

Alaska Water Quality Monitoring & Assessment Strategy

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



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Appendix A: Water Quality Monitoring and Assessment Strategy – Actions and Measurable Objectives

ACRONYMS

- AAC Alaska Administrative Code
- ACWA Alaska’s Clean Water Actions Program
- WQMA 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
- CWA Clean Water Act
- DEC Alaska Department of Environmental Conservation
- DFG Alaska Department of Fish & Game
- DO Dissolved Oxygen
- DOC Dissolved Organic Carbon
- DNR Alaska Department of Natural Resources
- EDD Electronic Data Deliverable
- EPA U.S. Environmental Protection Agency
- GIS Geographic Information System
- NARS National Aquatic Resource Surveys
- NHD National Hydrography Dataset
- NOAA National Oceanic & Atmospheric Administration
- NPDES National Pollutant Discharge Elimination System
- NPS Non-Point Source
- PPG Performance Partnership Grant
- QA Quality Assurance
- QAPP Quality Assurance Project Plan
- TDS Total Dissolved Solids
- TMDL Total Maximum Daily Load
- TOC Total Organic Carbon
- UA University of Alaska
- 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

MONITORING PROGRAM STRATEGY

Introduction

The Alaska Department of Environmental Conservation (DEC or Department), Division of Water (Division) 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 considerate of and reflecting Alaska’s unique needs and challenges. The Division’s original Strategy was published in 2005 and in 2015, the Strategy underwent a major update. This minor update provides a general roadmap of how the Division intends to conduct ambient water quality monitoring from 2020 through 2025.

The purpose of the Strategy is:

1. to provide a 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 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.

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).

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 includes evaluation of ambient water quality as well as projects that

target analysis of waterbodies to determine potential pollution sources. The Integrated Report is discussed throughout the Strategy and in detail in the Data Assessment section.

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, managed by DEC, funds priority projects with monies coming from multiple state and federal sources. The ACWA process is described in more detail throughout the Strategy.

DEC applies a Consolidated Assessment & Listing Methodology (DEC 2019) approach, based on EPA guidance (EPA 2002), as a framework for evaluating how water quality data should be collected, analyzed, and used for environmental decision making. This approach is used to develop and biennially 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. DEC follows guidance set forth in the CALM, while recognizing that there are different methods 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.

MONITORING OBJECTIVES

The Division of Water (Division) is the primary division within DEC responsible for ambient water quality monitoring, assessment, and protection. It sets the following water quality monitoring objectives:

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. Develop consistent monitoring approaches for assessing and remediating potentially impaired waters.
4. Ensure data quality and consistency throughout the Division’s water quality programs.
5. Improve the data management and accessibility of Alaska’s water quality data.

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 A-1 (see Appendix A).

The Division is comprised of several programs, one of which is directly involved in water quality monitoring and assessment activities: Water Quality Standards, Assessment, and Restoration (WQSAR). Individual sections within the program coordinate their monitoring and assessment responsibilities to the extent practicable. Therefore, the monitoring and assessment activities, as described below, are presented with the understanding that some of these activities may be jointly administered under more than one section. Other programs may also conduct activities that supplement, support, or coordinate with the WQSAR program.

The Strategy reflects the Division’s updated organizational structure as of 2020. More information about the Division and its programs can be found on the Division’s website.¹ 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.²

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 biennial Integrated Report, the semi-annual

¹ Alaska Department of Environmental Conservation, Division of Water webpage: <http://dec.alaska.gov/water>

² Alaska Department of Environmental Conservation webpage: <http://dec.alaska.gov/index.htm>

Performance Partnership Grant (PPG) report, the Nonpoint Source 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, Table A-1 includes information on how and when the progress on the action will be reported.

Monitoring Design

Alaska is rich in aquatic resources. 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.

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

Waterbody specific information is required to assess whether a waterbody is attaining WQS or whether it requires active stewardship, protection, or restoration. Water quality information may also support other programs, and serves as a basis for making permitting decisions. DEC employs three basic monitoring designs to accomplish its monitoring objectives.

1. Probabilistic/Randomized Designs in which all waters of a certain category (lakes, streams, rivers, coastal areas, etc.) located within a specific eco-region or larger watershed 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 uses probabilistic monitoring in its Water Quality Monitoring and Assessment (WQMA) program to assess the overall status and trends of Alaska's marine and freshwater resources.
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, development of a watershed plan, long-term trends, or permit conditions and limits. DEC uses a targeted approach in its NPS program when assessing point source and nonpoint source water

pollution, respectively. DEC also uses a targeted approach with its WHADA program for high priority watershed evaluations.

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 by the NPS program in implementing DEC's BEACH program.

By using these design approaches to accomplish the monitoring objectives set forth in this Strategy, the information gathered can then be 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 approaches to meet their programmatic needs. Individual water monitoring activities can be used to address more than one monitoring objective. The different types of monitoring are not mutually exclusive, nor are they independent.

Water Quality Assessment, Monitoring and Standards (WQSAR)

DEC's Water Quality Standards, Assessment, and Restoration program responsibilities include establishing legally defensible water quality standards, conducting monitoring, reducing and preventing nonpoint source pollution, ensuring water quality data meet quality assurances goals, and assessing the health of Alaska's waters for the Integrated Report.

The Clean Water Act (CWA) mandates that each state develops a program to monitor and report on the quality of its waters and prepare a report describing the status of its water quality (Integrated Report). The relevant CWA sections are Section 305(b), which requires that the quality of all waterbodies be characterized, and Section 303(d) which requires that states list any waterbodies that do not meet water quality standards (known as polluted or impaired waters). Ambient water quality data collected or received through WQSAR, WDAP or other DEC programs feed into the Integrated Report.

The monitoring and assessment functions described above are carried out by several sections within WQSAR.

Water Quality Monitoring and Assessment (WQMA)

While the monitoring and assessment effort is led by WQMA, both the NPS and WQMA sections contribute to collection of water quality information. WQMA manages several projects that conduct water quality monitoring.

Regional Surveys

Initial surveys were modeled after EPA's Environmental Monitoring and Assessment Program (EMAP), renamed to National Aquatic Resource Surveys (NARS), and adapted to include the unique conditions found in Alaska. WQMA implements 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. Data collected have been utilized by natural resource managers for permit limitation, water quality

standards development, compliance assistance, and to fulfill Integrated Reporting requirements. WQMA has conducted 17 regional surveys to date.

While there are no immediate plans for future surveys, DEC intends to utilize the expertise gained to conduct regional or watershed based surveys as part of the Watershed Health Assessment and Data Analysis program in the future.

Watershed Health Assessment and Data Analysis

DEC began a pilot effort to assess the health of high priority waterbodies across the state in 2020. This effort focuses on watersheds that are representative of the regional conditions, including reference and urbanized land use. Waterbodies are sampled in a statistically-valid manner ensuring the minimum sampling requirements outlined in the CALM are met, using a combination of NARS, USGS, and BLM standard methods. WHADA was initially implemented using a targeted design approach which included one impacted and one reference site per watershed. DEC intends to scale up to include probabilistic randomized design to evaluate baseline conditions at the larger watershed scale in the next 5-10 years.

Ambient Harbor Monitoring

DEC began conducting water quality monitoring in select harbors in 2015 to acquire data to support DEC understanding of marine background conditions and to be used in the development of the APDES General Permit for cruise ships. A grid was initially developed for select cruise ship harbors (three to five annually), and sites sampled were randomly selected from the grid each year. In 2019, the Alaska Legislature appropriated additional funds for an expanded survey during the summer of 2020 and 2021. This expanded survey adds common shipping corridors and other concentrated boating areas to the areas monitored. Additional sites were hand-picked to ensure high use areas were captured. Although this work was planned prior to the COVID-19 pandemic, the limited number of cruise ship voyages provides DEC a unique opportunity to compare years with little to no ship activity to future years when increased ship activity resumes. The expanded survey is planned for 18 harbors in Alaska in 2021. This work is funded intermittently and will continue as funding and resources allow.

Supplemental Monitoring

DEC occasionally conducts supplemental monitoring to inform management decisions. These surveys are typically funded through unique opportunities, are not re-occurring, and short in duration. Projects of this nature may utilize any of the three sampling approaches: targeted, probabilistic or census. Examples include a probabilistic survey of nutrients in the Matanuska-Susitna lakes, census of bacteria levels in Anchorage waterbodies, and a targeted survey of Chena Slough during *Elodea* eradication efforts. A potential future supplemental survey is a probabilistic survey of harmful algal blooms in Anchorage lakes. Supplemental monitoring is at management request and/or prioritized based on evaluation of waterbody value, potential threats and impairment status.

Nonpoint Source (NPS)

The overarching goal of the NPS Program is to protect and restore Alaska’s water quality from the harmful effects of nonpoint source pollution. While the majority of Alaska is undeveloped and relatively pristine, in populated areas 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.

The NPS Program coordinates ACWA, develops and implements waterbody recovery plans, manages the BEACH Program, supports development of bioassessment indices, 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.

The primary objectives of Alaska’s NPS Strategy are:

1. Protect healthy waters and restore impaired waters
2. Monitoring waters for nonpoint source pollution and effectiveness of best management practices
3. Develop and strengthen partnerships
4. Improve water quality through increased stewardship and public involvement
5. Share information (reporting and accountability)

Collaborative Opportunities

In addition to the ambient monitoring programs of the Division, other DEC programs collect water quality information. For example, 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 Department 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.

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. WQMA engages with multiple partners as part of the Integrated Report “call for data” and water quality data evaluation and the NPS program frequently partners on water quality protection and/or restoration projects through ACWA.

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. DEC does not have an overarching set of core or supplemental indicators that are routinely used. Instead, each Program identifies indicators necessary to meet the goals of specific projects or monitoring activities.

WQSAR Indicators

Indicators allow WQSAR to evaluate effects of multiple stressors, such as chemical contaminants and other human activities, on the biological communities.

WQMA core and supplemental indicators are based on the overall suite of NARS indicators, but may be adapted to meet environmental concerns specific to Alaska's waters and logistical constraints due to the remoteness of field sites. Core indicators are the minimum requirement of any monitoring effort and supplemental indicators may be added to provide a more robust look at environmental conditions. The list is not intended to be all inclusive; depending on project needs other indicators not listed here may be selected.

Table 1. WQMA marine core indicators

Water	Biological
Ammonia-N	Fecal coliform
Dissolved and total Cu	Enterococci
Dissolved and total Ni	
Dissolved and total Zn	
Water temperature	
pH	
Salinity	
Dissolved oxygen	

Table 2. WQMA freshwater core indicators

Water	Physical Habitat
Temp	Air temp
Dissolved Oxygen	Weather
pH	Canopy cover
Conductivity	Buffer width and condition
Turbidity	Trash coverage
	Depth and width

Table 3. WQMA freshwater supplemental indicators

Water	Physical Habitat	Biological
Nitrate	Flow	E-coli
Nitrite	Fish cover	Fecal
Total Phosphorus		Macroinvertebrates
Metals (Dissolved), Hg		
Hardness		
DOC		

NPS indicators 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 for Total Maximum Daily Load (TMDL) or alternate watershed plan development and implementation. Depending on the pollutant of concern, additional indicators may be required.

Table 4. NPS indicators

NPS Concern	Indicators
Pathogens	Fecal coliform, E. coli or enterococci, time, water temperature
Turbidity	Turbidity, time, depth
PAH	PAH, temperature, pH
Metals	Metal of concern, temperature, alkalinity, DOC, hardness, pH
Nutrients	Nutrient(s), temperature, pH
Dissolved oxygen	Dissolved oxygen, temperature, time, depth

QUALITY ASSURANCE

The Division developed and adopted a Water Programs Quality Management Plan ((WPQMP) DEC 2010), which outlines a systematic approach to quality assurance (QA) in 2010. 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 (EPA 2001).

Documents describing the Division’s Quality Assurance program, such as the management plan, can be viewed and downloaded on DEC’s Water Quality Assurance website.³

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, Native Alaskan tribal entities, businesses such as consulting firms, and volunteer and non-profit organizations. Sources of water quality data and information in Alaska are extensive. The challenge 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.

AWQMS is the repository for surface water quality data for the Division. Water quality data received through DEC funded projects and data provided to DEC that is not otherwise publicly available are uploaded into the AWQMS database. The AWQMS database was designed to store water quality data locally and to submit data to EPA’s Water Quality Exchange (WQX).

³ Alaska DEC, Division of Water Quality Assurance webpage: <https://dec.alaska.gov/water/water-quality/quality-assurance/>

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 the Water Quality Exchange (WQX). Data stored in AWQMS is available to all DEC staff and the public by request. 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 WQX to be entered into specific data fields. Data submitted undergoes QA review before it is loaded into AWQMS. Once entered, the data goes through additional QA before being submitted to WQX.

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.

DATA ASSESSMENT

Data analysis is performed primarily by WQMA as part of the Integrated Report. Additional data analysis methods may be employed for regional surveys, watershed planning and/or TMDL development, or permit development.

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). 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 WQS. 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 as of the most recent EPA approved Integrated Report are summarized in **Error! Reference source not found.5**.

Table 5: DEC's Integrated Report Waterbody Category Descriptions (DEC 2020)

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 supports all uses. Alaska does not currently use this category.	NA
2	Attaining some designated uses. Insufficient or no data to determine if remaining uses are being attained. Includes waters removed from Category 5.	77
3	Insufficient data and information to determine if any designated use is attained.	455
4	Impaired for one or more designated uses but have one of several different types of waterbody recovery plans.	
4a	TMDL recovery plan has been completed	43
4b	Enforceable actions and plan in place and expected to meet standards in a reasonable time.	25
4c	Not impaired by a pollutant. Alaska does not currently use this category.	NA
5	Impaired by pollutant(s) for one or more designated uses and requiring a TMDL.	9

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.

A key purpose of the Integrated Report is to highlight waters that are in need of a TMDL or other recovery plan because they are not attaining WQS. The preparation of a TMDL or alternate watershed plan for an impaired water is required by federal law (CWA Section 303(d)). A list of DEC’s approved TMDLs or watershed plans can be found on the Division’s website. Once a TMDL or other plan has been implemented, follow-up monitoring and assessment are required for

Category 4a or 4b waters to verify that the water quality standards and designated uses are improving.

The term, "persistent", is key to determining if a surface waterbody is impaired. Determining "persistent" exceedances of WQS is a waterbody-specific decision. Alaska's CALM and parameter specific listing methodologies describe the data review and evaluation process. The determination is data driven and based on analysis of factors including pollutant characteristics and consideration of the magnitude, frequency, and duration of the pollution event(s). Impairment determinations are based on credible data and data quality objectives are described in the CALM. "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.

Waterbody Assessment

DEC organizes water quality data for waterbody assessments geographically starting with the HUC10 watersheds. Assessment Unit Identifiers (AUIDs) provide a process and format that is accurate, durable and simple as Alaska's hydrographic data are continuously revised and improved. AUIDs follow a simple naming convention beginning with the HUC10 identifier with optional suffixes to further subdivide the waterbody (ACCS, 2020).

Data within a particular AUID will be assessed with respect to WQS to determine attainment or impaired status. Waterbodies may be segmented so that all data considered for a particular assessment are representative of the area in question. The assessment process identifies the specific segment that is impaired and the corresponding pollutant parameters of concern. This process is data driven and requires a minimum number of data points over a two year period to qualify for assessment.

Regional survey assessment

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, WQMA 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 site⁴ provides detailed information and the supporting software for conducting these analyses.

⁴ EPA National Aquatic Resource Surveys webpage: <https://www.epa.gov/national-aquatic-resource-surveys>

REPORTING

WQMA Reporting

WQMA prepares reports of the data collected through the program's regional surveys and targeted monitoring projects. All data is submitted to EPA through AWQMS and final reports are posted on DEC's webpage and uploaded to How's My Waterway. Survey summaries and assessment feed into the Integrated Report database (ATTAINS) to report on regional waterbody health. Survey information and reports can be found on DEC's website.^{5,6} Data collected from all WQMA surveys is available upon request. Table 7 lists completed and planned WQMA surveys.

Table 6: WQMA Surveys

Coastal Surveys	Status
2002 Southcentral	Completed
2004 Southeast	Completed
2006-2007 Aleutians	Completed
2009 Kachemak Bay	Completed
2010-2012 Chukchi Sea	Completed
2014 Offshore Oil and Gas (Simpson Lagoon)	Completed
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	Completed
2013 Arctic Coastal Plain Lakes	Completed
2015 Arctic Rivers	Completed
2016 Arctic Estuaries	Completed
2017 SE Lakes	Report writing
2018 SE Rivers	Report writing
2019 SE Wadeable Streams	Report writing
Other Projects	
Advanced Monitoring Initiative *	Completed
SE Data Mining Initiative	Completed
*This project evaluated historic datasets for post hoc environmental baseline	

⁵ Alaska DEC, Alaska Monitoring and Assessment Program Surveys webpage: <https://dec.alaska.gov/water/water-quality/monitoring/surveys/>

⁶ Alaska DEC, Water Quality Reports webpage: <https://dec.alaska.gov/water/water-quality/reports/>.

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 WQX via AWQMS. DEC directly transmits information collected by DEC staff; contractor/grantee data collection may be directly transmitted to WQX or sent to DEC who subsequently uploads to WQX. 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, TMDL's, and EPA's 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.

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 WQMA 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.

WQMA Evaluation

WQMA 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.

NPS 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 WQX. 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.

GENERAL SUPPORT AND INFRASTRUCTURE PLANNING

The Division implements the Strategy largely through the Water Quality Standards and Restoration Program (WQSAR, primarily through its WQMA and NPS programs). The WQSAR program has one supervisory position responsible for leading the implementation of this strategy, one QA officer, and full-time managers for WQMA, NPS, and WQS. WQMA has two full time staff members and one intern. The NPS Program has four full-time staff who perform ACWA waterbody evaluations and manage ACWA projects and contracts, which include waterbody specific monitoring activities. 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

Water Quality Monitoring and Assessment Strategy - Actions and Measurable Objectives

2020-2025

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

The monitoring program is designed to meet CWA objectives and answer the five key questions below (EPA 2003). For each question, the table describes the strategy objective and actions that are the program building blocks to achieve that objective. 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. Existing reporting mechanisms include the biennial Integrated Report, the semi-annual Performance Partnership Grant (PPG) report, the Nonpoint Source 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.

Key Questions	Strategy Objectives	Action/Program	Mechanism/Timeframe
<p>I. What is the overall quality of waters in the State?</p>	<p>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.</p>	<p>A. Use the biennial Integrated Report to provide an evaluation and description of Alaska’s waters. NPS and WQMA.</p>	<p>Integrated Report, every two years.</p>
		<p>B. Develop a data management workflow to improve data oversight, processing, and timely import to EPA database(s). The workflow will include a tracking mechanism including the status of projects and improve staff and public access to data. WQMA.</p>	<p>Implement workflow, by 2025</p>

Key Questions	Strategy Objectives	Action/Program	Mechanism/Timeframe
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 WQMA and will address regional data needs, priorities, methods, timing, and resources needed by various programs within the Division. WQMA, NPS.	Included in IR by 2026 cycle.
		B. Select the focus region(s) for the 2017-2021 WQMA survey cycle, and produce comprehensive regional report based on current 5-6 year survey cycle. WQMA.	Regional reports, 2022.
		C. Improve GIS tools and procedures to track progress on TMDL implementation and waterbody restoration. NPS.	NPS Strategy, by 2025.
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. WQMA.	IR, every two years.
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). WQMA.	IR, every two years.

Key Questions	Strategy Objectives	Action/Program	Mechanism/Timeframe
	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. WQMA.	As needed.
		B. Develop guidelines for using biological assessment information to supplement water quality data in CWA Section 303(d) listing decisions. WQS.	Guidelines, by 2025.
		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. NPS	NPS Strategy, by 2022.
IV. What level of protection is needed?	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, every three years.
	6. Develop protection and recovery plans through partnerships and ACWA grant projects with impacted communities.	B. TMDL/waterbody recovery plans are developed for 303(d) waterbodies. NPS.	See TMDL schedule in the IR.

Key Questions	Strategy Objectives	Action/Program	Mechanism/Timeframe
		C. Protection plans and combination protection/restoration watershed plans are developed through a community led process for AWCA high priority waters. NPS.	See TMDL schedule in the IR and ACWA grant solicitation/awards.
V. How effective are clean water projects and programs?	7. Gather and use ambient water quality information to measure effectiveness of projects and planning efforts.	A. The IR is updated every other year to include new information and current waterbody status. WQMA.	IR, every two years.
		B. Historic waterbody recovery plans and TMDLs are evaluated with each IR cycle. If new information indicates additional actions are needed or that the waterbody is now meeting standards, the plans will be reviewed and modified as necessary.	IR, every two years.
		C. Listing methodologies are updated to reflect changes in WQS and/or to provide guidance on additional types of data. WQMA, WQS.	Updated as needed with each IR cycle.
	8. Identify and target restoration of priority waters as identified through the ACWA process to • establish TMDLs;	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.	ACWA grant cycle, every two years.

Key Questions	Strategy Objectives	Action/Program	Mechanism/Timeframe
	<ul style="list-style-type: none"> • evaluate the response of a waterbody to load reductions and BMPs; and • determine the effectiveness of BMPs. 		
<p>V. How effective are clean water projects and programs? (continued)</p>	<p>9. Ensure data quality and consistency throughout the Division’s water quality programs.</p>	<p>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.</p>	<p>Ongoing, reported in PPG.</p>
		<p>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, WQMA and QA officer.</p>	<p>Ongoing, reported in PPG.</p>
	<p>10. Improve the data management and accessibility of ambient</p>	<p>A. Provide AWQMS training to new and existing staff. Provide training to public user groups interested in</p>	<p>Ongoing, as needed or requested.</p>

Key Questions	Strategy Objectives	Action/Program	Mechanism/Timeframe
	water quality data received or collected by the Division's water quality programs.	using or submitting information in DEC's AWQMS. WQMA.	
V. How effective are clean water projects and programs? (continued)	10. Improve the data management and accessibility of ambient water quality data received or collected by the Division's water quality programs. (continued)	B. Develop standard AWQMS templates for WQSAR and other division sections to ease loading of ambient data into AWQMS. WQMA.	Component of improved data workflow (I1B above), by 2025.
		C. Create external portal for data retrieval, viewing, and downloading by the general public of approved AWQMS data and AWCA nominated waters. NPS, WQMA.	Component of improved data workflow (I1B above), by 2025.
		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, WQMA.	Component of improved data workflow (I1B above), by 2025.
V. How effective are clean water projects and programs? (continued)	11. 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. WQMA.	Posted to DEC website when final.

Key Questions	Strategy Objectives	Action/Program	Mechanism/Timeframe
		B. Revise and update the Strategy. WQMA.	Revised Strategy by 2025.