Alaska Water Quality Monitoring & Assessment Strategy

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Alaska Department of Environmental Conservation
Division of Water
Water Quality Assessment & Monitoring Program
Juneau, Alaska

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ACRONYMS

AAC ..... Alaska Administrative Code
ACP..... Arctic Coastal Plain
ACWA ..... Alaska's Clean Water Actions Program
ADB ..... Assessment Database
AKMAP ..... Alaska Monitoring and Assessment Program
AOW..... Alaska's Oceans and Watersheds
APDES..... Alaska Pollutant Discharge Elimination System
AS ..... Alaska Statute
AWQMS..... Ambient Water Quality Monitoring System
BEACH ..... Beaches Environmental Assessment and Coastal Health Act
BMP..... Best Management Practices
CALM ..... Consolidated Assessment & Listing Methodology
CFR ..... Code of Federal Regulations
CPVEC..... Commercial Passenger Vessel Environmental Compliance
CWA ..... Clean Water Act
DEC..... Alaska Department of Environmental Conservation
DFG ..... Alaska Department of Fish & Game
DO ..... Dissolved Oxygen
DOC ..... Dissolved Organic Carbon
DMR ..... Discharge Monitoring Report
DNR ..... Alaska Department of Natural Resources
DROPS ..... Discharge Permits & Online Permit System
EDD ..... Electronic Data Deliverable
EMAP..... Environmental Monitoring and Assessment Program
EPA..... U.S. Environmental Protection Agency
GIS ..... Geographic Information System
HEM..... Hydrography Event Management
ICIS..... Integrated Compliance Information System
IHCA ..... Interagency Hydrology Committee of Alaska
MEC..... Maximum Projected Effluent Concentration
MOU..... Memorandum of Understanding
NARS..... National Aquatic Resource Surveys
NHD ..... National Hydrography Dataset
NOAA ..... National Oceanic & Atmospheric Administration
NPDES ..... National Pollutant Discharge Elimination System
NPR ..... National Petroleum Reserve
NPS ..... Non-Point Source
NSPS ..... New Source Performance Standards
PAH..... Polycyclic Aromatic Hydrocarbons
POP ..... Persistent Organic Pollutant

POTW ..... Publicly Owned Treatment Works
PPG ..... Performance Partnership Grant
QA..... Quality Assurance
QAPP ..... Quality Assurance Project Plan
RIDE ..... Required ICIS-NPDES Data Elements
RFP ..... Request for Proposals
RPA……Reasonable Potential Analysis
SIM..... STORET Import Module
STORET ..... Storage & Retrieval System
TBEL..... Technology-Based Effluent Limit
TDS..... Total Dissolved Solids
TMDL ..... Total Maximum Daily Load
TOC ..... Total Organic Carbon
UA..... University of Alaska
WEBSIM..... Web STORET Import Module
WQBEL ..... Water Quality-Based Effluent Limit
WPQMP..... Water Programs Quality Management Plan
WQS..... Water Quality Standards
WQSAR..... Water Quality Standards, Assessment and Restoration
WQX..... Water Quality Exchange
WDAP..... Wastewater Discharge Authorization Program
XML..... Extensible Markup Language

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1. MONITORING PROGRAM STRATEGY

1.1. Introduction

The Alaska Department of Environmental Conservation (DEC or Department), Division of Water (Division) has updated its long term Water Quality Monitoring and Assessment Strategy (Strategy) to guide its stewardship of Alaska's marine and fresh water resources. The Strategy is intended to meet the federal expectations for state water quality stewardship activities enumerated in the Clean Water Act (CWA) in a manner influenced by Alaska's unique needs and challenges. The Division's original Strategy was published in 2005. This updated strategy provides a general roadmap of how the Division intends to develop its ambient water quality monitoring programs from 2015 through 2025, with a minor Strategy update anticipated to occur in 2020.

The purpose of the revised Strategy is: (1) to provide an updated framework for Alaska resource agency decisions required for assessing and monitoring Alaska's water resources; (2) to support protection, stewardship, restoration, and permitting decisions; and (3) to serve as a roadmap for improving state, federal, local, tribal and public capabilities and performance over time for monitoring the status and trends of Alaska's water resources

In March 2003, the U.S. Environmental Protection Agency (EPA) issued *Elements of a State Water Monitoring and Assessment Program* (EPA 2003). This document provides a framework that DEC will follow to ensure its monitoring program meets requirements of Section 106(e)(1) of the CWA. It also shows how DEC will continue development of a state water monitoring and assessment program that remains eligible for Section 106 state assistance grants. The Strategy is organized around the ten elements that EPA identified to ensure that monitoring and assessment activities are conducted on a rational basis and in a manner that ensures information is of good quality and is accessible for resource management decisions. The ten elements which the Strategy addresses are:

1. Monitoring Program Strategy
2. Monitoring Objectives
3. Monitoring Design
4. Core and Supplemental Water Quality Indicators
5. Quality Assurance
6. Data Management
7. Data Analysis/Assessment
8. Reporting
9. Programmatic Evaluation
10. General Support and Infrastructure Planning

The Strategy's context is based upon the need to be consistent with state and federal water quality law, policies, and guidance. The statutory basis for the strategy is described in the next section. It is followed by a discussion of state and federal administrative policy which shape the strategy.

1.2. State and Federal Statutory Basis for the Strategy

National concern about the nation's water quality led Congress to enact the Federal Water Pollution Control Act Amendments of 1972. In 1977, this law was further amended and became commonly known as the Clean Water Act (CWA). Sections 305(b) and 303(d) of the CWA provide the main drivers for federal expectations of the states with regard to assessing and reporting on their water quality. Section 305(b) requires states to report on the conditions and needs of their waters biennially including:

- A description of the water quality of all navigable waters, accounting for seasonal, tidal and other variations {CWA§305 (b)(1)(A)}.
- An analysis of the extent to which all navigable waters provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water {CWA§305(b)(1)(B)}.

Federal authority under the CWA is limited to navigable waters and does not extend to all state waters. Alaska's Legislature authorized DEC to establish standards for water quality (Alaska Statutes (AS) 46.03.070-080) and regulate waste disposal through permitting processes (AS 46.03.100) for all waters both navigable and non-navigable. In Alaska, waters are defined by Alaska State Statutes as follows:

> "waters" includes lakes, bays, sounds, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, straits, passages, canals, the Pacific Ocean, Gulf of Alaska, Bering Sea, and Arctic Ocean, in the territorial limits of the state, and all other bodies of surface or underground water, natural or artificial, public or private, inland or coastal, fresh or salt, which are wholly or partially in or bordering the state or under the jurisdiction of the state. (AS 46.03.900(37)).

Alaska is estimated to have over 20,000 navigable rivers plus 3 million lakes and countless streams. The Strategy, when fully implemented, is intended to address all waters within Alaska, not just navigable waters, including but not limited to tidal and non-tidal rivers, streams, lakes, wetlands, groundwater, floodplains, estuaries, and near coastal waters (inclusive of the three-mile state economic zone). The CWA does not specifically require states to administer programs for monitoring and assessing ambient water quality conditions. The CWA has an elaborate framework for protecting water quality. The importance of monitoring within that structure is generally assumed, but not specifically addressed. Although there are no specific provisions authorizing state ambient monitoring programs, the CWA prohibits granting Section 106 funds to states that do not establish water quality monitoring procedures (ASIWPCA 2002).

Since 2002, Alaska has been reporting on the status and needs of its waters through a biennial document titled the Integrated Water Quality Monitoring and Assessment Report (Integrated Report). The Integrated Report is discussed throughout the Strategy.

1.3. State and Federal Administrative Policy

The Strategy integrates policy and program elements embodied in the Alaska Clean Water Actions (ACWA) Policy, EPA's *Consolidated Assessment and Listing Methodology (CALM), Toward a Compendium of*

Best Practices (EPA 2002), and *Elements of a State Water Quality Monitoring and Assessment Program* (EPA 2003). These major policies define, from a state and federal perspective, specific objectives for the Strategy. In March 2001, Alaska's resource agencies issued *Alaska's Clean Water Actions, Protecting Our Waters* (DEC 2001). This document laid out the need and approach for state resource agency efforts to protect and improve water quality, water quantity, and aquatic habitat. The ACWA approach was institutionalized in state government through issuance of Administrative Order 200 in October 2002. Resource agencies have subsequently developed and implemented the ACWA process to collaboratively rank and prioritize waterbodies for monitoring, assessment, and restoration. A single grant application and review process is now established that funds priority projects with monies coming from multiple state and federal sources. The ACWA Process is described in more detail throughout the Strategy.

The EPA Consolidated Assessment & Listing Methodology (CALM) approach serves DEC as a framework for documenting how water quality data should be collected, analyzed, and used for environmental decision making. DEC also follows the approach to develop and biannually publish its Integrated Report on the state of Alaska's waters. Within the Integrated Report, waterbodies are assigned to one of five categories that describe the extent to which waters are attaining water quality standards, whether they are impaired and require listing on the CWA 303(d) list, or whether they may be removed from the list. The CALM approach also recognizes that there are different methods (other than the Total Maximum Daily Load [TMDL] process) that can be used to reach attainment, and that waters may require attention for non-pollutant related problems such as habitat degradation and water quantity. DEC's CALM approach is described and incorporated throughout the Strategy.

In 2012, the EPA published *National Water Program Strategy: Response to Climate Change* (EPA 2012). This document identified six primary national goals for the response to climate change, two of which involve monitoring. The first goal was to improve water resources and climate change information; the second goal was to support integrated water resources management. The document also discusses information and recommendations specific to Alaska based on current or expected impacts of climate change. In addition to the national monitoring goals identified above, EPA intends to encourage communities and utilities to conduct vulnerability assessments and to partner with other federal agencies to coordinate and leverage climate research and other activities.

At the state level, the Alaska Climate Change Research Needs working group identified several overarching research needs for the Alaska Climate Change sub-Cabinet, convened by the Governor in 2007, that also support monitoring.

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2. MONITORING OBJECTIVES

The Division of Water (Division) is the primary division within DEC responsible for water quality monitoring, assessment, and protection. The Strategy addresses the following key questions for monitoring for CWA programs, as described in the EPA guidance (EPA 2003):

1. What is the overall quality of waters in the State?
2. To what extent is water quality changing over time?
3. What are the problem areas and areas needing protection?
4. What level of protection is needed?
5. How effective are clean water projects and programs?

In order to answer these questions, the Division sets the following water quality monitoring objectives, which, when fully implemented, will enable DEC and others to:

1. Determine the extent to which Alaska's waters meet the objectives of the CWA, attain applicable water quality standards (WQS), and provide for the protection and propagation of balanced populations of fish, shellfish, and wildlife.
2. Assess and describe the existing baseline conditions and long-term trends of Alaska's water resources.
3. Identify those Alaskan waters that are not meeting Alaska's WQS.
4. Develop consistent monitoring approaches for assessing potentially impaired waters.
5. Develop new or revised WQS using narrative and numeric criteria based on quality controlled data collected from Alaskan waters.
6. Gather and use ambient water quality information to
    a. develop and refine point source permit effluent limits and conditions;
    b. design and recalibrate mixing zone dimensions for wastewater permits;
    c. implement antidegradation analysis; and
    d. assess permit compliance.
7. Identify and target restoration of priority waters as identified through the ACWA process to
    a. establish TMDLs;
    b. evaluate the response of a waterbody to point source load reductions and Non-Point Source (NPS) best management practices (BMPs) established under the TMDL; and
    c. determine the effectiveness of BMPs used for controlling storm water, dredge and fill, and forestry related NPS water pollution.
8. Ensure data quality and consistency throughout the Division's water quality programs.

9. Improve the data management and accessibility of ambient water quality data received or collected by the Division's water quality programs.
10. Implement, review progress, and update the Strategy on a regular basis.

The Division has developed a framework for accomplishing this Strategy that is based on these objectives with implementing actions and measures, as shown in Table B-1 (see Appendix B). For each objective, the table shows the strategic objectives and actions that are the program building blocks to achieve that objective. It also identifies the deliverables and measurable objectives for each action. It is important to underscore that these objectives and actions do not impose any new requirements on any programs or establish any regulatory obligations on permittees or others. Many of the actions are already ongoing and the reporting mechanisms and timeframes on their progress are already in place. Those existing reporting mechanisms include the biannual Integrated Report, the semi-annual Performance Partnership Grant (PPG) report, the Nonpoint Source Pollution Control Strategy annual report, and the triennial review of Water Quality Standards. However, some actions will result in deliverables that would not be included in those reporting mechanisms. For those actions, the table identifies how and when the progress on the action will be reported. A minor strategy update in 2020 will include a status report on all the actions.

3. MONITORING DESIGN

The following section describes the various monitoring approaches that the Division uses to assess the health of Alaska's waters. This is followed by a description of Alaska's WQS and water quality monitoring and assessment activities being conducted and managed by the Division.

The Division is comprised of several individual programs, three of which are involved in water quality monitoring and assessment activities: Nonpoint Source Water Protection and Restoration Program (NPS); the Alaska Monitoring and Assessment Program (AKMAP) and the Wastewater Discharge Authorization Program (WDAP). Individual programs within the Division coordinate their monitoring and assessment responsibilities. Therefore, the monitoring and assessment activities, as described below for each program, are presented with the understanding that some of these activities may be jointly administered under more than one program.

The Strategy reflects the Division's current organizational structure. The Strategy will be updated and revised to reflect future programmatic or structural changes within the Division. Updates to the Strategy may also occur as new programs are added. More information about the Division and its programs can be found on the Division's website at http:dec.alaska.gov/water. DEC's Division of Environmental Health, Division of Air Quality, and Division of Spill Prevention and Response also manage and conduct environmental monitoring and assessment activities. More information about these divisions and their respective programs can be found at DEC's main web page (http://dec.alaska.gov/index.htm).

3.1. Monitoring Design

Alaska is rich in aquatic resources (Table 1). Approximately 40% of the total surface waters of the United States are located in Alaska. Alaska has approximately 47,000 miles of coastal marine shoreline, which constitute more than 50% of the total U.S. coastline (Alaska's Oceans and Watersheds [AOW] 2002). The surface area of coastal bays and estuaries in Alaska is 33,211 square miles, almost three times the estuarine area of the contiguous 48 states. Alaska's surface waters include over 15,000 salmon streams, which are an important resource to Alaskans and the world (DEC 2012). The vast majority of Alaska's water resources are in pristine condition due to Alaska's size, sparse population, and the remote character of the state. Alaska's immense size and great number of waterbodies pose logistical and budgetary considerations when designing a statewide water monitoring strategy. Therefore, DEC must prioritize how to apply available financial resources when assessing the ecological health of Alaska's abundant water resources.

Table 1: Alaska's Aquatic Resources

Atlas Topic	Value
State surface area (square miles)	656,425
Total miles of rivers and streams	365,000
Number of lakes/reservoirs/ponds	3,000,000+
Acres of lakes/reservoirs/ponds	12,787,200
Square miles of estuaries	3,331
Miles of coastal shoreline	44,000
Acres of freshwater wetlands	174,683,900
Acres of tidal wetlands	2,180,500
Sources: Alaska's Oceans and Watersheds (AOW. 2002. Two-day symposium held in Anchorage, Alaska. June 18 and 19, 2002. DEC, 2012. State of Alaska, FINAL 2012 Integrated Water Quality Monitoring and Assessment Report, Dated December 23, 2013.	

Alaska will continue to implement monitoring programs to provide the information required to satisfy monitoring objectives. These programs are based on designs using targeted short-term monitoring, intensive studies, effectiveness and verification monitoring, and random (probabilistic) sampling that provides monitoring data and information at multiple geographic and temporal scales. Monitoring data will continue to be used primarily to support water quality assessments, make ACWA determinations, and provide data and information to inform specific management questions.

The water monitoring programs can be used to address more than one monitoring objective. The different types of monitoring are not mutually exclusive, nor are they independent.

Table 2 shows how the five key monitoring questions and ten strategy objectives of the CWA are addressed by these programs.

Table 2: DEC Water Quality Monitoring Program Design to Meet CWA Monitoring Objectives

Clean Water Act Monitoring Objectives	DEC Water Monitoring Programs

I. What is the overall quality of the waters of the state?
1. Determines the extent to which Alaska's waters meet the objectives of the Clean Water Act, attain applicable water quality standards, and provide for the protection and propagation of balanced populations of fish, shellfish, and wildlife.
	• NPS
	  o ACWA Process
	  o Integrated Report
	• AKMAP

II. To what extent is water quality changing over time? 2. Assess and describe baseline and long-term trends for Alaska's waters.	• AKMAP • NPS o ACWA Process • WDAP

III. Where are the problem areas and areas needing protection?
3. Identify those Alaskan waters that are not meeting Alaska's WQS.
4. Develop consistent monitoring approaches for assessing potentially impaired waters.
	• NPS
	  o ACWA
	  o BEACH Program
	  o Bioassessment

IV. What level of protection is needed?
5. Develop new or revised WQS based on data collected from Alaskan waters.
	• WQS
	  o Triennial Review
	  o Use reclassification and site specific criteria
	  o Antidegradation

V. How effective are clean water projects and programs? 6. Gather and use ambient water quality information to • develop and refine point source permit effluent limits and conditions; • design and recalibrate mixing zone dimensions for wastewater permits; • implement antidegradation analysis; and • assess permit compliance. 7. Identify and target restoration of priority waters as identified through the ACWA process to • establish TMDLs; • evaluate the response of a waterbody to load reductions and BMPs; and • determine the effectiveness of BMPs. 8. Ensure data quality and consistency throughout the Division's water quality programs. 9. Improve the data management and accessibility of ambient water quality data received or collected by the Division's water quality programs. 10. Implement, review progress and update the Strategy on a regular basis.	• WDAP • NPS o ACWA process • AKMAP • QA Officer • CPVEC • Compliance Program

The following discussions describe the state's monitoring design for each of the five CWA key monitoring questions. DEC requires both regional information and waterbody specific information to assess the health of Alaska's aquatic resources. Regional information is used for describing the current status and the long-term trends, as well as the benchmark ecological conditions of Alaska's water resources. Regional information is generally obtained from multiple waterbodies or locations within the same eco-region or similar geographic province.

Waterbody specific information is required to assess whether a waterbody is attaining its designated use(s) or whether it requires active stewardship or restoration, and serves as a basis for making permitting decisions. DEC employs three basic monitoring approach designs to accomplish its monitoring and assessment objectives, as outlined in Section 2.0 of this document.

1. Probabilistic/Randomized Designs in which all waters of a certain category (lakes, streams, rivers, coastal areas, etc.) located within a specific eco-region make up a population from which an unbiased subset is randomly selected for monitoring. DEC follows certain criteria for defining the population and selecting sample sites in order to generate a data set with a known level of statistical confidence. DEC is using probabilistic monitoring in its AKMAP program to assess the overall status and trends of Alaska's marine and freshwater resources. DEC is encouraging other agencies to adopt the AKMAP approach for establishing regional baseline information. Elements of DEC's AKMAP are described throughout the Strategy.
2. Targeted Approach in which a waterbody is specifically selected for monitoring based on impairment concerns or the need to establish its current attainment status, a TMDL, long-term trends, or permit conditions and limits. DEC uses a targeted approach in its WDAP and ACWA program when assessing point source and NPS water pollution, respectively. Elements of these programs are described throughout the Strategy.
3. Census Designs in which all waters in a category, such as designated bathing beaches, are sampled at a defined frequency. Census designs are used in DEC's BEACH program.

By using these design approaches to accomplish the monitoring and assessment objectives set forth by this Strategy, the information gathered can then be easily evaluated to provide a comprehensive summary on the condition of the Alaska's water resources. Programs within the Division use a mix of these three monitoring approach designs to meet their programmatic needs as described in the following sections.

3.2. Alaska's WQS

The Division's Water Quality Standards Assessment and Restoration program (WQSAR) is responsible for developing and implementing Alaska's statewide WQS, which are documented in Title 18 of the Alaska Administrative Code (AAC), Chapter 70 (18 AAC 70). Alaska's WQS are an essential tool that enables the Division and others to assess the health of Alaska's waters. WQS are comprised of:

- Designated uses: The different ways the state defines how water can be used;
- Numeric and narrative criteria: the quantitative and qualitative means of assessing a water; and
- Antidegradation policy and implementation methodology: The process that the state uses to determine whether a change in water quality as the result of a discharge is warranted and the effect of such a discharge on the assimilative capacity of that water.

DEC has established WQS to protect both marine and freshwater for such designated uses as water supply, water recreation, growth and propagation of shellfish, and harvesting for consumption of raw mollusks or other raw aquatic life. For each designated use, DEC has established explicit water quality criteria for color, fecal coliform bacteria, dissolved oxygen or gas, dissolved inorganic substances or total dissolved solids, petroleum hydrocarbons, oil and grease, pH, radioactivity, residues, sediment, temperature, turbidity, and toxic or deleterious organic and inorganic substances. These WQS do not apply to the cleanup of groundwater at state or federally controlled contaminated or hazardous waste sites per 18 AAC 70.0.

For the protection of aquatic life, DEC has adopted EPA's recommended acute and chronic criteria for toxic and other deleterious organic and inorganic substances for both fresh and marine waters. These criteria are found in Alaska's *Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances*, adopted by Alaska into the WQS in 18 AAC 70.020(b).

DEC has adopted water quality criteria for toxic and other deleterious substances protecting human health for consumption of water and aquatic organisms from fresh and marine waters (18 AAC 70.020(b)(11) and (23)). Alaska is currently in the process of revising its human health criteria per 2015-2017 triennial review. Alaska has also adopted criteria for drinking water, irrigation and stock water to protect the water supply uses.

In a mixing zone, a defined portion of a waterbody is designated as the point of initial dilution. Specific water quality criteria are permitted to exceed the numeric limits for those criteria within the mixing zone. Water immediately outside the authorized mixing zone is required to meet all water quality criteria. When evaluating mixing zone authorization, DEC is required to consider the physical and chemical characteristics of the effluent and the receiving waters as well as the most technologically and economically feasible methods of treatment for the effluent. The mixing zone will not affect the ability to maintain and protect the designated uses, must protect the overall biological integrity, and will be as small as practicable.

DEC's WQS also have an established antidegradation policy (18 AAC 70.015), whole effluent toxicity limits (18 AAC 70.030), and exceptions to statewide standards. Exceptions to statewide standards are implemented through Short Term Variances; Zones of Deposit; Thermal Discharges; Reclassification of Waters; Site Specific Criteria; and Mixing Zones (18 AAC 70.200-270).

3.2.1. **Triennial WQS Review**

In accordance to the CWA, DEC conducts a review and update to Alaska's WQS every three years (the triennial review). The process entails issuance of a public notice of those water quality issues that DEC has identified as being issues of importance through engagement with EPA, state agencies, public and private stakeholders, and DEC internal management. DEC solicits comment on the proposed issues, consolidates comments and opinions via a response summary, and finalizes its workplan through release of a second public notice. The 2011-2013 triennial review process resulted in the following:

- Adopt antidegradation implementation methods;
- Resolve issues delaying EPA approval of mixing zone regulations;
- Monitor and assist the EPA review of residue criteria; and
- Evaluate Alaskan consumption rates for fish and shellfish for use in deriving human health criteria.

DEC continues to work on these issues as well as research such topics as revisions to temperature criteria, establishment of natural condition determination methodology, and EPA-recommended updates to various toxics criteria. None of these current triennial review priorities involve monitoring actions; however, future priorities may involve monitoring actions.

3.2.2. **Use Reclassification and Site Specific Criteria**

The Department is authorized under 18 AAC 70. 230 and 18 AAC 70.235 to reclassify waters according to public petition; reclassification requests are subject to language established in CWA section 101(a)(2) for recreation, growth and propagation of aquatic life, and harvesting for consumption uses and require a use attainability analysis. Other uses adopted under CWA section 303(c) for water supply uses require a use and value demonstration to justify reclassification. Reclassification can take place when a designated use is determined to be incapable of taking place and is not considered an existing use as of 1975, or is only capable of taking place on a limited (i.e., seasonal) basis. Site-specific criteria are assigned in cases where natural conditions or similar circumstances may preclude attainment of a particular use or criteria for said use (e.g., exceedances of bacteria criteria for recreational use in a freshwater location due to the presence of avian life). Such a determination would consider ambient water quality data. Reclassification and Site Specific Criteria decisions take place on a case-by-case basis and are subject to public notification and EPA approval.

3.2.3. **Antidegradation**

Antidegradation measures in state water quality standards assure the protection of existing uses of water, ensure that water quality does not fall below state water quality standards, allow the lowering of water quality in high quality waters only when necessary for important social or economic development, and provide a mechanism for designating water of exceptional ecological or recreational significance for additional protection. Alaska's antidegradation policy is found at 18 AAC 70.015 and has been in place since 1997. Regulations for antidegradation implementation methods have been proposed for adoption in 18 AAC 70.016. Implementation methods require permittees to provide information to the department so that an antidegradation analysis can be completed when applying for an APDES permit and 33. U.S.C. 1341 water quality certification for CWA §401 and §404 permit.

Project applicants shall submit sufficient information to DEC including identification of receiving water, geographical extent of area potentially affected by the discharge, parameters of concern in the effluent, and potential impacts to the receiving water. Applicants may submit credible information about the baseline ambient water quality of the receiving water. Such information will be used to determine the Tier of protection assigned to the water, the assimilative capacity of the water, and degree that water quality may be impacted as the result of a permits effluent.

More information about Alaska's WQS and the triennial review process can be found on the Division's website.

Table 3: DEC Water Quality Monitoring Objectives Achieved Through Triennial Review Process

Strategy Objective	Action/Program	Deliverables/ Media	Measures and Timeframe
5.Develop new or revised WQS based on data collected from Alaskan waters.	A. Through triennial review, evaluate new EPA-recommended revisions to WQS criteria and combined with an evaluation of existing ambient water quality data determine which revised criteria, if adopted, appear appropriate and reasonably attainable in Alaska. WQS.	Triennial Review of WQS.	• As guided by Triennial Review planning and priorities, evaluate available ambient water quality data for criteria when considering WQS revisions.
	B. Upon application, develop Use Attainability Analysis and Site-Specific Criteria to determine whether modification or removal of uses and criteria are appropriate based on available water quality data including information submitted by the applicant. WQS.	Use reclassification and site specific criteria adopted in Alaska WQS.	• As needed, adoption of site specific uses and/or criteria in Alaska WQS criteria submitted to EPA for approval.

Strategy Objective	Action/Program	Deliverables/ Media	Measures and Timeframe
	C. Through use of implementation methods outlined in the antidegradation regulation at 18 AAC 70.015 and 70.016, complete (1) Tier 1 existing use analysis; (2) de minimus finding(s); and (3) Tier 2 assimilative capacity findings. Develop guide for using ambient monitoring data in Tier 1 and Tier 2 antidegradation analyses for APDES permits. WQS and WDAP.	Guide for using ambient monitoring data for antidegradation analysis.	• By 2020, guide will be complete for incorporating ambient data into antidegradation analysis. • In 2020 minor Strategy update, discuss of progress and next steps.

3.3. NPS

Because much of Alaska is undeveloped and relatively pristine, the primary emphasis of the NPS Program is prevention. In populated areas, however, many waterbodies, including important salmon streams, have been degraded and are in need of restoration. Waterbody restoration plans are developed and implemented for waterbody locations where water quality is impaired. Restoration activities are designed to achieve a water quality condition appropriate to the specific site.

Under the NPS Program, the State identifies impaired waterbodies in the biennial "Integrated Water Quality Monitoring and Assessment Report" (Integrated Report). The NPS Program coordinates ACWA, develops and implements TMDLs, and manages the BEACH Program and forestry practices, as well as many other NPS pollution prevention activities. The most recent version of the NPS Program strategy can be found on the Division's website.

3.3.1. **CWA Sections 305(b) and 303(d) Integrated Report**

DEC's Section 305(b) Water Quality Assessment Report and Section 303(d) list of impaired waters are required by the CWA, and rely on water quality information obtained from DEC's programs as well as other natural resource agencies, industry, non-profit, and Native Alaskan organizations. Since 2002, DEC has been compiling the Sections 305(b) and 303(d) assessment results in a common Integrated Report. DEC's 2012 Integrated Report represents the most current summary of existing data analyzed by DEC for assessing compliance with Alaska's WQS. The Integrated Report describes the nature, status, and health of Alaska's waters and identifies impaired waters in need of action to recover water quality or habitat. The Integrated Report is an important tool for allowing Alaskans to understand the health of Alaska's waters and for identifying actions Alaskans can undertake to improve water quality in Alaska. The Integrated Report is updated every two years.

For purposes of the Integrated Report, the term "assessment" means the process of collecting and evaluating available water quality data to determine if an individual waterbody meets Alaska's WQS criteria or should be considered for inclusion on the Section 303(d) impaired waterbody list. The assessment process relies on information obtained generally within the last five years. The process of

gathering and analyzing data for inclusion within the Integrated Report is described throughout the Report, which can be found on the Division's website. Several of the ten Water Quality Monitoring Strategy Objectives are met and recorded in the Integrated Report. See Table 4. (The full list of ten strategy objectives are found in Appendix B, Table B-1.)

Table 4: Water Quality Monitoring Strategy Objectives Included in the Integrated Report

Strategy Objective	Action/Program	Deliverables/ Media	Measure and Timeframe
1. Determines the extent to which Alaska's waters meet the objectives of the Clean Water Act, attain applicable water quality standards, and provide for the protection and propagation of balanced populations of fish, shellfish, and wildlife.	A. Use the biennial Integrated Report to provide an evaluation and description of Alaska's waters. NPS and AKMAP.	Integrated Report.	Complete biennial Integrated Report including: • assessments of waters that are impaired or attaining WQS, and • updated information on regional baseline assessments and long-term trends, as available.
	B. Develop Ambient Water Quality Monitoring Index of the Division files, databases and websites identifying where ambient water quality data exists for Alaska's waters. The index will list sources of data, watershed/waterbody, period when information was collected, parameters collected, and how to access data. This index will be used in prioritizing data sets for data entry into AWQMS on a case by case basis, for example when data is identified to be useful to development of a TMDL, WQS, trend analysis, etc. AKMAP.	Index for historic (pre-2015) ambient water quality data storage locations.	• By 2020, compile index for historic ambient water quality data storage locations in DEC programs and, where accessible, external agencies. • In 2020, minor Strategy update, set Division priorities and define next steps including prioritizing data sets of interest to the Division, identification of resources needed for AWQMS entry, FTE estimates, and maintenance needs of the Index.

Strategy Objective	Action/Program	Deliverables/ Media	Measure and Timeframe
3.Identify those Alaskan waters that are not meeting Alaska's WQS.	A. Evaluate extent to which Alaska's waters are impaired for designated uses and report waterbody status in biennial Integrated Report. NPS.	Integrated Report, Waterbody categories 4 and 5. CWA 303(d) list.	• Integrated Report is completed biennially, and includes updated information on waters that need restoration.
	B. Increase the number of at risk waters the Division collects data on that are currently category 3 waters (insufficient information). NPS.	Waterbody Categories 2 through 5 in biennial Integrated Report. CWA 303(d) list.	• By 2020, waterbody assessments will be made on at least 5 threatened waterbodies to determine impairment or attainment of designated uses, moving them from category 3 into appropriate category.
4. Develop consistent monitoring approaches for assessing potentially impaired waters.	A. Develop listing methodologies for pollutants causing common impairments including monitoring protocols in the Integrated Report. NPS.	Public noticed Standard Listing Methodologies and referenced in Integrated Report.	• By 2020, develop standardized approach to listing methodologies and monitoring protocols for common pollutants.
	B. Develop guidelines for using biological assessment information to supplement water quality data in CWA Section 303(d) listing decisions.		• By 2020, supplement water quality impairment decisions with use of biological data.
	C. Develop procedures for using map or remote sensing based risk factors (e.g. impervious surfaces/roads, disturbed/cleared ground, water temperature) to conduct screening level watershed risk assessments.		• By 2020, use remote sensing data to help identify at-risk waters and supplement water quality data.

3.3.1.1. TMDL Waters

According to the CWA Section 303(d), and EPA's implementing regulations, Section 303(d) designated waters include impaired surface waters that do not or are not anticipated to meet applicable water quality standards solely through the implementation of existing technology-based or

similar controls by the next listing cycle (currently every two years). Impaired waterbodies are surface waters with documentation of actual or imminent persistent exceedances of water quality criteria. Adverse impacts to designated uses, as defined in Alaska's WQS. Section 303(d) of the CWA, requires that each state identify those waters within its boundaries for which effluent limitations are not stringent enough to implement any water quality standard applicable to such waters. Each state is also required to establish a priority ranking for such waters, taking into account the severity of pollution and the designated uses of such waters. A TMDL describes the process and steps to be taken to restore an impaired water to a condition that meets the applicable water quality standards for the pollutant parameters of concern. The current list of impaired waters in Alaska can be found on the Division's website.

In Alaska, impaired waters are priority ranked based on the severity of the pollution, the feasibility of implementing a waterbody recovery plan, and other factors, using the ACWA process, as described in Section 3.3.2. The development of a TMDL, or equivalent waterbody recovery plan, for an impaired water is scheduled by DEC 8 to 13 years into the future. Once a TMDL has been implemented, monitoring and assessment are necessary to determine if the pollutant control technology and BMPs are achieving prescribed load reductions. The list of approved TMDLs for Alaska's impaired waters can be found on the Division's website.

3.3.1.2. Listing Methodology

The CWA establishes a process for listing waters as impaired that don't meet water quality standards under CWA Section 303(d) and for delisting those waters. A "listing methodology" can be used to list a waterbody as impaired and to delist the waterbody once the impairment is removed. The listing methodology describes the quantity, quality, and nature of the data that must be collected in order to demonstrate that the waterbody is or is not attaining its designated use(s) and meeting water quality criteria. Each potential pollutant should have its own listing methodology. The listing methodology uses the water quality standards as the basis for comparison. The water quality of the waterbody is compared against the water quality standards, systematically and in a statistically significant manner. DEC has developed some listing methodologies – for example, turbidity and fecal coliforms – but these methodologies may become outdated and need revision as technology and standards change. New and revised listing methodologies will be public noticed to allow the public the opportunity to provide DEC information that may be included in the final methodology.

A listing methodology serves as the essential reference document for entities collecting water quality data. Partners and interested parties who collect water quality data consistent with the applicable listing methodology can aid DEC in its process of determining if a waterbody should be listed as impaired or delisted.

Data collected before a listing methodology is finalized will be compared against the listing methodology once it is finalized. When data gaps exist so that an impaired water determination cannot accurately be made based on the listing methodology, additional data may need to be collected to augment the past data

3.3.2. **ACWA Process**

DEC participates in the implementation of the ACWA process, established through an Administrative Order on October 2, 2002, to address all waters in Alaska requiring monitoring, assessment and restoration. DEC, Alaska Department of Natural Resources (DNR), and Alaska Department of Fish & Game (DFG) work together to focus state and federal resources on the waters of greatest need. The ACWA Process addresses priority waters having water quality, water quantity, or habitat problems. ACWA uses a targeted design approach to address those state watersheds, waterbodies, or waterbody segments requiring monitoring, assessment, or possible stewardship action(s). ACWA currently encompasses rivers, streams, lakes, reservoirs, estuaries, coastal areas, and wetlands and may address groundwater in the future. Water Quality Monitoring Strategy Objective number seven is achieved through the ACWA process. See Table 5.

During the next five years, the ACWA nomination process will prioritize projects that focus on actions to address turbidity and toxic substance impacts and their sources. Additionally, the ACWA process will prioritize projects that propose to gather information, develop program guidance, develop a listing methodology, and build partnerships for waters with bacteria contamination, which will become a future pollutant that the ACWA process will focus on for protection and restoration. These pollutants best represent related pollution concerns caused by both urban and natural resource development.

Table 5: Water Quality Monitoring Strategy Objectives Achieved through the ACWA Process

Strategy Objective	Action (Program)	Deliverables/ Media	Measure and Timeframe
7. Identify and target restoration of priority waters as identified through the ACWA process to • **establish TMDLs;** • **evaluate the response of a waterbody to load reductions and BMPs; and** • **determine the effectiveness of BMPs.**	A. Use ACWA to prioritize waters and manage and share information on water quality. Use ACWA process to identify Alaskan waters that need actions for (1) waterbody recovery, (2) protection, and (3) data collection and monitoring. Use ACWA database to track and plan actions on all nominated ACWA waters. NPS.	Annual ACWA grant solicitation and list of high priority actions and waters.	• Collect monitoring data necessary to support development or of two TMDLs or other watershed plan per year. • Conduct one monitoring project per year to measure effectiveness of BMPs.

3.3.2.1. ACWA Decision Tree

The ACWA Decision Tree is a diagram that depicts the flow of information, pathways, and critical decision points for the application of key criteria associated with the ACWA waterbody decision process. The ACWA Decision Tree process starts with the waterbody nomination. Once a waterbody has been nominated, an analysis is conducted and each nominated water is then placed into one of four categories using stewardship criteria and sufficient and credible data tables. Waters that are placed into the Data Collection and Monitoring Track, Protection & Maintenance of Waterbodies at Risk Track, or Waterbody Recovery Track are then further scored using ranking criteria to prioritize monitoring, assessment, and restoration activities, as described below. The ACWA Decision Tree is depicted in Figure A-1 (Appendix A).

3.3.2.2. ACWA Waterbody Nomination Process

Cooperating state resource agencies (DEC, DNR, and DFG) have developed a waterbody nomination and ranking process that prioritizes stewardship and corrective action for waters at risk of pollution and polluted waters. All waters in Alaska may be nominated for consideration in the ACWA process. Nominations may be made by any public or private entity. Every two years, as part of the Integrated Report development process, DEC formally solicits water quality data and information from all interested parties. Nomination forms are available on the Division's website. Once nominated, individual waters are reviewed and either entered into the ACWA database or returned to the nominator for additional information. The waterbody nomination process is the first step in the ACWA evaluation process and is a prerequisite for a waterbody to appearing the Integrated Report.

3.3.2.3. ACWA Analysis Phase

In the analysis phase, each newly nominated waterbody is studied to determine whether existing stewardship programs are adequate to maintain and protect the waterbody, and whether available data is sufficient to determine the existence or extent of a current or potential problem. The purpose of the analysis is to determine if existing stewardship programs (e.g. BMPs, federal regulations, WQS, and Alaska State Statutes) are adequate to address the water quantity, water quality, or aquatic habitat support issue(s) identified by the ACWA partner agencies. The analysis phase directs each nominated waterbody into one of four possible tracks:

- Data Collection & Monitoring Track;
- Protection & Maintenance of Waterbodies at Risk Track;
- Waterbody Recovery Track; and
- Adequately Protected.

A sufficient and credible support table exists for each component (water quality, water quantity, and habitat) of ACWA. The ACWA sufficient and credible data tables can be found on the Division's website.

3.3.2.4. ACWA Ranking Criteria

The ACWA Ranking Criteria were developed to assign a numeric value to waters placed in the Data Collection & Monitoring Track; Protection & Maintenance of Waterbodies at Risk Track; or Waterbody Recovery Track. The ACWA Ranking Criteria consist of three components (Habitat, Water Quality, and Water Quantity) for each evaluated waterbody. Ranking each waterbody provides a means to assign a relative priority and to focus attention on the waters of highest priority within each category. The ACWA Ranking Criteria can be found on the Division's website.

3.3.2.5. ACWA Action Phase

High priority waters placed into the Data Collection & Monitoring Track, Protection & Maintenance of Waterbodies at Risk Track, or Waterbody Recovery Track are addressed in the "Action Phase" by developing actions for individual waters. Actions include: identifying and implementing monitoring, protection, or recovery actions; evaluating the success of protection and recovery actions; or directing the waterbody for additional information, continued monitoring, or additional protection and recovery actions. The identification and ranking of ACWA priority waters serves as the basis for allocation of financial and staff resources to implement monitoring, assessment, and restoration actions.

DEC currently does not maintain an ambient, fixed, or rotating station water quality monitoring program. Water quality monitoring for high priority waters is solicited through the ACWA grant process and through the use of selected term contractors. Funding to support ACWA waterbody monitoring, assessment, restoration, and stewardship comes from state resource agencies through which requests for proposals are publicly solicited on a competitive basis annually. Each of these funding sources has a unique set of obligations and conditions for use. Projects may be implemented directly by agency staff through term contracts or through ACWA grants, as determined by resource agencies. A complete listing of ACWA funded projects can be found at the Division's website.

ACWA-funded projects have included implementation and monitoring of TMDLs; establishing biomonitoring protocols for specific ecoregions of Alaska; supporting watershed baseline and long-term monitoring groups; implementation of numerous watershed restoration projects; restoring fish habitat; and lake monitoring programs. Funding may be used in the future to evaluate the effectiveness of NPS water pollution control BMPs.

DEC works with many local government and non-profit groups throughout Alaska, providing financial and technical assistance for the monitoring, assessment, and restoration of 303(d) listed and other high priority waters requiring additional monitoring or protection. The continued support of local monitoring programs, when possible, results in cost-effective monitoring and restoration, thereby helping to implement DEC's monitoring strategy. Each ACWA grantee is required to submit their monitoring data electronically to DEC so that these data can be uploaded into DEC's Ambient Water Quality Monitoring System (AWQMS) database and eventually into EPA's Storage and Retrieval System (STORET) database.

3.3.2.6. ACWA Development

To assure that individual, ACWA funded, monitoring projects provide valid and useful data, DEC requires these six elements in any projects it funds or oversees and encourages other organizations to include in their monitoring efforts:

- Objectives that clearly describe the purpose of the monitoring and how the data will be used;
- Strategy and design that clearly and logically provide data that will meet those objectives;
- Indicators that provide the appropriate physical, chemical, and biological measurements;
- Quality assurance (QA) protocols that ensure adequate steps are taken so the data is valid and useful;
- Data management and reporting processes that manage and report data so the data has maximum short and long-term usefulness; and
- Evaluation processes to ensure the results are adequately reviewed to determine next steps.

3.3.3. **BEACH Program**

Alaska has 47,000 miles of coastline, most of which remains undeveloped. Alaskans use their public beaches for recreational purposes such as fishing, shell fishing harvesting, and boating. However, limited *intentional* swimming occurs in Alaska's cold, coastal waters. The BEACH Act, signed into law on October 10, 2000, seeks to reduce the risk of disease to recreational users of the nation's waters. The BEACH Act authorizes EPA to award grants to eligible coastal states and Tribes for the development and implementation of programs to monitor coastal recreational waters for disease-causing microorganisms and to notify the public if monitoring indicates a public health hazard.

Previous BEACH grant work, funded through DEC, established the statewide extent of beaches used for recreational purposes, the degree of use, the proximity of pollution sources to these beaches, and notification protocols for beach contamination situations. Currently, DEC is implementing a short-term program that: 1) funds follow-up baseline/pilot monitoring of selected beaches identified to be high risk locations through the ACWA process; 2) funds local governments through the ACWA grant process to conduct pilot beach monitoring at their beaches; and 3) notifies the public if pollution levels are above state and national standards established for recreational beaches. Sampling of selected beaches for *Escherichia coli* (*E. coli*) and *enterococci* is scheduled for the spring and summer of 2014. DEC, along with other states are currently evaluating how BEACH data can be incorporated into management decisions.

3.3.4. **Bioassessment**

Since the late 1990's, the focus in Alaska has been developing the protocols and procedures to monitor the biological health of Alaska's streams and to establish baseline biological conditions in different regions of the state. This work is being done in partnership with the University of Alaska (UA) Anchorage – Alaska Natural Heritage Program. AWCA and CWA Section 106 funds have been used to support these efforts. Bioassessment data can help distinguish among potential

stressors to an aquatic ecosystem as part of an integrated water quality sampling plan. This data can then be used to set protection and restoration goals, to identify stresses to the waterbody, and to assess and report on the effectiveness of management actions as reflected in the responses of biological communities.

Multi-metric biological indices have been developed for two regions in Alaska, Alexander Archipelago streams and Cook Inlet Basin streams. Multi-metric indices use multiple data sets, or metrics to evaluate and predict waterbody health based on disturbances within the watershed. In southwest Bristol Bay, the lack of impacted waterbodies prevented the development of a biological index; in this region, the baseline condition is reported. A baseline biological condition report has been completed for the Kvichak and Nushagak watersheds (southwest Bristol Bay) region. DEC plans to develop guidelines for using biological assessment information to supplement water quality data in CWA Section 303(d) listing decisions, this is discussed in detail in Goal 2 of the Alaska Clean Water Five-Year Plan, dated May 2015.

3.4. AKMAP

AKMAP started in 2004. It was initially modeled after EPA's Environmental Monitoring and Assessment Program (EMAP) and has since been adapted to include the unique conditions found in Alaska. AKMAP is responsible for implementing statistically defensible assessments of water quality; describing long-term trends of Alaska's water resources; and analyzing the extent to which Alaskan waters provide for the protection and propagation of shellfish, fish, and wildlife. This is accomplished through probabilistic/randomized designs, which provide general conclusions about the biotic and abiotic conditions within a study area.

Statewide probabilistic surveys in Alaska are problematic for several reasons. The remote nature of the state, sparse infrastructure, and extreme logistical expenses of sampling make statewide surveys impractical. Alaska instead conducts regional probabilistic surveys, focusing on areas with natural resource extraction activities, population centers, or other potential pollution sources. Additionally, probabilistic surveys in Alaska generally almost always select only remote or undisturbed locations, due to its vast landscape and limited population base. However, it is not possible to determine the condition of a resource without also evaluating a range of disturbed or stressed conditions. To allow for condition assessment, AKMAP has begun enhancing probabilistic surveys with additional targeted sites to include potentially impacted areas. Results of these surveys can then be compared to other regions in Alaska or other states. AKMAP overcomes some of these issues by focusing probabilistic surveys on regions that experience pressure from human population and/or resource extraction.

DEC's AKMAP is Alaska's lead implementation agency for EMAP surveys, which have since been renamed to National Aquatic Resource Surveys (NARS). NARS protocols and methodology are standardized across the nation, improving the comparability of data and identification of stressors. The main goals of NARS, from a national perspective, are to monitor the condition of the nation's ecological resources, evaluate the success of current policies and programs, and identify emerging problems before they become widespread. These same goals are applicable on a state level, and data

obtained from participating in NARS is envisioned as the beginning of DEC's statewide assessment of freshwater and coastal aquatic resources.

NARS focuses on a different waterbody type each year for a 5-year rotation, rotating through: wetlands, lakes, rivers, streams, and coastal surveys. Past AKMAP surveys have occurred across disparate regions of Alaska focusing on different waterbody types in each region. This piecemeal approach did not provide for a complete understanding of watershed conditions. To overcome this, AKMAP has selected the Arctic Coastal Plain (ACP) within the National Petroleum Reserve-Alaska (NPR) as the focus area for the 2010-2015 round of NARS surveys. The ACP surveys will provide coastal watershed assessments, linking wetlands, lakes, and flowing waters to their nearshore and offshore ocean habitats. Figure A-2 (Appendix A) shows the locations of AKMAP surveys.

AKMAP will select the region(s) for the next cycle of probabilistic surveys based on potential impairments to waterbodies from human populations, natural resource extraction, or a significant risk for degradation balanced against a lack of available data. The pollutant focus identified in Alaska Clean Water Five-Year Plan and logistical constraints will also be considered. Several approaches may be taken for the selection:

1. Selecting an entirely new area and completing the 5 year cycle there;
2. Selecting regions with previous isolated surveys and filling in data gaps; or
3. Selecting regions where separate DEC or non-DEC surveys are occurring to enhance or expand upon them.

Table 6: DEC AKMAP Surveys

Water Type	Alaska Region	2010	2011	2012	2013	2014	2015	2016	2017	2018
Coastal	ACP	Field	Field	Field Report		Field	Field	Field Report	Synthesis Report	
Wetlands	ACP		Field	Field Report					Synthesis Report	
Lakes	ACP		Research	Design, Pilot	Field	Field Report			Synthesis Report	
Rivers/ Estuary	ACP				Research	Design, Pilot	Field	Field Report	Synthesis Report	
Wetland/ Lakes	To be determined						Research	Design, Pilot	Field	Field Report

Table 7: EPA NARS Surveys

Water Type	2010	2011	2012	2013	2014	2015	2016	2017	2018
Coastal/ Estuary	Field	Lab, Data	Report	Research	Design	Field	Lab, Data	Report	
Wetlands		Field	Lab, Data	Report	Research	Design	Field	Lab, Data	Report
Lakes		Design	Field	Lab, Data	Report	Research	Design	Field	Lab, Data
Rivers		Research	Design	Field	Lab, Data	Report	Research	Design	Field
Streams*		Report	Research	Design	Field	Lab, Data	Report	Research	Design
Coastal/ Estuary		Lab, Data	Report	Research	Design	Field	Lab, Data	Report	Research

The University of Alaska (UA) and the National Oceanic and Atmospheric Administration (NOAA) have partnered with AKMAP for many years. DEC and UA recently renewed a Memorandum of Understanding (MOU) to enable the continued partnership and coordination of environmental research needs. UA Fairbanks School of Fisheries and Ocean Sciences is the primary partner for all coastal projects. UA Anchorage Alaska Natural Heritage Program is the primary partner for all freshwater projects. NOAA's National Status and Trends program has similar methods and goals as AKMAP and have partnered with DEC on coastal projects since 2009. Water Quality Monitoring Strategy Objective number two is met using the AKMAP process. See Table 8.

Table 8: Water Quality Monitoring Strategy Objective Met via AKMAP

Strategy Objectives	Action/Program	Deliverables / Media	Measure and Timeframe
2.Assess and describe baseline and long-term trends for Alaska's waters.	A. Develop and implement a long-term plan for assessing and reporting regional baseline and long term trends of water quality. Plan will be coordinated by AKMAP and will address regional data needs, priorities, methods, timing, and resources needed by various programs within the Division. AKMAP, NPS and WDAP.	Long-term monitoring plan.	• By 2020, complete initial plan for long-term monitoring for addressing gaps in regional baseline and long-term trends. • In 2025 Strategy update, discuss implementation of long-term plan.
	B. Select the focus region(s) for the 2017-2021 AKMAP survey cycle, and produce comprehensive regional report based on current 5-6 year survey cycle. AKMAP.	EPA CWA 106 Strategy reporting.	• By 2016, select focus area(s) for next 5 year plan for AKMAP surveys. • By 2020, report summarizing 2010-2016 AKMAP surveys will be completed.
	C. Improve GIS tools and procedures to track progress on TMDL implementation and waterbody restoration.		• By 2018, identify potential GIS based options that use water quality data to track progress on TMDL implementation.

3.5. WDAP

DEC's WDAP is administered by the Division. Its mission is to protect water resources and public health by regulating wastewater discharges.

3.5.1. **WDAP State Wastewater Permitting Activities**

The WDAP has authority to issue general and individual state wastewater discharge permits for subsurface discharges (i.e., groundwater) or for discharges to land outside the jurisdiction of the CWA. DEC monitors compliance with state issued permits at a level commensurate with environmental risk.

3.5.2. **NPDES Program in Alaska**

Prior to DEC's assumption of the NPDES program, EPA had been the NPDES permitting and compliance authority for wastewater discharges to State of Alaska surface waters. In 2008, the State of Alaska submitted a final application to EPA for the authority to implement the NPDES Program (Section 402 of the CWA) in State of Alaska jurisdictional waters. EPA approved the application and

agreed to transfer program authority to the State in four phases. The State's program is called the APDES program. In 2012, EPA completed the final transfer of authority and DEC assumed full authority to administer the APDES program in Alaska.

EPA continues to administer the NPDES Program in Alaska for a limited number of defined geographical areas. All EPA-issued NPDES permits are enforced by the EPA. EPA has issued general NPDES permits for discharges to federal waters (more than three nautical miles offshore) from oil and gas exploration facilities and seafood processing facilities. EPA may also issues individual NPDES permits to facilities that request or that require special conditions or do not fall within the parameters of a general permit.

Ambient water quality monitoring may be conducted as part of the wastewater discharge permitting process as part of five activities:

1. Ocean discharge determinations;
2. Reasonable potential analyses;
3. Mixing zone criteria development;
4. Antidegradation analysis; and
5. Pre-application process.

Several of the activities conducted during wastewater permitting also serve to meet the Water Quality Monitoring Strategy Objectives. See Table 9.

Table 9: Water Quality Monitoring Strategy Objective Met by Wastewater Permitting

Strategy Objective	Action (Program)	Deliverables/ Media	Measure and Timeframe
6. Gather and use ambient water quality information to • **develop and refine point source permit effluent limits and conditions;** • **design and recalibrate mixing zone dimensions for wastewater permits;** • **implement antidegradation analysis; and** • **assess permit compliance.**	A. Develop guides for permitters and permittees for baseline data gathering needed for permit applications. Guides will identify potential data needs (types, quantities, timing), appropriate collection and analytical methods, training on methods, and quality assurance and reporting considerations appropriate for different permit sectors. WDAP.	Guide for ambient water quality monitoring methods on DEC Water Intranet.	• By 2020, Guide complete and available to DEC permit staff and permittees. • In 2020 minor Strategy update, discuss progress and next steps.
	B. Maintain an electronic library of documents used in permit development. The electronic library will include permit guidance for obtaining the appropriate wastewater permit and permit process maps, procedures for performing a Reasonable Potential Analysis and establishing WQBELs, procedures for designing and sampling a mixing zone, procedures for determining compliance with acute and chronic aquatic life-based, among other procedures. WDAP.	Electronic library of permit development guidance documents on DEC Intranet.	• By 2020, the electronic library will include all documents needed by DEC permitters that provide clear and easily understood guidance for determining and collecting appropriate ambient water quality monitoring information for permits. • In 2020 minor Strategy update, discuss progress and next steps.

3.5.2.1. Ocean Discharge Criteria Evaluation

For APDES permits with discharges into waters of the territorial sea, contiguous zone, or oceans, CWA 403(c) requires DEC to consider guidelines for determining potential degradation of the marine environment prior to issuing an APDES permit. The Ocean Discharge Criteria (40 CFR 125, Subpart M) are intended to "prevent unreasonable degradation of the marine environment and to

authorize imposition of effluent limitations, including a prohibition of discharge, if necessary, to ensure this goal" (45 FR 65942, October 3, 1980).

In assessing the potential effects of a marine discharge during permit application review, DEC evaluates the impact of a marine discharge on the biological community based on ecological, social, and economic factors. Under the provisions of Section 403, DEC can require the permit applicant to provide the information necessary to conduct such an evaluation. Much of the information necessary to make these evaluations is usually already available to DEC in the form of previously published scientific studies, modeling run results, permit evaluations, or other data collection activities. If Section 403 requirements for protection of the ecological health of marine waters are not met, an APDES permit will not be issued. Conversely, when DEC makes a determination of no irreparable harm, a permit may be issued.

Confirmatory data on ecosystem health can be gathered during the permit cycle to be evaluated prior to reissuance of the permit. The data are collected as part of a monitoring program to assess the impact of the discharge on water, sediment and biological quality, as well as an assessment of alternative sites for the discharge or disposal of the wastewater.

The aforementioned data requirements can include ambient monitoring programs designed to determine degradation of marine waters, alternative assessments designed to further evaluate the consequences of various disposal options, and pollution prevention techniques designed to further reduce the quantities of pollutants requiring disposal and thereby reduce the potential for harm to the marine environment.

Any published ambient water quality, sediment chemistry, or other environmental data or reports used in the development of the Ocean Discharge Criteria Evaluation are retained as part of the administrative record supporting the final permit decision. Any applicant-provided environmental data, including ambient data, would likewise be retained as part of the administrative record.

3.5.2.2. Reasonable Potential Analyses

DEC regulations found in 18 AAC 83.435 and 18 AAC 70.015 require limits be placed in APDES permits to protect waters of the United States and achieve water quality standards established under 33 U.S.C. 1313, including state narrative criteria for water quality. Specifically, 18 AAC 83.435(b) states:

> Effluent limits in a permit must control all pollutants or pollutant parameters, either conventional, nonconventional, or toxic pollutants that the department determines are or may be discharged at a level that will cause, have the *reasonable potential* to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality.

DEC developed the Reasonable Potential Analysis (RPA) and Water Quality-Based Effluent Limits (WQBEL) Calculation Tool to establish a framework for permit development. This tool helps to ensure that final permit effluent limits are protective of water quality.

In order to make permit limit decisions, the permit writer must determine if ambient water quality data exists or are available. If statistically adequate ambient data are present, the permit writer uses

the 85th percentile of data to determine ambient water quality. If statistically adequate ambient data does not exist, the permit writer can either require that data be collected during the ensuing permit cycle, require that the data be collected outside of the permit, or use 15% of the most stringent applicable water quality criterion.

When appropriate, the Department can establish effluent limits and permit conditions based on natural or site-specific conditions in the receiving waterbody (18 AAC 70.235). The permit may include requirements to conduct monitoring of ambient water quality. Any and all data used in the RPA process will be retained in the administrative record.

3.5.2.3. Mixing Zone Criteria Development

Once DEC has established there is reasonable potential, DEC may authorize a mixing zone. A mixing zone" means a volume of water adjacent to a discharge, in which wastes discharged mix with the receiving water" (18 AAC 70.990).

In accordance with 18 AAC 70.240-250, the department will authorize a mixing zone only if it finds that available evidence reasonably demonstrates that applicable requirements of the water quality standards will be met. The available evidence considered includes evaluation of the natural levels of potential pollutants in sediments, water, or biota.

Some permits with approved mixing zones require permittees to monitor beyond the boundary of the authorized mixing zone to ensure results represent receiving water conditions free of influence from the wastewater discharge. This data is maintained in the facility compliance files.

Monitoring may also be required to gather effluent and receiving water body data, which may include ambient water quality data, to determine if additional effluent limits are required and/or to monitor effluent impact on the receiving water body quality. Any ambient water quality data used in mixing zone modeling will be retained in the administrative record.

3.5.2.4. Antidegradation Analysis

In order to issue a wastewater discharge permit that results in the lowering of ambient water quality, DEC must complete an antidegradation analysis. Antidegradation is a tool used to protect the water quality in the State of Alaska. Antidegradation implementation is the method or process for determining whether and to what extent the water quality may be lowered (see 18 AAC 70.015 and 70.016).

Antidegradation implementation methods require an analysis of the degradation caused by a new or expanded discharge before a permit is issued. Ambient water quality data is currently not required to complete an antidegradation finding; however, in some cases monitoring data may be needed for some findings including (1) Tier 1 existing use analysis, (2) de minimus finding(s), and (3) Tier 2 assimilative capacity findings. Consistent with the mixing zone and reasonable potential sections above, any ambient water quality data used as part of the antidegradation analysis will be memorialized in the administrative record for the permit.

3.5.2.5. Pre-Application Process

During the pre-application process, an applicant may collect ambient water quality data. The applicant can request a pre-application conference to explain the project for clarification of the application requirements prior to submitting a permit application to the Department. A pre-application conference is an opportunity for both the applicant and DEC to discuss ambient water quality data requirements (if any) for a particular project. Such data elements might include flow measurements that can establish critical low flow conditions or data requirements for the establishment of natural conditions.

Any ambient water quality data collected through the pre-application process and provided by the applicant may be considered by the permit writer when finalizing the permit. This data is not currently entered into a department database; however, the division anticipates, by 2020, a process will be developed to load some of this ambient water quality data into AWQMS, particularly data from major dischargers.

3.6. Commercial Passenger Vessel Environmental Compliance (CPVEC) Program

The Division administers the Commercial Passenger Vessel Environmental Compliance (CPVEC) Program for cruise ships and ferries (with over 50 overnight passengers) that discharge wastewater. The CPVEC program ensures ships' compliance with discharge requirements. In addition, it plans to conduct independent monitoring, including sampling receiving water to assess cruise ship impacts to marine waters. All sampling of receiving water will be done in accordance with the conditions of the general permit and the 2014 Cruise Line International Association – The Alaska Quality Assurance Project Plan (QAPP) or an alternate Department approved QAPP.

3.7. Collaborative Opportunities

In addition to the ambient monitoring programs of the Division, other DEC programs collect information on ambient water quality conditions. The Drinking water program in DEC's Division of Environmental Health receives limited information on some surface waters used for drinking water systems. In 2004, the Division also began a fish safety monitoring program in concert with other federal and state agencies. DEC's Seafood and Food Safety Laboratory analyzed marine, anadromous, and freshwater fish tissue for heavy metals and persistent organic pollutants (POPs). DEC's Division of Spill Response also receives information on ambient waters through investigations into contaminated sites and spills.

Opportunities for collaboration also exist with federal and other state agencies. Alaska is divided into federal land holdings totaling about 235 million acres (64%), state land holdings totaling 90.6 million acres (25%), and native corporate and private land holdings totaling 40.4 million acres (11%) (BLM 2002). The federal government administers about two thirds of the land in Alaska and employs at least 12 federal agencies that carry out environmental monitoring and assessment activities in Alaska. The need for state and federal coordination of these activities is even greater in a large state like Alaska, the majority of which is administered by the federal government. Much of the data and informational reports produced by each federal agency can be obtained online at their respective website locations. Some statewide monitoring coordination is accomplished through the

Interagency Hydrology Committee of Alaska (IHCA), which is federally chartered and composed of state and federal representatives who meet twice a year to discuss their respective monitoring initiatives. IHCA website can be accessed at the United States Geological Survey (USGS) website (http://ak.water.usgs.gov/ihca/).

Many public and private entities conduct water quality monitoring and assessment activities in Alaska, including federal land management agencies, Tribes and Native Alaskan organizations, local government, citizen monitoring groups, and academia. While there has been much collaboration and data sharing in the past, the opportunity exists to strengthen existing relationships and initiate new ones.

4. CORE AND SUPPLEMENTAL WATER QUALITY INDICATORS

Indicators are characteristics of the aquatic resource that provide quantitative or semi-quantitative data on the condition of the aquatic resource. EPA recommends that the monitoring strategy define a core set of indicators (e.g., water quality parameters) for each water resource type that include physical/habitat, chemical/toxicological, and biological/ecological endpoints, as appropriate, that reflect designated uses, and that can be used routinely to assess attainment with applicable water quality standards throughout the state (EPA 2003). EPA further recommends that this core set of indicators be monitored to provide statewide or watershed level information on the fundamental attributes of the aquatic environment and to assess WQS attainment/impairment status. Previously, chemical and physical indicators were emphasized; however, the EPA now recommends that biological monitoring and assessment should assume a more prominent role in state monitoring (EPA 2003).

EPA also recommends that the monitoring strategy describe a process for identifying supplemental indicators to monitor when there is a reasonable expectation that a specific pollutant may be present in a watershed, when core indicators indicate impairment, or to support a special study such as screening for potential pollutants of concern (EPA 2003). Supplemental indicators are important when identifying causes and sources of impairments and targeting appropriate source controls. Supplemental indicators may include each water quality criteria in the state's WQS, any pollutants controlled by the NPDES, and any other indicators of concern (EPA 2003).

4.1. NPS Indicators

Environmental indicators for waters monitored and assessed through ACWA are selected on a case-by-case basis and may include chemical, physical, and biological parameters for assessing water quality, water quantity, and habitat. These same indicators may be applied to waters requiring monitoring and assessment under DEC's TMDL Program.

4.2. AKMAP Indicators

Indicators allow AKMAP to evaluate effects of multiple stressors, such as chemical contaminants and other human activities, on the biological communities. AKMAP considers two types of indicators: condition and stressor.

Biological or physical characteristics are condition indicators used to evaluate the condition of the aquatic resource to an environmental value (McDonald 2000). For example, biodiversity of stream invertebrates is a condition indicator providing information on the environmental quality of the waters. Stressor indicator characteristics may change the current condition of an aquatic resource relative to the indicator's change in magnitude. These may be caused by natural and human induced stressors. Dissolved oxygen (DO) concentration and petroleum hydrocarbon contamination are examples of such stressors.

AKMAP indicators are based on the overall suite of NARS indicators, but have been adapted to meet environmental concerns specific to Alaska's waters and logistical constraints due to the remoteness of field sites. For the integrated AKMAP ACP watershed-to-estuary assessment, the

group of indicators presented in Tables 10 through 14 below has been selected for the wetland, lake, stream, and estuary systems.

Table 10: AKMAP NPR Wetland Indicators

Indicators	
Ecological Integrity/Human Use	**Trophic Status and Water Quality**
Vegetation species composition and abundance	Water chemistry (standard anions and cations, alkalinity, dissolved organic carbon [DOC], total organic carbon [TOC])
Algal species composition and abundance	Nutrients (TN, TP, NH_4, NO_3, PO_4)
Hydrologic assessment	**Soils**
	Profile descriptions
	Chemistry
	Bulk density
	Enzymes
	Stable isotopes

Table 31: AKMAP NPR Lake Indicators

Indicators	
Ecological Integrity/Human Use	**Trophic Status and Water Quality**
Phytoplankton assemblage	Vertical profiles: pH, DO, temperature, conductivity, turbidity
Zooplankton assemblage	Secchi disk transparency
Benthic macroinvertebrate assemblage	Water chemistry (standard anions and cations, alkalinity, DOC, TOC)
Sediment diatom assemblage	Nutrients (TN, TP, NH_4, NO_3, PO_4)
Sediment dating	Chlorophyll-a
Physical habitat characterization	**Other**
Macrophyte assemblage characterization	Lake area
Fish tissue	Basin morphometry
Sediment mercury	Watershed characteristics

Table 42: AKMAP NPR Wadeable Stream Indicators

Indicators	
Ecological Integrity/Human Use	**Trophic Status and Water Quality**
Periphyton (diatom) assemblage	In situ pH, DO, temperature, conductivity, turbidity
Benthic macroinvertebrate assemblage	Water chemistry (standard anions and cations, alkalinity, DOC, TOC)
Physical habitat assessment	Nutrients (TN, TP, NH_4, NO_3, PO_4)
	Chlorophyll-a
	Other
	Watershed characteristics
	Drainage area

Table 53: AKMAP NPR Non-Wadeable Stream Indicators

Indicators	
Ecological Integrity/Human Use	**Trophic Status and Water Quality**
Periphyton (diatom) assemblage	In situ pH, DO, temperature, conductivity, turbidity
Benthic (littoral) macroinvertebrate assemblage	Water chemistry (standard anions and cations, alkalinity, DOC, TOC)
Fish tissue	Nutrients (TN, TP, NH_4, NO_3, PO_4)
Physical habitat assessment	Secchi disk transparency
	Chlorophyll-a
	Other
	Watershed characteristics
	Drainage area

Table 64: AKMAP NPR Estuary Indicators

Indicators		
Water Column (CTD)	**Water Quality Individual Samples (Surface, Middle, Bottom Depths)**	**Sediment Chemical and Physical Parameters**
Chlorophyll a	Chlorophyll a	Carbon/Nitrogen Isotopes
Salinity	Conductivity	Grain Size
Depth	Carbon/Nitrogen Isotopes	Inorganic elements [A]
DO	Dissolved Organic Matter	Petroleum Hydrocarbons [A]
pH	DO	Organic Contaminants [A]
Photosynthetically Active Radiation (PAR)	Nutrients	TOC, Total Inorganic Carbon and Total Carbonate
Secchi depth	Particulate Organic Carbon (POC)	Visual Description
Temperature	Total Suspended Solids	
Biological	**Tissue Chemistry (Fish and Select invertebrates)**	**Habitat**
Benthic infauna ≥1mm	Carbon/Nitrogen Isotopes	Aquatic vegetation
Epifauna	Inorganic elements [A]	Debris
Fish assemblage	Petroleum hydrocarbons [A]	Real time GPS/Bathymetry tracking
Zooplankton	Organic contaminants [A]	Shoreline Erosion (Remote Sensing and observation)
Marine Mammal/Water Fowl observations	Lipid content (Fish)	Coastal Watershed Human Activity

Notes:
(A) – The individual AKMAP Statement of Work for each survey will provide a breakdown on the individual analyses.

4.3. WDAP Indicators

WDAP may collect ambient water quality during five processes as described in 3.5.2.. Indicators of ambient water conditions that may be collected in these processes are described below.

- Ocean discharge determinations – Permit specific; may include biological community quality, sediment chemistry, and other water quality parameters including published or applicant-provided ambient water quality, sediment chemistry, or other environmental data or reports.
- Reasonable potential analyses - The ambient indicators are permit specific, generally based on the permit sector type (e.g. mining, oil & gas, domestic wastewater).
- Pre-Application Process - Ambient water quality indicators may be collected during the pre-application process. The indicators may include flow measurements that can establish critical low flow conditions or data requirements for the establishment of natural conditions.
- Mixing Zones - As discussed in Section 3, DEC evaluates the natural levels of potential pollutants when considering and authorizing a mixing zone.
- Antidegradation - Ambient water quality data indicators for antidegradation analysis are determined by the reasonable potential analysis process (see Section 3.5.2.2), which establishes pollutants of concern.

5. QUALITY ASSURANCE

The Division developed a Water Programs Quality Management Plan ((WPQMP) DEC 2010), which outlines a systematic approach to quality assurance (QA) that has been adopted by the Division. It uses a structured and documented management system that describes the policies, objectives, principles, organization authority, responsibilities, accountability, and implementation plan for ensuring quality in its work processes, products, and services. This approach is based on guidance provided by EPA *in EPA Requirements for Quality Management Plans*, *EPA QA/R-2*, March 2001, which can be found at http://www.epa.gov/quality/qs-docs/r2-final.pdf.

5.1. Quality Assurance Documents

DEC has developed QA templates for use by DEC staff, contractors, DEC's point source and NPS pollution programs permitted dischargers, and ACWA grantees. The template provides guidelines for proper collection, handling, and analysis of water quality samples. These QA documents generally ensure that field sample collection and analytical procedures are consistent for DEC-funded projects being conducted throughout the state. The Division has developed the following documents that provide detailed QA and quality control procedures for performing Division-related water quality monitoring and assessment activities:

- *Any Town, Inc. Waste water Treatment Facility Quality Assurance Project Plan.* December, 2002;
- *Generic Quality Assurance Project Plan for Water Program Staff Sampling and Analysis Activities.* May 16. 2003;
- *Water Program Quality Assurance Project Plan (QAPP) Sampling Plan Checklist Revision 1.1.* May16, 2003;
- *Generic Quality Assurance/Quality Control Plan for Sampling and Analysis of Treated Sewage and Graywater from Commercial Passenger Vessels.* April 7, 2011. Note: This QAPP for small cruise ships is currently under revision;
- *Elements of a Tier 2 Water Quality Monitoring Quality Assurance Project Plan.* March 15, 2015;
- *Tier I QAPP Review Checklist.* February 23, 2009;
- *Elements of a Tier 2 Water Quality Monitoring Quality Assurance Project Plan* January 15, 2010;
- *Tier 2 QAPP Review Checklist.* January 15, 2010;
- *Generic Tier 2 Water Quality Monitoring QAPP. January 2015* ;
- *Water Programs Quality Management Plan, Revision* 7. January 16, 2014; and
- *2014 Cruise Line International Association – The Alaska Quality Assurance Project Plan (QAPP).*

Many of these documents can be viewed and downloaded on DEC's Water Quality Assurance website at http://dec.alaska.gov/water/wqapp/wqapp_index.htm

5.2. Quality Assurance Assistance

The Division's QA Officer provides oversight and technical assistance to DEC staff, as well as to Alaska's boroughs, municipalities, and nonprofit groups developing QAPPs. The QA Officer has reviewed and approved QAPP templates for water quality monitoring plans developed by non-profit organizations such as the Native American Fish and Wildlife Service and Cook Inlet Keepers (NAFWS 2004; CIK 1998). The QAPP templates developed by the Native American Fish and Wildlife Service and the Cook Inlet Keeper serve as templates which can be used by other non-profit monitoring groups when developing their own QAPPs. QAPPs are also developed with regional expertise and peer review being provided by resource agency and non-profit group members throughout Alaska. All DEC funded projects must comply with the Division's QA guidance, be approved by the Division's QA officer, and use labs that meet EPA lab competency criteria. The QA Officer will provide technical assistance to other agencies, the public, and permittees in developing QAPPs for their projects. This in turn ties into Water Quality Monitoring Strategy Objective number 8. Table 75: Water Quality Monitoring Strategy Objective Met by QA ProcessSee Table 75.

Table 75: Water Quality Monitoring Strategy Objective Met by QA Process

Strategy Objective	Action/Program	Deliverables/ Media	Measure and Timeframe
8. Ensure data quality and consistency throughout the Division's water quality programs.	A. All Division programs generating, using, or requiring collection of ambient water quality data will use Division Water Programs Quality Management Plan (WPQMP) to properly determine data uses, collect data of known quality, use appropriate QAPPs and methods, conduct regular audits, assure that proper training occurs before data collection, report and manage data. EPA and the Division's QA Officer review and update the WPQMP and evaluate and report on the Division's program's adherence to WPQMP. QA Officer.	EPA Quality Systems Review report. Updated WPQMP. Semi-annual PPG report.	Every 3 years • EPA's Quality Systems Review reports find no substantial deficiencies in the Division's quality systems. • EPA approves updated WPQMP. Every year • QAPPs reviewed and field audits conducted in accordance with annual PPG workplan.
	B. Collaborate with other agencies, public organizations, and industry to provide training and sampling protocols for monitoring ambient water quality. Division will help identify appropriate training for monitoring, how it can be obtained, and mechanisms for delivering it. NPS, AKMAP and QA officer.	Division's semi-annual PPG Report	• By 2020, provide two training events for ambient water quality monitoring, send 3 key staff to advanced monitoring training or conferences.

5.3. NPS Program Quality Assurance

5.3.1. **Methodology for Obtaining Data for the Integrated Report**

DEC accepts data on an ongoing basis. However, prior to preparing the Integrated Report, a formal request is made through a public notice, which is placed in newspapers and issued on-line to solicit data from the public. Phone calls are also made to federal and state resource agencies as well as to non-profit groups to acquire data for the Integrated Report.

5.3.2. **Consolidated Assessment and Listing Methodology**

Currently, DEC does not employ detailed written guidelines for acceptance, review, and analysis of data that are used in making designated use determinations in the Integrated Report. Several states have adopted policies or legislation specifically addressing how the state defines and assesses attainment with aquatic-life based WQS. EPA recommends that states develop a CALM which

clearly documents how attainment decisions are made and defines the indicators and thresholds that are used to assess attainment status for each WQS (EPA 2002). The EPA recommends that a state's CALM clearly define adequate statistical and other implementation procedures to ensure that all parties are aware of the minimum data set and statistical analysis requirements to show attainment. Typically, for every Integrated Report there is a new listing methodology.

5.4. AKMAP Quality Assurance

Surveys conducted by AKMAP are subject to rigorous QA planning and oversight. QA practices for AKMAP surveys conducted as part of NARS are subject to the national QAPP developed by EPA, and thus all states participating in NARS surveys must certify to follow the national QAPP and participate in field audits conducted by EPA personnel. AKMAP surveys conducted independently are required to develop QAPPs as part of the planning process. These QAPPs must be approved by DEC and potentially by the funding agency as well. AKMAP has developed QAPPs for previous coastal surveys (2006-2007Aleutians) and freshwater surveys (2004 Interior Wadeable Streams). These QAPPs serve as the basis for future standalone AKMAP surveys. Any modifications to previously approved coastal and freshwater survey QAPPs must be approved by DEC's QA Officer.

5.5. WDAP Quality Assurance

APDES regulations in 18 AAC 83(f) require all APDES-permitted facilities to develop a QAPP to ensure that the monitoring data collected is of appropriate type and quality for their intended use. The permittee is required to develop a QAPP within 90 days of the effective date of the final permit. The QAPP will describe the project-specific activities and standard operating procedures the permittee must follow for collecting, handling, storing, and shipping samples; laboratory analysis; and data reporting. QAPPs are also routinely required for state issued wastewater discharge permits in order to provide more consistency in data collection and assessment techniques.

EPA manages the Discharge Monitoring Report-Quality Assurance Study Program (DMR-QA). Major and selected minor permittees under the NPDES program are required to participate in the annual DMR-QA study program. DMR-QA evaluates the analytical ability of the laboratories that routinely perform self-monitoring analyses required by APDES permits.

6. DATA MANAGEMENT

DEC is committed to developing, building, managing, and maintaining an information management infrastructure that:

- Provides for efficient storage and retrieval of water quality assessment information of Alaskan waters;
- Improves water quality management decision making and water quality data analysis;
- Improves the quality and consistency of water quality reporting; and
- Complies with CWA reporting requirements.

Water quality monitoring in Alaska relies upon diverse sources of information and data generated both within DEC and outside of the department. DEC staff collaborate on monitoring with governmental agencies across local, state, and federal boundaries, as well as Native Alaskan entities, and volunteer and non-profit organizations. Sources of water quality data and information in Alaska are extensive. The problem is identifying its location, organizing its availability, and making it readily accessible, both to the general public and statewide professional resource agency staff in an effort to target limited resources towards the state's highest water resource priorities.

DEC actively accepts and solicits water quality data and information on a continuous basis. In addition to more traditional means of identifying information through professional networking using telephone, email, and professional meetings/conferences, DEC also seeks water quality data and information through a formal public notice conducted every two years as part of the Integrated Report process. Water quality data received are uploaded into the AWQMS database.

AWQMS is the repository for surface water quality data for the Division. The AWQMS database was designed to store water quality data locally and to submit data to EPA's National STORET through the Water Quality Exchange (WQX).

STORET is a historical EPA relational database of water quality data extending as far back as the 1950s. The Assessment Database (ADB), also developed and maintained by EPA, and the ACWA applications are data management tools used by DEC to synthesize the assessed results of water quality information for making management decisions and reporting purposes. Additional DEC management tools used to locate waterbodies statewide rely upon the availability of the National Hydrography Dataset (NHD) and various geographic information system (GIS) technologies.

Table 86: Water Quality Monitoring Strategy Objective Met by Data Management

Strategy Objective	Action/Program	Deliverable/ Media	Measure and Timeframe
9. Improve the data management and accessibility of ambient water quality data received or collected by the Division's water quality programs.	A. Provide AWQMS training to new and existing staff from WQSAR, WDAP, Compliance and CPVEC programs and Division QA Officer. Provide training to public user groups interested in using or submitting information in DEC's AWQMS. NPS, AKMAP and WDAP.	Increase user base and knowledge of AWQMS within the Division.	• By 2020, Division staff are able to access AWQMS, upload and retrieve data, and complete QA reviews. By 2025, provide training to public user groups.
	B. Develop AWQMS templates for major mining and cruise ship permits to ease loading of ambient data into AWQMS including mixing zone edge data. Load current ambient water quality data from WDAP major mining dischargers and CPVEC dischargers into AWQMS from dischargers with permits requiring ambient data. WDAP, Compliance and CPVEC.	Process for incorporating data from major mining and cruise ship permits. AQWMS templates. Data uploaded in AWQMS.	• By 2020, a process and AWQMS data templates will be developed to incorporate these new data sources into AWQMS. • By 2020, WDAP will have identified pilot projects and have started uploading data from those projects. • In the 2020 minor Strategy update, discussion of progress and a review of objectives will be included. • The 2025 Strategy update will evaluate the steps and resources necessary to upload data from major mining and CPVEC permittees.
	C. Create external portal for data retrieval, viewing, and downloading by the general public of approved AWQMS data and AWCA nominated waters. NPS, AKMAP, WDAP, and CPVEC.	Web based access for the public to ambient water quality data.	• By 2020, the public will be able to access and retrieve data from AWQMS.
	D. Create external portal for public entry of ambient water quality data into AWQMS. This data will be clearly distinguished from DEC collected data and will include appropriate quality assurance qualifiers. NPS, AKMAP, WDAP, Compliance and CPVEC.	Web based access for the public to ambient water quality data.	• By 2025, after training the public including grantees, permittees, agencies, and other public users will be able to input data into AWQMS through a web based portal.

6.1. AWQMS Water Quality Database

DEC participated in a multistate and Tribal effort in the development and implementation of AWQMS, which is the Division's current ambient water quality data management system. AWQMS was developed to manage water quality data on a local level and to facilitate entry of data into STORET. AWQMS works with the Water Quality Exchange (WQX), which became the mechanism for exchanging water quality data between EPA and its partners. It replaces the previous STORET Data Entry Module, which was discontinued in 2009. Data stored in AWQMS is available to all DEC staff and ACWA participants. It was specifically designed for compatibility with EPA's new WQX. Lab and field data can be imported and validated, reviewed for quality control or other purposes, and exported or submitted as a WQX-compatible file to EPA.

DEC requires ACWA grantees and contractors to use a Microsoft Excel template to submit laboratory and field water quality data. The template is designed to reduce data errors by only allowing data that is accepted by AWQMS and STORET to be entered into specific data fields. Data submitted undergoes QA analysis before it is loaded into AWQMS. Once entered, the data goes through additional QA before being submitted to STORET. In an effort to reduce data entry errors, DEC is working with state-certified laboratories to have laboratory data results submitted directly to DEC in electronic data deliverables (EDDs). EDDS can be configured to load directly into AWQMS without any rekeying of data, thus reducing common data entry errors. In the future, DEC hopes to create two new web interfaces, one where the public can retrieve data stored in AWQMS and one where grantees and contractors can load data into a staging area within AWQMS where it can undergo QA before loaded into the database. The system will eventually include a GIS component to support a web-based map browser.

6.2. ACWA Process

The Nonpoint Source Program (NPS) Program manages the ACWA Process, which consists of two databases: ACWA, a waterbody informational database that contains descriptive information on nominated waters, ranking scores, protective and restorative actions, and relative documents; and ADB, a waterbody nomination database and collection of web-based user interfaces physically hosted at DEC within the state of Alaska network.

6.2.1. **ACWA Waterbody Database**

The AWCA database was developed to store and retrieve information on Alaska's nominated waters. The database allows users to search for waters by waterbody name or region within the state. In addition to storing general location information on individual waters, the database can store the waterbody nomination form, the ACWA waterbody track, waterbody category, NHD hydrologic unit codes, anadromous stream catalog numbers, sufficient and credible scores, ranking scores, water body actions and the status of actions, and pertinent documents.

The database supports the generation of reports that are used by ACWA management and staff for the annual ACWA grant solicitation and generating documents for posting on DEC's web site until a public access portal is created allowing the public to access information directly from the database.

The system will eventually include a GIS component to support a web-based map browser for Internet users to identify the nomination status of waterbodies and query information.

6.2.2. Assessment Database

The ADB (version 2.3) is a relational database application for tracking water quality assessment results and generating reports, particularly useful for CWA Section 305(b) and 303(d) reporting and listing functions. DEC uses this database for individual waterbodies for which there is assessment information, and reports the status of water quality for these waters and the status of water quality in Alaska on a statewide basis. Assessments that show impairments (e.g., non-supporting uses or persistent exceedances of WQS and Section 303(d) listed waters), or assessments that report waters are maintaining and attaining WQS, are entered into the database. In addition, the causes (pollutants) and sources of pollution may also be entered into the database. Alaska regularly tracks and reports to EPA on this information. It allows for custom queries enabling the review of data in a variety of ways. The ADB is designed to make this process accurate and straightforward, yet flexible and user-friendly. It also allows Alaska to meet its water quality reporting requirements to EPA under the CWA.

6.3. National Hydrography Dataset

The National Hydrography Dataset (NHD) is a collection of digital line data representing waters throughout the United States. NHD development has been led by the USGS, with support from federal and state agencies including DEC. The NHD provides a uniform and consistent GIS base layer for water and standard database keys (unique identifiers) representing all streams and lakes in Alaska.

EPA has recently developed a new reach indexing tool called the Hydrography Event Management (HEM) tool. The HEM Tool is meant to be used with the NHD dataset to create NHD events for georeferencing waters, such as impaired waters.

The HEM Tool provides full functionality for adding and editing events in the NHD. Events are informational data that are linked to the NHD using a linear referencing system on NHD Flowlines. The use of events is a key characteristic of the NHD by allowing vast amounts of scientific information to be linked to the NHD while keeping the design simple and by making advanced analysis techniques possible. The HEM tool handles all the linear referencing mechanics to make working with events easy. It works on point, line, and area events and allows events to be located interactively, imported, or calculated. A Source Feature ID is created that provides the link between the event location and the informational data tied to the location. It also creates metadata linked to the event. The tool also provides network measuring to determine distances through the NHD Flowline network.

6.4. DROPS Database

DEC uses a facility database, Discharge Permits and Online Permit System (DROPS), to assist WDAP staff in their permitting functions. DROPS is designed for managing permit applications, tracking facility information, generating permits, archiving inspection and compliance information,

generating Discharger Monitoring Reports (DMRs), and storing applicant's monitoring data provided as part of the permitting process. Although almost all the water quality data that may be in the reports is effluent data, some ambient water quality data may be included.

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7. DATA ANALYSIS/ASSESSMENT

7.1. NPS Program Data Analysis

7.1.1. Integrated Report Data Analysis

The Integrated Report is submitted to EPA to comply with the CWA Section 305(b) (State Report on Water Quality) and Section 303(d) (Identification of Impaired Waters). Beginning with the 2002/2003 reporting cycle, the CWA impaired waters list ("Section 303(d) list") and the statewide water quality assessment report ("Section 305(b) report") were integrated into one report, the Integrated Report. In the Integrated Report, all waterbodies are grouped into one of five categories based on available information and the degree to which a waterbody attains water quality objectives. EPA has approval authority over Category 5 waters, which are those waters that are CWA Section 303(d) listed, also known as "impaired" waters. The five waterbody categories and the number of waterbodies in each category are summarized in Table 97.

Table 97: DEC's Integrated Report Waterbody Category Descriptions

Listing Category	Category Definition	Number of Waters Currently in Category
1	Attaining WQS for all designated uses. This category requires that all data and information show that the waterbody is available for all uses.	Majority of Alaska Waters
2	Attaining some designated uses. Insufficient or no data to determine if remaining uses are being attained. Includes waters removed from Category 5.	48
3	Insufficient or no data and information to determine if any designated use is attained.	327
4	Impaired for one or more designated uses but not needing a TMDL.	
4a	TMDL has been completed	37 (for 44 impairments)
4b	Expected to meet standards in a reasonable time.	3
4c	Not impaired by a pollutant.	None
5	Impaired by pollutant(s) for one or more designated uses and requiring a TMDL.	24
Source: DEC, 2012 State of Alaska, FINAL 2012 Integrated Water Quality Monitoring and Assessment Report.		

One of the core performance measures of the Section 305(b) portion of the Integrated Report is reporting the number and percent of assessed river miles, lake acres, and estuary square miles that have water quality supporting designated beneficial uses (EPA 1997). A comparison of river and stream miles assessed in Pacific Northwest states shows that the total number of river and stream miles assessed in Alaska is relatively low. Because of this, DEC needs to focus its limited monetary resources on high priority waters identified through the ACWA process.

Alaska's waterbody assessments consider all existing and readily available data and information, as required by EPA. DEC maintains an ongoing solicitation for waterbody information year-round and continuously strives to identify, access, and make available information that may be used to describe

the total number of un-impaired river miles, lake acres, or estuary square miles assessed throughout Alaska.

Another core performance measure of the Integrated Report is the percent of total river miles and lake acres that have been assessed for the need for fish consumption advisories and compilation of state-issued fish consumption advisory methodologies as reported through the National Listing of Fish and Wildlife Advisories (EPA 1997). Many states issue fish consumption advisories. Currently, DEC's Division of Environmental Health is collecting data on heavy metals and POP concentrations in Alaska's anadromous and resident fish populations. To date, Alaska has not found it necessary to issue fish consumption advisories.

A key purpose of the Integrated Report is to highlight waters that are in need of a TMDL because they are not attaining water quality goals. The preparation of a TMDL document for an impaired water is required by federal law (CWA Section 303(d)). A list of DEC's approved TMDLs can be found on the Division's website (http://dec.alaska.gov/water). Once a TMDL has been implemented, follow-up monitoring and assessment are required for Category 4a waters to verify that the water quality standards and designated uses are being met. DEC makes a concerted effort to monitor Category 3 waters where little or no information exists to make a designated use determination.

7.1.2. **ACWA Process Data Analysis**

The ACWA agencies (DEC, DNR, and DFG) perform a "Stewardship Analysis" and review existing data in order to categorize and rank each waterbody. ACWA identifies impaired waterbodies as surface waters with documentation of actual or imminent "*persistent exceedances"* of water quality criteria, or with adverse impacts to designated uses, as defined in the state's water quality standards. These waters are entered into the Waterbody Recovery Track. Designation of a waterbody as "impaired" does not necessarily indicate that the entire waterbody is affected. In most cases, only a segment of the waterbody is affected. The assessment process identifies the specific segment that is impaired and the corresponding pollutant parameters of concern.

The term, "persistent", is key to determining if a surface waterbody is impaired. Determining "persistent" exceedances of WQS is a waterbody-specific decision that is described in listing methodologies developed for some pollutants but more often requires the application of best professional judgment. The determination is based on a discussion and analysis of a variety of factors including pollutant characteristics (for instance, consideration of the magnitude, frequency, and duration of the pollution event(s)), pollutant sources, size of the waterbody, and the degree of remediation response required. Impairment determinations are based on credible data. "Credible data" means scientifically valid chemical, physical, or biological monitoring data collected under a scientifically accepted sampling and analysis plan, including quality control and quality assurance procedures that are consistent with Alaska's WQS in 18 AAC 70. DEC's sufficient and credible data tables used for evaluating water quality data can be found on the Division's website (http://dec.alaska.gov/water).

7.2. AKMAP Data Analysis

In AKMAP data analysis, procedures for areal extent are directly linked to the survey design phase. Using the EPA survey package within the R statistical program environment and incorporating the design parameters, such as site weights, AKMAP can develop population estimates for the data collected. It is also possible to compare subpopulations or strata in species survey, especially if the design allocated an appropriate number of sites. EPA's Aquatic Resource Monitoring web site (http://www.epa.gov/nheerl/arm) provides detailed information and the supporting software for conducting these analyses.

7.3. Other Data Analysis

EPA recommends that both acute and chronic aquatic life criteria for toxics not be exceeded more than once during a three-year period on average (EPA 2002). An APDES permit may, when appropriate, specify a schedule of compliance leading to compliance with the CWA and all applicable regulations (18 AAC 83.560). Compliance with chronic aquatic life and human health criteria are required to be measured at the boundary of the mixing zone by the permittee (18 AAC 70.255(c)). DEC requires all mixing zone monitoring to be performed at the outer edge of the mixing zone and evaluates wastewater discharge permits for compliance with chronic aquatic life-based and human health criteria on a case-by-case basis. This may require collection, analysis, and evaluation of ambient water quality data in and/or adjacent to the proposed mixing zone.

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8. REPORTING

8.1. NPS Program Reporting

The NPS Program has a number of reports that contain analytical data or evaluations of the data. DEC ensures that all analytical information collected is transmitted to STORET via AWQMS. DEC directly transmits information collected by DEC staff; contractor/grantee data collection may be directly transmitted to STORET or sent to DEC who subsequently uploads to STORET. Data is transmitted irrespective of whether it is collected to determine the basic health of a waterbody under the ACWA program, develop estimates for restoring a waterbody in support of a TMDL, or alert the public to possible health risks under the BEACH program.

In addition to reporting information via the AWQMS database, the ACWA database, TMDL's and the Grants Tracking System (GRTS) all contain water quality monitoring information. These additional reporting tools frequently evaluate the results against Alaska's WQS to determine the health of the water or actions needed to restore the water.

8.2. AKMAP Reporting

AKMAP prepares reports of the data collected through the program's regional coastal and freshwater surveys. Data collected for coastal surveys, including the 2002 South Central, 2004 Southeast, 2009 Kachemak Bay, and the 2006-2007 Aleutian Islands near shore surveys have been compiled and a final report for each survey has been completed. All data was submitted to EPA. Field work has been completed for the 2010-2012 Chukchi Sea survey, and data is undergoing QA reviews. A final report is expected to be issued in 2014. Data collected for freshwater surveys, including: 2004 Interior Wadeable Streams, 2006 Tanana River, 2008 Cook Inlet Lakes, and the 2009 Yukon River surveys have been completed with final reports issued.

In 2011, AKMAP selected the ACP within the NPR as the focus region for the upcoming sampling schedule of NARS. Two surveys in this focus area have been initiated: the 2011 ACP Wetlands and the 2013 ACP Lakes survey. The next survey in this focus region, rivers and estuaries, is in development and is planned for 2015. Data from all surveys will be synthesized to provide a broad overview of the region. Field reports will be completed for each survey, but a combined report will be the final product for this round of surveys. The combined report is expected in 2016.

Data collected from all AKMAP surveys is available upon request. Table 108 lists completed and planned AKMAP surveys.

Table 108: AKMAP Surveys

Coastal Surveys	**Status**
2002 Southcentral	Completed
2004 Southeast	Completed
2006-2007 Aleutians	Completed
2009 Kachemak Bay	Completed
2010-2012 Chukchi Sea	Data Analysis
2014 Offshore Oil and Gas (Harrison Bay)	Planning
Freshwater Surveys	
2004-2005 Tanana Watershed Wadeable Streams	Completed
2006 Tanana River Basin	Completed
2008 Cook Inlet Lakes	Completed
2009 Yukon River	Completed
2011 Arctic Coastal Plain Wetlands	Report Writing
2013 Arctic Coastal Plain Lakes	Data Analysis
2015 Arctic Rivers and Estuaries	Planned
Other Projects	
Advanced Monitoring Initiative *	Completed
*This project evaluated historic datasets for post hoc environmental baseline	

8.3. Other Reporting

The Division has developed Table B-1 (Appendix B) that consolidates the reporting mechanisms for each of the above activities and also identifies other reports that will be generated to track progress towards meeting the objectives of the strategy. In 2020, the Division will develop a minor Strategy update that will include reports on all actions planned in the strategy.

9. PROGRAMMATIC EVALUATION

EPA recommends that states conduct periodic reviews of each aspect of its monitoring program to determine how well each program serves its water quality objectives as outlined in their respective monitoring strategies. EPA also recommends that states have a feedback mechanism for reporting useful information to water quality managers and incorporating their input on future data needs (EPA 2003). Information needs may include site-specific criteria modification studies, support for enforcement actions, validation of success of control measures, modeling for TMDLs, monitoring un-assessed waters, and other activities.

Periodic reviews of the Division's program activities are undertaken to determine how well each program is meeting its water quality decision needs for all state waters. This evaluation is partially accomplished through an annual PPG work plan, developed in conjunction with EPA, which details the objectives and activities to be accomplished under each program within the Division. DEC reports to EPA every six months on the status of PPG-funded activities.

Data gathered by the Division may be used to:

- Determine the extent Alaska's streams, lakes, and coastal waters meet some pre-determined reference or water quality condition;
- Determine if an association exists between the status of aquatic resources and the most important natural or anthropogenic stresses;
- Help to determine the effectiveness of DEC's pollution control measures;
- Revise, develop, or modify existing WQS;
- Help develop new water quality criteria, such as nutrients;
- Integrate repeated AKMAP assessments to assess and forecast trends in monitored indicators into adaptive management practices; and/or
- Evaluate if DEC is making the correct regulatory decisions for protecting Alaska's aquatic resources.

DEC uses data gathered on a large scale to help better understand the overall condition of Alaska's water quality. This allows DEC and other resource managers to: 1) report on the overall condition of Alaskan waters, a responsibility of the CWA; and 2) use the information to make good decisions about our laws and regulations that protect Alaska's water resources.

Table 119: Water Quality Monitoring Strategy Objective Met by Programmatic Evaluation

Strategy Objective	Action/Program	Deliverables/ Media	Measure and Timeframe
10. Implement, review progress and update the Strategy on a regular basis.	A. Provide access to the Strategy to all Division staff, reference it when developing new guidance on ambient water quality data collections, and discuss objectives in the annual Division of Water Managers' Meeting.	Web based access (intra and inter).	• By 2020, complete a minor update of this Strategy focusing on objectives and incorporating new significant sources of ambient data to the Division.
	B. Revise and update the Strategy.	Revised Strategy in 2025, Minor Update in 2020.	• By 2025, complete a major revision of this Strategy, revising all necessary sections and updating objectives.

9.1. NPS Program Evaluation

Data that the NPS Program collects is compiled and reported in a number of documents. As noted earlier, DEC strives to ensure that all analytical results are stored in AWQMS and appropriate parameters are transmitted to EPA's water quality database (STORET). Data may also be used to:

- Determine the overall health of a waterbody. DEC documents these decisions in our Integrated Report;
- Determine actions necessary to restore a waterbody to health. These actions may be outlined in the implementation section of TMDLs or other restoration plans;
- Determine if public health advisories are necessary due to elevated bacteria levels; and/or
- Determine actions necessary to protect healthy or threatened waterbodies.

9.2. AKMAP Evaluation

AKMAP evaluates data collected through its surveys in an effort to describe Alaska's coastal and freshwater conditions for water chemistry, toxic compounds in sediment and fish tissue, and biotic and abiotic conditions. These data may also be used in future focused studies targeting specific locations that exhibit elevated levels of toxic compounds in sediment or fish tissue, show anomalies in benthic infauna, or show anomalies in fish pathology, distribution, or abundance.

9.3. WDAP Evaluation

DEC continues to draft and revise guidance documents and permit checklists to provide policy direction for the APDES Program. The WDAP continues to post various permit development documents on the intranet site instead of developing a written manual for permit writers (see Table B-1, objective 6 in Appendix B). This offers increased efficiencies by eliminating the need to distribute notifications of updates as well as actual updates to staff. The WDAP will maintain an electronic library of documents used in permit development.

The electronic library will include procedures for performing a RPA and establishing WQBELs, procedures for evaluating and authorizing mixing zones, procedures for evaluating and authorizing seafood zones of deposits, procedures for determining compliance with acute and chronic aquatic life-based standards, and other procedures.

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10. GENERAL SUPPORT AND INFRASTRUCTURE PLANNING

The Division implements the Strategy largely through the Water Quality Standards and Restoration Program (WQSAR, primarily through its NPS and AKMAP programs). The WQSAR program has one supervisory position responsible for leading the implementation of this strategy, one QA officer, and full-time managers for NPS, AKMAP, and WQS. The NPS Program has seven full-time staff who perform ACWA waterbody evaluations and manage ACWA projects and contracts, which include waterbody specific monitoring activities. AKMAP has one full time staff member and one intern. WQS has one full time staff member. The Strategy is based on the premise that staffing levels will remain static with the possible addition of seasonal staff or college interns to assist with monitoring projects. Future projects are dependent upon funding. ACWA activities may be expanded or reduced based upon the level of EPA CWA Sections 106 and 319 funding under the Performance Partnership Agreement.

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APPENDIX A

Figures

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Figure A-1: ACWA Decision Tree

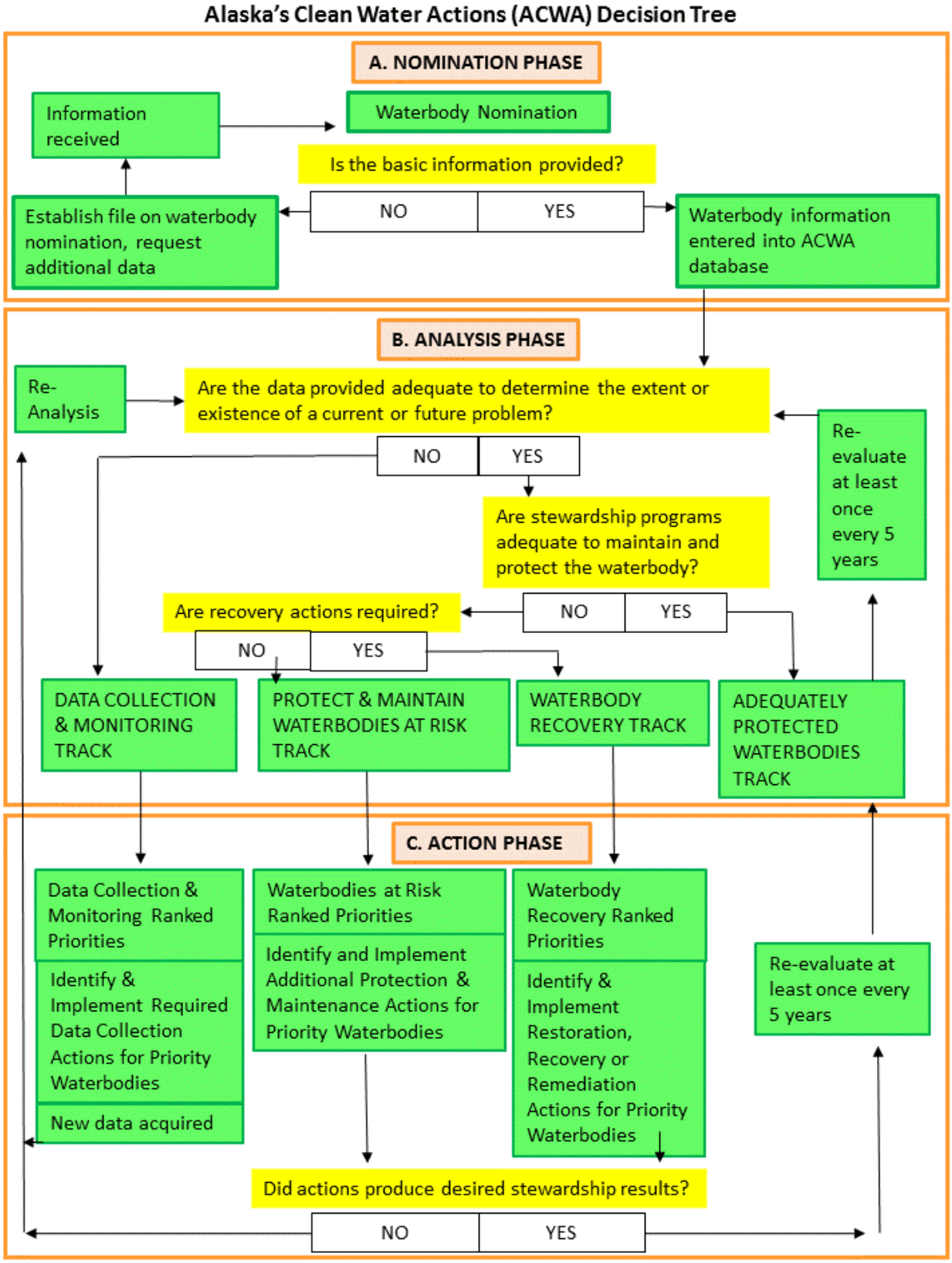

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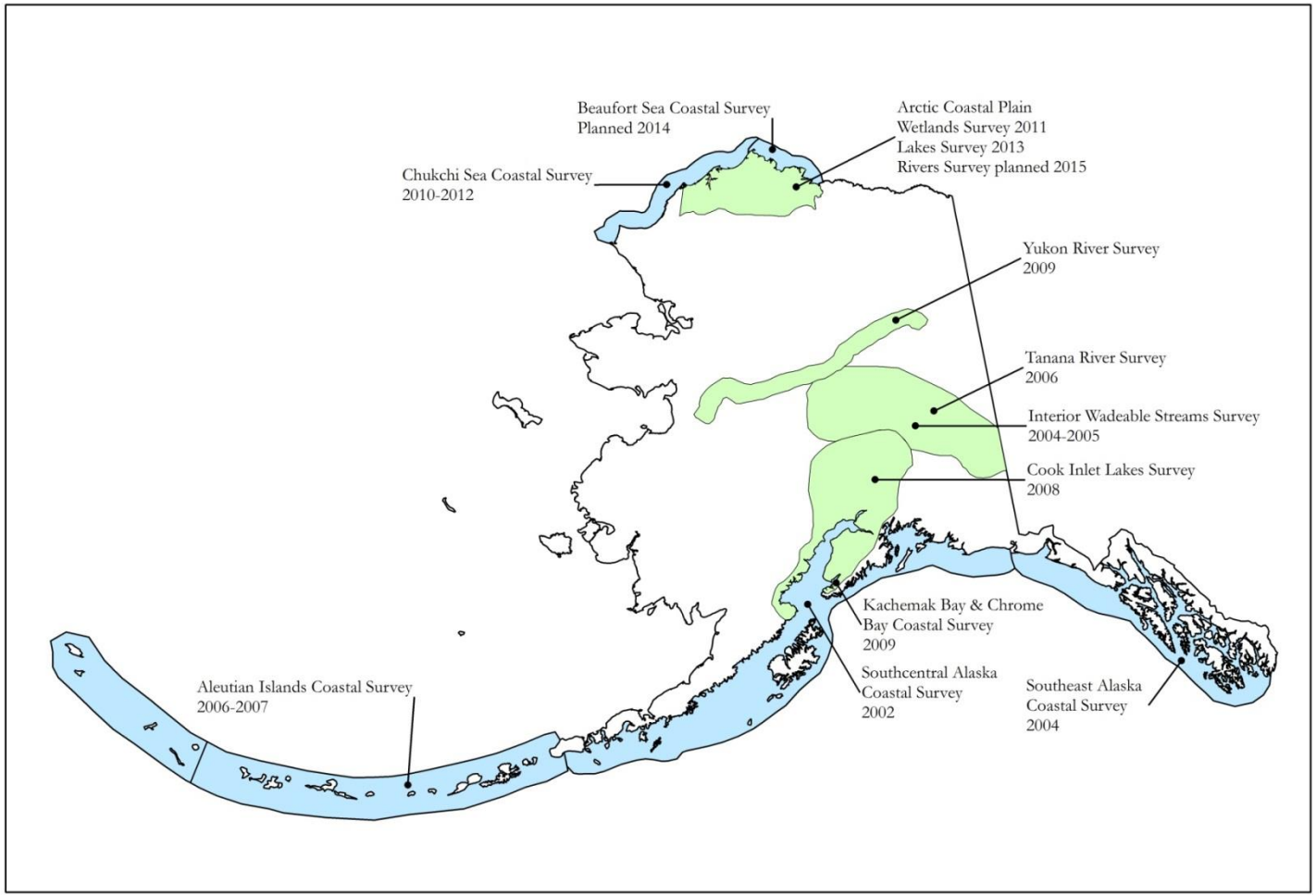
Figure A-2: AKMAP Completed and Planned Surveys



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APPENDIX B

Water Quality Monitoring and Assessment Strategy - Actions and Measurable Objectives

Appendix B: Water Quality Monitoring and Assessment Strategy - Actions and Measurable Objectives

Alaska is unique. Among all other states, Alaska places highest in almost every category related to waters. Alaska has more than 40% of the entire nation's surface water resources including over three million lakes, over 12,000 rivers, thousands of streams and more coastline than the rest of the U.S. put together. Nearly half of Alaska is considered wetlands. The only area where Alaska does not lead the list is in the numbers or percentages of impaired waters.

As a result, Alaska needs to implement statewide monitoring strategy that are designed to monitor a wide range of waters with daunting challenges for data collection, analysis and management. DEC's water quality monitoring efforts require fostering and maintaining partnerships between DEC programs, as well as local state and federal agencies.

Alaska Clean Water Five Year Strategic Plan (FY2016-2020)

In 2015, DEC developed a five year plan for the Nonpoint Source Program integrating both CWA sections 303(d) and 319 national program goals. In the Plan, DEC set a 5-year pollutant focus and seven goals which will be implemented through the actions and task in the tables as shown below.

Pollutant Focus

- Turbidity/sediment
- Toxics (with emphasis on metals and petroleum)
- Bacteria

Goals

1. Increase the amount known about Alaska's waters.
2. Standardize how DEC evaluates information for the purpose of listing and delisting a waterbody on the impaired waterbody list by developing listing methodologies and policy.
3. Increase or continue collaboration with other programs, agencies and community-based organizations.
4. Restore waters that are impaired and keep them healthy once restored.
5. Conduct outreach on best management practices (BMPs) so that urban and industrial development sustains water quality.
6. Keep Our Clean Waters Clean: Highlight and protect healthy waters that are at risk.
7. Keep Our Clean Waters Clean: Educate the public on water quality and smart practices to prevent pollution.

TABLE B-1 - WATER QUALITY MONITORING AND ASSESSMENT STRATEGY - ACTIONS AND MEASURABLE OBJECTIVES

Key Questions	Strategy Objectives	Action/Program	Deliverables/ Media	Measure and Timeframe	Five Year Plan[1] Goals
I. What is the overall quality of waters in the State?	**1. Determines the extent to which Alaska's waters meet the objectives of the Clean Water Act, attain applicable water quality standards, and provide for the protection and propagation of balanced populations of fish, shellfish, and wildlife.**	A. Use the biennial Integrated Report to provide an evaluation and description of Alaska's waters. NPS and AKMAP.	Integrated Report.	Complete biennial Integrated Report including: • assessments of waters that are impaired or attaining WQS, and • updated information on regional baseline assessments and long-term trends, as available.	1,2,3,4,6
		B. Develop Ambient Water Quality Monitoring Index of the Division files, databases and websites identifying where ambient water quality data exists for Alaska's waters. The index will list sources of data, watershed/waterbody, period when information was collected, parameters collected, and how to access data. This index will be used in prioritizing data sets for data entry into AWQMS on a case by case basis, for example when data is identified to be useful to development of a TMDL, WQS, trend analysis, etc. AKMAP.	Index for historic (pre-2015) ambient water quality data storage locations.	• By 2020, compile index for historic ambient water quality data storage locations in DEC programs and, where accessible, external agencies. • In 2020, minor Strategy update, set Division priorities and define next steps including prioritizing data sets of interest to the Division, identification of resources needed for AWQMS entry, FTE estimates, and maintenance needs of the Index.	1,3

[1] DEC. 2015. Alaska Clean Water Five-Year Strategic Plan (FY2016-2020).

Key Questions	Strategy Objectives	Action/Program	Deliverables/ Media	Measure and Timeframe	Five Year Plan[1] Goals
II. To what extent is water quality changing over time?	**2. Assess and describe baseline and long-term trends for Alaska's waters.**	A. Develop and implement a long-term plan for assessing and reporting regional baseline and long term trends of water quality. Plan will be coordinated by AKMAP and will address regional data needs, priorities, methods, timing, and resources needed by various programs within the Division. AKMAP, NPS and WDAP.	Long-term monitoring plan.	• By 2020, complete initial plan for long-term monitoring for addressing gaps in regional baseline and long-term trends. • In 2025 Strategy update, discuss implementation of long-term plan.	1,3,4
		B. Select the focus region(s) for the 2017-2021 AKMAP survey cycle, and produce comprehensive regional report based on current 5-6 year survey cycle. AKMAP.	EPA CWA 106 Strategy reporting.	• By 2016, select focus area(s) for next 5 year plan for AKMAP surveys. • By 2020, report summarizing 2010-2016 AKMAP surveys will be completed.	1,3,6
		C. Improve GIS tools and procedures to track progress on TMDL implementation and waterbody restoration.		• By 2018, identify potential GIS based options that use water quality data to track progress on TMDL implementation.	1,2,4
III. What are the problem areas and areas needing protection?	**3. Identify those Alaskan waters that are not meeting Alaska's WQS.**	A. Evaluate extent to which Alaska's waters are impaired for designated uses and report waterbody status in biennial Integrated Report. NPS.	Integrated Report, Waterbody categories 4 and 5. CWA 303(d) list.	• Integrated Report is completed biennially, and includes updated information on waters that need restoration.	1,4

Key Questions	Strategy Objectives	Action/Program	Deliverables/ Media	Measure and Timeframe	Five Year Plan[1] Goals
III. What are the problem areas and areas needing protection? (continued)	**3. Identify those Alaskan waters that are not meeting Alaska's WQS. (continued)**	B. Increase the number of at risk waters the Division collects data on that are currently category 3 waters (insufficient information). NPS.	Waterbody Categories 2 through 5 in biennial Integrated Report. CWA 303(d) list.	• By 2020, waterbody assessments will be made on at least 5 threatened waterbodies to determine impairment or attainment of designated uses, moving them from category 3 into appropriate category.	1,6
	4. Develop consistent monitoring approaches for assessing potentially impaired waters.	A. Develop listing methodologies for pollutants causing common impairments including monitoring protocols in the Integrated Report. NPS.	Public noticed Standard Listing Methodologies and referenced in Integrated Report.	• By 2020, develop standardized approach to listing methodologies and monitoring protocols for common pollutants.	1,2
		B. Develop guidelines for using biological assessment information to supplement water quality data in CWA Section 303(d) listing decisions.		• By 2020, supplement water quality impairment decisions with use of biological data.	
		C. Develop procedures for using map or remote sensing based risk factors (e.g. impervious surfaces/roads, disturbed/cleared ground, water temperature) to conduct screening level watershed risk assessments.		• By 2020, use remote sensing data to help identify at-risk waters and supplement water quality data.	1,6

Key Questions	Strategy Objectives	Action/Program	Deliverables/ Media	Measure and Timeframe	Five Year Plan[1] Goals
IV. What level of protection is needed?	**6. Develop new or revised WQS based on data collected from Alaskan waters.**	D. Through triennial review, evaluate new EPA-recommended revisions to WQS criteria and combined with an evaluation of existing ambient water quality data determine which revised criteria, if adopted, appear appropriate and reasonably attainable in Alaska. WQS.	Triennial Review of WQS.	• As guided by Triennial Review planning and priorities, evaluate available ambient water quality data for criteria when considering WQS revisions.	1,2
		E. Upon application, develop Use Attainability Analysis and Site-Specific Criteria to determine whether modification or removal of uses and criteria are appropriate based on available water quality data including information submitted by the applicant. WQS.	Use reclassification and site specific criteria adopted in Alaska WQS.	• As needed, adoption of site specific uses and/or criteria in Alaska WQS criteria submitted to EPA for approval.	1,2
		F. Through use of implementation methods outlined in the antidegradation regulation at 18 AAC 70.015 and 70.016, complete (1) Tier 1 existing use analysis; (2) de minimus finding(s); and (3) Tier 2 assimilative capacity findings. Develop guide for using ambient monitoring data in Tier 1 and Tier 2 antidegradation analyses for APDES permits. WQS and WDAP.	Guide for using ambient monitoring data for antidegradation analysis.	• By 2020, guide will be complete for incorporating ambient data into antidegradation analysis. • In 2020 minor Strategy update, discuss of progress and next steps.	1,2

Key Questions	Strategy Objectives	Action/Program	Deliverables/ Media	Measure and Timeframe	Five Year Plan[1] Goals
V. How effective are clean water projects and programs?	**6. Gather and use ambient water quality information to** • **develop and refine point source permit effluent limits and conditions;** • **design and recalibrate mixing zone dimensions for wastewater permits;** • **implement antidegradation analysis; and** • **assess permit compliance.**	A. Develop guides for permitters and permittees for baseline data gathering needed for permit applications. Guides will identify potential data needs (types, quantities, timing), appropriate collection and analytical methods, training on methods, and quality assurance and reporting considerations appropriate for different permit sectors. WDAP.	Guide for ambient water quality monitoring methods on DEC Water Intranet.	• By 2020, Guide complete and available to DEC permit staff and permittees. • In 2020 minor Strategy update, discuss progress and next steps.	N/A
		B. Maintain an electronic library of documents used in permit development. The electronic library will include permit guidance for obtaining the appropriate wastewater permit and permit process maps, procedures for performing a Reasonable Potential Analysis and establishing WQBELs, procedures for designing and sampling a mixing zone, procedures for determining compliance with acute and chronic aquatic life-based, among other procedures. WDAP.	Electronic library of permit development guidance documents on DEC Intranet.	• By 2020, the electronic library will include all documents needed by DEC permitters that provide clear and easily understood guidance for determining and collecting appropriate ambient water quality monitoring information for permits. • In 2020 minor Strategy update, discuss progress and next steps.	N/A

Key Questions	Strategy Objectives	Action/Program	Deliverables/ Media	Measure and Timeframe	Five Year Plan[1] Goals
V. How effective are clean water projects and programs? (continued)	**6. Gather and use ambient water quality information (continued)**	C. Develop guides for permitters and permittees for baseline data gathering needed for permit applications. Guides will identify potential data needs (types, quantities, timing), appropriate collection and analytical methods, training on methods, and quality assurance and reporting considerations appropriate for different permit sectors. WDAP.	Guide for ambient water quality monitoring methods on DEC Water Intranet.	• By 2020, Guide complete and available to DEC permit staff and permittees. • In 2020 minor Strategy update, discuss progress and next steps.	N/A
	7. Identify and target restoration of priority waters as identified through the ACWA process to • **establish TMDLs;** • **evaluate the response of a waterbody to load reductions and BMPs; and** • **determine the effectiveness of BMPs.**	A. Use ACWA to prioritize waters and manage and share information on water quality. Use ACWA process to identify Alaskan waters that need actions for (1) waterbody recovery, (2) protection, and (3) data collection and monitoring. Use ACWA database to track and plan actions on all nominated ACWA waters. NPS.	Annual ACWA grant solicitation and list of high priority actions and waters.	• Collect monitoring data necessary to support development or of two TMDLs or other watershed plan per year. • Conduct one monitoring project per year to measure effectiveness of BMPs.	1,4,5,6

Key Questions	Strategy Objectives	Action/Program	Deliverables/ Media	Measure and Timeframe	Five Year Plan[1] Goals
V. How effective are clean water projects and programs? (continued)	**8. Ensure data quality and consistency throughout the Division's water quality programs.**	A. All Division programs generating, using, or requiring collection of ambient water quality data will use Division Water Programs Quality Management Plan (WPQMP) to properly determine data uses, collect data of known quality, use appropriate QAPPs and methods, conduct regular audits, assure that proper training occurs before data collection, report and manage data. EPA and the Division's QA Officer review and update the WPQMP and evaluate and report on the Division's program's adherence to WPQMP. QA Officer.	EPA Quality Systems Review report. Updated WPQMP. Semi-annual PPG report.	Every 3 years • EPA's Quality Systems Review reports find no substantial deficiencies in the Division's quality systems. • EPA approves updated WPQMP. Every year • QAPPs reviewed and field audits conducted in accordance with annual PPG workplan.	1,2
		B. Collaborate with other agencies, public organizations, and industry to provide training and sampling protocols for monitoring ambient water quality. Division will help identify appropriate training for monitoring, how it can be obtained, and mechanisms for delivering it. NPS, AKMAP and QA officer.	Division's semi-annual PPG Report	• By 2020, provide two training events for ambient water quality monitoring, send 3 key staff to advanced monitoring training or conferences.	1,2
	9. Improve the data management and accessibility of ambient water quality data received or collected by the Division's water quality programs.	A. Provide AWQMS training to new and existing staff from WQSAR, WDAP, Compliance and CPVEC programs and Division QA Officer. Provide training to public user groups interested in using or submitting information in DEC's AWQMS. NPS, AKMAP and WDAP.	Increase user base and knowledge of AWQMS within the Division.	• By 2020, Division staff are able to access AWQMS, upload and retrieve data, and complete QA reviews. By 2025, provide training to public user groups.	1

Key Questions	Strategy Objectives	Action/Program	Deliverables/ Media	Measure and Timeframe	Five Year Plan[1] Goals
V. How effective are clean water projects and programs? (continued)	**9. Improve the data management and accessibility of ambient water quality data received or collected by the Division's water quality programs. (continued)**	B. Develop AWQMS templates for major mining and cruise ship permits to ease loading of ambient data into AWQMS including mixing zone edge data. Load current ambient water quality data from WDAP major mining dischargers and CPVEC dischargers into AWQMS from dischargers with permits requiring ambient data. WDAP, Compliance and CPVEC.	Process for incorporating data from major mining and cruise ship permits. AQWMS templates. Data uploaded in AWQMS.	• By 2020, a process and AWQMS data templates will be developed to incorporate these new data sources into AWQMS. • By 2020, WDAP will have identified pilot projects and have started uploading data from those projects. • In the 2020 minor Strategy update, discussion of progress and a review of objectives will be included. • The 2025 Strategy update will evaluate the steps and resources necessary to upload data from major mining and CPVEC permittees.	N/A
		C. Create external portal for data retrieval, viewing, and downloading by the general public of approved AWQMS data and AWCA nominated waters. NPS, AKMAP, WDAP, and CPVEC.	Web based access for the public to ambient water quality data.	• By 2020, the public will be able to access and retrieve data from AWQMS.	1
		D. Create external portal for public entry of ambient water quality data into AWQMS. This data will be clearly distinguished from DEC collected data and will include appropriate quality assurance qualifiers. NPS, AKMAP, WDAP, Compliance and CPVEC.	Web based access for the public to ambient water quality data.	• By 2025, after training the public including grantees, permittees, agencies, and other public users will be able to input data into AWQMS through a web based portal.	1

Key Questions	Strategy Objectives	Action/Program	Deliverables/ Media	Measure and Timeframe	Five Year Plan[1] Goals
V. How effective are clean water projects and programs? (continued)	**10. Implement, review progress and update the Strategy on a regular basis.**	A. Provide access to the Strategy to all Division staff, reference it when developing new guidance on ambient water quality data collections, and discuss objectives in the annual Division of Water Managers' Meeting.	Web based access (intra and inter).	• By 2020, complete a minor update of this Strategy focusing on objectives and incorporating new significant sources of ambient data to the Division.	N/A
		B. Revise and update the Strategy.	Revised Strategy in 2025, Minor Update in 2020.	• By 2025, complete a major revision of this Strategy, revising all necessary sections and updating objectives.	N/A