
1	Total Nitrogen	Important	Relevant
2	Total Soluble Inorganic Nitrogen	Important	Relevant
3	Ammonia	Less relevant	Less relevant
4	Nitrite	Less relevant	Less relevant
5	Dissolved Inorganic Nitrogen Loading	(see #8)	(see #8)
6	Total Phosphorus	Important	Relevant
7	Soluble Phosphorus	Important	Relevant
8	Biostimulatory Substances	Important	Relevant
9	Clarity	Important	Important
10	Pytoplankton	Important	Important
11	Algal Growth Potential	Relevant	Relevant
12	Biological Indicators (with Periphyton)	Important	Important
13	Suspended Materials	Important	Relevant
14	Settleable Materials	Less relevant	Less relevant
15	Suspended Sediment Loading	(see #13)	(see #13)
16	Total Dissolved Solids	Relevant	Less relevant
17	Conductivity	Relevant	Less relevant
18	pH	Relevant	Less relevant
19	Sodium Absorption Ratio	Less relevant	Less relevant
20	Chloride	Less relevant	Less relevant
21	Sulfate	Less relevant	Less relevant
22	Boron	Less relevant	Less relevant
23	Chemical Constituents	Less relevant	Less relevant
24	*E. coli*	Important	Important
25	Coliform Bacteria	Relevant	Relevant
26	Fecal Coliform	Relevant	Relevant
27	Temperature	Relevant	Relevant
28	Temperature Change	Relevant	Relevant
29	Dissolved Oxygen	Relevant	Relevant
30	Aesthetic Condition	(see #9 and #12)	(see #9 and #12)
31	Color	Less relevant	Less relevant
32	Taste and Odor	Relevant	Less relevant
33	Floating Materials	Less relevant	Less relevant
34	Oil and Grease	Less relevant	Less relevant
35	Toxicity	Important	Important
36	Radioactivity	Less relevant	Less relevant
37	Aquatic Communities and Populations	Important	Important
38	Nondegradation	Important	Less relevant

Attachment 2: Estimated funding and budget for Integrated Nearshore Monitoring Plan implementation

Annual Monitoring Funding as of 2014 Calendar Year

Parameter	Funded	*Estimated* Funding Needs
Turbidity		$80k
Transmissivity		
Chlorophyll		
Phytoplankton	$150k	
Periphyton		
Macrophytes	**	$60k
Macroinvertebrates		$55k
Fish and Crayfish		$80k
Toxicity*		
Harmful micro-organisms*		
Coordination/Integration		$25k
Totals:	$150k	$300k

*Anticipate need met through agency staff monitoring resources and coordination with water supply agencies

**One-time funding source of $50-100k not reflected in totals