State of Rhode Island and Providence Plantations

Consolidated Assessment and Listing Methodology
For the Preparation of
The Integrated Water Quality Monitoring and Assessment Report

Pursuant to Clean Water Act Sections 303(d) and 305(b)

2014 Assessment and Listing Cycle

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LIST OF ACRONYMS AND TERMS

305(b) = Section 305(b) of the Federal Clean Water Act requires states to assess the health of their surface waters and submit biennial reports describing the water quality conditions. In Rhode Island, this was know as the State of the State's Waters Report. As of 2008, the 305(b) Report was integrated with the 303(d) List of Impaired Waters and published as the *Integrated Water Quality Monitoring and Assessment Report*.

303(d) = Section 303(d) of the Federal Clean Water Act requires that each state identify waters for which existing required pollution controls are not stringent enough to achieve State water quality standards. Any waterbody or waterbody segment that is assessed as not meeting its water quality standards under the 305(b) assessment process, is placed on the 303(d) List of Impaired Waters.

Acute = Refers to a stimulus severe enough to rapidly induce an effect; in aquatic toxicity tests, an effect observed in 96 hours or less is typically considered acute. When referring to aquatic toxicology or human health, an acute effect is not always measured in terms of lethality.

ADB = Assessment Database

Aquatic Life Criteria = The highest concentration of a pollutant in a water that is not expected to cause toxicity to aquatic life.

AQLUS = Aquatic Life Use Support

Antidegradation = The third component of water quality standards are the antidegradation rules that contain provisions designed to preserve and protect the existing beneficial uses and to minimize degradation of water quality.

AU = Assessment Unit – a waterbody or waterbody segment.

BPJ = Best professional judgment, means a determination, based on best engineering and/or scientific practices and best management practices, involving any pollutant, combination of pollutants or practice(s), on a case-by-case basis, which is determined by the Director to be necessary to carry out the provisions of the Clean Water Act and any applicable chapters of the General Laws of Rhode Island.

CALM =Consolidated Assessment and Listing Methodology, provides a description of the assessment and listing methodology used to develop the Section 305(b) water quality assessments and Section 303(d) impaired waters list.

Chronic = Defines a stimulus that lingers or continues for a relatively long period of time. The measurement of a chronic effect can be reduced growth, reduced reproduction, etc., in addition to lethality.

CWA = Clean Water Act, refers to the Federal Water Pollution Control Act (33 U.S.C. § 1251) et seq. And all amendments thereto.

DEM or RIDEM =Rhode Island Department of Environmental Management

Designated uses = Those uses specified in water quality standards for each waterbody or segment whether or not they are being attained. In no case shall assimilation or transport of pollutants be considered a designated use.

DO = Dissolved oxygen

DQA = Data quality assurance

DQO = Data quality objective

Ecoregion = Relatively homogeneous areas with respect to ecological systems and the interrelationships among organisms and their environment.

EPA = United States Environmental Protection Agency

FDA = United States Food and Drug Administration

HEALTH = Rhode Island Department of Health

Human health criteria = the highest concentration of a pollutant in water that is not expected to pose a significant risk to human health.

IR = Integrated Water Quality Monitoring and Assessment Report. New format for reporting 305(b) water quality assessments and 303(d) Impaired Waters listings.

Macroinvertebrates = Aquatic invertebrate organisms that are used to assess water quality conditions.

MCLs = Maximum contaminant levels, maximum permissible level of a contaminant in water which is delivered to any user of a public water system.

MDL = Method Detection Limit/Detection Limit - the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.

NSSP = National Shellfish Sanitation Program

OWR = Office of Water Resource, Rhode Island Department of Environmental Management

Probabilistic Sampling = Monitoring design where the site selection is random.

QA = Quality assurance

QAPP = Quality Assurance Project Plan

QC = Quality control

QL = Quantitation Level – also known as the minimum level or minimum reporting level, is the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. In general this is the minimum concentration of an analyte that can be measured and reported with an acceptable degree of confidence.

RBP = Rapid bioassessment protocol

RIGIS = Rhode Island Geographic Information System

RIPDES = Rhode Island Pollution Discharge Elimination System

SDWA = Safe Drinking Water Act

TMDL = Total maximum daily load, the amount of a pollutant that may be discharged into a waterbody without violating water quality standards. The TMDL is the sum of wasteload allocations for point sources, load allocations for nonpoint sources, and natural background. Also included is a margin of safety.

USGS = United States Geological Survey

Water Quality Criteria = Elements of the State water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use.

Water Quality Standards = define the goals for a waterbody by designating its uses, setting criteria to protect those uses, and establishing provisions to protect water quality from pollution (antidegradation).

WET = Whole Effluent Toxicity

WQUAL = Access database used by RIDEM/OWR to store water quality data.

Rhode Island Consolidated Assessment and Listing Methodology
For 305(b) and 303(d) Integrated Water Quality Monitoring and Assessment Reporting

1.0 INTRODUCTION

Rhode Island enjoys an abundance of water resources that support vital uses such as drinking water, recreation, habitat, and fish and shellfish consumption. With 1,420 miles of streams and rivers, 20,749 acres of lakes and ponds, 158 square miles of estuarine waters, and 420 miles of coastal shoreline, the state is faced with a tremendous challenge to monitor and accurately report on the condition of its surface waters.

Sections 305(b) and 303(d) of the federal Clean Water Act direct states to monitor and report the condition of their water resources. Since 2001, the United States Environmental Protection Agency (USEPA) has recommended that states integrate their 305(b) water quality assessment report with their 303(d) List of Impaired Waters, into an Integrated Water Quality Monitoring and Assessment Report (Integrated Report). EPA's guidance for the Integrated Reporting and Listing Decisions provides recommendations on the delineation of waterbodies, reporting the status and progress towards comprehensive assessment of state waters, attainment of state water quality standards and the basis for making attainment decisions. For the 2014 submissions, EPA recommends that States prepare their Integrated Report consistent with previous guidance including EPA's 2006 Integrated Reporting Guidance which is supplemented by EPA's 2008, 2010, 2012, and current 2014 Integrated Report Guidance memos available at http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/guidance.cfm.

In accordance with these CWA requirements and recent federal guidance, the *Rhode Island Consolidated Assessment and Listing Methodology* (RI CALM) documents the decision-making process for assessing and reporting on the quality of the State's surface waters following the Integrated Reporting format. This process is the basis for a majority of water pollution abatement actions undertaken in RI, and is fundamental to watershed-based environmental protection.

1.1 Background

Section 305(b) of the CWA requires each state to assess the health of their surface waters and submit biennial reports describing the water quality conditions. Prior to 2008, the Rhode Island 305(b), *State of the State's Waters Report* provided information on the quality of all assessed waters in the state relative to their designated uses and the water quality criteria established in the Rhode Island Water Quality Regulations.

Section 303(d) of the CWA requires that each state identify waters for which existing required pollution controls are not sufficient to achieve State water quality standards (water quality uses and criteria). These waters are referred to as "water quality limited" or "impaired". DEM develops this list of impaired waters from the 305(b) water quality assessments. Under the 305(b) assessment process, any waterbody or waterbody segment that is assessed as not meeting its water quality standards due to a pollutant is placed on the 303(d) Impaired Waters List. The 303(d) list provides an inventory of these waterbodies and the water quality impairment, and prioritizes them for restoration. Once a waterbody is identified as impaired, Section 303(d) requires that a Total Maximum Daily Load (TMDL) be developed. TMDLs describe the amount

of a given pollutant that a waterbody can receive and still meet water quality standards. This allowable load is allocated among point and non-point sources of pollution, with consideration to a margin of safety. The TMDL process provides an analysis of the sources causing the impairment and where possible, the specific actions necessary to achieve the required pollutant reductions needed to meet allocations set by the TMDL. A waterbody is removed from the 303(d) List of Impaired Waters once a TMDL is completed, an alternative pollution control plan is approved or data indicates the impairment no longer exists.

1.2 Integrated 305(b)/303(d) Report

The 305(b) water quality assessment report and the 303(d) impaired waters list must be submitted to the US Environmental Protection Agency (EPA) every even year. Prior to 2008, DEM submitted the 305(b) Report and 303(d) List as separate documents. In 2008, following EPA guidance, DEM integrated the 305(b) assessment information and 303(d) impaired waters list into a single document called the Integrated Water Quality Monitoring and Assessment Report (Integrated Report). RIDEM's 2014 Integrated Report continues to follow the integrated format to provide an effective tool for assessing and reporting on the quality of the state's waters.

The federal guidance results in a fundamentally different scope, organization, and options for communicating about water quality than previous guidance for these individual reports. This approach offers several significant improvements over the traditionally separate assessment report and impaired waters list. The Integrated Report allows for a more thorough evaluation of water quality for all designated uses thereby facilitating implementation of the recommendations for comprehensive monitoring detailed in the RI Water Monitoring Strategy. Furthermore, the integrated approach emphasizes the importance of quality data and science-based decision making in both monitoring and assessment for implementing an effective water quality management program.

The new integrated format provides five new categories of assessment determination replacing the old 305(b) assessment terminology (fully supporting, threatened, partially supporting, not supporting) and the 303(d) List Group format previously utilized by DEM. The Integrated Report categories are summarized below and further discussed in Section 6. Based on the assessment and listing methodology described in this document, each surface waterbody of the state will be placed into one of the following five assessment categories:

Category 1 - Attaining all designated uses and no use is threatened (waters are considered to be "fully supporting" all uses).

Category 2 - Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened (i.e., some uses are fully supporting however more data is needed to assess other uses).

Category 3 - Insufficient or no data and information are available to determine if any designated use is attained, threatened, or impaired (i.e., more monitoring is needed to assess any use; associated waters are considered to have insufficient data or to be not assessed).

Category 4 - Impaired or threatened for one or more designated uses but does not require development of a TMDL because;

A. TMDL has been completed (and when implemented are expected to result in attainment of the water quality standard), or
B. Other pollution control requirements are reasonably expected to result in attainment of the water quality standard in the near future, or
C. Impairment is not caused by a pollutant.

Category 5 - Impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL (this is the 303(d) Impaired Waters List).

The Integrated Report format emphasizes the importance of monitoring and assessing waterbodies in each category to obtain the information needed to evaluate progress toward attainment of water quality standards, to address data gaps, and to ensure that waterbodies which currently meet water quality standards, continue to do so. While each waterbody will be placed into only one of the 5 reporting categories, the attainment status of each designated use for each waterbody can be tracked to assist in addressing data gaps and directing monitoring.

The Integrated Report combines the non-regulatory requirements of the 305(b) water quality assessments with the regulation-based 303(d) List of Impaired Waters which mandates TMDL development. While all five Categories represent assessment status under Section 305(b), Category 5 represents reporting requirements under Section 303(d). Therefore, the regulatory requirements (i.e., USEPA approval, public participation, etc) only apply to Category 5 of the Integrated Report.

1.3 **Assessment and Listing Methodology**

This Consolidated Assessment and Listing Methodology (CALM or Methodology) document describes in detail the decision making process for assessing the quality of surface waters in accordance with requirements of Section 305(b) and for generating the list of impaired waters in accordance with requirements of Section 303(d). The Methodology describes the quality of data necessary to be used in the assessment and listing process, and how that data and information are then interpreted to arrive at an assessment of water quality for placement in one of the 5 Integrated Report Categories. The assessment and listing methodology is based on the following documents:

- *Consolidated Assessment and Listing Methodology, Toward a Compendium of Best Practices*, USEPA, First Edition, July 2002. USEPA 2002 (http://www.epa.gov/owow/monitoring/calm.html).
- *Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates: Report Contents*, USEPA September 1997, EPA-841-B-97-002A (http://www.epa.gov/owow/monitoring/guidelines.html).
- *Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates: Supplement*, USEPA September 1997, EPA-841-B-97-002B (http://www.epa.gov/owow/monitoring/guidelines.html).
- *Rhode Island Water Quality Regulations, July 2006*, as amended December 2010 (http://www.dem.ri.gov/pubs/regs/regs/water/h2oq10.pdf).
- Guidance for Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act (http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/guidance.cfm)

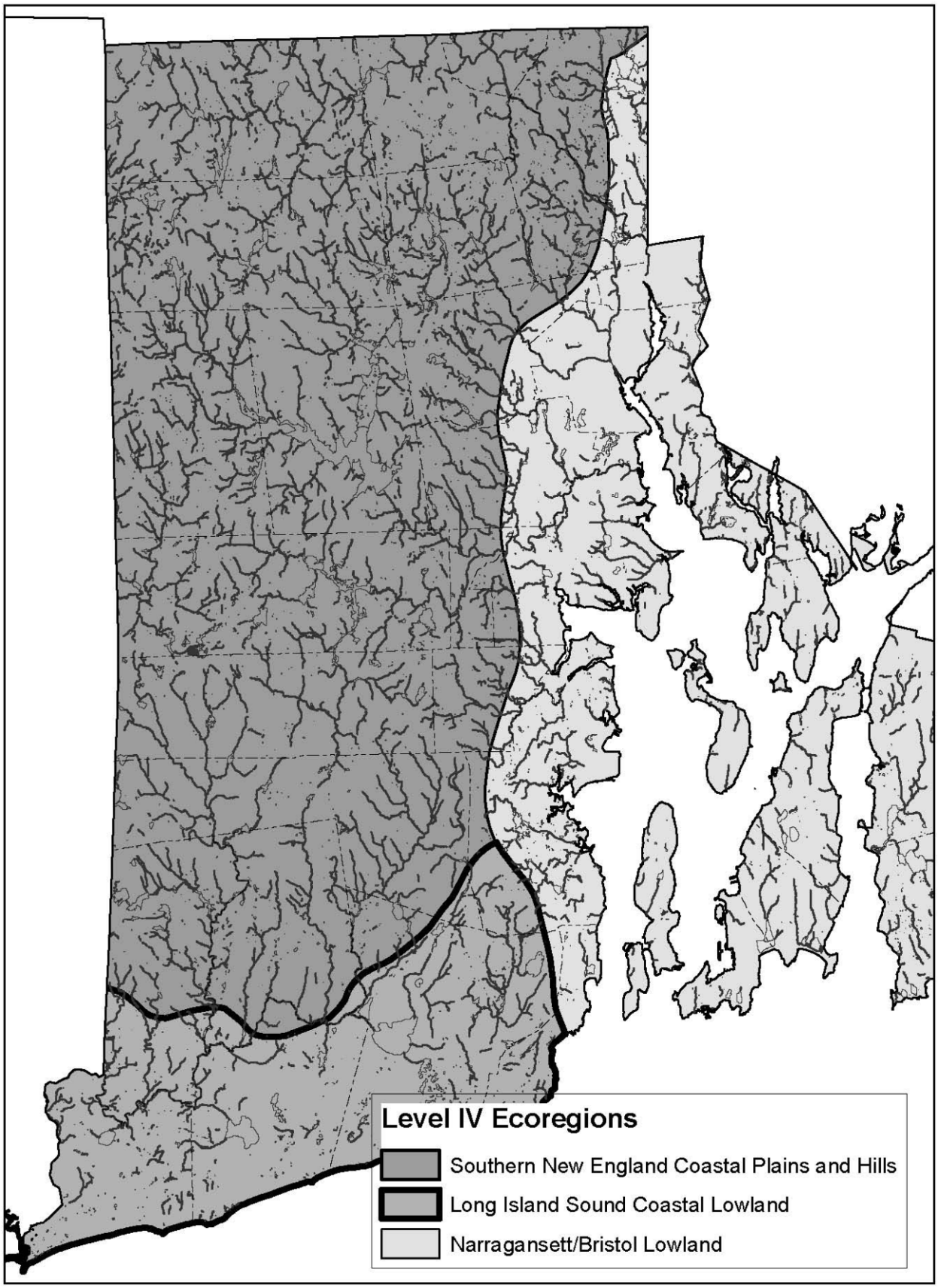
The Assessment and Listing Methodology is envisioned to be a dynamic process that will evolve as the state's Monitoring Strategy (RIDEM 2005a) (Section 8.0) is implemented. The Methodology will be modified, as appropriate, to accompany subsequent Integrated Reports.

1.4 Summary of Major Changes from the 2012 CALM

Bioassessment Methodology: Historically, RIDEM has used a Reference Site Approach to evaluate macroinvertebrate communities in RI rivers and streams for use in conducting Aquatic Life Use support decisions. Under the Reference Site Approach, biological conditions in rivers and streams are measured against conditions observed at a state reference station. Advances in scientific understanding and more recent EPA guidance suggest that use of a Reference Condition Approach strengthens the scientific rigor of a bioassessment. Because healthy biological communities may vary, instead of using one reference station, the reference condition is developed using multiple stations to account for natural differences. The range of all possible biological responses to increasing levels of stress is modeled as the Biological Condition Gradient (BCG) and is represented numerically by the biotic index. RIDEM recently completed initial work toward development of a Reference Condition Approach utilizing a Multimetric Biological Condition Index (MBCI) for use in applying macroinvertebrate data to interpret biological condition along a gradient. Current data limitations identified by this project resulted in development of a MBCI for only the Coastal Plains and Hills (CPH) ecoregion of the state (Figure 1). Within the two Lowland ecoregions, core sites with minimal disturbance have not been identified in sufficient numbers to support index development in these areas of the state. Therefore, as described in the Aquatic Life Use Assessment methodology (Section 5.4.3), two approaches for analyzing the biological data utilizing benthic macroinvertebrate communities, are used for the 2014 assessment cycle as interpretation of the current narrative standard. The recently developed reference condition approach will be used for data collected in the CPH region and the historically used reference site approach will be applied to the Lowland ecoregions of the state. Work toward developing a low gradient sampling protocol, metric adjustment and development of an index for Lowland sites in the state is an important future task that may need to be pursued on a regional basis with neighboring states.

Nutrient Data Evaluation Methodology: In accordance with the National initiative to develop nutrient criteria, the Department is currently working to further evaluate and refine numeric nutrient criteria for lakes and ponds and has initiated additional work to develop numeric nutrient criteria for rivers and streams. Initial results of the Department's numeric nutrient criteria development work suggest multiple indicators of eutrophication may be required to assess nutrient impairment in some lakes that exhibit effects but have a seasonal average Total Phosphorus (TP) level less than the current numeric criteria of 25 µg/l. These findings are incorporated as a translation of the narrative nutrient criteria such that lakes and ponds that exhibit persistent elevated chlorophyll *a* and/or recurring cyanobacteria blooms, with seasonal average TP less than 25 µg/l, may be assessed as impaired for nutrients.

Figure 1 Level IV Ecoregions in Rhode Island



2.0 **WATER QUALITY STANDARDS**

As noted above, a major aspect of the CALM is to document the decision making processes used to assess attainment with the water quality standards. To understand this process it is important to be familiar with the Rhode Island water quality standards. Water quality standards serve as the foundation for the state's water quality management program. Standards drive 305(b) water quality assessments, 303(d) lists of impaired waters, TMDLs, RIPDES permits, and nonpoint-source management measures. Water quality standards define the *goals* for a waterbody by designating its uses, setting criteria to protect those uses, and establishing provisions to protect water quality from pollutants. A water quality standard consists of three basic elements:

(1) ***designated uses*** of the water body (e.g., recreation, water supply, aquatic life, etc.),
(2) ***water quality criteria*** to protect designated uses (numeric pollutant concentrations and narrative requirements), and
(3) an ***antidegradation policy*** to maintain and protect existing uses and high quality waters.

The Rhode Island water quality standards have been developed to restore, preserve, and enhance the water quality of Rhode Island waters, and to maintain existing uses. These standards provide for the protection of the waters from pollutants so that the waters shall, where attainable, be fishable and swimmable, and be available for all designated uses and thus assure protection for the public health, welfare, and the environment. These objectives are implemented through the water quality standards, which are a fundamental element of the state's Water Quality Regulations (RIDEM 2006) (http://www.dem.ri.gov/pubs/regs/regs/water/h2oq10.pdf).

Within the Water Quality Regulations are numeric water quality criteria that represent parameter-specific thresholds for acceptable levels of substances in waters of the state. For other parameters, the standard is more descriptive (narrative) in nature (e.g. "no toxics in toxic amounts"). The Water Quality Regulations also contain antidegradation rules and policies. The provisions of the State Antidegradation Regulations have as their objective the maintenance and protection of various levels of water quality and uses.

As described in the Water Quality Regulations, all surface waters of the state are assigned to one of four freshwater (Class AA, A, B, B1), or one of three saltwater (Class SA, SB, SB1), classifications. Each class is defined by the designated uses (see Section 2.1) which are the most sensitive and, therefore, governing water use(s) which it is intended to protect. Surface waters may be suitable for other beneficial uses, but are regulated to protect and enhance the designated uses. Another classification, Class C or SC, is available should it be proven through a Use Attainability Analysis (UAA) that this classification is appropriate. This C or SC classification is not, however, currently designated to any waterbodies because it does not meet the "swimmable" goals of the CWA.

In addition, the state has incorporated partial use classifications into the Water Quality Regulations. Partial use denotes specific restrictions of use assigned to a waterbody or waterbody segment that may affect the application of criteria. Partial use designations have been adopted in the Water Quality Regulations for waters that will likely be impacted by activities such as combined sewer overflows (CSOs) and concentrations of vessels (marinas and/or mooring fields). Partial use designation for waters impacted by CSOs are denoted by "{a}"

following the classification. Partial use designation for waters with concentration of vessels are denoted by "{b}" following the classification.

2.1 **Designated Uses**

Designated uses are goals or intended uses for surface waterbodies, whether they are being attained or not. In accordance with Section 305(b) of the CWA, states are required to survey their water quality for attainment of the "fishable/swimmable" goals of the Act. Attainment of the CWA goals is measured by determining how well waters support their designated uses. Six designated uses are evaluated for the purposes of the 305(b) water quality assessment process. There are slight differences in the wording for designated uses as they are stated in the Water Quality Regulations and as they are described in 305(b) assessments. Table 1 lists the designated uses as they appear in the 305(b) assessment process and the comparable designated use as described in the Water Quality Regulations, and the applicable water classification to which the designated uses apply.

Table 1 Designated uses for surface waters as described in RI Water Quality Regulations and 305(b)/303(d) assessments.

305(b) Designated Use	RI WQ Regulations Designated Use	Applicable Classification of Water	Designated Use Definition
Drinking Water Supply	Public Drinking Water Supply	AA	The waterbody can supply safe drinking water with conventional treatment.
Swimming/ Recreation	Primary Contact Recreation	AA*, A, B, B1, B{a}, B1{a}, SA, SA{b}, SB, SB{a}, SB1, SB1{a} (all surface waters)	Swimming, water skiing, surfing and similar water contact activities where a high degree of bodily contact with the water, immersion and ingestion are likely.
Swimming/ Recreation	Secondary Contact Recreation	AA*, A, B, B1, B{a}, B1{a}, SA, SA{b}, SB, SB{a}, SB1, SB1{a}, SC (all surface waters)	Boating, canoeing, fishing, kayaking or other recreational activities in which there is minimal contact by the human body with the water and the probability of immersion and/or ingestion of the water is minimal.
Aquatic Life Support/ Fish, other Aquatic Life, and Wildlife	Fish and Wildlife Habitat	AA, A, B, B1, B{a}, B1{a}, SA, SA{b}, SB, SB{a}, SB1, SB1{a}, SC (all surface waters)	Waters suitable for the protection, maintenance, and propagation of a viable community of aquatic life and wildlife.
Shellfishing/ Shellfish Consumption	Shellfish harvesting for direct human consumption	SA, SA{b}	The waterbody supports a population of shellfish and is free from pathogens that could pose a human health risk to consumers
Shellfish Controlled Relay and Depuration	Shellfish harvesting for controlled relay and depuration	SB, SB{a}	Waters are suitable for the transplant of shellfish to Class SA waters for ambient depuration and controlled harvest.
Fish Consumption	No specific analogous use, but implicit in "Fish and Wildlife Habitat"	AA, A, B, B1, B{a}, B1{a}, SA, SA{b}, SB, SB{a}, SB1, SB1{a}, SC (all surface waters)	The waterbody supports fish free from contamination that could pose a human health risk to consumers.

* - Class AA waters may be subject to restricted recreational use by State and local authorities.

2.2 Numeric Water Quality Criteria

Pursuant to the CWA requirements, Rhode Island has adopted water quality criteria for the protection of aquatic life and human health, in the Water Quality Regulations. The criteria consist of numeric values that represent parameter-specific thresholds for acceptable levels of substances in the waters of the state. The State has adopted numeric aquatic life criteria for conventional (dissolved oxygen, pH, temperature, etc.) parameters that are class-specific values. In other words, the criteria may vary depending on the water quality classification of the waterbody. The criteria for these chemical and physical parameters appear in Tables 1 and 2 of the Water Quality Regulations.

The State has also adopted aquatic life criteria for toxic parameters (metals, organics, chlorine and ammonia) that apply to *all* water classifications. The criteria for these parameters can be found in Appendix B of the Water Quality Regulations.

The Water Quality Regulations also contain water column criteria for the protection of human health from water and aquatic life consumption. These human health water quality criteria can be found in Appendix B of the Water Quality Regulations.

2.3 Narrative Water Quality Criteria

The state has adopted narrative criteria to supplement the numeric criteria. Narrative criteria are descriptions of the conditions necessary for a waterbody to attain its designated use. The narrative criteria are contained within the Water Quality Regulations. The state uses these descriptive criteria to evaluate water quality indicators such as toxicity, nutrients, excess algal growth, noxious aquatic plants, aesthetics, habitat and biological condition. In general, the state's narrative criteria indicate that waters should be free from substances that:

- Cause injury to, are toxic to, or produce adverse physiological responses in humans, animals, or plants;
- Settle to form objectionable deposits;
- Float as debris, scum, oil, or other material in concentrations that form nuisances;
- Produce objectionable color, odor, taste, or turbidity; or
- Produce undesirable aquatic life or result in the dominance of nuisance species.

2.4 Antidegradation

The third component of water quality standards are the antidegradation rules that contain provisions designed to preserve and protect the existing beneficial uses and to minimize degradation of the state's water quality. The antidegradation provisions consist of four tiers of water quality protection as defined in the Water Quality Regulations.

2.5 **Assessment Indicators**

Under the assessment process, the term "indicators" refers to a wide range of measures of water quality (e.g., physical, chemical, biological, etc.). For any designated use, there are often many parameters/indicators that can be evaluated to determine the use attainment status. Table 2 shows the designated uses and associated parameters/indicators utilized to assess attainment of each designated use for RI waters. Many of the indicators can be easily linked to enforceable water quality standards. Accordingly, data collected to support measuring these indicators are an integral part of the RI water quality assessment process. In other cases, the data collected for an indicator may not be easily compared to a standard or threshold. Such data may not be directly used in the water quality assessment process, but are needed to understand the functioning of aquatic ecosystems for purposes of effective protection and management.

For several uses there is a hierarchy of indicators used to assess attainment with the water quality standards. The core indicators, shown in bold in Table 2, represent the most direct measures of the use and are considered the primary data needed to support water quality standards attainment decisions and to identify impaired waters. Table 2 also notes several indirect measures of designated use attainment. These supplemental indicators may be evaluated for waters where there is a reasonable potential for specific pollutants to cause or contribute to water quality impairments based on evaluation of watershed conditions, including land use and source assessments.

The protocol for determining attainment of the criteria and uses (standards) is described in Section 5, Assessment Evaluation Methodology.

Table 2 Designated Uses and Indicators for Attainment Evaluations.

Designated Use	Indicators Evaluated For Attainment Of This Use *
Drinking Water Supply	• Compliance with SDWA standards (MCLs) in the finished drinking water (HEALTH) • Finished Drinking Water Restrictions – use advisories associated with source water contamination (HEALTH) • Treatment Requirements – contaminants in source water that requires more than conventional treatment (HEALTH) • Fecal coliform bacteria (terminal reservoir) (RI WQRegs)
Swimming/Primary and Secondary Recreation	• **Enterococci** (RI WQRegs); • **Fecal coliform bacteria** (RI WQRegs); • **Beach closure information for designated beach waters** (HEALTH) • Minimum water quality general criteria and aesthetics (narrative criteria) (RI WQRegs)
Fish, other Aquatic Life, and Wildlife	• **Biological (macroinvertebrate) data including physical habitat information** (RI WQRegs) • **Conventional parameters** (RI WQRegs) • Toxic parameters in water column (RI WQRegs) • Toxicity data (RI WQRegs) • Minimum water quality general criteria and aesthetics (narrative criteria) (RI WQRegs)
Shellfish Consumption	• **Fecal coliform bacteria** (RI WQRegs) • **RI Shellfish Growing Area Monitoring Program classifications** • Minimum water quality general criteria and aesthetics (narrative criteria) (RI WQRegs)
Shellfish Controlled Relay and Depuration	• See Section 5.4.7
Fish Consumption	• **Fish consumption advisories for specific waterbodies** (HEALTH)

* Core indicators are represented in **bold** lettering.

3.0 **ASSESSMENT UNITS**

The waters of the state have been assigned to an assessment unit (AU), which refers to a waterbody or waterbody segment. Each assessment unit has been assigned an identifying number, referred to as a waterbody ID number (WBID#). These identifying numbers are unique to the waterbody to allow for tracking of assessment information and indexing in RIGIS (Rhode Island Geographic Information System) for mapping purposes. The state tracks and assesses surface waterbodies visible on a 1:24,000 scale map (USGS topographic map). In some cases the entire waterbody is considered as one AU, which is generally the case for lakes in the state. In other cases, the waterbody is segmented into several AUs. This is the situation for most rivers and estuarine waters. Waters are segmented to reflect classification changes, hydrologic drainage basin boundaries, assessment changes, land use changes, and shellfish growing area status. Waters are also segmented to differentiate among waterbody types (lake vs. river vs. estuarine). There are, however, AUs for river segments that include run-of-the-river lakes (impoundments/reservoirs) along the course of the river segment. The length or size of each AU is estimated by RIGIS. Due to refinements in software, estimates of AU size may vary slightly from year to year. Assessments are conducted on each individual assessment unit. Water quality data collected within an AU is considered to be representative of the entire AU unless and until more recent data or information indicate otherwise.

The unique identifying number for each AU is based upon the Basin and Subbasin within which each AU is located. For this purpose, the state has been divided into 10 major Basins: Blackstone, Woonasquatucket, Moshassuck, Ten Mile, Thames, Pawtuxet, Narragansett, Pawcatuck, Westport, and Coastal. Each ID number begins with "RI" to indicate that this waterbody is located in Rhode Island. The next four digits indicate which Basin the waterbody is located within. The next three digits indicate which subbasin the waterbody is located within. The next letter is an indication of the waterbody type where an "R" is for river, "E" is for estuarine, "L" is for lake, and "C" is for coastal shoreline. The last two digits represent the unique number for the waterbody. There may be a letter following the last two digits which represent the segment of that waterbody. For example, RI0008040R-03A represents the Pawcatuck River Basin (RI0008), Wood River Subbasin (040), a river waterbody type (R), Brushy Brook (03), segment A of the brook. A listing of the waterbodies/AUs and their waterbody ID numbers can be found in Appendix A of the RI Water Quality Regulations.

While assessments are determined on an individual AU basis, to comply with federal EPA reporting requirements, DEM will compile assessment results on the basis of 12 digit HUC watershed sub-basins. Performance measures associated with EPA's Strategic Plan, are intended to track improvements of these sub-basins over time.

For the 2014 cycle, DEM is tracking the following number of AUs by waterbody type:

Waterbody Type	Total Size in the State at 1:24,000	Total Size Tracked	Total Number of Assessment Units Tracked
Rivers and Streams	1,420 Miles	1,377.94 Miles	511
Lakes and Ponds	20,749 Acres	18,816.33 Acres	236
Estuarine	159 Sq. Miles	158.96 Sq. Miles	133
Coastal Shoreline	78.62 Miles	78.62 Miles	1
Total			881

4.0 GENERAL DATA REQUIREMENTS

As stated in RIDEM's Quality Management Plan (RIDEM 2010), it is the policy of the RIDEM that all environmental data generated and compiled shall be of known quality and adequate for its intended use, well documented, and be verifiable and defensible. RIDEM's OWR staff review all readily available data for consistency with data quality assurances (DQA) and data quality objectives (DQO) described below, to be used in the assessment and listing determinations for the Integrated Report. Furthermore, OWR staff review monitoring data in accordance with the Department's *Summary Guidance for Reviewing Environmental Monitoring Data* (RIDEM 2007) (http://www.dem.ri.gov/pubs/sops/datarevw.pdf).

4.1 Data Sources

DEM strives to consider all readily available water quality data and related information in developing the 305(b) water quality assessments and 303(d) impaired waters listing. In determining if data are appropriate, DEM considers quality assurance/quality control, data quality objectives, monitoring design, age of data, accuracy of sampling location information, data documentation, and data format (hard copy versus electronic).

The primary source of data generated for assessments is developed from programs consistent with the RI Water Monitoring Strategy and the Strategy has as a goal to comprehensively assess the state's waters over a specified number of years. As the Monitoring Strategy is implemented, there continues to be gaps that have to be addressed with additional investments of resources. Data generated from implementation of the Monitoring Strategy are used in multiple programs but one of the primary purposes is to support the assessment process.

There is a variety of data generated in programs outside of the Water Monitoring Strategy framework. This includes data on pollution sources, pollutant releases, and impacts to surface waters generated by special projects, research, volunteer efforts, and the federal government. DEM is interested in all such data and gives it consideration but the applicability to the assessment process may be limited by the sampling design and data quality objectives of those projects. That data, because it generally has not been collected for assessment purposes, may be limited for application in assessments due to the frequency of sampling, indicators collected, number of samples, etc. The DQOs outlined below are used to allow DEM to determine, in a consistent manner, whether this data can be used to make decisions about the water quality attainment status.

Prior to initiating data review, DEM solicits water quality data through verbal requests at meetings and workshops, postings on the DEM website, and through written/email requests to organizations, individuals, and agencies that potentially collect water quality data. DQA and DQO preferences for use in assessments and a time schedule by which data must be submitted for consideration in developing the next Integrated Report assessments, are noted in the data request. A cutoff date is necessary to ensure adequate time for staff to process, assess, and report the information by the EPA mandated deadlines. DEM will accept hard copy and/or electronic data and information from all projects. However, electronic data are preferred, and considered more readily available, due to the significant effort that may be needed to analyze large hard copy datasets.

Data must be submitted to DEM with the required quality assurance and quality objective documentation as noted below. If the data collection and analysis does not include appropriate DQA and DQO, the data may still be considered for the water quality assessments following a qualitative approach as discussed in Sections 4.3, 4.4 and 5. DEM is committed to using only data that meets the DQOs and DQAs as outlined below, to develop the impaired waters list (Category 5 of the Integrated Report).

4.2 **Data Management**

Both ambient water quality data and water quality assessment and listing information are stored in databases maintained by staff of DEM's Office of Water Resources (OWR).

4.2.1 Water Quality Database

For the 2014 assessments, ambient (instream) chemical monitoring data are managed by means of a new SQL database, SWIMS (State Water Information Management System), that was developed by enfoTech and OWR staff. SWIMS has been developed to compare most water quality data to the appropriate RI water quality criteria and to generate reports of the data for each AU. SWIMS will replace the Microsoft Access Database WQUAL that was previously used to maintain the water chemistry data collected by projects funded by DEM's OWR.

DEM/OWR in coordination with a contractor (Tetra Tech) developed a Microsoft Access database, BioQual, which stores, retrieves, and analyzes data relating to benthic macroinvertebrate and fish communities, instream habitat, and site physical characteristics. This database is currently used to maintain and evaluate macroinvertebrate data.

4.2.2 Assessment Database

Assessment information generated for the Integrated Reports is maintained in a Microsoft Access database, called the Assessment Database (ADB), which was developed by EPA and their contractors. The ADB is a data management tool designed to store assessment information in a way that is consistent with EPA's guidance on generating the Integrated Report, including listing the 5 categories of waterbodies. EPA developed the ADB to ease the burden of state reporting, encourage standardization of reporting among states, as well as to facilitate the generation of the National Assessment Database and the National Water Quality Inventory.

4.3 **Data Quality Objectives**

Data Quality Objectives (DQOs) describe the intended use of the data and some of the requirements that must be attained (quality and quantity) to meet the intended use. For purposes of water quality assessments and impaired waters listings, data must be of a certain quantity and quality to adequately meet environmental management and regulatory decision-making needs. DQOs for the water quality assessment and listing process ensure that the majority of data relied upon for assessment and listing decisions is of high quality. To meet the assessment and listing objectives, certain data quality, frequency, duration, dataset size, type of data, etc, are required.

While DEM will consider all available data, in some cases data may not meet these DQOs. Use of datasets that do not meet the DQOs described below, is discussed in Section 5.3.

4.3.1 Core parameters

The RI Water Monitoring Strategy has identified indicators to monitor ecological health of the water resources. The current listing in the Strategy is expected to be refined over time as an adaptive management approach. For the purposes of water quality assessments, core and supplemental indicators used to evaluate each use are shown in Table 2. For swimming (recreation), shellfish consumption, fish consumption and aquatic life use, the core indicators required for assessments have been established and are noted in Table 2. For aquatic life use assessments, the current practice is to use one biological assemblage however the goal is to incorporate a second (i.e., fish or periphyton). Table 2 also notes several indirect measures of designated use attainment. These supplemental indicators may be added for waters where there is a reasonable potential for specific pollutants to cause or contribute to water quality impairments based on evaluation of waterbody and watershed conditions, including land use and source assessments.

For drinking water use assessments of surface waterbodies, the analysis is complex, covering a broader range of parameters/indicators. HEALTH regulations require terminal reservoirs to be sampled in accordance with drinking water program requirements. Samples are usually collected from one location near the intake to the drinking water treatment plant. In these terminal reservoirs, the analyses entail a list of over 100 parameters that reflect the compounds for which MCLs have been established for *finished* drinking water. HEALTH uses this data to determine drinking water use attainment for the terminal reservoirs. In many water supply districts, upgradient reservoirs and tributaries are not routinely sampled by the water suppliers. Furthermore, in the up-gradient waters the range of parameters analyzed is significantly less than the over 100 parameters that correspond to HEALTH's MCLs. DEM and HEALTH plan to work toward defining the core parameters/indicators required to assess drinking water use attainment for these up-gradient reservoirs and tributaries within drinking water supply systems.

4.3.2 Frequency of sampling and sample/dataset size

The number of samples needed to make a use support decision plays a large role in how defensible and rigorous the assessment is. Due to variability of chemical (toxics and conventional parameters excluding DO) data, to support as an acceptable, valid analysis, a dataset based on a minimum of 5 data points is recommended. A smaller dataset may be utilized following the modified assessment method as described in Section 5.3. As discussed in RI's Water Monitoring Strategy, chemical data is collected in support of biological and physical information, however under the Rotating Basin monitoring design, it is not intended to be used alone for aquatic life use support assessments. However, experience with the Rotating Basin approach has shown there are certain areas, including the coastal zone, in which existing current methods are not practical to collect biological data. In such cases, if the only available data for aquatic life use assessments is chemical data, that data would be used.

The state has a total phosphorous criteria for lakes and tributaries at the point where they enter lakes, but is currently working toward refinement of this criterion and development of numeric

nutrient criteria for freshwater lakes/ponds and rivers/streams. During the numeric nutrient criteria development, the minimum dataset size and frequency of sampling will be addressed.

A seasonal sampling index period for lakes trophic monitoring data is considered sufficient for use in conducting lakes assessments. Given the biological response of lakes to variations in the weather, one year of data is not always considered representative of the general condition of the lake. Assessment decisions are enhanced when based on several years of data. Because the state currently obtains most lake water quality data from an agreement with the URI Watershed Watch Program (URIWW), the lake sampling index period is defined as April to November to be consistent with the URIWW's sampling schedule. Samples are collected on a monthly or twice-monthly basis depending on the parameter, during the sampling period.

For rivers and streams, a seasonal sampling index period that extends from August through September, is required for biological data. Sampling following DEM's macroinvertebrate monitoring protocol for wadeable rivers (Section 5.4.3), includes one sample per site during the sampling index period. The sampling protocol for deep, non-wadeable rivers requires 3 samples per site during the sampling index period.

Grab samples for freshwater dissolved oxygen (DO) analyses should be collected in the early morning hours over the course of the growing season in an effort to capture the critical period for this aquatic life use indicator.

RI's saltwater DO criterion evaluates cumulative exposures of low DO with established minimum standards. Therefore RI is moving to a reliance on continuously collected saltwater DO data or data that can correlate to continuous data. Grab samples or similar DO data may still be considered if it can be correlated to continuous data or is representative of a longer time period. The saltwater DO criterion evaluates cumulative exposures of low DO observed during May to October.

4.3.3 Sampling conditions

Currently, RIDEM will accept data collected under any sampling conditions such as low or high tide, dry or wet weather. The Department requests that the sampling conditions and other metadata about sample collection are documented within the data report. Useful sampling condition information includes date and time of sampling, tide conditions, depth sampled, flow, date, and amount of last rainfall event. This information will be examined during the determination of usability of the data for assessment purposes.

4.3.4 Probabilistic sampling data

DEM expects data to be made available via probabilistic surveys conducted by EPA and possibly others. By design, these surveys are targeted to populations of waterbodies rather than individual waterbodies. In most probabilistic surveys the design results in collection of samples from a single point on a single day. With respect to RIDEM's assessment process for individual waterbodies, biological (macroinvertebrate) and fish tissue data collected by EPA's probabilistic monitoring (NRSA and NLA) are likely to have the most fitting applicability to the assessment

process but may be constrained by the applicability of the field methods employed. Chemical data limited to a single sampling event will have less applicability given the DQOs of the assessment program. Single sample information may be used to direct additional targeted monitoring to those areas that indicate potential water quality degradation.

4.3.5 Spatial Extent of Assessment

Assessments are based on one or more sampling stations the Department deems representative of an AU for a distance upstream and downstream where no significant influences (landuse, point source discharges, etc.) exist that might tend to change water quality or biological and habitat conditions. For lakes, a single sampling station (usually located at the deepest point of the lake) is generally considered representative for the entire lake. Future refinement to the monitoring strategy for lakes is to add additional sampling in larger lakes with geomorphologically unique areas. As described in Section 3, for rivers and estuarine waters, the boundaries of the AUs were defined taking into account landuse changes, pollution sources, classification changes and assessment changes. Depending upon the consistency of the watershed conditions (landuse, discharges, etc.), monitoring data from a sampling location in one AU may be considered applicable to upstream and/or downstream AUs as well. In general, for wadeable streams, a single monitoring station should only be considered representative of no more than 10 miles of stream length unless circumstances (e.g., watershed or landuse characteristics) suggest otherwise.

4.3.6 Analytical Techniques

Clean sampling and analytical techniques will be implemented as needed to meet DQOs for use of the data. In addition, adequately sensitive analytical methods will be implemented to achieve necessary detection limits and quantitation levels for intended use of the data.

4.4 **Data Quality Assurance**

Quality assurance (QA) is an important component of the major monitoring programs relied upon by state water protection programs. It is important to ensure that the data generated by monitoring and used to support decision-making in water protection programs is valid and appropriate. DEM maintains a goal of generating and compiling data of acceptable quality for use in the water quality assessment program. To achieve this goal, certain data quality assurance and quality control procedures must be met. QA is defined as the overall management system of a project including the organization, planning, data collection, quality control, documentation, evaluation, and reporting activities. QA provides the information needed to determine the data's quality and whether it meets the project's requirements. Quality control (QC) is defined as the routine technical activities intended primarily to control errors. Since errors can occur in either the field, the laboratory, or in the office, QC must be a part of each of these activities.

To comply with EPA regulations, monitoring projects funded by federal money are required to develop, submit, and implement an EPA approved Quality Assurance Project Plan (QAPP). QAPPs define the scope of work for the project, including the DQOs, and QA/QC. Not all monitoring programs, however, operate with QAPPs oriented to EPA guidance. DEM may

receive and use data from such programs, but is obligated to document quality assurance if the data is relied upon for making decisions in the assessment of water quality, most notably, for development of the Category 5 List of Impaired Waters. Water quality monitoring data and information must follow EPA's Quality Assurance/Quality Control (QA/QC) guidelines as documented in EPA New England's *Quality Assurance Project Plan Program Guidance* (USEPA 2010), to be utilized in the development of RI's Impaired Waters List (Category 5). Where quality assurance cannot be documented or has not met minimum requirements, the data will be given less weight and may be used to assess waters into one of the other four categories of the Integrated Report but will most likely be considered as insufficient data. Use of datasets that do not meet these QA/QC protocol is discussed further in Section 5.

5. ASSESSMENT AND EVALUATION METHODOLOGY

Once data is evaluated for attainment of the DQO and DQA requirements described above, an assessment is conducted where the water quality data are compared to the narrative and numeric criteria to evaluate attainment of the designated uses defined for each waterbody. This section describes the assessment methodology for interpreting compliance with the water quality standards (uses and criteria) and determination of use support attainment for placement in one of the five Integrated Report Categories.

5.1 Use Support Attainment Options

In conducting water quality assessments, each designated use of a waterbody or waterbody segment is assigned a level of use support that characterizes the degree to which to the water is attaining that use. In accordance with the requirements associated with the development of the Integrated Report and Lists, the use support groups have changed slightly from the previous 305(b) use support groups (fully supporting, fully supporting but threatened, partially supporting, not supporting). One of the following Use Support Attainment groups is assigned to each designated use for each AU:

- *Fully Supporting* – The use is fully supporting if, in accordance with this document, there is sufficient data or information to demonstrate that the water quality standards are being attained.

- *Not Supporting* – The use is not supporting if, in accordance with this document, there is sufficient data or information to indicate an impairment or non-attainment of the water quality standards.

- *Insufficient Data/Information* –Where the data or information available to conduct an attainment determination for any use is not sufficient to make a final assessment determination, in accordance with this document, the use is considered Not Assessed due to insufficient data/information.

- *Not Assessed* – The use is considered Not Assessed or Unassessed where there is no data or information available to conduct an assessment, in accordance with this document.

Threatened – For any of the use support options noted above, the ADB allows any designated use for the AU to also be flagged as Threatened. The use may be flagged as threatened if the data or information indicate that the use is currently fully supporting, in accordance with this document, but non-attainment is predicted by the next Integrated Reporting cycle. Note that assessing a use as Threatened results in placement of the associated AU into Category 5.

For each AU, once each designated use is assessed and assigned into one of the use support attainment groups above, that information is summarized such that each AU is then placed into one of the Integrated Reporting Categories as discussed in Section 1.2.

5.1.1 Observed Effects

The Integrated Reporting guidance and ADB (EPA's Microsoft Access Assessment Database) allow for tracking monitoring observations that may indicate a decline in water quality. These monitoring observations, called Observed Effects, represent responses to pollutants or other stressors causing impairment. Such Observed Effects can include excess algal growth, chlorophyll a, Secchi depth, cyanobacteria, noxious aquatic plants, color, taste and odor, siltation/sedimentation, and fish kills. Based on an evaluation of a waterbody and watershed conditions, including land use and source assessments, AUs may be listed as impaired for the pollutant generally associated with the observed effect. The listed pollutant would be incorporated into the monitoring strategy for the waterbody.

5.2 **Assessment Quality/Confidence**

Data used to make assessment decisions, especially for listing a waterbody into Category 5, must be defensible. Therefore, the quality of the data used to determine an assessment must be documented to define the basis of the final assessment determination. The ADB requires documentation of the confidence of the assessment, or the confidence of the data quality used to make assessment determinations. Four levels of descriptive information, that represent a hierarchy of data quality, are available within the ADB from which to choose. The four levels of information and a description of the data quality associated with each level, are as follows:

- Level 1 = Low: Level 1 represents data with a greater degree of uncertainty. Level 1/Low quality data or information does not have a Scope of Work (SOW) or QA/QC Plan or QAPP or one is not available or documented; and/or the plans were not followed; and/or the plans do not meet requirements noted in this document; and/or samplers had no training. This data may be 10 years old or older; considered evaluated (not monitored) or qualitative based upon landuse, citizen complaints or observations. This information is not considered sufficient for use in conducting an assessment and without other data would lead the waterbody to be considered unassessed or not assessed. The information would be used to help guide future monitoring activities under the Monitoring Strategy.

- Level 2 = Fair: Level 2/Fair quality data or information is collected following a basic QA/QC plan or QAPP that is documented and available. The QA/QC Plan or QAPP meet some of the requirements noted in this document. Samplers had minor training. The age of this data may be between 5 and 10 years old. This data or information may include some evaluated or qualitative observations from qualified professionals. This information would be used to conduct a water quality assessment but would most likely be considered "insufficient data" (Category 3). The quality of this data may be questionable for an impairment determination.

- Level 3 = Good: Level 3/Good quality data or information is collected following an adequate QA/QC plan or QAPP that is documented and available. The QA/QC Plan or QAPP meet most of the requirements noted in this document. Samplers had moderate training. This includes actual water quality data that has been collected during the past 5 years. This information is considered sufficient for an impairment determination and subsequent listing in Category 5.

- Level 4 = Excellent: Level 4/Excellent quality data are of the highest quality and provide relatively high level of certainty. Data in this level are collected following an acceptable QAPP or QA/QC plan that is documented and available and samplers were well trained. This includes actual water quality data that has been collected during the past 5 years. This information and data is considered sufficient for an impairment determination and subsequent listing in Category 5.

5.3 General Assessment Protocol

This section describes the general rules followed for data evaluation and assessment and listing determinations. Some of these general rules have been discussed previously in this document. In addition, more information about the listing methodology can be found in Section 6.

- Depending on the waterbody, a number of types of acceptable data may be available for consideration of water quality assessments and listings. It is not uncommon to have inconsistent water quality data, therefore some interpretation is required in making the final assessment. In general, for purposes of determining attainment status, DEM employs a weight of evidence approach that considers the amount of each type of data, the quality of each set of data, the variability of each set of data, and the strength of the linkage of each set of data to protection of the water quality standards. For example, when making aquatic life use assessments, DEM weighs biological data, a core indicator, more heavily than toxics data. This is because the biological data provide a direct measure of the status of the aquatic biota and detect the cumulative impact of multiple stressors on the aquatic community. Furthermore, it is difficult to conclude that aquatic life is impaired based solely on low level exceedances of numeric water quality criteria for the protection of aquatic life due to metals since the Department has observed incidences of low level exceedances co-occurring with fully supporting biological communities. This is due to potential questions of site specific applicability of the numeric metals aquatic life criteria. Table 3 outlines the general protocol for determining aquatic life use support (AQLUS) status for AUs with biological and/or toxics data:

Table 3 Protocol for Determining AQLUS Status for AUs with Biological and/or Toxics Data

Biological Data	Toxics Data	Pollution Source Present?	Aquatic Life Use Support Status
Fully Supporting	Fully Supporting	Yes or No	Fully Supporting
Fully Supporting	Not Supporting	Yes	Insufficient Data
Fully Supporting	Not Supporting	No	Fully Supporting
Not Supporting	Fully Supporting or Not Supporting or No data	Yes or No	Not Supporting
No data	Fully Supporting	No	Fully Supporting
No data	Not Supporting	Yes	Not Supporting
No data	Not Supporting	No	Insufficient Data
Fully Supporting	No data	Yes or No	Fully Supporting
Not Supporting	No data	Yes or No	Not Supporting

- Best professional judgment (BPJ) may be utilized to interpret water quality data for the purposes of determining use attainment status. This is often the case where waters in their natural hydraulic condition may fail to meet their assigned water quality criteria from time to time due to natural causes, without necessitating the modification of the assigned water quality standard. Such waters will not be considered to be violating their water quality standards if violations of criteria are due solely to naturally occurring conditions unrelated to human activities.

- In general, qualitative information provided by qualified professionals that indicates a degraded condition may exist will be considered insufficient data upon which to conduct a use attainment determination. Sites with insufficient data that indicate a degraded condition will be given a higher priority for future monitoring under the Monitoring Strategy.

- Evaluated or qualitative data representing Level 1 quality data are considered useful information but not defensible or sufficient for use in conducting an assessment. This information will be useful in making decisions about where to target monitoring efforts.

- Monitoring data that followed adequate DQO and DQA but which is more than five years old may be used, or continue to be used for assessments, on a case-by-case basis if conditions in the waterbody and the watershed have not changed. Data that is more than five years old that had previously been used to list a waterbody as impaired, will not be excluded due to age.

- Use support (assessment) determinations made from water quality data collected in one AU, may be extrapolated to another AU. Only fully supporting assessment determinations may be extrapolated to another AU and only if the watershed conditions support the accuracy of that assessment extrapolation.

- Actual monitored water quality data collected following the DQO and DQA requirements as detailed in this document will be given the greatest weight and will serve as the primary basis for determining impairments and listing waters into Category 5.

- AUs flagged as threatened for any designated use, will be listed in Category 5.

- AUs assessed with a biological impairment where the cause of the impairment is unknown, will be listed in Category 5. AUs assessed with a biological impairment where the cause is determined not to be due to a pollutant, will be listed in Category 4C, pending no other pollutant-caused impairments.

- A modified assessment method will be used for data sets that <u>do</u> meet the QA/QC requirements describe in Section 4.4, but do <u>not</u> meet the preferred data quality objectives (DQOs) requirements described in Section 4.3. These types of data sets include adequate QA/QC protocol however, may include fewer than the required number of data points, and/or sampling less than the required frequency and duration. These data sets may still have value in assessing water quality and will be evaluated on a case-by-case basis to determine if they adequately represent existing water quality conditions. If it is determined that the data <u>do not</u> adequately represent existing water quality conditions, the information will result in an

assessment of insufficient data. If it is determined that these data sets do adequately represent existing water quality, BPJ will be used to determine if an impairment exists and the factors used in the BPJ decision will be documented.

- Determinations of impairment made by RIDEM's Office of Waste Management for site remediation projects are considered sufficient information to list an AU in Category 5.

5.4 **Assessment Methodology By Designated Use**

This section describes the assessment methodology followed for each of the six individual use designations. Ambient water quality data are compared to the water quality standards and/or guidelines associated with the indicators noted in Table 2, to assess each designated use. Each designated use is then assigned a use support attainment status as listed in Section 5.1.

5.4.1 Applicable Flow Conditions

The water quality criteria apply under the most adverse conditions, as determined by the Director according to sound engineering and scientific practices as defined below. For non-flowing waters, most adverse conditions will be defined on a case-by-case basis. The ambient water quality criteria are applicable at or in excess of the following flow conditions:

- Aquatic Life Criteria – the acute and chronic aquatic life criteria for freshwaters shall not be exceeded at or above the lowest average 7 consecutive day low flow with an average recurrence frequency of once in 10 years (7Q10).

- Human Health Criteria – The freshwater human health criteria for non-carcinogens and carcinogens are applicable at or in excess of the harmonic mean flow, which is a long-term mean flow value calculated by dividing the number of daily flows analyzed by the sum of the reciprocals of those daily flows. For seawaters, the ambient human health water quality criteria are applicable when the most adverse hydrographic and pollution conditions occur at the particular point of evaluation.

5.4.2 Mixing Zones

The Water Quality Regulations allow for the establishment of a mixing zone. Mixing zones are defined as a limited area or volume in the immediate vicinity of a discharge where mixing occurs and the receiving surface water quality is not required to meet applicable standards or criteria, provided the minimum conditions described in Rule 8.D.1.e and 8.D.1.f of the Water Quality Regulations are attained. Consistent with the Water Quality Regulations, water quality data used to conduct assessment determinations are based on samples taken outside of DEM designated mixing zones.

5.4.3 Aquatic Life Use Support (AQLUS) Assessment

As noted in Table 2, the core indicators upon which aquatic life use assessments are based, include biological indicators, physical habitat, and conventional parameters. Samples are collected for core indicators to assess the attainment/impairment status of waters. In addition to

core indicators, several supplemental indicators may be useful in the aquatic life use assessment process to further define potential stressors or sources of aquatic life impairment. Available water chemistry data are compared to applicable water quality standards and/or guidelines as described below to supplement biological data in the evaluation of the AQLUS status. Section 5.3 General Assessment Protocol, describes the process for AQLUS determinations for AUs with biological and toxics data.

- **Biological Data and Habitat Information in Wadeable Streams** – Aquatic biological indicators such as macroinvertebrates, algae and fish communities integrate the cumulative effects of different stressors such as excess nutrients, toxic chemicals and excessive sediment, during their life cycles. The aggregate biological data provide a more reliable reflection of the ecological condition of a waterbody than do snapshot measurements of water chemistry. Therefore, as recommended by the U.S. EPA, RIDEM uses biological and habitat monitoring data as core indicators for aquatic life use support determinations (U.S. EPA, 2002). To date, benthic macroinvertebrate sampling is the primary form of bio-monitoring utilized by RIDEM. Algae and fish assemblages are, however, being monitored in a number of streams and rivers to assist in understanding these biological communities, develop numeric nutrient criteria, and allow for more holistic assessments of aquatic life use.

  Currently, the state's Water Quality Regulations list biocriteria as narrative descriptions that should be attained, rather than numeric values to describe expected biological conditions. These narrative criteria are utilized to evaluate the biological condition of the state's waters. Currently, a single sampling methodology (EPA's Rapid Bioassessment Protocol, Plafkin et al, 1989) is implemented for macroinvertebrate collection and habitat evaluation as described below. Two approaches for analyzing the biological data utilizing benthic macroinvertebrate communities are used for the 2014 assessment cycle as interpretation of the current narrative standard – the historically utilized reference site approach and a recently developed reference condition approach. Both approaches are based on the concept of comparing ambient biological conditions of a waterbody, defined by various calculated macroinvertebrate community metrics, to either a reference site or a reference condition, as detailed below.

  Biological and Habitat Field Sampling Methods – To date, benthic macroinvertebrate sampling is the primary form of biomonitoring utilized by RIDEM for wadeable stream bioassessments. Sampling of the macroinvertebrate community occurs annually during a single survey, usually in August or September, to capture the critical biological index period when base flows are at their lowest of the year and water quality is presumed to be at its worst. Biological data (benthic macroinvertebrate samples) are collected in riffle areas of perennial, wadeable streams/rivers, using the single habitat approach in accordance with EPA's 1999 RBP method (USEPA 1999a), for use in evaluating the biological condition. In the field, macroinvertebrate kick samples are collected over a 3-minute duration in the riffle/run areas using D-frame nets. Habitat information, collected concurrently with biological sampling, are used as supplemental information to enhance the interpretation of biological conditions when making biological assessment determinations. Habitat evaluations are based on visual observations of the stream/river using EPA's *Rapid Bioassessment Protocols (RBP) for Use in Wadeable Streams and Rivers, July 1999, (EPA/841-B-99-002).* Stream habitat is assessed using the EPA habitat assessment form for high gradient streams, which provides a convention to rate specific stream habitat characteristics along a gradient. Ten specific habitat parameters are rated

from 0-20 using the best professional judgment of a qualified professional. Each parameter is rated with a value that increases with habitat quality. The values from each parameter are totaled for each station to create the habitat score as shown in the table below.

Habitat Assessment Category	Habitat Score
Optimal	>150
Suboptimal	101-150
Marginal	51-100
Poor	<50

Biological Data Analyses – Macroinvertebrate samples are preserved in the field and returned to the laboratory to be sorted. Samples are sub-sampled until 100 organisms are picked, and then identified to genus/species, or the lowest practical taxonomic level, by a qualified professional. The taxonomic data are analyzed using selected metrics or measures, of the macroinvertebrate community. Metrics are predictable measures of the macroinvertebrate community's response to stressors, such as changes in water quality or habitat degradation. These metric values, which describe the health of the identified macroinvertebrate community, are then used to assess the biological condition of the stream. Historically, RIDEM has utilized a reference site approach where metrics observed at each station are compared to metrics observed at a single reference station. As noted above, RIDEM has been working toward development of a reference condition approach utilizing a Multimetric biological condition index to evaluate the biological communities of the state's rivers and streams. Discussion of each approach and the geographical areas of application are discussed below.

Reference Condition Approach – Initial work recently completed by RIDEM (Tetra Tech, 2012) toward development of a reference condition approach produced a Multimetric Biological Condition Index (MBCI) model to use for interpreting biological condition along a gradient based upon Rhode Island data. Use of the MBCI reference condition approach is the preferred assessment method as it uses multiple sites to characterize the reference condition and therefore accounts for natural variability inherent in riverine systems. Use of the MBCI model integrates naturally different ambient conditions among many stations due to variable factors such as geology, slope, elevation, stream order, catchment area, or landscape in the watershed. This reference condition approach avoids any misinterpretation of dissimilar macroinvertebrate metric scores where monitoring stations are not naturally like a reference station, and are not expected to be comparable. However, given the available data, the preliminary work to develop an accurate MBCI restricted its applicability to the higher gradient region, covering most of Rhode Island, which is known as the Southern New England Coastal Plains and Hills Ecoregion (SNECPH or CPH) area of the state (Figure 1).

To determine the MBCI score, taxonomic data are analyzed using 6 selected measures (see table below) of the macroinvertebrate community (metrics). Metrics are scored according to the formula in the table below, and the scores are averaged to produce the MCBCI score for the station.

Metric	Metric Category	Scoring Formula [a]
Total Taxa	Richness	100*metric value/32.8
% Non-insect	Composition	100*(46.3-metric value)/(46.3)
Beck's Index	Tolerance	100*metric value/24.8
Clinger Taxa	Habit	100*metric value/18
% Predators	Feeding Group	100*metric value/22.7
% Filterers	Feeding Group	100*(83.1-metric value)/(80.8)

[a]: If the calculated score was outside of the valid scoring range of 0-100, the score was re-set to the nearest extreme before averaging all scores to arrive at the index score.

Each station is then classified into one of the Biological Condition Categories shown below based on its MBCI score:

Biological Condition Category	Approximate MBCI Score Thresholds
Non-impaired	>86 %
Slightly impaired	56-85 %
Moderately impaired	36-55 %
Severely impaired	< 35 %

Reference Site Approach – The MBCI project determined that stations located on rivers/streams in the Long Island Sound Coastal Lowland and Narragansett/Bristol Lowland (Lowlands) areas of the state are different from the CPH area because natural landscape characteristics (elevation, slope) differ between the two regions (Figure 1). Therefore, the MBCI model cannot be applied to these lowland stations. Since the majority of the area in RI is classified as CPH, there are naturally fewer stations located in the Lowlands, resulting in a small dataset to evaluate this area for the MBCI development. Furthermore, the Lowland areas have more intense land uses so the range of disturbance among these stations is too narrow to identify an adequate number of reference stations to develop a reference condition and index model for these ecoregions relying only on RI data. Instead, the reference site approach, historically applied statewide, will continue to be used to evaluate stations where appropriate in the smaller coastal lowland Level IV ecoregion areas of the Narragansett/Bristol Lowland and the Long Island Sound Coastal Lowland for the 2014 assessments and until further study.

Under the reference site approach, biological conditions in streams/rivers are measured against conditions observed at a state reference station. A station located on Adamsville Brook serves as the reference in the coastal areas of Narragansett Bay, the islands, and the Narragansett/Bristol Lowland and Long Island Sound Coastal Lowland ecoregions. Taxonomic data are analyzed using 8 selected measures of the macroinvertebrate community (metrics). These eight metrics (taxa richness, Hilsenhoff Biotic Index, ratio of scrapers/filtering-collectors, ratio of EPT/chironomids, % contribution of dominant taxa, EPT index, community loss index, ratio of shredders/total) are combined into an index score. Each station is then classified into one of the biological condition categories shown in the table below, based on a comparison of its index score to the index score from the reference station. Where index score percentage values are intermediate to the ranges below, best professional judgment is used for placement in the appropriate Biological Condition Category.

Biological Condition Category	Approximate Index Score Ranges (as % reference station score)
Non-impaired	>83 %
Slightly impaired	54-79 %
Moderately impaired	21-50 %
Severely impaired	< 17 %

Biological Assessments – Generally, the biological assessments are determined using both the Biological Condition and Habitat Assessment Categories in accordance with the table below. Where available, general temporal trends in biological and habitat category assignments observed at each station over the course of several years are also used in the final bioassessment evaluation. Individual habitat parameters, physical site characteristics (e.g., drainage area size), photographic logs, and all other available physical or geomorphic information (e.g., sampled downstream of an impoundment, flow) are also evaluated to ensure macroinvertebrate sampling stations were located in appropriate perennial, riffle habitats. This information is taken into account with BPJ to determine the appropriate biological condition status. For example, extended drought conditions or impoundments immediately upstream of a sampling station will have a significant effect on aquatic macroinvertebrate populations. Therefore, available information on river flow or precipitation for the year, to document wet or drought conditions, may be incorporated with station information, habitat scores, physical data and macroinvertebrate metrics to make the overall assessment.

Summary of Bioassessment Determinations

Biological Condition Category	**Habitat Assessment Category**	**Bioassessment Determination**
Non-impaired	Optimal	Fully Supporting
Non-impaired	Suboptimal	Fully Supporting
Non-impaired	Marginal	Fully Supporting
Non-impaired	Poor	Fully Supporting
Slightly impaired	Optimal	Fully Supporting
Slightly impaired	Suboptimal	Fully Supporting
Slightly impaired	Marginal	Fully Supporting
Slightly impaired	Poor	Fully Supporting
Moderately impaired	Optimal	Not Supporting
Moderately impaired	Suboptimal	Not Supporting
Moderately impaired	Marginal	Not Supporting
Moderately impaired	Poor	Not Supporting
Severely impaired	Optimal	Not Supporting
Severely impaired	Suboptimal	Not Supporting
Severely impaired	Marginal	Not Supporting
Severely impaired	Poor	Not Supporting

- **Biological Data in Non-wadeable Large Rivers** – Historically, evaluation of the biological condition of deeper, non-wadeable rivers was determined from multi-plate substrate sampling of the macroinvertebrate community. Due to limitations in the methodology being employed, the program was suspended in 2013. DEM has an interest in biological sampling in large rivers and is evaluating the most appropriate methodology to employ. In the interim, large, non-wadeable rivers will be assessed for Aquatic Life Use using available water chemistry data.

- **Conventionals**: Conventional parameters include the following physical water characteristics: dissolved oxygen, nutrients, turbidity, pH and temperature. Except as stated within the individual criteria for these parameters in tables 1 and 2 of the Water Quality Regulations or as noted below, for any one conventional parameter, the water quality standard is not attained whenever more than 10% of the measurements exceed the criteria. For small datasets (4 data points or less) however, there must be two exceedances of the criterion for the use to be considered impaired. The reasoning for this decision is to attempt to identify chronic or recurring exceedances that do justify listing in Category 5 and targeting with limited resources.

  Dissolved Oxygen (DO): Freshwater criteria for DO are listed in Tables 1 and 2 of the Water Quality Regulations. Freshwater DO criteria are based upon cold water and warm water fish habitat. Daily averages and instantaneous (grab) measurements of DO should not exceed the criteria except as naturally occurs. To capture potential diurnal fluctuations in DO, grab samples should be collected in the early morning hours. DO levels in bottom waters may be naturally low, especially in lakes, therefore, BPJ of qualified professionals will be used to interpret low DO levels in these situations. As noted in Section 5.3 and as defined in the Water Quality Regulations, natural hydraulic condition of ponds/lakes can result in establishment of a thermocline that can result in low DO levels in the hypolimnia. Using BPJ, under that state, hypoxia in the hypolimnia could be considered to result from the natural hydraulic condition of the pond and not be considered a violation of the DO criteria. Determinations of naturally low DO will be made by evaluating current and historical loadings, data collected over an entire season, and characteristics of the watershed.

  Saltwater DO criteria, listed in Table 3 of the Water Quality Regulations, are based upon waters above or below a seasonal pycnocline, or for waters without a seasonal pycnocline. These criteria evaluate cumulative exposures of low DO with established minimum standards. Therefore RI is moving to a reliance on continuously collected DO data or data that can correlate to continuous data. Grab samples or similar DO data may still be considered if it can be correlated to continuous data or is representative of a longer time period. The saltwater DO criterion evaluates cumulative exposures of low DO observed during May to October. The OWR has completed a project to develop software that is utilized to evaluate continuous DO data relative to the saltwater criteria.

  Nutrients: In accordance with the National initiative to develop nutrient criteria, the Department is currently working to further evaluate and refine numeric nutrient criteria for lakes and ponds and has initiated additional work to develop numeric nutrient criteria for rivers and streams. The Water Quality Regulations currently contain a numeric

criterion for total phosphorus (TP) in lakes and tributaries at the point they enter lakes. The seasonal index period average TP concentration shall not exceed 25 ppb in any lake, pond, kettlehole or reservoir, except as naturally occurs, and the average TP in tributaries at the point where they enter lakes shall not cause an exceedance of this TP criteria, except as naturally occurs.

The Water Quality Regulations also contain a narrative nutrient criteria which preclude nutrient concentrations associated with cultural eutrophication that cause undesirable or nuisance aquatic vegetation, or render waters unsuitable for the designated uses. Initial results of the Department's on-going numeric nutrient criteria development work suggest multiple indicators of eutrophication may be required to assess nutrient impairment in some lakes that exhibit effects but have a seasonal average TP level less than the current numeric criteria. As a translation of the narrative nutrient criteria, lakes and ponds that exhibit persistent elevated chlorophyll *a* and/or recurring cyanobacteria blooms, with seasonal average TP less than 25 ug/l, may be assessed as impaired for nutrients, except as naturally occurs.

Although the regulations do not contain numeric criteria for nutrients in rivers or estuarine waters, in accordance with the narrative nutrient standard, evaluations of persistent, potentially severe eutrophication and/or low DO may result in a determination of impairment for the waterbody with total phosphorus listed as the suspected cause in freshwater rivers and total nitrogen listed as the suspected cause in saltwaters.

- **Toxics** – Toxicants include metals, organics, chlorine and ammonia. Chemical data provides direct information about whether specific pollutants are present in amounts that are causing, or are likely to cause adverse impacts to aquatic organisms. The aquatic life water quality criteria for these parameters can be found in Appendix B of the Water Quality Regulations. The water quality standards include duration considerations of a one-hour averaging period for the acute criteria and a four-day averaging period for the chronic criteria. In addition to samples collected over a one hour period, grab samples will be considered sufficient to assess the acute criteria. For the assessment of chronic aquatic life criteria, the sample(s) must be representative of conditions, including hydrologic conditions, during a 4 day averaging period. For wet weather sampling events, if the data are collected during several days of high flow, the samples would be assumed representative of the 4 day average condition to assess chronic aquatic life criteria. These criteria should not be exceeded more than once every three years on average.

- **Non-Native Aquatic Plants** – Aquatic invasive plants are non-native plants that have been introduced (accidentally or intentionally) into lakes and rivers, and whose introduction threatens the diversity or abundance of native species, the stability of the ecosystem and/or the use of the infested water body. Generally unrelated to excess nutrients, invasive plants are able to thrive and can out-compete beneficial native plants that are naturally a part of our aquatic ecosystems. RIDEM seasonal surveys initiated in 2007 coupled with additional data reported via the URI Watershed Watch Program and RI Natural History Survey has documented the widespread occurrence of aquatic invasive plants in RI freshwaters.

Using Best Professional Judgment, where a non-native population has invaded and become established in a waterbody creating large monotypic stands of a plant, decreasing plant diversity and changing the available fish and wildlife habitat, the waterbody may be assessed as Not Supporting Aquatic Life Use and impaired due to the presence of non-native plants. Such an impairment is not appropriate to include on the 303(d) List for inclusion in the TMDL program which addresses impairments due to pollutants. Instead, such an impairment leads to listing the waterbody into Category 4C pending no other impairments requiring a TMDL or impairments which have an approved TMDL. RIDEM's Aquatic Invasive Species monitoring program and response efforts can be found at http://www.dem.ri.gov/programs/benviron/water/quality/surfwq/aisindex.htm.

- **Toxicity** – Ambient water column and sediment toxicity tests are useful for examining the effects of unknown mixtures of chemicals in surface waters. Toxicity thresholds are expressed in terms of "toxic units" that cause toxic effects to aquatic organisms. Toxicity levels are determined by exposing aquatic organisms to ambient samples. Even unknown toxicants are addressed during testing. RI has narrative toxicity criteria established as "no toxics in toxic amounts". RI requires whole effluent toxicity (WET) testing of all major facilities under the RIPDES Program. Such effluent tests are screening tools to indicate the potential for ambient water quality impacts. In RI, toxicity testing of ambient waters and sediment are typically only conducted in accordance with site remediation projects to assess if there are toxic impacts at the site. Toxicity is determined by comparing toxicity test results from the site in question with tests conducted at unimpacted sites. Determinations of toxic impacts in ambient waters and sediments at site remediation locations are made in conjunction with the RIDEM Office of Waste Management and are listed as impaired for assessment purposes.

5.4.4 Recreational/Swimming Use Assessment

The assessment of recreational/swimming use is based on enterococci, E. coli, and/or fecal coliform bacteria data, and bathing beach closure information at designated bathing beaches. Designated Bathing Beaches are defined as bathing beaches licensed and regulated by the Rhode Island Department of Health. As noted in Table 1, the Water Quality Regulations identify two types of recreational uses – primary contact recreation defined as those water-related recreational activities that involve significant ingestion risks and includes, but is not limited to, swimming, diving, surfing, and water skiing; and secondary contact recreation defined as those water-related recreational activities where the probability of water ingestion is minimal and includes, but is not limited to, boating and fishing. Currently the state's recreational bacteria criteria apply to both primary and secondary recreational uses. Therefore, the term 'recreational use' is frequently interchanged with the term 'swimming use'. Enterococci are the primary bacteria indicator for assessing recreational/swimming use attainment. During the transition to this newer indicator, the water quality standards have maintained fecal coliform criteria for use in evaluating swimming use when adequate enterococci data are not available. In some instances for freshwaters, data for another swimming use indicator, E. coli, are available and the EPA criteria (geometric mean of 126 colonies per 100 ml) for this indicator are used to evaluate that data.

The use of bacteriological data by the water quality assessment and beach monitoring programs may differ slightly to account for some of the inherent differences between the two programs. HEALTH's Beach program makes beach management decisions based on real time water quality data on a given day or weekend therefore focusing on more recently collected information to determine whether a swimming advisory should be issued. As noted in the Water Quality Regulations, HEALTH utilizes both the single sample maximum and geometric mean criteria for determining swimming advisories at designated beaches. This contrasts with the use of monitoring data for making a water quality assessment determination for non-designated beach waters where data collected over a longer period of time is considered. For assessment purposes on non-designated beach waters, the geometric mean is more relevant because it is a more reliable measure of long term water quality, being less subject to random variation. The disruption of recreational activities at designated bathing beaches is taken seriously by the state and investigated by HEALTH. It is, however, the state's experience that most beach closures are temporary, lasting only a few days and frequently related to transient sources.

For assessment purposes, the recreational/swimming use support status of non-designated beach waters shall be determined by evaluating the geometric mean of all samples collected over the recreational bathing period of May through October. The recreational/swimming use for a non-designated beach waterbody shall be considered Fully Supporting with respect to Enterococci if the geometric mean criteria (54 colonies per 100 ml for freshwaters and 35 colonies per 100 ml for salt waters) is met. The recreational/swimming use for a non-designated beach fresh waterbody shall be considered Fully Supporting with respect to fecal coliform if the geometric mean of 200 MPN/100 ml is met and not more than 10% of the total samples taken exceed 400 MPN/100 ml. The recreational/swimming use for a non-designated beach salt waterbody shall be considered Fully Supporting with respect to fecal coliform if the geometric mean of 50 MPN/100 ml is met and not more than 10% of the total samples taken exceed 400 MPN/100 ml.

The recreational/swimming use for a non-designated beach waterbody shall be considered Not Supporting with respect to Enterococci if the geometric mean criteria (54 colonies per 100 ml for freshwaters and 35 colonies per 100 ml for saltwaters) is exceeded. The recreational/swimming use for a non-designated beach fresh waterbody shall be considered Not Supporting with respect to fecal coliform if the geometric mean of 200 MPN/100 ml is not met or more than 10% of the total samples taken exceed 400 MPN/100 ml. The recreational/swimming use for a non-designated beach salt waterbody shall be considered Not Supporting with respect to fecal coliform if the geometric mean of 50 MPN/100 ml is not met or more than 10% of the total samples taken exceed 400 MPN/100 ml. These values are based upon all samples collected over the recreational bathing season.

For designated beach waters, bacteria data and beach closure information collected under HEALTH's Beach Monitoring Program are utilized to assess recreational uses at these waters. The Rhode Island Department of Health (HEALTH) Beach Monitoring Program uses bacteriological (enterococci) data to issue beach advisories and make opening and closure decisions for designated bathing beaches (http://www.health.state.ri.us/beaches/). For recreational use attainment decisions at designated beach waters, beach closures as issued by the DOH are not considered an impairment of the recreational use unless the closure is recurrent throughout a substantial part of the swimming season for several consecutive years. Such assessments are made in coordination with HEALTH's Beach Monitoring Program staff.

The state's narrative criteria, that all waters shall be free from pollutants in concentrations or combinations that may adversely affect human health, shall be applied to the presence of potentially hazardous chemicals in water and bottom sediment as an indicator of swimming use impairment.

5.4.5 Fish Consumption Use Assessment

Fish can be a part of a healthy diet and the Rhode Island state agencies recommend and promote the consumption of healthy fish choices. Fish Consumption use support is determined by consumption advisories issued by the Rhode Island Department of Health (HEALTH). Consumption advisories are based on risk assessments conducted by HEALTH using fish tissue contaminant data collected from fish in RI waters (http://www.health.state.ri.us/healthrisks/poisoning/mercury/about/fish/index.php).

While Rhode Island State government historically never invested in the systematic assessment of fish tissue contamination, in recent years RIDEM has developed a collaborative program that is targeting assessment of publicly accessible lakes and ponds. Data is collected via a collaborative program implemented by the RIDEM Office of Water Resources (OWR) and Division of Fish and Wildlife (DFW), HEALTH and EPA. This effort integrated the collection of samples for fish tissue analysis with the fish community surveys being conducted by RIDEM DFW. Additional data are also generated and made available with varying frequency by researchers and site specific studies. As the current data indicates, the degree of contamination is variable and it is difficult to extrapolate results from one freshwater to another. Accordingly, DEM is continuing to work to build capacity to ensure that freshwater fish tissue data can be assessed systematically. The statewide advisory against consumption of freshwater fish species known to contain the most mercury are precautionary, region-wide advisories, and not based on waterbody specific actual contaminant monitoring data collected within RI waters; therefore, these advisories are not reflected in the assessment of Fish Consumption use.

For freshwaters, the AU is considered fully supporting fish consumption use when fish tissue data collected in that AU, do not result in consumption advisories for any fish species or any consumer group. The AU is considered impaired for fish consumption use when there is a consumption advisory for some fish species or for consumer groups as determined from fish tissue data collected within that AU.

For saltwaters, the statewide advisory against consumption of saltwater fish species known to contain mercury and PCBs are precautionary, region-wide advisories, and not based upon any actual contaminant monitoring data collected within RI waters. Limited data in Rhode Island saltwaters have been collected by researchers (EPA). However, recently, researchers from Roger Williams University have generated additional information on mercury contamination of fish tissue from fish collected in Narragansett Bay. This work has revealed the potential for mercury bio-magnification in certain fish species from particular areas of the Bay. Further research and review of mercury in sediment data, fish species in Narragansett Bay, trophic status of fish, and mercury in fish tissue data is needed. This information will help to determine if there are resident species of fish living in particular areas of the Bay where a preponderance of data and evidence indicate the presence of mercury in sediment and/or the local food chain which allows for bio-magnification of mercury in certain species of resident fish at levels that may require a Fish

Consumption use impairment for those areas of the Bay. Until these data gaps have been addressed, the saltwaters of the state are considered Fully Supporting Fish Consumption Use with a reminder to consumers of the saltwater species-specific fish consumption advisories posted by HEALTH (see link above).

5.4.6 Shellfish Harvesting/Consumption Use Assessment

Shellfish Consumption Use assessments for AUs are determined by the Shellfish Growing Area Classification (Approved, Seasonal Closure, Conditional Closure, Prohibited) assigned in accordance with the State's FDA NSSP-approved Shellfish Growing Area Monitoring Program, and supporting data. The protocol for shellfish use classification determinations is based upon the NSSP (National Shellfish Sanitation Program) requirements. These requirements include conducting routine bacteriological monitoring at NSSP-approved stations and shoreline surveys within the state's waters where shellfish are intended for direct human consumption. Bacteriological samples for use in shellfish classification determinations must be analyzed at a FDA certified laboratory. Results are analyzed and classification status is determined in accordance with the Shellfish Growing Area Monitoring Program's Standard Operating Procedures (RIDEM 2008).

The AU is considered fully supporting shellfishing use when there are no water quality related shellfishing restrictions in effect (Approved Status). The AU is considered impaired for shellfishing use when the waterbody has a Conditional or Prohibited closure status for shellfishing. There are two types of waters where further evaluation is required for water quality assessment purposes. Several Class SA estuarine areas are permanently closed to shellfishing strictly due to safety concerns. The boundaries of these closed safety zones have been defined by modeling complete failure of treatment at nearby wastewater treatment facilities. Other estuarine areas are seasonally closed to shellfishing under the partial use classification SA{b}. By definition of the SA{b} classification, these areas are in the vicinity of marinas and/or mooring fields and in accordance with NSSP requirements, are closed primarily in the summer months when anchorages or mooring fields are being used by boats. In these SA and SA{b} areas, following the same NSSP-approved methods for evaluation of data as described above, if the actual water quality data attains the applicable fecal coliform criteria, the shellfishing use is considered Fully Supporting for assessment purposes. If the actual water quality data exceeds the applicable fecal coliform criteria, the shellfishing use is considered Not Supporting for assessment purposes.

The state's narrative criteria, that all waters shall be free from pollutants in concentrations or combinations that may adversely affect human health, shall be applied to the presence of potentially hazardous chemicals in the water column and bottom sediment as an indicator of shellfish consumption impairment.

5.4.7 Shellfish Controlled Relay and Depuration Assessment

Class SB waters are designated for shellfish harvesting for controlled relay and depuration. RIDEM's Division of Fish and Wildlife implements the state's only relay and depuration operation in cooperation with the Narragansett Bay Commission, the RI commercial shellfishing

industry, and the RI Department of Health. The Shellfish Relay Transplant Program involves the transplant of shellfish from Class SB waters to Class SA waters suitable for shellfish harvesting under the coordination and authority of RIDEM for the purpose of ambient depuration and controlled harvest. Water quality criteria have not been established by FDA to evaluate this use. However, the NSSP requires that the harvested shellfish will be made safe for human consumption by the ambient depuration treatment process. The specific SB waters currently managed for controlled relay have been determined to be safe for existing relay operations. Although the safety evaluation has not been completed for all SB waters, for assessment purposes all SB waters are considered fully supporting the shellfish harvesting for controlled relay and depuration use. Shellfish will not be harvested from any additional SB waters until an analysis has been completed confirming that the level of contamination in shellstock can be reduced to levels safe for human consumption.

5.4.8 Drinking Water Use Assessment

All Class AA waters are designated for Drinking Water Use and all waters within a Drinking Water Supply watershed are assessed for Drinking Water Use support. HEALTH's Office of Drinking Water Quality (DWQ) implements the federal Safe Drinking Water Act (SDWA) in Rhode Island (http://www.health.ri.gov/programs/drinkingwaterquality/index.php). Drinking water use assessments of public surface water systems are conducted by, and based upon data and information compiled by, DWQ staff. DWQ monitors drinking water quality at the source, at the entry to the distribution system, and within the distribution system to evaluate for compliance. The larger public drinking water suppliers monitor some of the source waters for several parameters to adjust treatment levels as necessary for compliance. HEALTH regulations require terminal reservoirs to be sampled in accordance with drinking water program requirements. Samples are usually collected from one location near the intake to the drinking water treatment plant. In these terminal reservoirs, the monitoring and analyses entails a list of over 100 parameters that reflect the compounds for which Maximum Contaminant Levels (MCLs) have been established for *finished* drinking water. In many water supply districts, up-gradient reservoirs and tributaries within the drinking water supply watershed are not routinely or comprehensively sampled by the water suppliers. In the up-gradient waters, the range of parameters sampled may be significantly less than the over 100 parameters analyzed at the terminal reservoirs. HEALTH may determine that this data is too limited in scope in some up-gradient waters to use in conducting a drinking water use assessment. Therefore, these upstream waters within drinking water supply watersheds may be considered unassessed for drinking water use. DEM and HEALTH plan to work toward defining the core parameters/indicators required to assess drinking water use attainment for these up-gradient reservoirs and tributaries within drinking water supply watersheds.

The data utilized by DWQ to determine the drinking water use attainment status consists of ambient (source) water quality data, information about the level of treatment required, and finished water quality data. The use support status is based on violations of the MCLs, use restrictions, and/or best professional judgment by the DWQ staff. Surface source waters are considered fully supporting drinking water use when there are no violations of MCLs and no restrictions or advisories, and no requirement of more than conventional treatment (standard filtration and chlorination). Surface source waters are considered impaired for drinking water use when there are violations of the MCLs, and/or requirements of more than conventional

treatment (standard filtration and chlorination), and/or, frequent taste and odor problems, and/or contamination-based closures of the source water.

5.5 **Causes and Sources of Impairments**

For those AUs that are not fully supporting their designated uses, the identity of the pollutants causing, or threatening to cause, water quality impairments and the sources of those pollutants, are reported where possible.

5.5.1 Causes

Causes of impairment are pollutants or stressors that prevent or threaten water quality from meeting the water quality standards. Causes of actual or threatened impairments may include chemical contaminants, physical parameters, and biological parameters. For the purposes of Section 303(d) impaired waters listing requirements, it is important to distinguish if the impairment is due to pollution or a pollutant. Pollutant, as defined in the Water Quality Regulations, generally refers to a chemical and/or physical parameter which will likely alter the physical, chemical, biological or radiological characteristics and/or integrity of water. In general, a pollutant can be thought of as something which can be expressed in terms of a loading (i.e. pounds per day) and physically allocated. Pollution is defined in the Water Quality Regulations as the human-made or human-induced alteration of the physical, chemical, biological or radiological characteristics and/or integrity of water. This broad term may encompass many types of changes to a waterbody, including alterations to the character of the water (eg., exotic, non-native, or invasive species; habitat degradation; flow alteration) that do not result from the introduction of a specific pollutant or presence of pollutants in a waterbody at a level that causes an impairment. Not all pollution-causing activities must be analyzed and allocated in a TMDL. Section 303(d) is a mechanism that requires an accounting and allocation of pollutants introduced into impaired waters. In some cases, the pollution is caused by the presence of a pollutant, and a TMDL is required. In other cases, pollution is caused by activities other than the introduction of a pollutant. Therefore, waters impaired by pollution are listed in category 4C where they are flagged to be addressed by a more appropriate program.

Degradation of the biological community is considered a cause of impairment even though the actual cause (pollutant) may be unknown. When data for an AU indicates a biological impairment, even though the actual cause of the biological impairment is unknown, the AU will be listed in Category 5. However, when biological data and information indicate that the impairment is not caused by a pollutant, the AU will be placed in Category 4C, pending there are no other pollutant impairments for the AU that would keep it in Category 5.

5.5.2 Sources

Sources are the facilities or activities that generate pollutants or stressors that cause water quality impairments. Sources of impairments may include both point sources and nonpoint sources of pollution. Point sources discharge pollutants directly into surface waters from a conveyance. Point sources include but are not limited to industrial facilities, municipal sewage treatment facilities, combined sewer overflows, and storm sewers. Nonpoint sources deliver pollutants to surface waters from diffuse origins. Nonpoint sources include urban runoff that is not captured

in a storm sewer, agricultural runoff, leaking septic tanks, and landfills. In general, the actual sources of impairment are not determined until a TMDL or similar analysis is conducted on the waterbody. As such, most of the sources noted in water quality assessments are just potential sources. The ADB allows for documentation of confidence in source identification. The source may be listed as *suspected* for those situations where the information is based on BPJ and/or landuse information. The source may be listed as *confirmed* for those situations where the source causing the impairment has been identified and verified.

6.0 INTEGRATED REPORT CATEGORIES AND LISTING METHODOLOGY

Based on the assessment and listing methodology described in this document, the attainment status of each designated use for each AU are integrated such that each AU is placed in one of the five Integrated Reporting attainment Categories where the 5th category is the list of impaired waters needing a TMDL. The attainment status of each designated use for each AU is also tracked and reported to assist in addressing data gaps and directing monitoring.

As described in Section 5, assessments may result in different use support attainment status for the different designated uses on one AU. For example, an AU may be fully supporting swimming use, but there may be insufficient data to develop an aquatic life use support status. The Integrated Report Categories are described below with a description of how the results of the individual assessments for each designated use on an AU are integrated to determine the final Integrated Report Category for each AU. In general, the integration of all designated use assessment determinations follows a hierarchical approach where a determination of impairment for any cause (pollutant), for any designated use on an AU will result in placement of the AU in Category 5. The five categories are as follows:

Category 1: Attaining all designated uses and no use is threatened. AUs will be placed in this category if the available data and information meet the requirements of this assessment and listing methodology and are sufficient to assess each designated use of the AU and the assessment results indicate that the AU is attaining all water quality standards for all designated uses.

Category 2: Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened. AUs will be placed in this category if there are data and information, which meet the requirements of this assessment and listing methodology, to support a determination that some, but not all, uses are attained and none are threatened. Attainment status of the remaining uses is unknown because there is insufficient or no data or information.

Category 3: Insufficient or no data and information are available to determine if any designated use is attained, impaired, or threatened. AUs will be placed in this category where there is no data, or the data and/or information to support an attainment determination for any use are not sufficient and/or consistent with the requirements of this assessment and listing methodology.

Category 4: Impaired or threatened for one or more designated uses but does not require development of a TMDL. (Three subcategories)

A. TMDL has been completed. AUs will be placed in this subcategory once all TMDL(s) for the AU have been developed and approved by EPA that, when implemented, are expected to result in full attainment of the standard. Where more than one pollutant is associated with the impairment of an AU, the AU will

remain in Category 5 until all TMDLs for each pollutant have been completed and approved by EPA.

B. Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future. Consistent with the regulation under 130.7(b)(I),(ii), and (iii), AUs will be placed in this subcategory where other pollution control requirements required by local, state, or federal authority are stringent enough to implement any water quality standard applicable to such waters. These requirements must be specifically applicable to the particular water quality problem.

C. Impairment is not caused by a pollutant. AUs will be placed in this subcategory if pollution (e.g., flow, presence of invasive species, etc.) rather than a pollutant causes the impairment.

Category 5: Impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL. This category constitutes the **Section 303(d) List** of waters impaired or threatened by a pollutant(s) for which one or more TMDL(s) are needed. AUs will be placed in this category if it is determined, in accordance with this assessment and listing methodology, that a pollutant has caused, is suspected of causing, or is projected to cause an impairment. Where more than one pollutant is associated with the impairment of a single AU, the AU will remain in Category 5 until TMDLs for all pollutants have been completed and approved by EPA.

6.1 Method to Rank and Prioritize Impaired Waterbodies

Section 303(d) of the CWA requires that waters on the 303(d) List be ranked in order of priority that the TMDLs will be developed. The RI 303(d) List identifies impaired waterbodies and provides a scheduled time frame for development of TMDLs. As such, the 303(d) List is used to help prioritize the State's water quality monitoring and restoration planning activities. Scheduling is not necessarily representative of the severity of water quality impacts, but rather reflects the priority given for TMDL development with consideration to shellfishing waters, drinking water supplies and other areas identified by the public as high priority areas. It is important to note that TMDL schedules are dynamic and subject to revisions due to resources, public interest and support, and technical factors.

7.0 **DELISTING METHODOLOGY**

Delisting is the term used to describe the process of removing a waterbody from the 303(d) List of Impaired Waters. The existing federal regulations require states to demonstrate good cause for not including waterbodies on the 303(d) list that were included on previous 303(d) lists. Good cause has been defined as including, but not being limited to, more recent and/or accurate data, or more sophisticated water quality modeling which indicates attainment of the water quality standards; flaws in the original analysis that led to the waterbody being listed; and/or changes in conditions, e.g. new control equipment, or elimination of discharges.

As noted in Section 5.3, an AU may not be removed from an impaired category based solely on the age of the data used to originally list the waterbody as impaired. Although the data that was used to determine an original impairment may no longer meet data age requirements, the AU cannot be shifted to another category for this reason alone. Some reasons AUs may be removed from the 303(d) list include the following:

1. A determination that the AU is meeting water quality standards due to:
    - An error that was made in the initial assessment and listing; and/or,
    - More recent data or information that meets the requirements of this assessment and listing methodology, demonstrates that water quality standards are being attained; and/or,
    - Revisions to the RI water quality standards may cause a determination of compliance with the standards.

2. Reassessment of available information or data – AUs previously on the 303(d) list based upon data that is insufficient to meet current data quality and quantity requirements may be moved to Category 3 and scheduled for further monitoring.

3. TMDL has been completed – AUs with more than one pollutant associated with the impairment, will remain in Category 5 until TMDLs for each pollutant have been completed and approved by EPA. AUs will be removed from Category 5 and placed in Category 4A once all TMDLs for that AU have been developed and approved by EPA.

4. Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future – Consistent with the regulation under 130.7(b)(I),(ii), and (iii), AUs will be placed in Category 4B where other pollution control requirements required by local, state, or federal authority are stringent enough to implement any water quality standard applicable to such waters.

5. Impairment is not caused by a pollutant – AUs will be placed in Category 4C if the impairment is caused by pollution and not a pollutant.

6. New spatial extent – When sufficient data warrants, waterbodies previously identified (numbered) and listed on a large scale may be broken into smaller assessment units (AUs) and placed in other categories, if appropriate.

8.0 WATER QUALITY MONITORING

The Integrated Report guidance emphasizes the importance of monitoring to obtain data and information necessary to characterize the attainment status of all AUs. The guidance notes that Section 106(e)(1) of the CWA requires States to develop a comprehensive monitoring and assessment strategy that provides a description of the sampling approach, a list of parameters to be tested, and a schedule for collecting data and information. RIDEM, in cooperation with the RI Environmental Monitoring Collaborative (RIEMC), accomplished this by preparing the Rhode Island Water Monitoring Strategy (RIDEM 2005a, http://www.dem.ri.gov/bayteam/documents/DEM Water Monitoring Strategy 2005-2010.pdf). The strategy describes existing efforts as well as new monitoring initiatives that need to be implemented in order to meet the state's data needs regarding water resources. The monitoring framework reflects the partnerships and collaborations that occur among state, local and federal agencies, universities, colleges, other organizations and volunteers regarding monitoring activities. Specific monitoring activities for Rhode Island's coastal waters, rivers, streams, lakes and ponds are recommended. When fully implemented, the strategy will yield data to support a statewide assessment of water quality conditions, allow measurements of key environmental indicators and provide important information to support management decision-making at both the state and local level. While the strategy has not yet been fully implemented, priority monitoring programs have been implemented and sustained via strategic investments by the RI Bays, Rivers and Watersheds Coordination Team playing a vital role. Specifically, RIDEM has continued implementation of the rotating basin approach for wadeable streams, maintained the number of active streamflow gages and monthly monitoring of large rivers in partnership with USGS, continued operation of the fixed-site monitoring network in Narragansett Bay in partnership with URI-GSO, and expanded monitoring programs to support nutrient criteria development in freshwaters. For more detail, see the 2013 Annual Report of the Rhode Island Environmental Monitoring Collaborative (http://www.dem.ri.gov/bayteam/documents/emcrep13.pdf). There are still significant gaps in data collection that need to be addressed as well as challenges in sustaining the capacity to maintain priority monitoring programs. RIDEM will be evaluating gaps and other issues as part of updating and refining the Monitoring Strategy. The update is being done in coordination with the RIEMC. RIDEM, as part of the Coordination Team, will be continuing to seek to secure the resources needed to support full implementation of the updated strategy.

9.0 **PUBLIC PARTICIPATION**

As noted previously, the Department will solicit submittal of data and information for use in developing the Integrated Report. This request for data will be posted on the Department's website, mailed to stakeholders and announced during meetings and workgroup functions. In addition, the Department will involve researchers or other water quality experts, in the assessment and listing determinations.

Under 40 CFR 130.7(b)(6), the Department is required to provide a description of the methodology used to develop the Impaired Waters 303(d) list. This Consolidated Assessment and Listing Methodology (CALM) document describes the framework for assessing data and determining which of the five categories an AU will be assigned to in fulfillment of that requirement. DEM will be coordinating with the Rhode Island Environmental Monitoring Collaborative, and the Rhode Island Bays, Rivers and Watersheds Coordination Team and its Science Advisory Committee as part of the public review of the draft CALM. On its website, DEM will also inform the general public about the draft CALM review process. DEM expects to solicit and receive comments from and will respond to the comments, before finalizing the document. As needed, the process may involve a public workshop.

The Integrated Report combines the non-regulatory Section 305(b) water quality assessment reporting with the more regulation-driven aspects of the Section 303(d) impaired waters listing requirements. The public participation requirements of these programs are different. In general, Category 5 of the Integrated Report is considered reporting under Section 303(d) for impaired waters. Regulatory requirements regarding public participation, EPA approval, and adoption of the Impaired Waters List apply only to Category 5 waters.

The Department will publish notice of the availability of the draft 2014 Category 5, Impaired Waters 303(d) List upon its completion. The notice will provide for an informational workshop and solicit comments on the draft 2014 Category 5, 303(d) Impaired Waters List. The Department maintains a comprehensive mailing list for the notification of the draft 303(d) Impaired Waters List that includes designated watershed councils, interested stakeholders, municipal contacts, and state, local, and federal government among others. While comments will be solicited only on the Category 5, 303(d) Impaired Waters List, the entire Integrated Lists (Categories 1 through 5) will be provided during the public notice for informational purposes.

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