Revised – 10/31/2022

ALASKA OCEAN OBSERVING SYSTEM
DATA ASSEMBLY CENTER AND DATA MANAGEMENT SUBSYSTEM PLAN

EFFECTIVE: JUNE 1, 2021 – MAY 31, 2026

1.0 INTRODUCTION

The Alaska Ocean Observing System (AOOS) was established in 2004 by a consortium of partner agencies and research institutions and serves as the regional association for integrating coastal and ocean observing activities in Alaska's three regions: Arctic, Bering Sea/Aleutians and Gulf of Alaska. AOOS formally serves as the Alaska regional component of the U.S. Integrated Ocean Observing System (IOOS) and is a participating Regional Coastal Observing System (RCOS) under the authority of the Integrated Coastal and Ocean Observation System Act of 2009 (ICOOS Act).

As a member of IOOS, AOOS has a mandate to collect, organize, and provide access to Alaska oceanographic data. These data need to be easily understandable, electronically accessible, and well organized to allow policy makers, industry, and the general public to make well-informed decisions. To satisfy this mandate, AOOS supports a regional Data Assembly Center (DAC) and web-based data portal (called the Ocean Data Explorer) for the entire state of Alaska providing ocean, coastal and relevant watershed environmental data and information products.

To ensure data collected by AOOS and other regional entities and distributed through the AOOS DAC and on the AOOS web portal are managed according to best practices identified by NOAA, and that the data are of a known quality to the end user, AOOS is implementing recommended and standard practices as defined by the U.S. Integrated Ocean Observing System (IOOS) Data Management and Communications (DMAC) committee. These practices apply to data standards, metadata and data, transport, and access, archival, information technology (IT) security, quality control and quality assurance, described in the NOAA IOOS Program Office whitepaper on the data management and communications subsystem (2010).

The AOOS Data Management Subsystem (referred to hereafter as the AOOS Data System) must adhere to these practices, and the AOOS Data System Plan (referred to hereafter as the Data Plan) provides the approach to the necessary implementation, describing how data are ingested, managed, and distributed from the source to public dissemination. The Data Plan is organized as follows:

- Section 2 provides an overview of the AOOS Data Management Subsystem, describing the function and goals and objectives of the AOOS Data System management, the data management structure, and details related to the AOOS data management team.
- Section 3 briefly describes the AOOS data resources, defines data categories and asset types, and describes how the data categories are handled in the Plan.
- Section 4 presents the AOOS Data System statement of work and includes descriptions of the system computing infrastructure including details about the processes related to data flow including data ingestion, standards for format and content, metadata, quality control procedures and flagging protocols, data stewardship, preservation, public access and dissemination, data archival and preservation, and data system performance and security measures.
- Section 5 provides summaries of primary AOOS Data System applications.

- This document, unless superseded, pertains to a period of five years from June 1, 2021 through May 2026.

2. AOOS DATA MANAGEMENT SUBSYSTEM

The mission of the AOOS Data Management Subsystem (AOOS Data System) is to acquire, archive and share marine data and information products to meet the needs of Alaska stakeholders and the national IOOS program. AOOS uses a data management system that allows a complex array of oceanographic and environmental data types to be well organized, accessible, and understandable. The AOOS Data System uses a distributed data management approach, which allows data to seamlessly interchange between participating data providers, which are primarily government agencies and research entities. The system is composed of an internal master node coupled with external data provider nodes existing within the agencies producing and managing source data. This distributed configuration increases capacity and technical knowledge within agencies, allowing them to better meet their own internal data management goals. The distributed architecture leverages hardware, bandwidth and staff resources across multiple systems and groups. Utilization of currently available external data feeds for sensor, remote sensing and other data sources improves access to data for AOOS users with minimal effort.

Integrating available sources of interoperable data feeds into data access applications and data management systems adds a variety of data resources at a low cost. Large quantities of real-time and historical sensor information, remote sensing satellite information and marine habitat and biological data for the Alaska region are openly available on the AOOS Data System for use through interoperability protocols. For example, NASA Earth Observations (NEO) provides an expansive array of long term oceanographic, climate and atmospheric remote sensing datasets. Real-time and historical sensor data feeds for the Alaska region are available for hundreds of sensors via SNOTEL, the National Data Buoy Center (NDBC), the Center for Operational Oceanographic Products and Services (CO-OPS) and other NOAA programs. Additional sources of interoperable data include those hosted at NASA's Jet Propulsion Laboratory (JPL), U.S. Geological Survey (USGS) TerraServer and other research organizations.

As referred to in the AOOS Strategic Operations Plan, the purpose of the AOOS Data Management Plan is to document the following:

1. The overall management objectives and protocols for the data served on the AOOS website;
2. The individuals responsible for coordination and management of observational data across the region and the procedures for soliciting and evaluating the data management team's capability;
3. The data resources including descriptions of data categories and types served by the AOOS Data System; and
4. Regional Data Stream (Management) Plans, which are data management implementation protocols for aggregate sets of non-federal data, either by source or platform, that AOOS provides access to on its data system.

2.1 AOOS Data System Management Goals and Objectives

The Data Manager and Data System Management Team for AOOS are tasked with overseeing fulfillment of four primary goals and numerous objectives within the AOOS Data Management Work Plan.

Goal 1: Provide Core Data Management Support to the AOOS Program

1. Provide technical support for AOOS cyber infrastructure;
2. Develop and maintain web-based data portal;
3. Deliver real-time, delayed-mode and historical data for in-situ and remotely-sensed physical, chemical and biological observations;
4. Deliver model-generated outputs, including both nowcasts/forecasts and reanalysis, to AOOS (and IOOS) users;
5. Implement Quality Assurance of Real-Time Oceanographic Data (QARTOD) quality control (QC) checks for AOOS Data Portal real-time data feeds if available;
6. Develop and implement process for archiving AOOS generated (funded) data, and when possible, shared data assets from other providers into federal archives; and
7. Provide system performance and security measures.

Goal 2: Provide Data Management support to the AOOS program

1. Provide overall data management project management and oversight;
2. Engage with data providers to access, understand, and appropriately document data (metadata and QA/QC) that is ingested through the AOOS infrastructure;
3. Participate in Alaska committees and teams (including teams as determined by the Executive Director, and the joint State-Federal Data Integration Initiative) in order to facilitate data integration and interoperability within Alaska;
4. Participate in national and cross-regional committees, workshops and teams in order to further the development of a coordinated approach to IOOS data management;
5. Participate in international development of Arctic Observing Network (AON) and Sustained Arctic Observing Network (SAON) data management;
6. Work closely with the AOOS office, other data management awardees if selected, and appropriate advisory committees to implement identified user products, tools and their web interfaces;
7. Develop product requirements;
8. Beta test and refine products in order to increase their utility;
9. Provide reports as requested;
10. Develop detailed work plans with measurable timelines, deliverables, and performance metrics; and
11. Assist with development of funding proposals.

Goal 3: Develop and maintain special data products

1. Support existing products;
2. Ingest new data according to priorities developed by AOOS staff; and
3. Develop new data and information products.

Goal 4: Web Portal Hosting and Support

1. Host and maintain the AOOS web portal at www.aoos.org ;
2. Provide access to the user interface and visualization tools, data products, data query and access tools, decision-support tools, agency project tracking systems and databases, as well as IOOS Registry tools; and

3. Work with AOOS staff to update the website periodically in order to improve clarity, ease of use, and the overall "look and feel."

2.2 Data System Management Structure

The AOOS Data System Team(s) reports to the AOOS Executive Director and works directly with AOOS staff as an integral component of the overall AOOS program. An external Data Management Advisory Committee (http://www.aoos.org/about/committees.html) provides advice to the Executive Director, AOOS Board and the Data Team (Figure 1). Other external committees are used as needed to provide additional advice on implementation and user needs.

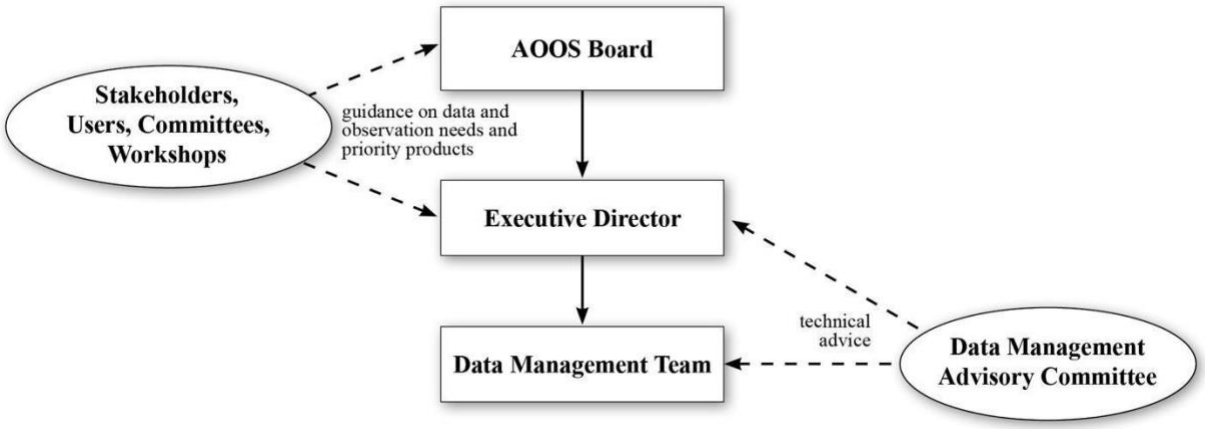

Figure 1. AOOS Data Management System.

2.3 AOOS Data System Management Team

The Data Team is involved with all aspects of the AOOS data flow, including data ingestion, conversion, discovery, maintenance of data feeds, storage, and any necessary archival services. Its primary function is to gather and serve data important to the AOOS region to end-users via standard services as recommended by the Integrated Ocean Observing Committee (IOOC) and the IOOS Program Office (e.g., OPeNDAP, ERDDAP, etc.). It is also tasked with managing and archiving any AOOS-funded data assets including oceanographic models, buoys, or other devices.

AOOS Data Manager: The AOOS Data Manager is the Data System management lead and provides project management expertise while overseeing all aspects of the AOOS Data System. The Data Manager supervises all staff on the AOOS data management team, referred to as the Data Team. Additionally, he/she contributes to proposal development and general AOOS data management reporting requirements. For the purposes of certification under the 2009 Integrated Coastal Ocean Observing System Act, the Data Manager is considered an RCOS employee (see RCOS (formerly RICE) Certification Requirements, Section 997.26(c)) and is one of the AOOS individuals responsible for collection, management or dissemination of observing data, and is responsive to federal government control.

AOOS Data Team: The AOOS Data Team is responsible for all AOOS deliverables in the annual AOOS data management workplan (See Section 4.0 of this Plan). Working under the direction of the AOOS Executive Director and with the AOOS staff, the Data Team designs and deploys a data management subsystem to meet the needs of the AOOS user base while providing functional components required by IOOS as described in this Data Plan. The resulting management system will increase the access and use of data by all user groups and allow data management staff to rapidly develop new capabilities and tools to meet emerging user needs. The Data Team also provides data management and informatics support for AOOS and development capacity for map-based data portals, spatial planning tools and data management frameworks, which transfer and ingest data from external systems via interoperability protocols. The team ensures transparency and communication between client and contractor about design requirements and development progress, and remains current with, researches and employs new technologies to extend the capabilities of digital information and computer analysis systems.

2.4 AOOS Procedures for Evaluating the Data Subsystem Management Team

In 2010 AOOS chose to contract for professional data management services. Data Manager and Team selection followed a process of broadly soliciting competitive proposals to provide web portal, data management, communication and user product services for AOOS for up to 5 years. AOOS solicited proposals for two sets of services, and proposers were encouraged to bid on one or both of these components, separately or combined.

> *I. Data Management and Communication Services:* Services include providing data management support (data ingestion, metadata, relational database development and maintenance) and communication services (web portal, data clearinghouse, coordination, and communication), building upon the hardware, software, query tools and products developed over the previous years, and following the national IOOS Program guidance.
>
> *II. User Product Development Services*: Develop user-driven products and associated interface and visualization tools that will be maintained by and interact with the data system developed under component #1 above.

AOOS procedures followed during the solicitation, evaluation and selection of contractual data management support are fully described in A.

2.5 Statement of AOOS Data System Ownership and Intellectual Property

All equipment, hardware, software code and products purchased and/or developed as a result of the data management system proposal award(s) belong to the Alaska Ocean Observing System.

3. AOOS DATA RESOURCES AND ASSET TYPES

The AOOS Data System provides data to the public from multiple sources and diverse external organizations in addition to AOOS funded projects. AOOS data inventories, organized by category and accessible through the AOOS Data System as of June 30, 2022 are provided in Appendices B, C, D and E. These appendices are updated annually, or more often as needed, to reflect changes in the data asset inventory on the AOOS Data System.

3.1 Observational Data Types

The AOOS data inventories include multiple types of data, including real-time data, near real-time data, historical data, and citizen science data. AOOS defines each data type in a consistent manner with IOOS RCOS Guidelines as follows:

- *Real-time data* are ingested, served, and displayed by the AOOS Data System at the same frequency the data are collected (and sometimes reported) by the originator with little to no delay. Examples of real-time assets include weather stations, oceanographic buoys, and webcams.
- *Near real-time data* are ingested by the AOOS Data System at the same frequency that the data are made available; however, there is some delay (hours to days) between data collection and when the data provider makes it available. Examples of near real-time assets include satellite images and derived satellite products.
- *Historical data* are data that are one month old or older. AOOS historical data were sometimes collected in real-time and subsequently archived; other historical data are ingested from private sources and local or national archives upon stakeholder request.
- *Citizen science data* are collected by members of the general public who are not necessarily trained as scientists. They might be affiliated with a non-profit, education or local community organization (e.g., marine science center), or private business or enterprise. As these data are collected by volunteers and typically have limited quality assurance and quality control (QA/QC), these data may require quality flags to alert the end user that the data may not be “science” quality.

3.2 Data Categories

AOOS data types are divided into four major categories that determine the level of documentation and quality control (QC) that is required for the data assets within each category:

Federally Sourced Data: Federally sourced data are assumed to be quality controlled following rigorous and documented data management and archival processes by the provider, and thus only require generic documentation by AOOS on how these data are ingested and made available to the public (Section 4.0). Federally sourced data served by the AOOS Data System are exempt from detailed data stream documentation. The AOOS Data System provides access to data from the National Oceanographic and Atmospheric Administration (NOAA), the U.S. Geological Survey (USGS), the U.S. Forest Service (USFS), the Federal Aviation Administration (FAA), the National Science Foundation (NSF), the U.S. Department of Agriculture (USDA), and U.S. Fish and Wildlife Service (USFWS) (Appendix B).

Model Products: Model products served by the AOOS Data System may incorporate or assimilate observational data (e.g., all bathymetric charts served by AOOS are from gridded models derived

using “true” observations). However, they are considered a “data product” that falls outside the realm of “true” observations, therefore are exempt from detailed data stream documentation (Appendix C).

Static Data Products: AOOS static data products are typically derived from observed data, but are displayed in a way that the original data are no longer reproducible and cannot be used to assemble a numerical observational dataset in time or space. Other types of static data products are merely representations of fixed political or legal boundary information. These products fall outside the realm of “true” observations, therefore are exempt from detailed data stream documentation (Appendix D).

Regional Data Streams: Regional Data Streams are defined here as any data resource that does not fit into the exempt categories already discussed: federally sourced data, model product, and static data product. These include not only AOOS generated observational assets, but also regional data provided by local or state agencies, private companies supporting maritime activities in coastal waters, university projects, research studies funded and conducted by other organizations. Many regional data streams originate from leveraged projects AOOS helps support, but also come from sole source providers affiliated with other entities (research, private, NGO, etc.). Occasionally, a federally sourced data asset is manipulated in some fashion prior to display and, therefore, requires documentation (e.g., federal satellite data that are transformed from a National Sea Ice Data Center (NSIDC)-binary format into netCDF). Data streams may be of any data type: real-time, near real-time, historical, citizen science (Appendix E).

The primary processes involved with data management and flow include data ingestion, standards and format, metadata and discovery, quality control, stewardship and preservation, access and dissemination, archival and security. Descriptions of the processes that consistently apply to all data are provided throughout Section 4.0. Additional data management documentation unique to individual regional data streams are provided through a systematic data stream plan template that closely follows the RCOS (formerly referred to as RICE) Certification Guidance Data Management and Communications (DMAC) requirements (section 997.23 f (1-6)) and the NOAA Data Sharing Template. AOOS implements this customized Regional Data Stream Plan template to facilitate consistent documentation to the best of our ability, and to streamline any future modifications to existing data stream protocols.

The Regional Data Stream Plans use a consistent and comprehensive set of questions designed to describe how data streams with similar procedural controls are handled and managed end to end. Grouped parameters may originate from a single platform type (e.g., a mooring that provides temperature, salinity, and oxygen data, all of which are treated in a standard way); a data type that is handled similarly across all platforms (e.g., webcam imagery); or originate from a single data source (e.g., Alaska State Department of Transportation weather observations).

Exempt Data Requiring a Data Stream Plan: On occasion, a data stream that would normally be considered exempt will require documentation:

- Data products that include representations that can be used to reproduce numerical data in time or space are considered observing data, are treated as a Regional Data Stream and documented as such;
- A federal data source that is translated or transformed in some way between the source of ingestion to the AOOS access point of delivery (e.g., smoothing, block averaging) is treated as a Regional Data Stream and documented as such.

Quality Control Documentation: IOOS DMAC guidelines require that no raw data will be served on the regional association websites, and no raw data are served by the AOOS Data System. Generic quality control (QC) applied to all data ingested and provided by the AOOS Data System is described in Section 4.4.4 of this plan. QC descriptions unique to individual regional data streams are included in the Regional Data Stream Plans, and may follow one of four paths for a given data stream:

1. Follows prescribed QARTOD guidelines (required for real-time data only if a QARTOD Manual exists for the parameters in the data stream).
2. When QARTOD guidelines do not exist, some other suitable form of QC implementation is completed and described;
3. A description of the QC completed by the data provider (e.g., brief description or link to QC protocols performed at the source).
4. Data are considered exempt from QC documentation or requirements if federally sourced or designated as citizen science.

Specific QC and QARTOD applications applicable to AOOS Regional Data Streams are summarized in Appendix F. Regional Data Stream Plans are available in Appendix G, with individual data stream plans as sub-documents numbered G-1 through G-45.

4. AOOS DATA SYSTEM WORK PLAN

Details of specific work plan activities and projects are determined in agreement with the AOOS Executive Director and the Data Manager. The AOOS Board and the AOOS staff contribute to the data management work plan on an annual basis. The plan is reviewed monthly by the Data Manager and AOOS Staff together, and updated as necessary on a quarterly basis.

4.1 Computing Cyberinfrastructure

The AOOS Data System is the backbone of the cyberinfrastructure that is leveraged to acquire, archive and share marine data and information products. This infrastructure has been developed to meet the guidelines and specifications recommended by the NOAA-funded Integrated Ocean Observing System (IOOS) and endorsed by the federal Interagency Ocean Observation Committee (IOOC) and Global Earth Observation (GEO) Program. The data system is built using several mature, open-source interoperability and data stewardship systems to provide full-lifecycle data management services, including: data ingestion, metadata, data aggregation and assembly, data catalog and discovery, data access and transport, data storage, and end user input and feedback.

The AOOS data system is divided into four logical tiers, which separate the suite of technologies composing the system summarized here (Figure 2).

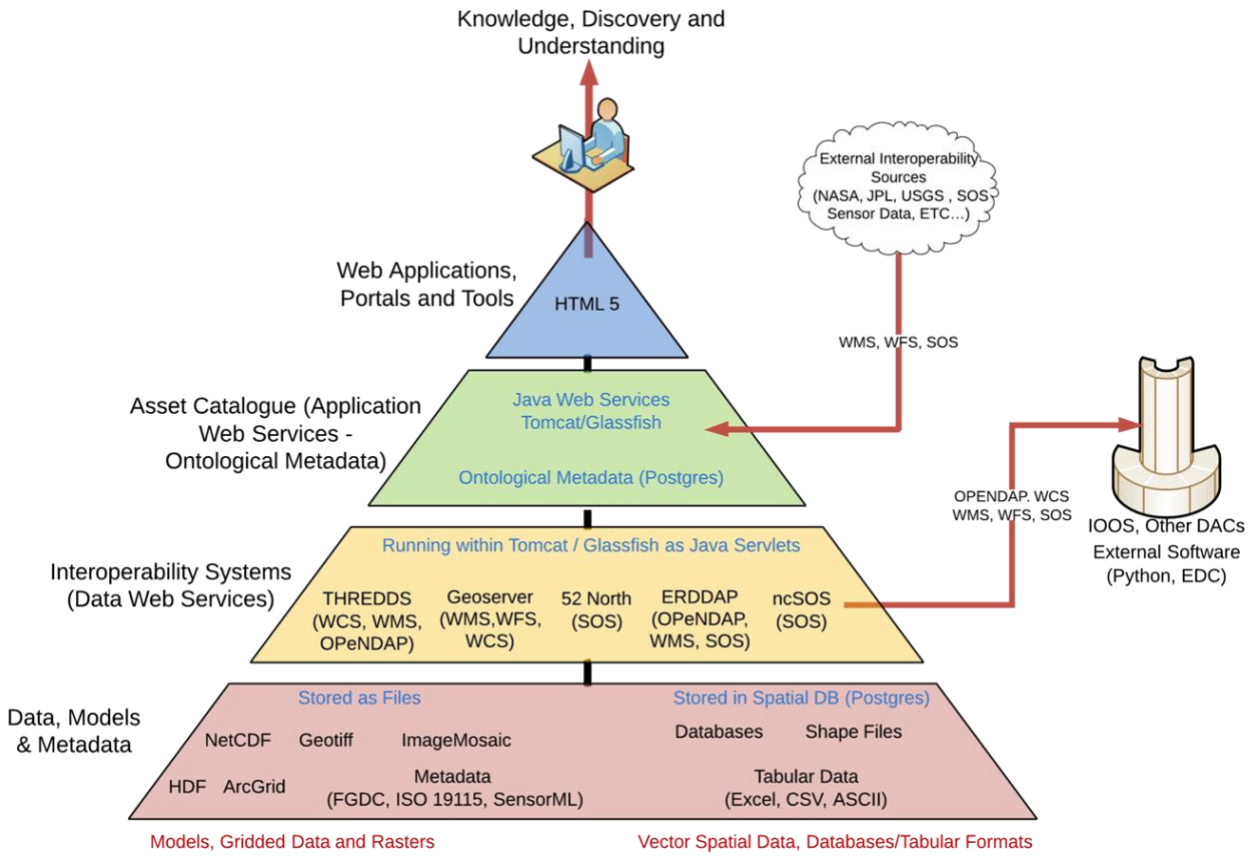

Figure 2. A schematic of the AOOS Data System that details the flow of data through logical technology tiers so that it can be consumed by users to enable discovery and understanding of marine data and products.

Tier 1 (Data, Models and Metadata) represents the source data, which are stored as files or loaded within geospatial databases. Tier 1 is the base of the data system framework where the source datasets produced by researchers, instruments and remote sensing platforms, metadata, and model outputs, enter the data system to provide the foundation for applications and user tools. These resources can be stored either in native formats or spatially enabled databases. The decision to choose one method over the other is dictated by the requirements of the interoperability system that will be serving the data. Data which has a tabular or vector form (Shapefiles, databases, Excel spreadsheets, comma separated values (CSV) text files, etc.) will be converted into netCDF files when appropriate, and will be loaded into a PostgreSQL database and spatially indexed. When possible, GeoServer, an open source geospatial data server, will then connect to the database and serve the data via WFS and WMS protocols. Imagery, raster, and model data will be stored in a file server in their native file formats. THREDDS and/or ncWMS will be used to serve NetCDF and HDF files which may contain two, three, four or higher dimensional

gridded datasets. GeoServer or other OGC compliant mapping servers will be utilized to serve GeoTIFF, ArcGrid, or other two-dimensional imagery/raster data.

Tier 2 (Interoperability Systems) includes systems such as Web Map Services (WMS) and Web Coverage Services (WCS), that are then implemented and connected to the underlying data sources in Tier 1. Various interoperability servers (GeoServer, THREDDS, ncWMS, ERDDAP, etc.) are implemented on top of source data to expose a powerful set of interfaces for other computing systems and humans to extract, query, and visualize the underlying source data. These systems will facilitate all aspects of data delivery to users in addition to providing the muscle for the machine-to-machine data transfer to national data assembly systems as required. These systems have been developed using the Java programming language and run within Tomcat servlet containers.

Tier 3 (Asset Catalog) includes an Asset Catalog, which provides (1) ontological metadata and (2) connections to externally-hosted data via web services. The ontological metadata in the catalog describes the characteristics including geographic locations, spatial and temporal resolution, units, source location and parameter standard name, taxonomy, date of last update, etc. of each data resource. Dynamic fields in the ontological metadata (e.g., coverage dates, which change when new data arrive) are updated automatically by the system as new data are ingested; static metadata fields (e.g., narrative descriptions of the data) are updated manually. Storing the metadata outside of the files themselves is critical to providing a responsive, up-to-date public-facing catalog. It also allows AOOS to optimize data discovery tools such as advanced searching by parameter or geographic location and build tools such as on-the-fly unit conversions for gridded datasets. External web services in Tier 3 provide the catalog access to external (web-based) sources of information. This is commonly used to display data and basemaps from reliable data providers so data do not have to be stored and maintained by AOOS. Parameter standard names come from the CF (Climate and Forecast) conventions which are described in Appendix H.

Tier 4 (User Applications) is the final technical level and is composed of the web-based applications and tools that allow users to discover and explore the data resources in the system. Web services written in Java connect to the asset catalog and provide applications with access to the underlying descriptions of AOOS data assets and sources. The asset catalog contains relationally-structured maps between data types, sources, and a controlled set of definitions so that user interface applications can connect users to vast arrays of data through simple but powerful interfaces. These interfaces are available at both statewide and regional scales, including the Arctic, Cook Inlet, and Gulf of Alaska, to provide users with access to public data. These interfaces include the following:

- Public-facing data catalogs showing data assets that are updated automatically when new data are published into the system;
- A powerful, prioritized, Google-like search interface that allows users to search by geography, time, access method, or words contained in metadata descriptions;
- A secure method to share project-and file level metadata and data files with the public;
- Interactive maps that allow users to explore other, related datasets relevant to the Alaska marine and coastal environments.

User interfaces are comprised of web-based applications and tools that provide users access to all the data and products within the data management system. These applications make it easy to discover and explore data that have been published throughout Alaska. Finally, at the top of the pyramid atop Tier 4, users have a powerful and intuitive experience of the underlying systems working together to facilitate the discovery, accessibility and comprehension of data served by the AOOS Data System.

4.2 Data Ingestion

Observations and information are ingested into the AOOS Data System from a variety of sources and include both historical and real-time observations, forecast, nowcast and hindcast model outputs, GIS information, and synthesized products that can be useful for layering with other data in the AOOS system. Each data asset ingested into the DMAC has its own level of data processing maturity and quality with respect to documentation and the metadata available.

Data are ingested into the AOOS system using one of several pathways:

1. Auto submission pathway from the Workspace- not visualized data;
2. Contribution by the originator;
3. Direct access or harvest from the originator website (real-time sensors, models and satellite imagery).

Project data supported by AOOS using IOOS funding provide data to AOOS in a timely manner, as stipulated in the agreed contractual statement of work. When possible, data are served in real-time; however, in many areas of the AOOS region, real-time data are not possible due to weather, ice interference with surface buoys used to transmit data, and lost power or data telemetry. On projects that do not produce real-time data, the project investigators are responsible for making sure data become accessible by AOOS as soon as possible. Data submission timelines are detailed in the AOOS-funded project Data Management Plans (DMPs) These are project specific data submission plans, though slightly different from the Data Stream Plans provided in Appendix G. DMPs are generated by the Principal Investigator (PIs) receiving an AOOS award, the AOOS Project Manager for that award, and the data management team at Axiom. Using the DMPs, Project Managers at AOOS regularly track data submissions to the Research Workspace as per the timelines listed in the DMP. Further, AOOS project managers check in annually or more often with AOOS project PIs relative to the data submission deliverables to help ensure they are in process to be submitted to the Research Workspace and subsequently publicly released in a timely manner. Many of the AOOS funded projects are not real-time and are data collections from year-round moorings or ship-board observing activities. These datasets often have 1-2 year lead times prior to submission to the Research Workspace.

4.3 Contributing Data to AOOS

The general process for data submission is outlined below:

1. Data are organized in the AOOS Research Workspace (Section 5.0) and accompanied by robust, descriptive metadata.
2. When a project is complete or its embargo period ends, the Principal Investigator (PI) selects the 'Published' option for their project in the Research Workspace. AOOS funded projects are generally not allowed to have embargo periods, though have in the past. Some holds are honored on some externally (non-AOOS) funded data assets AOOS manages for research purposes.
3. The PI selects the files or folders of content to be published.
4. The Research Workspace creates a resource map of the content to be published.

5. Automated checks look for and prompt for and capture metadata content required for publishing but found to be absent from the metadata record, including:
    a. Parameters or observations;
    b. Collection methods and quality controls procedures;
    c. File formats;
    d. Update and submission frequencies;
    e. Responsible parties and affiliations;
6. A metadata rubric is returned to user to show completeness, and the PI provides additional metadata content until they're satisfied with rubric results.
7. The PI pushes the archived package on for review by an AOOS Program Manager or data management teamstaff.
    a. The reviewer checks data files to ensure they match program data management plan requirements for formatting, quality, naming conventions, etc.;
    b. The reviewer verifies metadata quality, and if necessary, improves or sends the metadata back to the PI for additional details, depending on the assignment of responsibility within the program.
8. Reviewed data, metadata, and resource maps are finally pushed into the member node for long term preservation.

4.4 Data Flow Processes

The flow of data from the source to AOOS data portals follows the same general path for all sources as illustrated in the following flow diagram (Figure 3).

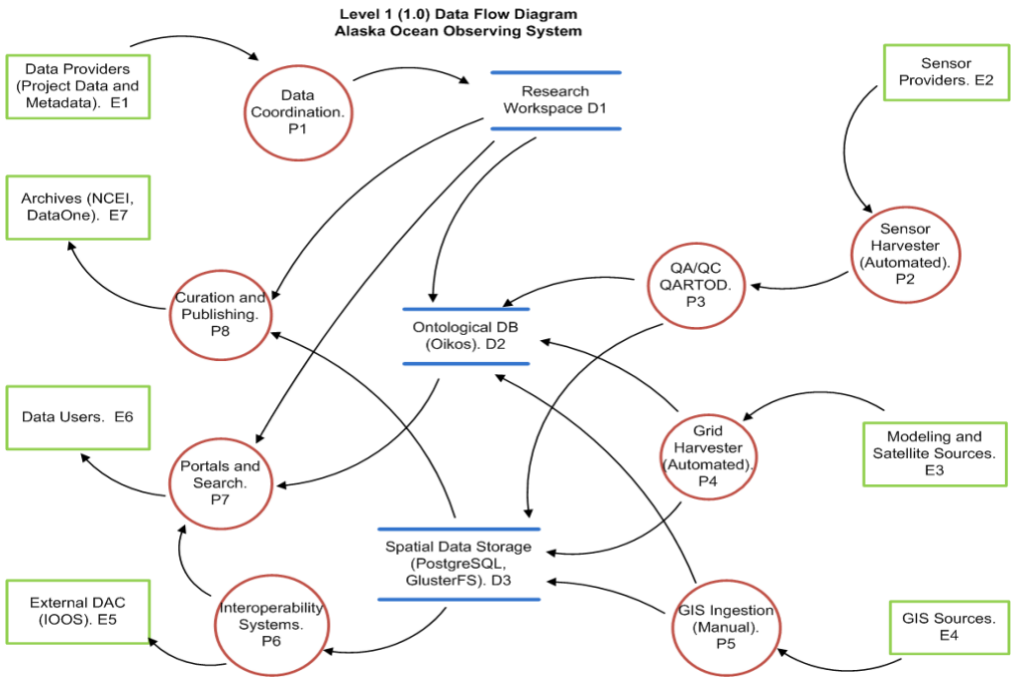

Figure 3. Flow diagram of data: From data, source, model, and GIS providers to users, archives, and external Data Assembly Centers.

4.4.1 Shared Data File Formats

AOOS provides data through six data access services (listed in Section 4.4.2), the last of which is "direct file downloads" of any of the original shared data file formats:

1. *Network Common Data Form (NetCDF)* - a self-describing, machine-independent data format that AOOS uses primarily for raster (gridded) data. Some data stored as unstructured grids use this format as well.
2. *Comma Separated Values (CSV)* - a human-readable ASCII format that is nearly universally accepted by spreadsheet and programming languages. AOOS uses CSV formats to allow users to download (1) time-series extractions from raster data, and (2) GIS vector and polygon information (e.g., boundaries).
3. *Shapefile* - an open geographic information system format for point, vector, and polygon data. AOOS allows users to download shapefiles of static GIS layers such as boundaries, biologic distributions, etc.
4. *Portable Network Graphics (PNG)* - PNG is a lossless, image format provided as an alternative to shapefiles in the AOOS catalog. PNGs are limited in use as they are pre-projected, pre-scaled, and pre-sized images of data layers. However, AOOS provides PNG files as example WMS requests, which are useful to users who cannot access GIS services and who do not understand how to manipulate WMS requests.

Data available for digital download allow users to download files with usable numbers on which they can do further analysis or visualization of their own. These fundamentally differ from images (provided by WMS services and PNG files), which are pre-rendered with a fixed scale and applied color ramp. These types of downloads are differentiated under the “download” button in the catalog interface.

4.4.2 Data Access Points

Access points provide standardized, documented services that allow users to download what they need from AOOS without having to make person-to-person data requests. AOOS offers six access points:

1. *Thematic Realtime Environmental Distributed Data Services (THREDDS)* - THREDDS is a set of services that allows for machine and human access to raster data stored in NetCDF formats. THREDDS provides spatial, vertical, and temporal subsetting as well as the ability to select individual dimension or data variables to reduce file transfer sizes. AOOS provides THREDDS access points for raster (gridded) data stored in NetCDF format.
2. *Open-source Project for a Network Data Access Protocol (OPeNDAP)* - OPeNDAP is a protocol that can transfer binary or ascii data over the web. Like THREDDS, it provides spatial, vertical, and temporal subsetting and the ability to select individual variables to reduce file transfer sizes. Unlike THREDDS, requested data are provided as non-NetCDF, structured output. OPeNDAP output can be imported directly into graphical programs such as GrADS, Ferret, or R. AOOS provides OPeNDAP access points for raster (gridded) and time-series data.
3. Web Map Service (WMS) - WMS provides machine access to images, which can be used by individuals or programs (e.g., tiling services). Accessing programs use GetCapabilities requests to ask for image data in whatever format they require, which allows them to gather image tiles over specific areas with the projections, styles, scales and formats (PNG, JPG, etc.) that fits their needs. AOOS provides WMS access points for point, vector, and polygon information, as well as rasterwell raster data through open source software packages ncWMS, ncWMS2, sci-wms and GeoServer.

4. Web Feature Service (WFS) - WFS provides machine access to the vector elements of static layers. AOOS provides WFS access points for point, vector, and polygon information, as well as time-series and raster data through the open source software applications (e.g., GeoServer).
5. Environmental Research Division's Data Access Program (ERDDAP) - ERDDAP is a common data server that provides access to subsetting and downloading data. AOOS provides ERDDAP access to all time-series data in the region, a subset of gridded data, and some tabled based GIS-data based products.
6. Direct File Downloads - AOOS often provides data as downloadable files. These files are mostly served in the original standard shared data file formats above, or in the case of project-specific data, in their native file formats.

4.4.3 Metadata

AOOS relies on AOOS project PIs, local investigators and data providers to implement and provide documentation of best practices for Quality Assurance (QA) on their activities related to data submitted to AOOS. Part of the data ingestion process is to establish adequate metadata and provide metadata links that furnish the necessary background information to establish the purpose of the data and expected quality. AOOS requires standards-compliant metadata for data from projects with AOOS or IOOS funding, which will facilitate long-term data preservation and archival with NCEI. Dynamic fields in the ontological metadata (e.g., coverage dates, which change when new data arrive) are updated automatically by the system as new data are ingested; static metadata fields (e.g., narrative descriptions of the data) are updated manually. Though AOOS does not require specific metadata standards for ingesting other types of data (including shared assets not funded by AOOS), most modern data submittals are accompanied by standard ISO/FGDC metadata records, and if so, these data can also be priority candidates for long-term preservation with NCEI. However, some smaller private data providers and many older datasets come with informal metadata documentation that is variable in terms of completion and detail required by modern standards, and some are only accompanied with narrative information. In these cases, AOOS works to make the source information easily accessible to the end-user by providing links to source data or data providers, and making all available metadata information that came with the data available in the data catalog. These data may have limitations on being suitable for long-term preservation with NCEI.

Details and availability of metadata are discussed in individual Regional Data Stream Plans.

4.4.4 Quality Control Procedures

A primary mission of AOOS is to serve as the Alaska Regional Data Assembly Center (DAC), aggregating data from local and federal sources and making them available, accessible, and understandable to the public. Quality Assurance (QA) are procedures undertaken during the experiment and/or instrument design phases of data collection, ensuring that all the data collected is as accurate and precise as possible. AOOS is reliant on individual data providers to follow and document adequate QA protocols according to best practices for a given technology or application, and QA will not be discussed in this document. Section 4.0 of the AOOS Funded Project Data Management Policies for which all AOOS awardees must comply addresses QA procedures to be implemented by the Project Principal

Investigators (PIs), and states that data providers must make available standard operating and QA protocols documentation either with their respective DMPs, or upon request by AOOS.

Quality control (QC) processes are implemented by AOOS and are used to identify and flag questionable or bad data after data collection. Sharing these protocols and quality flags are an important component of publicly serving data. General QC documentation is provided here but is also provided in more detail in the individual Regional Data Stream Plans (Appendix G: G1-G45).

AOOS Implemented QC Protocols

AOOS does not receive or serve any raw data transmitted directly from stations, so any applied QC procedures administered by AOOS are in addition to those applied by the data provider. For many project-based and historical datasets, AOOS provides the same data (though sometimes in converted formats) that are available from the source provider. Any QC procedures that are documented and made available to AOOS by the providers are included in the QC section of the individual Regional Data Stream Plans (Appendix G: G1-G45).

Effective 2018, AOOS fully implements policies outlined in the US IOOS Quality Assurance of Real-Time Oceanographic Data (QARTOD) manuals where applicable. The QARTOD procedures followed are documented in this plan, in Appendix F of this plan, in the individual Regional Data Stream Plans (Appendix G: G1-G45), and on the data stream station page on the AOOS Data Portal. When a new QARTOD manual, or an updated QARTOD parameter manual becomes available, any new required and recommended tests are first evaluated for implementation. If any new tests are implemented by AOOS (based on applicability of the test and ability for AOOS to implement it), Appendix F of this plan will be updated during the next revision cycle (usually every 2-5 years, or as needed) to incorporate any new or revised test information. The station page for the individual data stream on the AOOS Data Portal also details all the QARTOD tests being conducted on the data stream when implemented, regardless of this plan's revision timeline. As new QARTOD protocols are updated and new parameter manuals developed over time, Data Stream Plans will be updated accordingly to include newly required QARTOD implementations.

Implementation of QARTOD tests by AOOS have different processes depending on the data type -- real-time data, historical data, federal data, data without available or clear QC, and citizen science data.

1. Real-time data: AOOS ensures that quality control (QC) standards are implemented and QC flags are added to all real-time data that are not received from a federal source. AOOS currently serves various non-federal data streams that also require QARTOD QC implementation. Details on AOOS QARTOD QC implementation are described in Appendices F and G. QC procedures differ depending on whether they are implemented by the data provider or AOOS.

QC by Data Provider

Various programs operating assets in Alaska manage some of the non-federal, real-time regional data streams and provide adequate QC to these datasets, including observations from Coastal Data

Information Program (CDIP) wave buoys. Water level data collected by the Alaska Department of Natural Resources (ADNR) is managed and made public by NOAA's NWS Alaska Pacific River Forecast Center (APRFC), but AOOS accesses real-time data directly from the sensor provider Stillwater Technologies. High Frequency Radar (HFR) derived surface current data is served through the HFR Network. CDIP, the APRFC and the HFR Network ingest and perform extensive QC on the raw data collected by these platforms prior to making them available to the public. AOOS sources data from HFR Network and CDIP directly for display on the AOOS Data System, and therefore, is not required to perform additional QC. Since AOOS currently ingests data directly from Stillwater Technologies (the manufacturer for iGage and iRadar water level technologies used by the ADNR water level installations) rather than from the APRFC, AOOS performs QARTOD on those data. Please refer to the Regional Data Stream Plans for Cook Inlet, Kodiak and Nome CDIP Wave Buoys (Appendices G-16 and G-42), ADNR Water Level (Appendix G-40) and HFR Surface Currents (Appendix G-13).

As some other data providers document existing QC performed at the source by the data originator (e.g., Canada Water Office stream gauge data), links to these procedures, or a brief summary of the QC performed are provided in the Regional Data Stream Plans. In these cases, parameters and/or configuration for the quality test are defined by the data provider. In cases where the data provider makes quality flags available within their data, those flags are mapped to QARTOD flag definitions so they can be ingested for display in the AOOS Data System; additional QC are not required on those assets. Roll-up summary flags and individual test flags are shown visually in the AOOS Data Portal with links to the QC documentation made available by the data provider (refer to QC by AOOS section below). Flags are also stored alongside the data for download in CSV and netCDF downloads, as well as via THREDDS and ERDDAP servers.

QC by AOOS

For sources that do not provide quality flags, the AOOS Data System runs automated QC and where available, QARTOD tests after ingesting observation data. Tests are run using the open-source ioos_qc library (https://github.com/ioos/ioos_qc) which implements a suite of QARTOD tests as well as other quality control algorithms. The quality test code and test thresholds are documented and publicly available through the AOOS Data Portal. Links to the ioos_qc methods used are available both within data charts and on sensor pages (i.e., the data stream station pages) within the AOOS Data Portal. Thresholds used for each test are also viewable on sensor pages (see example page) and users are linked to the test code in GitHub.

Within one hour after observations are ingested to the AOOS Data System, a process is run to calculate flags for the following QARTOD tests, depending on the parameter:

- Gross Range Test- checks that values are within reasonable range bounds.
- Spike Test- checks if the difference in values between a data point and its neighbors exceeds a threshold.
- Rate of Change Test- checks if the first order difference of values exceeds a threshold.
- Flat Line Test- checks for consecutively repeated values within a tolerance.

Tests are run for all sensor data that do not already have QC tests applied to them and are applied continuously as new data enter the system. The quality test thresholds can be defined per sensor

parameter, when input from the sensor operator or subject matter expert has been obtained. When a specific sensor QC configuration has not been defined, it will fall back to a default set of thresholds for each test. For example, the Gross Range thresholds for Air Temp might be (-90C, +60C), and Barometric Pressure might be (800, 1090) mbar.

Further, AOOS applies two additional QC procedures to real-time and historical observation data before it is stored in the AOOS Data System. These tests include the following:

1. Syntax Test: Each regional data source uses unique syntax to transfer data. Some (e.g., Canada Water Office) have standardized data storage protocols and provide files whereas others (e.g., Alyeska Weather stations) are merely html web pages that are scraped for data. Therefore, each regional source requires a custom syntax test, which merely checks for parity errors by testing if data can be extracted from the downloaded or scraped data. If no data can be extracted, the test fails, and no data are accessed, served or stored for that record.
2. Time-Gap Check: AOOS implements a *"time-gap check"* that informs observational assets (e.g., weather stations) displayed on its "Real-Time Sensor Map". If no data are received from an existing observational station for four hours, the icon on the map changes from a scaled color to a small gray-shade dot. If no data are received from an existing observational station for one week, the asset is automatically removed from the map, although assets are still made available on a historical sensor map.

The quality flag results are made available in the AOOS Data Portal both visually and for download. By default data are provided with a "rollup" (i.e., summary) flag applied to it. This rollup flag is the worst case of all individual tests (see "Primary Flag" in the QARTOD Data Flags Manual). If any of the flags fail, that data point is not shown in portal visualizations, such as time series plots or anomaly charts, but the data are still available when the dataset is downloaded. An example of the rollup flags run by the AOOS system for AOOS data assets can be seen here.

In displays of individual parameters, the individual test flags are shown visually alongside the data. Within a timeseries chart the "flag statistics" are shown as a stacked bar plot showing the test results (e.g., pass, fail, suspect, missing data) at each data point alongside the observation data. Users can interact with flags by hovering over them to view a breakdown of individual test results. Additionally, users can turn on and off quality filtered tests entirely or by test results type using a checkbox. The quality flags are responsive to the time binning represented within the chart thereby allowing a user to view summary flags or narrow down to individual data points. An example of the individual test flags run by the AOOS system for the Marine Exchange Alaska's wind sensor from the Anchorage Port station can be seen here.

In addition to being viewable, quality test results are available for download in the AOOS Data Portal. The single rollup flag variable is served alongside the data in CSV downloads, as well as THREDDS and ERDDAP servers. For serving individual quality flags, a second flag variable is also available within the downloaded data for each measured parameter - an 11-character string wherein each digit is the result of an individual test. Quality tests are described in a standard way, as described by the IOOS Metadata Profile v1.2, in which QARTOD flag variables are associated with data variables using the CF "Ancillary Variables" approach. An example of the Marine Exchange Alaska's wind sensor dataset from the Anchorage Port station and embedded quality test results available in ERDDAP is here.

3. Historical Data: The need for quality metadata, including documented QC procedures, that accompanies historical and project data being received and made available through AOOS is currently being addressed at data inception. All modern (current day) incoming project data are managed and curated by the project researchers through a tool called the Research Workspace. To facilitate the entry of more consistent and complete metadata, including documentation of QA/QC performed on the data from project researchers, a comprehensive metadata editor used within the Workspace allows the AOOS Data Management Team to directly verify the existence of appropriate and required QA/QC documentation before data are pushed to the AOOS Catalog.

QA/QC procedures for historical (older than one month) data can vary widely among data providers. In the past, prior to the use of the Research Workspace, QC procedures may not have been consistently available or provided with the data. Therefore, not all of the historical project data ingested by AOOS has been accompanied with current day standard documentation in the metadata record, and might refer back to the data provider. This is often the case where AOOS re-serves and repackages (via products) historical data assets that have limited documentation and QC information. AOOS will continue to provide access to such data assets, balancing the desire to make available valuable historical data resources (that might otherwise not be discoverable anywhere else) with the need for current-day-standards quality QC documentation. As part of that effort, AOOS always provides links to the data provider, regardless of the metadata status, and all AOOS data resources provide originator information that is available with the metadata links. When documentation of methods and procedures are available, that information and the associated links to documents are provided as part of the metadata and will have associated links or bibliographies provided in the individual Data Stream Plans.

When QARTOD applies, data assets that were previously reporting real-time data and that have had their historical data stored and made available in the AOOS Data System, follow the same QC protocols as the real-time data (e.g., King Island Wave Buoy; non-federal weather data). In these cases, the applicable quality tests are run retroactively for all legacy time series data available within the AOOS Data Portal. The quality test results are available visually along the time series continuum within the AOOS Data Portal and for download following the same procedures as the real-time data.

4. Citizen Science Data: Any data collected by members of the general public (including private businesses) who are not trained scientists, though sometimes working in cooperation with a scientific program, may be documented as citizen or community observer sourced. These data do not require documented QC procedures. However, they do require a description of the process of how data are displayed and clearly marked as “citizen science” on the data portals. Citizen science data assets made public on the AOOS Data Portal will have individual Regional Data Stream Plans (Appendix G). Citizen science data served by AOOS will also be flagged accordingly (e.g., Primary Level flagging standard (UNESCO 2013) Value 2, “Not evaluated, not available or unknown.”). If any QC has been performed by the provider or AOOS, this will be documented in the Regional Data Stream Plan as well as on the sensor page on the AOOS Data Portal for that asset. A disclaimer will also be associated with any citizen science data transmissions. There may be times a private data stream can be elevated from citizen science status if the QC applications provide stronger confidence in the data, when the technologies used are

mainstream and well-accepted (e.g., private weather stations), and the operational protocols for the given technology are known and straightforward.

5. Federal Data: AOOS serves many federal datasets that already have been through a rigorous QC process, and therefore, do not require additional QC implementation by AOOS. The National Data Buoy Center (NDBC), a part of the National Oceanographic and Atmospheric Administration's (NOAA) National Weather Service (NWS), operates and quality controls data from moored buoys, Coastal-Marine Automated Network (C-MAN) stations, and Deep-Ocean Reporting and Assessment of Tsunamis (DART®) tsunameter stations. NDBC also quality controls and distributes environmental data from partner program stations, including the Integrated Ocean Observing System (IOOS) (approximately 300 stations nationwide -- See the NDBC webpage at http://www.ndbc.noaa.gov/ioos.shtml for a description of the IOOS program at NDBC). All of these stations acquire environmental data used primarily for preparing weather warnings, analyses, and forecasts. The quality control procedures used by NDBC are either completely automated or may include a manual (human intervention) component in addition to the automated QC. The completely automated procedures are performed at the National Weather Service Telecommunications Gateway (NWSTG) for real-time messages used in operational forecasts and warnings. The other procedures are performed at NDBC for data submitted for archival. The generic real-time automated procedures performed at NWSTG check to eliminate gross errors (spike test), transmission parity errors (syntax test similar to what AOOS applies), range limit exceedances (gross range) and time continuity checks. Relational checks, such as examining a wind gust to wind speed ratio, are also performed to check the quality of both measurements. Other checks assess instrumentation functionality to ensure measurements are not impacted by issues like a low battery voltage. When sensor or system degradation is detected, the affected data are removed before posting on the NDBC Web site or archival. The real-time processing procedures followed by NWSTG will not allow release of data from a degraded sensor. For more information, please refer to the NDBC Handbook of Automated Data Quality Control Checks and Procedures.

6. Procedure for data that cannot be QC'd as directed: There may be situations that arise where AOOS or a stakeholder or client requests ingestion of a data stream that comes with informal metadata documentation and has limited QC documentation (if any). This occurs, for instance, when AOOS is contracted to develop a historical database of data assets not currently archived or publicly available elsewhere. In these cases, AOOS works towards researching and documenting to the best of their ability, the expected QC for these limited data sets, making the source information easily accessible to the end-user by providing links to source data or data providers, and making all available metadata information that comes with the data available in the data catalog. Often, these data are used to develop a product (e.g., a geospatial parameter distribution). If no QC can be documented or post-applied to a given data stream, perhaps because it is in the form of a data product, such data streams will have a low confidence score for QC, and this will be clearly defined and spelled out in the metadata file for that data stream. These data will be flagged consistently with the Primary Level flagging standard (UNESCO 2013) as value 2, "Not evaluated, not available or unknown."

7. Procedure for Citizen Science Data QC and Flagging: Citizen Science data do not have established QARTOD QC or flagging protocols. In some cases, Citizen Science data will not be accompanied by rigorous QA or QC, and data may not be qualified. Citizen Science data that have no known implemented QC tests, or projects that provide community-based information where the information

quality is not available will have their data flagged consistently with the Primary Level flagging standard (UNESCO 2013) as value 2, “Not evaluated, not available or unknown.” If QC has been performed, this will be documented in the Regional Data Stream Plan for that asset. All Citizen Science data will be defined as such in the description and metadata associated with these data streams, and associated disclaimers will be provided.

4.4.5 Stewardship and Preservation

AOOS stores ingested data in a secure, professionally managed external facility. AOOS currently has total storage space for over 1.8 petabytes of data, and those resources are geo-replicated between Portland, Oregon and Providence, Rhode Island. Local data storage in Anchorage is limited to temporary files only that are checked in to the main servers on a sub-daily basis.

AOOS stores all aggregated data, be it real-time sensors, forecasts results, static GIS layers, etc., indefinitely beyond the life of each individual project. This means that real-time sensor feeds will become historical sensor feeds one-month after collection, and it allows AOOS to grant users extremely rapid web-based access to all sensor data (federal and non-federal) since AOOS began aggregating feeds. The only assets that are not kept indefinitely in storage are webcam images.

4.4.6 Public Access and Dissemination

The AOOS Data System provides a variety of environmental and socioeconomic data resources in a one stop data portal, free to the public, with data originating from federal and state agencies, local municipalities, academic institutions, research organizations, private companies, non-profit organizations, and community observers. Any data served by the AOOS Data Portal carries with it the permission to view and access and carries no privacy or ethical restrictions. Data access is defined here as being permitted to download data through any of the AOOS hosted data portals.

Occasionally, a data sharing agreement between AOOS and a data provider will identify the existence of intellectual property rights (IPR) to the data, and this is noted in the applicable Regional Data Stream Plans. However, IPRs do not restrict access to any of the data that is freely served through any of the AOOS hosted data portals. IPR information is merely provided out of courtesy for the data provider, and it is an unwritten expectation as well as a best practice, that as with all data used by someone other than the originator, clear credit is given to the data source (the originator) and data provider (in this case AOOS) in any work or publications that emanate from using data accessed via the AOOS portals.

New datasets received by AOOS are immediately available to the public after data ingestion and documentation is complete; however, they are added to the searchable, public catalog only after the data provider is contacted and any feedback (if given) is considered. Once published in the catalog, datasets are promoted via the AOOS website, social media accounts, and email newsletter.

4.4.7 Data Archival

As a federally funded program, AOOS is required to submit data it generates (funds) to a national archive center. AOOS is working with the National Centers for Environmental Information (NCEI) to

assist with the preservation of data generated by AOOS and when possible, data shared by other providers to the AOOS Data Portal (but not funded by AOOS). Data archival of non-AOOS generated datasets depends if the data are already being archived elsewhere (in which case, AOOS will not duplicate archival efforts), AOOS has cooperation to archive data with the data provider, there exists availability of adequate metadata associated with the data, and AOOS has available resources to complete the archival process. The bulk of the data assets managed by AOOS are non-real-time, non-federal assets, sometimes from small private data originators, and often from distinct research projects or large, integrated ecological research programs. AOOS will continue to make all data served on the AOOS portal available to NCEI and will work with IOOS and NCEI to make available any data asset they would like to curate. The AOOS Data Management Team is consulting with several NCEI staff members (John Relph and Julie Bosch) on automating the submission of AOOS-generated and managed data assets, and other non-federal provider (not AOOS funded) real-time assets to the NCEI.

AOOS Generated and Managed Assets: AOOS generates (funds) and serves many datasets that already have archival mechanisms in place, including CDIP wave buoy data, real-time sensor streams from federal sources (e.g., NSF Circum-Arctic Lakes Observing Network, NOAA CO-OPS, NOAA NDBC, NOAA PMEL, USGS NWIS, etc.), and marine mammal telemetry data from the BOEM-funded MARES program. In March 2017, the AOOS Data Management Team Axiom Data Science submitted a Submission Information Form (SIF) to NCEI for AOOS funded sensor data. The AOOS Data Management Team completed what is required for the SIF, and NCEI will determine the final scope of the SIF for sensor-based data.

AOOS generated and managed data stream submissions will be completed using the sensor SIF, describing elements like the information provided by the Regional Data Stream Plans (G). The King Island Buoy (Data Stream Plan G23) is one such AOOS generated asset that when operational, utilized this SIF, and is used here to illustrate the kinds of information to be included on the sensor SIF for other AOOS generated assets:

1. List of parameters collected: sea water temperature, significant wave height, maximum wave height, wave from direction, dominant wave period, air temperature.
2. Process steps/quality control including final format: When buoy is redeployed, data will be sent from the buoy via modem to the AOOS Data System, converted to ASCII format, tested according to applicable QARTOD procedures, and aggregated into daily netCDF files.
3. Timing of data submissions: Historic data will be submitted once, as a single netCDF file. When the buoy is redeployed, submission timing will be determined during SIF revision in coordination with NCEI and based upon the projected size of the netCDF files over several durations (e.g., annually, semi-annually, quarterly, etc.).
4. Development of data documentation: The submitted netCDF files will contain attributes describing buoy location, deployment and retrieval dates, instrumentation, points of contact, and other information captured by the Attribute Convention for Data Discovery, as applicable.
5. Data disposition: While developing the SIF, the AOOS Data Team will consult with NCEI staff to determine mechanisms acceptable to both parties to transfer the data, with an initial intent to explore the appropriateness of having the NCEI implement FTP pull processes from a specified FTP location and using an agreed-upon netCDF format and manifest procedure.
6. Data affiliations:

- Submitting institution: AOOS;
- AOOS Operations Director point of contact: Dr. Carol Janzen (janzen@aoos.org);
- AOOS Data Manager point of contact: Rob Bochenek (rbochenek@axiomdatascience.com).

NCEI does not currently support an automated way to generate SIFs for non-sensor data (e.g., historical), which comprises a significant portion of AOOS data offerings. It is our understanding that NCEI can generate a SIF per each non-sensor dataset for certain datasets they've identified as of interest for NCEI archival, probably as one-offs through the Send2NCEI application. An example of non-sensor data is the Cook Inlet Beluga Whale Prey Availability in Winter Habitats (Data Stream G15).

AOOS Shared Non-federal Assets

The bulk of the data assets shared by but not directly funded through AOOS are non-real-time, non-federal assets, sometimes from small data originators, and often from distinct research projects or large, integrated ecological research programs (e.g., Data Stream Plans G18, *Exxon Valdez* Oil Spill Trustee Council, Gulf Watch Alaska Long-term Monitoring Program). Given the extensive data sets that are shared with AOOS and limited resources, AOOS prioritizes data streams for NCEI archival first as those funded by AOOS. AOOS will assist other data providers with archival of shared assets of interest to NCEI if they are not archiving data already with NCEI or elsewhere and with their cooperation, pending AOOS resources. Data stream plans provided in Appendix G outline NCEI archival objectives f of each data stream asset, regardless of their funding source. Though much of the data may fall outside the immediate purview of the NCEI, all data will be offered to NCEI for archival and will remain available for future archival there.

To facilitate archival of the valuable assets not accepted by NCEI, the Research Workspace has been seamlessly connected to an external data repository maintained by Axiom staff. This repository is an instance of the DataONE Generic Member Node, a preservation-oriented repository that provides byte-level persistence of objects, accepts and exposes any metadata format, and is connected to the DataONE Network. As a DataCite member organization, Axiom is able to reserve and assign DOIs to all archived objects in the Research Workspace DataONE Member Node. As a member of the DataONE Network, all content in the Research Workspace Member Node is replicated at several other geographically-distributed data archives across the network. This distributed redundancy ensures the security of the data against local failures and its availability in perpetuity independent of the future of Axiom, AOOS, or any single replication center.

Selected project data (primarily integrated ecological research projects) comprising AOOS-managed non-federal assets are being deposited and cataloged in the DataONE repository, which can be accessed at: https://search.dataone.org/portals/RW

4.4.8 Performance and Security

Axiom's main cyberinfrastructure resides within the Axiom data center, part of the West Coast US internet backbone located at the Pittock Internet Exchange. There, the data center benefits from access to low-latency, high-bandwidth internet connections, direct level 2 network connection to cloud providers (Amazon Web Services), and network and power reliability. All data center resources are

protected by several levels of onsite redundancy and backup with offsite data backup through Amazon Glacier. Several layers of physical hardware (enterprise-level firewalls) and system monitoring software (NAGIOS) are in place to provide hardened cyber security.

The primary hardware components of the Axiom IT system are:

- ~6000 processing cores in a series of interconnected blade arrays with 1.8 petabytes of high-performance disk storage.
- Compute and storage nodes connected over a low latency, converging fat tree topology Infiniband based network fabric (40 Gb/Sec between nodes, 240Gb/Sec between compute and storage clusters).
- GlusterFS is employed as a distributed clustered storage layer which allows for horizontal scaling of throughput and storage capacity.
- A multi-braided Gb/Sec internet connection for the high-bandwidth demands of centralized cloud applications.
- Individual workstations for staff amounting to ~25 Linux, Mac, and Windows computers located in their respective offices.

4.4.9 System Change Management Processes

AOOS has a system change management process that is designed to control the implementation of all changes made to any device or application within the AOOS production environment. The operational requirements of the AOOS data assembly center demand highly available and functional data services. The system change management process exists to ensure AOOS can provide a high level of availability and integrity in the delivery of technology services. The scope of the process includes all infrastructure, applications, and services used by the AOOS client community for research or data access purposes. The objectives of the process are to ensure that all changes are properly analyzed, documented, and communicated to AOOS staff and to all functional groups and clients potentially affected by, or involved in, their execution. Procedures required before, during, and after any change execution and the respective areas of responsibility are documented. The proper analysis and testing are performed a priori to assess the need for a change versus the potential impact (good/bad) of the change. No change is executed without first being properly planned, documented, peer reviewed, tested, and approved. Specifically, AOOS utilizes a separate staging environment for isolating and testing new software systems and evaluating how they affect the AOOS data system before they are deployed into production systems. User communities are notified prior to release of any major upgrades or system changes. Each system change is tracked via several mechanisms including task tracking systems and an internal Gitlab software repository, which enables the team to document what was changed, how it was changed, when it was changed and by whom. The AOOS data management staff at Axiom can roll back system changes to previous checkpoints if for some reason the new system change causes unforeseen problems in addition to running ad hoc reports to describe changes over time.

5. AOOS Data System Applications

The AOOS Data System hosts several integrated data management tools to ease data access, storage, and sharing by its users including the Research Workspace and its metadata editor, and the AOOS Ocean Data Explorer, the statewide data portals. These are further described below.

5.1 Research Workspace

The AOOS web-based data management application, named the Research Workspace ('Workspace'), is used to assemble, store, and share data by researchers or AOOS partners. Since its release in April 2012, the Workspace user-base has grown to more than 500 individuals from a number of large-scale scientific research programs, including the *Exxon Valdez* Oil Spill Trustee Council programs, the North Pacific Research Board's Gulf of Alaska Integrated Ecosystem Research Program and Annual Research Programs, the Distributed Biological Observatory, the Marine Biological Observation Network (MBON, which includes the Arctic MBON), the Arctic Animal Telemetry Network, the Marine Arctic Ecosystem Study, and several other integrated multidisciplinary programs. Users have uploaded over 18 terabytes of data spread across more than 800,000 files.

The Workspace provides users with an intuitive, web-based interface that allows scientists to create *projects* to represent scientific studies or focuses of research within a larger effort. Within each project, users may create topical groupings of data using folders and upload data and add contextual resources (e.g., documents, images, and any other type of digital resource) to their project by simply dragging and dropping files from their desktop (Figure 4). Standard, discovery-level ISO 19115-2 compliant metadata can be generated for both projects and individual datasets. Users of the Workspace are organized into groups, and everyone within a group can view the projects, folders, and files uploaded by other group members. This allows preliminary results and interpretations to be shared by geographically or scientifically diverse individuals working together on a project or program before the data are shared with the public. It also gives program managers and other stakeholders a transparent and front-row view of how users have structured and described projects, and how their programs are progressing through time. The Workspace has the following capabilities:

Secure group, user, and project profiles: Users of the Workspace have a password-protected user profile that is associated with one or more disciplinary groups or research programs.

Advanced and secure file management: A core functionality of the Workspace is the ability to securely manage and share any type of digital resource in real-time among researchers and study teams.

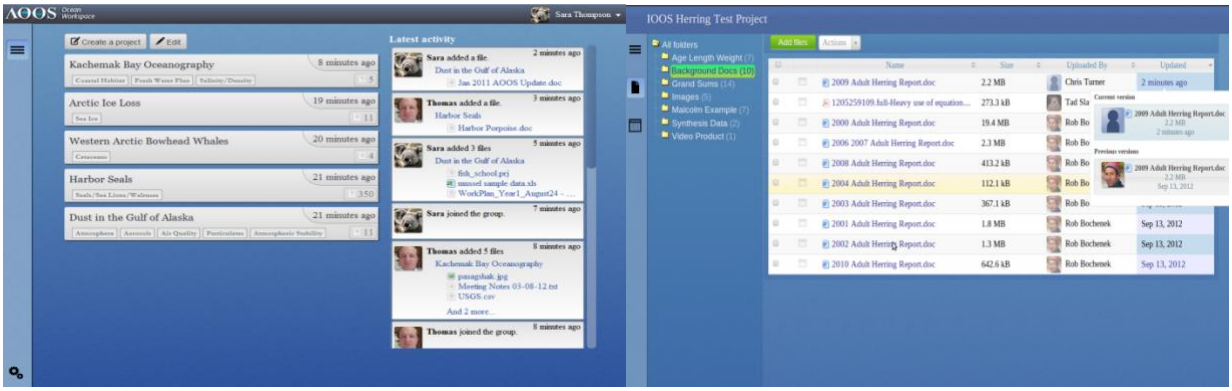

Figure 4. Screenshots of project and file management in the workspace. Left: A list of projects to which the example user has access rights. Right panel: The interface a researcher would use to organize independent files into folders and the versioning system in the workspace.

Specifically, the Workspace employs the following technological components:

- Database systems — PostgreSQL 9 is used for storage of tabular and relational data representations and is extended with PostGIS for spatial data. All data uploaded to the Workspace are replicated across multiple database servers to provide redundancy and ensure high availability.
- Object storage and schema-less data representations — MongoDB is used as a persistent NoSQL storage and query system for file objects, tabular data (flat structures) and hierarchically structured data (generally XML). MongoDB allows horizontal scaling through sharing across physical devices and provides redundancy and high availability through replication. The MongoDB instance consists of a three-node cluster, and each node maintains a complete replicate of the others. Data within each node is further redundant by virtue of RAIDed disk arrays.
- Web tier — The web services used by the Workspace are developed using Java and integrated into a web application framework called Play!, which provides a stateless architecture for Java and Scala development. The RESTful, stateless design allows services to be scaled across application nodes for load balancing, redundancy, and horizontal scalability.
- Caching and pub/sub — Redis is used as an intermediary between the web and data tiers. It also serves as a pub/sub interface for managing communications between web tier nodes and serving real-time connections to browser clients in a scalable manner.
- User interface — The user interface of the Workspace is composed of several JavaScript and HTML5 libraries and integrates with server-side modules wrapped into the Play! framework.

5.2 Metadata Editor

The Research Workspace includes an integrated metadata editor that can be used to generate FGDC-endorsed ISO 19110 and 19115-2 standards metadata. To facilitate taxonomic description, the AOOS Data Team, Axiom, developed a tool that allows users to search the ~625,000 taxonomic entities of the Integrated Taxonomic Information System (ITIS) to rapidly add species information to metadata. Because the Workspace is a cloud-based service, researchers can move between computers during the metadata generation process in addition to allowing team members and administrators to simultaneously review and edit metadata in real time.

The metadata editor is used as a core component in the AOOS Data System. Metadata are generated at multiple points throughout the project lifecycle. At the onset of the project high-level overview information about the project is documented, which includes the location, project timeline, contacts, keywords, taxonomic species, and expected data. As the project progresses and data are collected and moved through the quality control, processing, and analysis phases, more descriptive metadata can be captured by researchers. While the workflow for creating metadata may vary project-by-project, annual metadata revisions help to keep pace with new data submissions and changes to the collection procedures. As the project data matures, the completeness, content, and quality of the metadata record should also mature to robustly describe the data and meet national format standards.

After metadata has been written that complies with content and quality requirements, the Workspace can be used as a gateway to publish data and associated metadata to AOOS's publicly accessible data portals (Figure 5), described in more detail below. This feature simplifies the publishing of data and metadata for researchers and data managers.

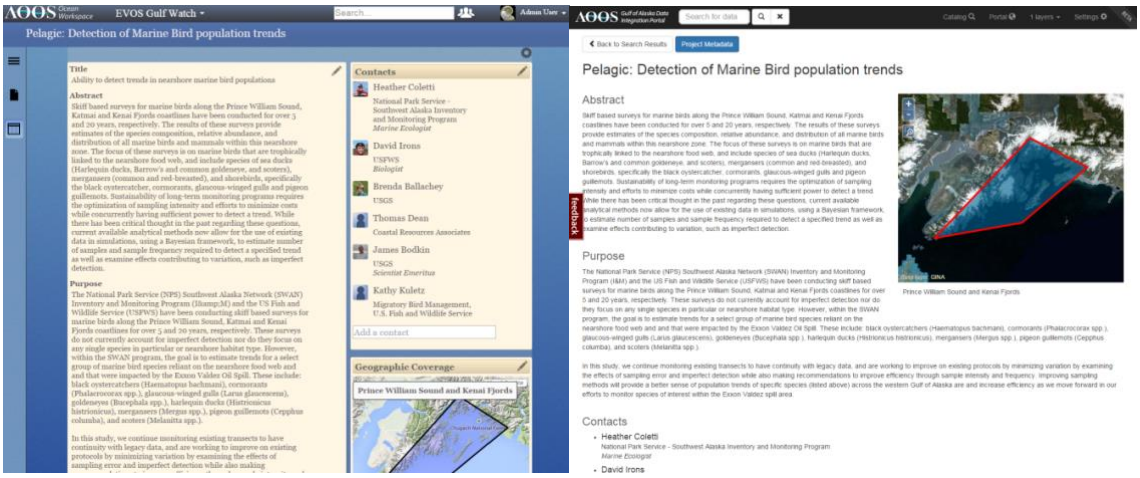

Figure 5. Left: the current Workspace metadata interface. Right: a Workspace project as seen from the AOOS Data Portal.

5.3 AOOS Data Portals

Through its Data System, AOOS maintains numerous data portals, which are customized public web interfaces that allow scientists, managers, and the public to discover and have access to public data from many sources. Some of these portals include: the Ocean Data Explorer, a statewide portal providing access to all of AOOS' public data; regional subsets of the Ocean Data Explorer, such as the Arctic Portal and the Gulf of Alaska Portal; the Real-time Sensor Map that accesses 3,000 real-time sensors; the Model Explorer that displays satellite observations, model predictions, and numerical simulations, and more. Other portals are more thematically organized such as the Cook Inlet Response Tool and the Cook Inlet Beluga Whale Ecosystem Portal. The portals use the metadata and other contextual information to develop a series of search indexes using a highly scalable technology called Elastic Search. Elastic Search is a Java-based distributed indexing scheme that allows entire collections of documents, databases, and flat files to be indexed via several dimensions. When implemented,

collections of information can be searched rapidly by spatial queries, time, text patterns, parameter, and taxonomy. This technology facilitates data discovery and access to information, metadata, and data using a Google-like search interface.

Within the data portals, users can search or browse real-time conditions, operational and research forecasts, satellite observations, and other spatially referenced datasets that describe the biological, chemical, and physical characteristics of Alaska and its surrounding waters. Data in the portals can be interactively mapped by adding and removing layers, selecting base maps, and seeing changes over time with an interactive time slider. Using the portals, users can also access metadata and project contacts, as well as download data in a variety of formats.

6. REFERENCES

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APPENDIX A

AOOS CONTRACTUAL PROCEDURES FOR SOLICITATION, EVALUATION AND SELECTION OF THE AOOS DATA MANAGER AND THE DMAC TEAM

Process for Solicitation and Selection

Following an external review of its existing sole-source data management contract with the University of Alaska Fairbanks, the AOOS Board voted in 2010 to solicit competitive proposals for two sets of services, with proposers allowed to bid on one or both of these components, separately or combined.

> *I. Data Management and Communication Services:* Services include providing data management support (data ingestion, metadata, relational database development and maintenance) and communication services (web portal, data clearinghouse, coordination, and communication), building upon the hardware, software, query tools and products developed over the previous years, and following the national IOOS Program guidance.
>
> *II. User Product Development Services*: Develop user-driven products and associated interface and visualization tools that will be maintained by and interact with the data system developed under component #1 above.

AOOS Data System Management Proposal Components for Data Management Team Selection

The following are the basic components that must be included in submitted proposals if they are to be considered:

- Signed Cover Page -- Names of applicant organization and principal/co-investigators, requested funds and other support, and a place for the signature of an official authorized to legally bind the submitting organization.
- Contact Information -- Names, affiliations, phone, email, and physical addresses for applicant lead, partners and collaborators.
- Section that explains whether this proposal is responsive to requested services Section I, II or both.
- A Proposal Summary – Description of the overall proposal and a brief description of its goals and objectives.
- Technical Approach – Detailed description of the work to be performed including goals, methods, and appropriate technical details.
- Management Approach and Personnel Qualifications – Description of the management structure and responsibilities of key personnel, including qualifications, past experience and successes with similar or relevant projects of key personnel, discussion on how key personnel will coordinate and collaborate with other programs.
- Deliverables and Timelines – Demonstrate candidate team can achieve an outcome and product within the requested award period. Example: Provide a clear table, organized by semi-annual reporting period, detailing timelines, measurable milestones (accomplishments and deliverables), and performance metrics that will be used to track the program's progress.

- Budget Information and Narrative – Detailed budget narratives must be provided that match to the tabular budgets and include a list of the personnel for each component of the project, including position aligned with expertise, proposed tasks, time commitment and labor costs.
- Data System Management Team Resumes – Curriculum vitae of *two pages maximum* are required for all key personnel.
- Past Experience – For each key person in the proposal, provide at least 3 references of people that have knowledge of the proposer's past experience. For the proposing institution or organization, provide 3 references that show the institution's or organization's experience and capabilities relevant to the AOOS Data System management requirements.

AOOS Evaluation Criteria for Data System Management Team Selection

Proposals were evaluated on these criteria:

The selected AOOS Data Manager and DMAC Team must exhibit advanced capabilities in developing user products and data visualization tools. The team must show experience in working collaboratively and flexibly with other teams.

Soundness of Approach: (50%) This assesses whether the approach is technically sound, whether the methods are appropriate, and whether there are clear project goals and objectives consistent with the objectives stated in the AOOS DMAC Plan. Reviewers will consider the following:

- Deliverables that are clearly identified, measurable, connected to timelines, and designed to meet goals and objectives;
- The conceptual framework, design, methods, and approaches are adequately developed, well integrated, and appropriate to the aims of the project;
- The applicant acknowledges potential problem areas and consider alternative approaches.

Qualifications and Past Experience of Applicants and Partners: (30%) This ascertains whether the applicant possesses the necessary education and skills, experience, training, facilities, and administrative resources to accomplish the stated goals. Reviewers will consider the following:

- The entity's working environment contributes to the probability of success;
- The proposed activities employ useful collaborative arrangements;
- The applicants have the technical programming skills, as well as strong project management skills, and the flexibility and willingness to work with a variety of users.

Project Costs: (10%) The Budget is evaluated to determine if costs are reasonable, allowable and necessary, and if they are realistic and commensurate with the project needs and time-frame. Considerations:

- The proposal effectively describes expenditure of funds for the first year (which are guaranteed);
- The proposal lays out a path for years 2-5 (which is subject to future appropriations but has a high probability of success).

Project Management: (10%) This provides a description how the overall data team will be managed. Considerations:

- How the is team structured to accomplish its goals;
- A clear organizational chain of command.

AOOS Data System Management System Proposal Review Process

Proposals are reviewed by an expert panel comprised of representatives from academia, private research institutions, and government agencies. AOOS Conflict of Interest policies (adopted by AOOS Board May 11, 2010). are followed in selection of panel members and review of the proposals. The panel rates the proposals as described above and places them in a relative rank order. The review panel may decide to give the final top group of applicants the opportunity for an interview and presentation in person as part of an opportunity to complete a "best and final" offer and help clarify any outstanding questions.

The review panel recommended unanimously that the AOOS data management contract be awarded to the team of AXIOM, led by Rob Bochenek. The Executive Director subsequently agree with the recommendation and present it to the full AOOS Board. A 5-year contract was awarded to Axiom, and subsequently extended by the Board for an additional 3 years to August 31, 2018. In August 2020, the contract was extended by the Board for an additional 3 years to August 31, 2020. In August 2020, the Executive Committee extended the Axiom contract until August 2021. On May 13, 2021, the Board unanimously approved the extension of the Axiom contract through June 2026 with a mid-term review in 2023.

Contract Provisions for Annual Performance Reviews, Renewal, Transition and Termination

The review panel also will make funding recommendations to the AOOS Executive Director and AOOS Board; however, the AOOS Board will make final funding decisions based on the criteria detailed above, the panel and Executive Director recommendations, and, in addition, may consider other factors such as:

- Balance/distribution of funds between the two components of the Data System Management RFP
- Applicant's prior award performance
- Partnerships and/or participation of targeted groups
- Adequacy of information necessary to make a decision

APPENDIX B

AOOS Federal Source Data Inventory (August 2022)

Federally sourced data served over the AOOS Data System.

National Oceanographic and Atmospheric Administration (NOAA)

NOAA Water
NOAA National Weather Service
NOAA HADS (Stream Height and Weather)
NOAA US Climate Research
NOAA KBNERR (Kachemak Bay National Estuary Research Reserve System - NERRS)
NOAA PMEL Carbon Program
NOAA IOOS HF Radar
NOAA Alaska Shorezone (imagery media)
NOAA Aleutian Island, Gulf of Alaska, Cook Inlet, Arctic Ocean, Norton Sound Bathymetry
NOAA National Ocean Data Center Arctic Regional Climatology Monthly
NOAA National Data Buoy Center - Environment Canada Data (wind vectors, gusts, water temperature, wave height, wave direction)
NOAA National Marine Fisheries Service (NOAA-NMFS)- Bering Arctic Subarctic Integrated Survey (BASIS)

United States Geological Survey (USGS)

National Water Information System (NWIS)
US Permafrost and Climate
Alaska National Wildlife Refuge (ANWR Coastal Bathymetry)
Polar Bear
Hydrology data (including precipitation)
Wave Dynamics Cameras

Federal Aviation Administration (FAA) WEBCAMS

Webcams

Department of Agriculture

Sno-Tel Stations (weather)
Desert Research Institute RAWS (remote auto weather stations) (http://raws.fam.nwcg.gov/) part of Department of Agriculture

National Science Foundation

CALON (Circum-Arctic Lakes Observation Network) (Webcams)

US Fish and Wildlife Service (USFWS)

Seabird Studies

APPENDIX C

AOOS Model Product Data Inventory (August 2022)

AOOS Data System model outputs and brief description of the output and run periods.

Type of Model	Brief Description
Alaska Region Digital Elevation Model v2.0	bathymetric digital elevation model (DEM) with nominal 1-km grid, many regions 1 km not resolved
Alaska Region Digital Elevation Model v2.0 - Continental Shelf Stretch	bathymetric digital elevation model (DEM) with nominal 1-km grid, many regions 1 km not resolved
Alaska Storm Surge Forecasting System - ALCOFS - ADCIRC	The ADCIRC storm surge model acts as a main engine and incorporated air-sea-ice drag parameterization, which aim at higher accuracy for predicting water level during winter storm by considering sea ice coverage.
ARSC High Resolution Rapid Refresh (HRRR)	Model forecasting was suspended on 12 April 2015 while software was transitioned to new compute infrastructure. No new forecasts have been made.
Bering Sea Regional Ocean Modeling System (ROMS) Hindcast	1/5/1990-10/13/2004, Sea Surface Height, Velocity, Si, Ammonium, Detritus, DO, plankton, ice velocity etc.
CAFS - Coupled Arctic Forecast System	The NOAA-ESRL Coupled Arctic Forecast System (CAFS) is adapted from the Regional Arctic System Model and modified for short-term weather-scale forecasts.
CLIVAR Co-ordinated Ocean-Ice Reference Experiments (CORE) Climate Model	1/19/1969-01/02/2005, lots, benthic detritus, infauna, velocity, euphausiids, ice phytoplankton, Sea Surface Temperature, etc.
Coastal Gulf of Alaska ROMS-GOANPZ	Gulf of Alaska nutrient-phytoplankton-zooplankton (GOANPZ) ecosystem model is embedded in the ROMS circulation model. The NPZ model for the CGOA consists of ten compartments: nitrate, ammonium, small phytoplankton, large phytoplankton, large and small microzooplankton, small copepods, large oceanic copepods, euphausiids and detritus

Type of Model	Brief Description
Coastal Observing Research and Development Center (CORDC) Alaska Coast HF Radar Derived Surface Currents	HF radar-derived surface current dataset provides nearshore sea surface velocity measurements
Cook Inlet Operational Forecast System (CIOFS)	CIOFS generates water level, wind, water temperature, salinity, and current nowcast and forecast guidance out to 48 hours, four times per day.
Extratropical Storm Surge Water Level Guidance for Alaska V2.0 (current Year only)	ETSS 2.0 surge model grid provides estimate of relative water levels attributed to storms
Extratropical Storm Surge Water Level Guidance for Alaska V2.1	ETSS 2.1 surge model grids provide estimates of both relative WLs from storms and absolute WLs caused by both storm and tide.
GOFS 3.0: HYCOM + NCODA - Global Surface, Region 6, and Region 7	4-day forecast containing ocean temperature, salinity, eastward and northward currents, and elevation information.
Gulf of Alaska - COBALT Hindcast - Daily and Monthly Averages	This interactive tool is based on an ocean acidification model that merged physical and biogeochemical ocean models and a hydrological model to reproduce past conditions from 1980-2013 in the Gulf of Alaska.
HIOMAS 2KM Forecast and Hindcast	HIOMAS is a modeling and prediction system of sea ice and currents in the Arctic Ocean.
HYCOM West Coast US Forecast (1/12°) (HYCOM Consortium for Data Assimilative Modeling)	Salinity (surface, subsurface), Sea Surf Height, Velocity (surf, subsurface), temp (surf, subsurface)
National Weather Service (NWS) Sea Ice	five-day sea ice forecasts throughout the year
NCEP Climate Forecast System Reanalysis (CFS-R) Climate Model	12/29/2002-12/30/2012, lots, benthic detritus, infauna, euphausids, temp, etc.
NCEP Reanalysis Daily Averages Surface Flux	12/31/1947-present Surface Flux: Skin Temperature
NCEP Global Forecast System GFS Model	09/04/2015-present, ice cover or water surf, pressure at ground or water surf, etc.
NOAA Coastal Survey Development Lab (CSDL) Regional Ocean Modeling System (ROMS)	01/06/2008-02/05/2008, Sea Surface Height, sea water velocity in Cook Inlet and Shelikof Straits
NOAA Coastal Survey Development Lab (CSDL) Shelikof Straits and Cook Inlet Digital Elevation Model (DEM)	Static layer DEM for Cook Inlet and Shelikof Straits
North American Mesoscale (NAM-12) Forecast for Alaska	02/26/2016-01/16/2016

Type of Model	Brief Description
Northwest Gulf of Alaska (NWGOA) Three-Dimensional Ocean Circulation Numerical Model	A 10-year ocean circulation hindcast for the waters of the Northwest Gulf of Alaska (NWGOA), with particular focus on Cook Inlet and Shelikof Strait.
NWS National Digital Forecast Database (NDFD) for Alaska	1/25/2011- present, T, Hum, Sig wind wave ht, Cloud cover, Precipitation, snow accumulation, wind, wind gust
OSTIA: Operational Sea Surface Temperature and Sea Ice Analysis	A Group for High Resolution Sea Surface Temperature (GHRSST) Level 4 sea surface temperature analysis produced daily on an operational basis at the UK Met Office using optimal interpolation (OI) on a global 0.054 degree grid.
PMEL CCCma Climate Model	01/26/2003 - 01/01/2040, lots benthic detritus, infauna, velocity, etc.
PMEL ECHO-G Climate Model	01/29/2002-12/04/2039, lots (see above)
PMEL FORECAST	10/19/2013-08/03/2014, lots (see above)
PMEL MIROC Climate Model	12/29/2002-12/04/2039, lots (see above)
Polar Data Catalogue Metadata Repository	12/29/2002-12/04/2039, lots (see above)
Prince William Sound (PWS) Regional Ocean Modeling System (ROMS) Forecast - 1-km Resolution	velocity, salinity, Sea Surface Height (SSHt), temp
Prince William Sound (PWS) Regional Ocean Modeling System (ROMS) Forecast - 3-km Resolution	velocity, salinity, SSHt, temp
Prince William Sound (PWS) Regional Ocean Modeling System (ROMS) Forecast - 9-km Resolution	velocity, salinity, SSHt, temp
Prince William Sound (WPS) Regional Ocean Modeling System (ROMS) Nowcast - 1-km Resolution	velocity, salinity, SSHt, temp
Shell Sea Ice	operation-driven sea ice forecasts for Shell management, historical back to 2010
SNAP Climate Projections AR5, RCP 6.0	01/01/2006-12/31/2100, projected air T, Projected near surface winds
SNAP Climate Projections AR5, RCP 8.5	01/01/2006-12/31/2100, projected air T, Projected near surface winds
SNAP Historical Climate Models AR5	01/01/1958-12/31/2005, mod historical Air Temperature, Wind
SNAP Historical Estimates and Projections of Sea Ice Concentration AR5	01/15/1860-12/15/2100, Mod Sea Ice Concentrations

Type of Model	Brief Description
SNAP Scenario Climate Projections	12/31/1979-11/30/2099, different scenarios of monthly average air Temperature and monthly total precipitation
Texas A&M Prince William Sound (PWS) Wave Simulation	12/16/2011-09/13/2013,peak wave periods, sig wave heights, Stokes drift directions (on site for archival purpose)
U.S. National Ice Center Arctic and Antarctic Sea Ice Concentration and Climatologies in Gridded Format	This data product is the weekly sea ice concentrations product from USNIC's G10033.
Wave Watch III (NMWW3)	2/3/2011-present, swell direction, period, sig swell wave height, wind, wind wave direction, etc.
Wave Watch III (WW3)	
Weather Research and Forecasting (WRF) for Prince William Sound and Cook Inlet from AEFF	11/15/2010-03/02/2013. Air Temp, hourly accumulation precipitation, hourly accumulation snow/ice, physical snow depth, etc.
Weather Research and Forecasting (WRF) for South Central Alaska (12 km) from AEFF	11/15/2010-03/02/2013. Air Temp, hourly accumulation, precipitation, hourly accumulation, snow/ice, physical snow depth, etc.
Weather Research and Forecasting (WRF) model for Southcentral Alaska (3km) from AEFF	10/25/2012-06/08/2014, Air T, Hourly accumulated precipitation, SST, wind
NOAA Coastal Survey Development Lab (CSDL) Shelikof Straits and Cook Inlet Digital Elevation Model (DEM)	Static layer DEM for Cook Inlet and Shelikof Straits

APPENDIX D

AOOS Static Data Product Inventory (August 2022)

AOOS Data System static data products.

Type of Data Product	Source
Alaska Governmental Boundaries	Alaska Department of Natural Resources
Alaska Oil and Gas Areas	BOEM/BSEE
Nautical Charts Maritime Limits and Boundaries	NOAA
Static maps	USFWS National Wetlands Inventory
Polar Data Catalogue Metadata Repository	NOAA
Essential Fish Habitat	NOAA AK Fisheries
Environmental Sensitivity Index Maps, AK and Cook Inlet, (ESI)	NOAA Response and Restoration –
Legal Land Claims Maps	BLM CADASTRAL – Alaska Bureau Land Management
Rangifer/Caribou Herd Extent Maps (Static Boundaries of ranges)	CAFF/CARMA
AK Dep of Env - Cook Inlet Geographic Response Strategies (plans)	Cook Inlet Regional Citizen's Advisory Council (CIRCAC) TOOL
Static maps on resources and leasing	Department of Natural Resources Oil and Gas Resources
Static Maps on ADF&G's *Atlas to the Anadromous Waters Catalog*, differentiating between fish life history phases for which the waters are used.	Alaska Department of Fish and Game
GIS based synthesis of existing ecology information	Kachemak Bay Ecological Characterizations
Data Product where no data can be pulled off map. Sampling protocols are described in Pegau et al. (2004).	Kachemak Bay Intertidal Habitat Maps
Cook Inlet salt marshes and species maps	CIRCAC and KBRR (Kachemak Bay Research Reserve)

Type of Data Product	Source
GIS based Static map on historic and current fish haul data in Beaufort and Chukchi Seas since 1972.	BOEM-sponsored Data
Hydrocarbon Contaminants in Alaska's Southern Coast (CIRCAC and EVOSTC) maps. Prince William Sound Herring Program 1974-2007 aerial Herring survey maps including routes, spawn distributions layers	Exxon Valdez Oil Spill Trustees Council
Mapped distributions for synthesis of important areas for birds and mammals in the U.S. Beaufort and Chukchi Seas	Alaska Audubon
Alaska Cetacean Biologically Important Areas	NOAA
Cook Inlet Historic Research Sites	NOAA
Biophysical and chemical distribution information	Marine Arctic Ecosystem Study (MARES)
Subsistence Resources Used by Kaktovik, Nuiqsut and UtqiaÄ¡vik	Stephen R. Braund & Associates

APPENDIX E

AOOS Regional Data Stream Inventory (August 2022)

AOOS Regional Data Streams with descriptions to indicate the data type (Real-time, historical, citizen science), category (Federal source, data product, other), and whether a QARTOD manual exists for any of the parameters belonging to the data stream. (Note: A QARTOD manual may only exist for some of the parameters listed in the Data Stream).

Data Stream	Real-time	Historical > 1 month	Citizen Science	AOOS Supported	Data Product	Federal Origin	QARTOD Manual *
G1: Alaska Community Database		x					
G2: Alaska Department of Environmental Conservation (ADEC) Resources		x			x		
G3: AK Department of Fish & Game: Fish Counts		x					
G4: Alaska Department of Fish and Game: Statewide Salmon Statistical Areas and Commercial Harvest in Cook Inlet		x					
G5: AK DOT Road Weather Information System (RWIS)	x					x AOOS access MADIS	Y
G6: Alaska HAB Monitoring		x					
G7: Alyeska Resort Weather Stations	x		x				Y
G8: Aquarius Satellite Data		x			x	x	
G9: AIS Vessel Traffic		x			x		
G10: AK Marine Exchange (AIS) Weather Stations	x			x			Y
G11: Bering Sea Sub-Network		x			x		

Data Stream	Real-time	Historical > 1 month	Citizen Science	AOOS Supported	Data Product	Federal Origin	QARTOD Manual *
G12: Canada Water Office (stream gage)	x						
G13: CORDC Alaska Coast HF Radar Derived Surface Currents	x			x	x	x	Y
G14: Community-based Observing Networks and Systems (CBONs)			x				
G15: Cook Inlet Beluga Whale Prey Availability in Winter Habitats		x					
G16: Cook Inlet CDIP Wave Buoy	x			x		x	Y
G17: Cook Inletkeeper Stream Temperature Monitoring	x thru 2020	x					Y
G18: EvosTC-Gulf Watch Program		x					
G19: EvosTC-Prince William Sound Herring		x					
G20: Ocean Acidification Moorings		x		x			Y
G21: Inupiaq Place Names			x				
G22: ISER Arctic Village Socio		x			x		
G23: AOOS King Island Wave Buoy	x 2015			x			Y
G24: National Sea Ice Data Center (NSIDC) Satellite Observations		x				x	
G25: OA Measurements: GAK Seward Line and PWS		x		x		x	Y
G26: Oceanographic Station GAK1		x			x		Y
G27: RUSALCA CTD Scans		x				x	Y
G28: RUSALCA Fish Communities		x				x	

Data Stream	Real-time	Historical > 1 month	Citizen Science	AOOS Supported	Data Product	Federal Origin	QARTOD Manual *
G29: RUSALCA Megabenthos Trawls		x				x	
G30: RUSALC Nutrient Analyses		x				x	
G31: RUSALCA Zooplankton Community Surveys		x				x	
G32: RUSALCA Zooplankton nets		x				x	
G33: Salmon Telemetry		x					
G34: Shell Oil Sea Ice		x					
G35: SNAP Historic average monthly Temperature and Precipitation		x		x	x		
G36: SNAP Historical Sea Ice Atlas		x		x	x		
G37: University of Alaska, Fairbanks, Ice Detection Buoy	x 2015 2017			x		2017 Via GTS	Y
G38: UAF Water and Environmental Research Center (WERC)		x					
G39: WebCAMS (AK Harbor, NorthCoast, CVT, AKDOT, CIRCAC, FAA, CALON)	x		x		x	x	
G40: Water Level Sensors (AK DNR, JOA Surveys, Orion Space Solutions, others)	x			x		x (some)	Y
G41: Gliders	x			x		x	Y
G42: Nome and Kodiak CDIP Buoy	x			x		x	Y
G43: COASST Beached Bird Monitoring Data		x		x			
G44: SOFAR, Wave buoys	x						Y
G45: Gulf of Alaska Ecosystem Observatory	x	x		x			Y

APPENDIX F

QUALITY CONTROL AND QARTOD APPLICATIONS TO AOOS REGIONAL DATA STREAMS

QARTOD and Quality Control Tests Implementation

The AOOS Data System employs fundamental data quality control prior to making data available on its data portals as prescribed by QARTOD guidance provided by the U.S. IOOS Program Office. That guidance has been provided for 34 IOOS Core Variables. As of August 2022, 12 manuals have been provided for 15 variables; exceptions include pCO2 and Total Suspended Matter, which will be addressed in the future, and parameters for which manuals are not feasible. The manuals listed on IOOS's page Real-time Quality Control Manuals (Manuals tab) guide AOOS's implementation of QARTOD.

In addition, AOOS's DMAC provider, Axiom Data Science, helped develop and use the IOOS QC Python package on GitHub. Four of these available tests have been implemented within the AOOS Data System using this package:

- Gross Range: Data point exceeds sensor or operator-selected min/max,
- Flat Line: Invariant value,
- Rate of Change: Excessive rise/fall, and
- Spike: Data point n-1 exceeds a selected threshold relative to adjacent data points.

Configurations for these tests depend on the parameters to which they are applied, but are broadly based on measurement instrument resolution, range, and accuracy. Climatology tests are not implemented because of the unavailability of records long enough to compute the required limits. Other tests have been applied as described in the sections below.

QARTOD has been implemented for as many of the IOOS Core Variables as possible. There are several reasons why QC might not have been implemented for a given parameter. These reasons include: 1) lack of IOOS guidance from manuals; 2) the parameter is not used in AOOS's real-time systems; 3) the available units (such as RFU in the cases of optical measurements) are relative and so constant limits cannot be applied; and 4) good information could not be found regarding instrument measurement accuracy or range.

Here is a summary of the relevant parameters (and which variations have QARTOD implemented):

1. Dissolved Oxygen (Saturation in % and concentration in mg/L but not other units)
2. Current Speed and Direction (m/s and degrees to)
3. Surface Waves (15 different parameters including period, significant height, direction, etc.)
4. Temperature (both air and water)
5. Salinity (and conductivity)
6. Water Level (meters using datums NAVD88, MLLW, MHHW, NGVD29, and Local Station)
7. Wind Speed and Direction (m/s and directions to and from)
8. CDOM (as Expressed As Equivalent Mass Fraction Of Quinine Sulfate Dihydrate but other units are relative so can't be QC'd)
9. Optical properties
    a. In water irradiance (not implemented)

b. Above water irradiance (not implemented)
c. Beam Attenuation (not implemented)
d. Turbidity (in NTU, but RFU is a relative measure so can't be QC'd)
e. PAR (surface downwelling only)
f. Chlorophyll (ug/L but not other units)
g. Backscatter (not implemented)

10. Dissolved Nutrients
    a. Nitrogen: NO3, NO2, NH4 (NO3 in mg/L but not other species or units)
    b. Phosphate (in mg/L but not other units)
    c. Silicate (not implemented)
11. pH

Currents from High Frequency Radar are not an IOOS Core Variable, but there is a manual for it, so QARTOD has been implemented for those measurements.

Data flags (Table 1) required by QARTOD are implemented for Regional Data Streams that require QC flags. When possible, QC by the data provider is used preferentially instead of AOOS-generated flags. In cases when the data provider uses a different system than QARTOD, their flags are mapped to the equivalent QARTOD flags.

Table 1. Flags for real-time data based on UNESCO (2013) standards.

FLAG	DESCRIPTION
Pass = 1	Data have passed critical real-time quality control tests as outlined in the Data Stream Plan, and are deemed adequate for use as preliminary data.
Not Evaluated = 2	Data have not been QC-tested in any way, or the information on quality is not available.
Suspect or High Interest = 3	Data are either suspect or of high interest to data providers and users. This flag is to draw particular attention from the operators.
Fail = 4	Data are considered inadequate for inclusion in critical operational analysis because they have failed one or more real-time QC checks. This flag is to warn the provider and the user that these data have not met QC tests, and may not meet minimum standards to be considered accurate. This flag is used when QC Failed data are left in the record.
Missing Data == 9	Data are missing; Used as a placeholder (NaN)

This appendix will be updated as more QARTOD applications become available or change, and when AOOS adds a real-time data stream not described here. Regardless, individual data stream plans will contain all the necessary QARTOD application information for any real-time data stream.

QARTOD Weather Data QC Implementation: Real-time QC is conducted on the following wind parameters, as described in the QARTOD manual for weather parameters: https://cdn.ioos.noaa.gov/media/2017/12/QARTOD_Wind_Manual_v1.1_final_draft_signed.pdf

- Wind Speed
- Wind Direction
- Wind Gust

There are five required tests and three strongly recommended for these weather parameters outlined in the QARTOD application, of which six are implemented by the AOOS Data System (required tests: the syntax, gross range and time gap tests; strongly recommended: flat line, rate of change, and spike tests). Information about the tests implemented by AOOS are available in the IOOS QARTOD library (ioos.github.io/ioos_qc/) and on the station pages in the AOOS data portal (see wind sensor example). QARTOD requires three additional tests -- a timing gap test that flags missing data points, location test and climatology test. A version of the Timing Gap Test, which with QARTOD is intended to ensure ingestion of minimum hourly time series, is performed by AOOS. The AOOS version of the timing gap test changes the station color to a grey shade ("shade-flags") on the real-time sensor map display after 4 hours of missed data reports and removes the station from the map (though not the archive) after a week of missed reports. The Location Test will be implemented when there is a GPS (latitude and longitude) location provided as part of the station data stream (e.g., on a buoy). Most nonfederal weather data offered by AOOS originate on land-based (fixed) platforms, and location data feeds are typically unavailable, eliminating the need for this test. The Climatology Test is more rigorous, and currently, the AOOS Data System does not have the historical data in place to perform meaningful climatology tests on non-federal sourced weather assets. It is a test that may be considered after there are 7+ years of data in the AOOS archive.

At least one regional weather station is from a community observer asset (Alyeska Resort G-7), and QC is not required; however, to increase the usefulness of such assets, these same QARTOD checks are implemented on these assets. When possible, data quality assurance of these assets is also documented (e.g., installation, maintenance and validation procedures). Please refer to the Regional Data Stream plans for more details on QC protocols for specific weather data assets in Appendix G (G-5, G-7, G-11).

QARTOD In-situ Surface Wave Data QC Implementation: Real-time QC are conducted on the following parameters, as described in the QARTOD manual for in-situ surface wave data: https://cdn.ioos.noaa.gov/attachments/2019/02/QARTOD_Waves_Update2Final.pdf

- Wave Height
- Wave Direction
- Wave Period

QARTOD requires five QC tests on wave data, two of which are frequency tests only required if reporting out wave spectra data. In addition, three tests are strongly recommended. AOOS performs five QC tests (required: syntax, gross range and time gap test on bulk wave parameters (except wave period); strongly recommended: flat line and spike tests). Information about the tests implemented by AOOS are available in the IOOS QARTOD library (ioos.github.io/ioos_qc/) and on the station pages in the AOOS data portal (see wave buoy station example). The AOOS timing gap test changes the station color to a grey shade ("shade-flags") on the real-time sensors map display after 4 hours of missed data reports and removes the station from the map (though not the archive) after a week of missed reports. QARTOD's timing gap test differs slightly from the AOOS test, and flags missing data points, which is intended to ensure ingestion of minimum hourly time series.

AOOS implements the required QARTOD QC checks on all real-time wave data assets that do not originate from a federal source or an exempt data network provider (e.g., CDIP).

QARTOD Water Level Data QC Implementation: Real-Time QC are conducted on parameters as described in the QARTOD manual for water level data: https://cdn.ioos.noaa.gov/media/2021/04/QARTOD_WaterLevelManual_Update_V2.1_Final.pdf

QARTOD requires five tests and three strongly recommended tests for real-time water level data reporting, of which six are implemented by the AOOS Data System (required tests: the syntax, gross range and time gap tests; strongly recommended: flat line, rate of change, and spike tests). Information about the tests implemented by AOOS are available in the IOOS QARTOD library (ioos.github.io/ioos_qc/) and on the station pages in the AOOS data portal (see water level sensor example). QARTOD requires three additional tests including a timing gap test that flags missing data points, location test and climatology test. A version of the Timing Gap Test, which with QARTOD, is intended to ensure ingestion of minimum hourly time series, is performed by AOOS. The AOOS version of the timing gap test changes the station color to a grey shade ("shade-flags") on the real-time sensors map display after 4 hours of missed data reports and removes the station from the map (though not the archive) after a week of missed reports. The Location Test will be implemented when there is a GPS (latitude and longitude) location provided as part of the station data stream (e.g., on a buoy). Some of the non-federal water level data may originate from fixed platforms, such as bridges, and location data feeds may, therefore, be unavailable, eliminating the need for this test. The Climatology Test is more rigorous, and currently, the AOOS Data System does not have the historical data in place to perform meaningful climatology tests on non-federal sourced water level assets. It is a test that may be considered after there are 7+ years of data in the AOOS archive. Please refer to the Regional Data Stream plans for more details on QC protocols for water level data assets in Appendix G (e.g., G-40).

QARTOD HFR Data QC Implementation: Real-Time QC are conducted as described in the QARTOD manual for High Frequency Radar derived surface current data:
https://cdn.ioos.noaa.gov/media/2022/07/HFR_QARTOD_Manual_Update_Final-1b.pdf

A total of seven QC tests for HFR derived surface currents are required by QARTOD:

- Signal-to-noise ratio test to ensure the measured signal is sufficiently above a noise level;
- Syntax test;
- Max threshold test to ensure radial current speed is not unrealistically high;
- Valid location test (radial components), to remove radial vectors that get placed over land or in other unmeasurable areas;
- Data density threshold to check a sufficient number of radial velocities exist to compute a total velocity vector;
- GDOP threshold that tests uncertainty in velocity due to geometric relationship between radials is low enough for the vector to be valid;
- Max speed threshold to ensure total current speed is not unreasonably high.

The Alaska HFR data served by AOOS are and will continue to be acquired from the National IOOS HFR data server at Coastal Observation Research and Development Center University of California San Diego (UCSD). UCSD acquires the HFR data directly from the University of Alaska Fairbanks (UAF), QC is performed, and data are converted to NetCDF format. The following link provides the QC documentation on the UCSD website that describes the quality control performed on HFR Network data:
http://cordc.ucsd.edu/projects/mapping/documents/HFRNet_QC-RTVproc.pdf
If these data are processed and accessed through the HFR Network, they do not require additional QC or QARTOD QC implementations by AOOS.

QARTOD In-situ Temperature and Salinity Data QC Implementation: Real-time QC are conducted as described in the QARTOD manual for in-situ temperature and salinity data: https://cdn.ioos.noaa.gov/media/2020/03/QARTOD_TS_Manual_Update2_200324_final.pdf

There are five required and three strongly recommended tests for in-situ temperature and salinity identified by QARTOD, of which six are implemented by the AOOS Data System (required tests: the syntax, gross range and time gap tests; strongly recommended: flat line, rate of change, and spike tests). Information about the tests implemented by AOOS are available in the IOOS QARTOD library (ioos.github.io/ioos_qc/) and on the station pages in the AOOS data portal (see temperature sensor example). QARTOD requires two additional tests including a timing gap test that flags missing data points, location test and climatology test. A version of the Timing Gap Test, which with QARTOD, is intended to ensure ingestion of minimum hourly time series, is performed by AOOS. The AOOS version of the timing gap test changes the station color to a grey shade ("shade-flags") on the real-time sensors map display after 4 hours of missed data reports, and removes the station from the map (though not the archive) after a week of missed reports. The Location Test will be implemented when there is a GPS (latitude and longitude) location provided in the station data stream, as might be the case on a moored buoy. The Climatology Test is more rigorous, and currently, the AOOS Data System does not have the historical data in place to perform meaningful climatology tests on non-federal sourced weather assets. It is a test that may be considered after there are 7+ years of data in the AOOS archive. Please refer to Appendices G for QC protocols planned for any AOOS real-time temperature and salinity observations (e.g., G-16, G-17 G-23, G-37).

APPENDIX G

AOOS REGIONAL DATA STREAM PLANS (AUGUST 2022)

APPENDIX-INDEX	Regional Data Stream Descriptor
G-1	Alaska Community Database
G-2	Alaska Department of Environmental Conservation (ADEC) Resources
G-3	Alaska Department of Fish and Game, Fish Counts
G-4	Alaska Dept of Fish and Game: Statewide Salmon Statistical Areas and Commercial Harvest in Cook Inlet
G-5	Alaska Dept of Transportation, Road Weather Information System (RWIS)
G-6	Alaska Harmful Algal Bloom (HAB) Monitoring
G-7	Alyeska Resort Weather Stations
G-8	Aquarius Satellite Data
G-9	Automatic Identification System (AIS) Vessel Traffic
G-10	Marine Exchange of Alaska (AIS) Weather Stations
G-11	Bering Sea Sub-Network (BSSN), Community-Based Observing Network for Adaptation and Security
G-12	Canada Water Office
G-13	CORDC - Alaska Coast HF Radar Derived Surface Currents
G-14	Community-based Observing Networks and Systems (CBONs)
G-15	Cook Inlet Beluga Whale Prey Availability in Winter Habitats
G-16	Cook Inlet CDIP Buoy
G-17	Cook Inletkeeper Stream Temperature Monitoring
G-18	Exxon Valdez Oil Spill Trustee Council, Gulf Watch Alaska Long-Term Monitoring Program
G-19	Exxon Valdez Oil Spill Trustee Council, Prince William Sound Pacific Herring Research and Monitoring (HRM) Program

APPENDIX-INDEX	Regional Data Stream Descriptor
G-20	Ocean Acidification Moorings
G-21	Inupiaq Place Names
G-22	ISER Arctic Villages Socioeconomic Data
G-23	King Island Wave Buoy
G-24	National Snow and Ice Data Center (NSIDC) Sea Ice Concentration
G-25	Ocean Acidification Measurements: Gulf of Alaska Seward Line and Prince William Sound
G-26	Oceanographic Station: GAK1
G-27	RUSALCA CTD Scans
G-28	RUSALCA Fish Communities
G-29	RUSALCA Megabenthos Trawls
G-30	RUSALCA Nutrient Analyses
G-31	RUSALCA Zooplankton Community Surveys
G-32	RUSALCA Zooplankton Nets
G-33	Salmon Telemetry from the Copper River, Alaska
G-34	Shell Sea Ice
G-35	SNAP Historical Monthly Temperature and Precipitation
G-36	SNAP Historical Sea Ice Atlas
G-37	University of Alaska Fairbanks, Ice Detection Buoy
G-38	University of Alaska Fairbanks, Water and Environmental Research Center (WERC)
G-39	Web Cams (Various Sources)
G-40	Water Levels Sensors (AK DNR iGages and other sources)
G-41	Glider
G-42	Nome and Kodiak CDIP Buoy
G-43	COASST Beached Bird Monitoring Data

APPENDIX-INDEX	Regional Data Stream Descriptor
G-44	SOFAR, Wave Buoys
G-45	Gulf of Alaska Ecosystem Observatory

APPENDIX H

AOOS Climate and Forecast (CF) Conventions

To make it easier for disseminated AOOS data to be used in other contexts, CF conventions have been adhered to as much as possible. Because they provide the ability to standardize parameter definitions, CF conventions are increasingly gaining acceptance and have been adopted by a number of projects and groups as a primary standard. As the tag "CF" implies, the conventions were initially developed for use by "Climate and Forecast" models of the atmosphere and ocean; parameter units and definitions are most applicable in that context. Using this standard enables data served by AOOS to be more easily incorporated into modeling projects.

AOOS has implemented this standard by linking the parameters displayed in the data portals to CF standard names as they are presented by the Marine Metadata Interoperability's Ontology Registry and Repository (ORR); CF standard names are available at https://mmisw.org/ont/cf/parameter/. These linkages are retained in the netCDF files served by the AOOS ERDDAP server using attributes described in the NetCDF Climate and Forecast (CF) Metadata Conventions . Whenever possible, CF's canonical units are also used, though this is limited by legacy definitions within the AOOS data system, by the units in which data come to AOOS, and by the requirements of visual display on the data portal. Adherence to CF conventions is continually improving and remains a priority for future development.

Below is a table that summarizes the AOOS parameters that are linked to CF standard names. Additionally, if the parameter has been configured for QARTOD quality checks, that has also been noted.

Parameter	Units	CF Standard Name	CF Units	AOOS QARTOD
Air Pressure At Sea Level	mbar	air_pressure_at_mean_sea_level	Pa	YES
Air Temperature	°C	air_temperature	K	YES
Average Wave Period	s	sea_surface_wave_mean_period	s	YES
Barometric Pressure	mbar	air_pressure	Pa	YES
Chlorophyll	µg/L	mass_concentration_of_chlorophyll_in_sea_water	kg/m^3	YES
Chlorophyll a Mass Concentration	µg/L	mass_concentration_of_chlorophyll_a_in_sea_water	kg/m^3	
Conductivity	mS/cm	sea_water_electrical_conductivity	S/m	YES
Current Speed	m/s	sea_water_speed	m/s	YES
Current To Direction	degree	sea_water_velocity_to_direction	degree	YES
Depth	m	depth	m	YES

Parameter	Units	CF Standard Name	CF Units	AOOS QARTOD
Dew Point	°C	dew_point_temperature	°K	YES
Dissolved Oxygen Concentration	mg/L	mass_concentration_of_oxygen_in_sea_water	kg/m^3	YES
Dissolved Oxygen Concentration	µmol/L	mass_concentration_of_oxygen_in_sea_water	kg/m^3	
Dissolved Oxygen Concentration	mL/L	mass_concentration_of_oxygen_in_sea_water	kg/m^3	
Dominant Wave Directional Spread	degree	sea_surface_wave_directional_spread_at_variance_spectral_density_maximum	degree	YES
Dominant Wave From Direction	degree	sea_surface_wave_from_direction_at_variance_spectral_density_maximum	degree	YES
Dominant Wave Period	s	sea_surface_wave_period_at_variance_spectral_density_maximum	s	YES
Downwelling Photosynthetic Photon Flux In Sea Water	µmole/m^2/s	downwelling_photosynthetic_photon_flux_in_sea_water	$mol/m^2/s$	
Eastward Sea Ice Velocity	m/s	eastward_sea_ice_velocity	m/s	
Eastward Sea Water Velocity	m/s	eastward_sea_water_velocity	m/s	YES
Eastward Wind	m/s	eastward_wind	m/s	
Evaporation Rate	mm/hr	lwe_water_evaporation_rate	m/s	
Ground Temperature	°C	soil_temperature	°K	
Incoming Shortwave Radiation	W/m^2	toa_incoming_shortwave_flux	W/m^2	
Maximum Wave Height	m	sea_surface_wave_maximum_height	m	YES
Nitrate Concentration (NO3)	µmol/L	mole_concentration_of_nitrate_in_sea_water	mol/m^3	
Northward Sea Ice Velocity	m/s	northward_sea_ice_velocity	m/s	
Northward Sea Water Velocity	m/s	northward_sea_water_velocity	m/s	YES
Northward Wind	m/s	northward_wind	m/s	
Oxygen Saturation	%	fractional_saturation_of_oxygen_in_sea_water	%	YES

Parameter	Units	CF Standard Name	CF Units	AOOS QARTOD
pH	fraction	sea_water_ph_reported_on_total_scale	1	YES
Precipitation (accumulation)	mm	lwe_thickness_of_precipitation_amount	m	YES
Precipitation (increment)	mm	lwe_precipitation_rate	m/s	
Reflected Shortwave Radiation	W/m^2	toa_outgoing_shortwave_flux	W/m^2	
Relative Humidity	%	relative_humidity	%	YES
Salinity	PSS	sea_water_practical_salinity	$1E^{-03}$	YES
Sea Floor Depth Below Sea Surface	m	sea_floor_depth_below_sea_surface	m	
Sea Surface Temperature	°C	sea_surface_temperature	°K	YES
Sea Water Density	kg/m^3	sea_water_density	kg/m^3	
Sea Water Pressure	dbar	sea_water_pressure	dbar	YES
Sea Water Pressure Due To Sea Water	dbar	sea_water_pressure_due_to_sea_water	dbar	
Sea Water Sigma-t	kg/m^3	sea_water_sigma_t	kg/m^3	YES
Significant Wave Height	m	sea_surface_wave_significant_height	m	YES
Snow Depth	m	surface_snow_thickness	m	YES
Snowfall Thickness	mm	thickness_of_snowfall_amount	m	
Solar Radiation	W/m^2	solar_irradiance	W/m^2	YES
Stream Height	m	height	m	
Surface Albedo	fraction	surface_albedo	1	
Surface Downwelling Photosynthetic Photon Flux In Air	$\mu mole/m^2/s$	surface_downwelling_photosynthetic_photon_flux_in_air	$mole/m^2/s$	YES
Surface Downwelling Photosynthetic Radiative Flux In Air	W/m^2	surface_downwelling_photosynthetic_radiative_flux_in_air	W/m^2	
Surface Temperature	°C	surface_temperature	°K	
Swell Height	m	sea_surface_swell_wave_significant_height	m	YES
Swell Wave To	degree	sea_surface_swell_wave_to_direction	degree	YES

Parameter	Units	CF Standard Name	CF Units	AOOS QARTOD
Direction				
Turbidity	NTU	sea_water_turbidity	1	YES
Upward Sea Water Velocity	m/s	upward_sea_water_velocity	m/s	
Visibility	m	visibility_in_air	m	YES
Water Level	m	sea_surface_height_above_sea_level	m	
Water Level Predictions (Tides)	cm	sea_surface_height_amplitude_due_to_geocentric_ocean_tide	m	
Water Surface Height above Datum	m	water_surface_height_above_reference_datum	m	
Water Temperature	°C	sea_water_temperature	°K	YES
Wave Directional Spread	degree	sea_surface_wave_directional_spread	degree	YES
Wave From Direction	degree	sea_surface_wave_from_direction	degree	YES
Wave Mean Height	m	sea_surface_wave_mean_height	m	YES
Wave Swell Period	s	sea_surface_swell_wave_period	s	
Wave To Direction	degree	sea_surface_wave_to_direction	degree	YES
Wind From Direction	degree	wind_from_direction	degree	YES
Wind Gust	m/s	wind_speed_of_gust	m/s	YES
Wind Speed	m/s	wind_speed	m/s	YES
Wind To Direction	degree	wind_to_direction	degree	YES
Wind Wave Height	m	sea_surface_wind_wave_significant_height	m	YES
Wind Wave Period	s	sea_surface_wind_wave_period	s	
Wind Wave To Direction	degree	sea_surface_wind_wave_to_direction	degree	YES

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Alaska Community Database Online (CDO) is a compilation of published data from a variety of sources and aggregated by the State of Alaska Department of Commerce, Community, and Economic Development Office of Community and Regional Affairs. The data are organized by locations in Alaska that include Communities and Places of Interest. An area is classified as a Community if it is a City, Borough, or an unincorporated area with a qualified entity that has received money from the Community Revenue Sharing program at least once within the last five consecutive years.

Website URL: http://portal.aoos.org/#module-metadata/48e97510-39d7-44b2-b7b8-2eefeb55917c/d558bdfe-b410-11e5-95e7-00265529168c

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

The parameters include community information for communities across Alaska including: population size, pronunciation, incorporation date and status, and links to community infrastructure plans, including: photo library, plans, infrastructure, and profile maps.

D. Provide information about the sampling platform or instrumentation.

N/A

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are public through the State of Alaska website: https://dcra-cdo-dcced.opendata.arcgis.com/

B. In which format(s) were data received by AOOS?

Data was received as geodatabase files from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from three unique access points:

- Web Mapping Service (WMS)
- Web Feature Service (WFS)
- File Downloads (PNG, Shapefile, CSV)

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and Shapefiles. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Geodatabase files were access from the State of Alaska ArcGIS REST service . Data was imported to PostgreSQL, visualized with custom JSON REST service (JAVA). The original shapefiles were re-projected to EPSG:3572 (Alaska-based polar) for visualization in the AOOS data portals. PDF tables from yearly reports were transcribed into yearly PostgreSQL tables.

F. What metadata or contextual information is provided with the data?

The State of Alaska provides overview information and non-standard metadata at https://dcra-cdo-dcced.opendata.arcgis.com/pages/metadata. Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's metadata page.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

State of Alaska Department of Commerce, Community, and Economic Development

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

State agency

a. If Federal data source, were changes applied to the data?

No

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Historical

C. If real-time, list the QARTOD procedures that are currently applied.

Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

QC by originator

F. Describe the data control procedures that were applied by the originator.

Contact the data provider for availability of QC information.

a. Provide a link to any documented procedures.

N/A

G. Describe the data control procedures that were applied by AOOS.

No applied AOOS QC. This is a synthesis product made from existing data sources.

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers. This data stream is not of interest to NCEI at this time.

B. Which long-term data storage facility will be used for preservation?

N/A

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

These datasets were developed by Defenders of Wildlife for inclusion in its Bering Strait Response Teaching Tool. The spatial information herein came from a variety of sources, including the ADEC website, geographic response strategies issued by the State of Alaska, annual reports detailing past spills, and the published locations of local response equipment containers, towing systems, and places of refuge. The data represent Defenders' best estimate of the spatial information used by Alaska DEC and others for spill response.

Website URL: http://portal.aoos.org/#module-metadata/7a9d740e-6dbe-4368-8335-50e2bc49d807/d6c9adc6-83e3-4357-a3f2-03d109cb05b3

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

The parameters include the locations of emergency towing systems, the locations of local response equipment containers, geographic response strategies tied to regions, potential places of refuge for ships, subarea contingency plans, and a layer showing the ten largest oil spills by year (2007-2014).

D. Provide information about the sampling platform or instrumentation.

N/A

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically through webpages and reports.

B. In which format(s) were data received by AOOS?

Data were received as shapefiles and PDF files from the originator, with the exception of the Geographic Response Strategies data layer which was accessed from the State of Alaska ArcGIS REST server.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from three unique access points:

- Web Mapping Service (WMS)
- Web Feature Service (WFS)
- File Downloads (PNG, Shapefile, CSV)

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and Shapefiles. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data files were provided to AOOS by Defenders of Wildlife, who aggregated them from original files, webpages and reports. Data were imported to PostgreSQL, visualized with custom JSON REST service (JAVA). The original shapefiles were re-projected to EPSG:3572 (Alaska-based polar) for visualization in the AOOS data portals. PDF tables from yearly reports were transcribed into yearly PostgreSQL tables.

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

Alaska Department of Environmental Conservation (ADEC)

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

State agency

a. If Federal data source, were changes applied to the data?

N/A

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Historical

C. If real-time, list the QARTOD procedures that are currently applied.

Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

QC by originator. The data represent Defenders' best estimate of the spatial information used by Alaska DEC and others for spill response.

F. Describe the data control procedures that were applied by the originator.

Contact the data provider for availability of QC information.

a. Provide a link to any documented procedures.

N/A

G. Describe the data control procedures that were applied by AOOS.

No applied AOOS QC. This is a synthesis product made from existing data sources.

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers. This data stream is not of interest to NCEI at this time.

B. Which long-term data storage facility will be used for preservation?

N/A

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Alaska Department of Fish and Game (ADF&G), federal agencies, and non-government organizations operate counting projects to count the numbers of migrating fish (primarily salmon), using weirs, sonars and counting towers in a number of streams throughout Alaska. The counts are used by the various fisheries divisions for a variety of management objectives. The information displayed has been compiled from the ADF&G Fish Count Data Search website, which contains counts from a number of different sources to provide inseason and historical data. Counts are generated during the summer migration period extending from late-May (when the weir or sonar is installed) until August (when the weir or sonar is removed). The data displayed are daily counts of individual fish passing the count station (i.e. weir, sonar, tower, etc.).

Website URL: http://portal.aoos.org/#module-metadata/778ba7e7-daf6-4595-bea1-78239afdc324/73e0d06e-133d-4a67-b3e6-ddc486cdd067

B. How many station locations are there for this data stream?

66

C. What are the specific parameters of the data.

Daily counts of individual fish passing in-river counting stations as reported by the State of Alaska.

D. Provide information about the sampling platform or instrumentation.

The sampling platforms include various fish counting devices, including weir, sonar, and tower.

2. DATA PATHWAY

A. Is a data sharing agreement required?

No. Data are available to the public through the ADFG website. This site does not include access to all of the fish count locations in the state, only those for which inseason data are readily available. All counts for the current year are considered preliminary data and subject to change.

B. In which format(s) were data received by AOOS?

Data were received either as a CSV file from originator, or as a XLSX file directly from originator depending on the fish count station.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from three unique access points:

- Web Mapping Service (WMS)
- Web Feature Service (WFS)
- File Downloads (PNG, Shapefile, CSV)

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and Shapefiles. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For these data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

Alaska Department of Fish and Game, Division of Sportfish

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

State agency

a. **If Federal data source, were changes applied to the data?**
N/A

b. **If Yes, describe any changes to the data that require documentation?**
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Historical, early 1960s - 2015

C. If real-time, list the QARTOD procedures that are currently applied.
Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
Some QC as delivered from ADFG

F. Describe the data control procedures that were applied by the originator.
QC specific to biological fish counts is applied by ADF&G. Contact the data provider for availability of QC information.

a. **Provide a link to any documented procedures.**
N/A

G. Describe the data control procedures that were applied by AOOS.
No applied AOOS QC. This is a synthesis product made from existing data sources.

a. **Provide a link to any documented procedures.**
N/A

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers. This data stream is not of interest to NCEI at this time.

B. Which long-term data storage facility will be used for preservation?
N/A

C. Describe any transformation necessary for data preservation.
N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Alaska Department of Fish and Game (ADF&G) manages approximately 750 active fisheries, 26 game management units, and 32 special areas. In these maps, a small subset of the ADF&G salmon fishing information is represented. The Statistical Areas used for the analysis of salmon commercial fishing by ADF&G are shown. Additionally, shown is a time series of salmon (all species) commercial harvest from 1985 to 2015 within Cook Inlet districts 244, 245, and 246.

Website URL: https://portal.aoos.org/#module-metadata/7b7d38d8-8d04-4fcf-97f4-8dbb333761d1

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

The parameters include the location of statistical areas used by ADF&G, and commercial salmon harvest numbers as collected by the State of Alaska in Cook Inlet Districts 244-247.

D. Provide information about the sampling platform or instrumentation.

N/A

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data were made public through an agreement between the Alaska Department of Fish and Game and AOOS.

B. In which format(s) were data received by AOOS?

Data were received as shapefiles and XLSX files from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from three unique access points:

- Web Mapping Service (WMS)
- Web Feature Service (WFS)
- File Downloads (PNG, Shapefile, CSV)

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and Shapefiles. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Original XLSX files were provided to AOOS by ADF&G who collects the data from voluntarily-submitted (but required) fish tickets. Data were imported to PostgreSQL and visualized with custom JSON REST service (JAVA).

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site. Metadata and usage notes were added by ADF&G.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

Alaska Department of Fish and Game

I. Describe any effect of IPR on data access.

None

3. DATA SOURCE AND QUALITY CONTROL

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

State agency

a. If Federal data source, were changes applied to the data?

No

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Historical

C. If real-time, list the QARTOD procedures that are currently applied.

Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

QC by originator

F. Describe the data control procedures that were applied by the originator.

QC specific to biological fish counts is applied by ADF&G. Contact the data provider for availability of QC information.

a. Provide a link to any documented procedures.

N/A

G. Describe the data control procedures that were applied by AOOS.

No applied AOOS QC. This is a synthesis product made from existing data sources.

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers. AOOS will facilitate data archival with NCEI. Currently, these data are not of interest to NCEI.

B. Which long-term data storage facility will be used for preservation?

N/A

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Road Weather Information System (RWIS) is a network of meteorological and pavement sensors located along the highway system. RWIS stations are located in strategic locations to provide accurate real-time road weather information and critical observations for forecasts. This and other weather information helps Alaska Department of Transportation & Public Facilities (ADOT&PF) improve timeliness of maintenance actions (e.g., snowplowing; deposit anti-icing/de-icing chemicals on the highways). AOOS served data from RWIS directly, which now makes up the historical sensor data for this data stream.

MADIS ingests data from NOAA data sources and non-NOAA providers, decodes the data then encodes all of the observational data into a common format with uniform observational units and time stamps. Quality checks are conducted and the integrated data sets are stored along with a series of flags indicating the results of the various QC checks. MADIS provides several methods for users to access the data to meet their needs. Users can request data from July of 2001, which is when MADIS was first available to the public, to the present.

To provide these services, MADIS leverages partnerships with international agencies; federal, state, and local agencies (e.g., states' Departments of Transportation); universities; volunteer networks; and the private sector (e.g., airlines, railroads) to integrate and quality check observations from their stations with those of NOAA.

MADIS runs operationally at the NWS National Centers for Environmental Prediction (NCEP) Central Operations (NCO) as part of the Integrated Dissemination Project (IDP). All MADIS data are being added to NOAA's data archive that is run by the National Environmental Satellite, Data, and Information Service (NESDIS) National Climatic Data Center (NCDC). Research and development efforts are being provided by NOAA's Office of Oceanic and Atmospheric Research (OAR) Earth System Research Laboratory (ESRL) Global Systems Division (GSD).

AOOS began accessing data from the MADIS system starting in 2017.

https://portal.aoos.org/?ls=JQoyT7l_#map

B. How many station locations are there for this data stream?

56

C. What are the specific parameters of the data.

The parameters of this data stream include: date, time, cameras and three categories of environmental sensors: atmospheric, surface/sub-surface, and water level/snow depth.

Deployed sensors may include: air temperature, relative humidity, wind speed and direction, precipitation occurrence, precipitation type, precipitation intensity, precipitation accumulation, visibility, visibility situation, station atmospheric pressure, snow depth, water level, solar radiation, pavement temperature, pavement grip (friction), pavement contaminant depth, and soil temperature (single sensor and multi-sensor probe).

Refer to the About RWIS page link for more details:
https://www.google.com/url?q=http://www.roadweather.alaska.gov/iways/roadweather/forms/About.html&sa=D&ust=1473815268471000&usg=AFQjCNE7bRGiBGbkHnanpwLDfcrvH43q8Q

D. Provide information about the sampling platform or instrumentation.

Alaska's RWIS stations may include some or all the following:

1. pavement sensors in travel lanes to measure surface and subsurface (17" below the surface) temperatures
2. atmospheric sensors adjacent to the roadway to measure: air temperature, dew point temperature, relative humidity, wind speed and direction, precipitation occurrence, precipitation accumulation, atmospheric station pressure, snow depth, or stream water level
3. closed circuit cameras that take images of the roadway for snow and ice control as well as for traveler information. ADOT&PF also provides images of mountains and passes to supplement the Federal Aviation Administration web camera program

2. DATA PATHWAY

A. Is a data sharing agreement required?

Yes. The information that is provided on this website is a property of the Alaska Department of Transportation & Public Facilities (ADOT&PF). It is not to be sold, or used in any process for resale as a value-added product, or otherwise distributed for profit in any form without expressed written consent of the ADOT&PF. The ADOT&PF assumes no responsibility for any loss due to any computer or software generated problems associated with these files. It is the sole responsibility of the user to keep all files current with those on the web site. ADOT&PF will provide no technical support. ADOT&PF provides the foregoing information as a public service. This information is published automatically and its accuracy or timeliness cannot be guaranteed. The observation screens are not automatically refreshed; users of these data should use the refresh or reload capability of their web browsers to get the most recent observations. This information depends on internet availability, communication networks, and computer equipment which are beyond the control of the ADOT&PF. The weather links to other sites are provided as a service to the traveling public and do not represent ADOT&PF.

B. In which format(s) are data received by AOOS?

Data are retrieved from the MADIS API system

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically, data are available from unique

access points:
- File downloads (CSV)
- ERDDAP
-netCDF

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and through ERDDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested (e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For this data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by the user. Summary statistics may include minimum, maximum and mean values. Seasonal statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?

The Road Weather Information System (RWIS) provides overview information and a glossary describing each sensor measurement. Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

Alaska Department of Transportation & Public Facilities

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

Federal

a. If Federal data source, were changes applied to the data?

MADIS ingests data from NOAA data sources and non-NOAA providers, decodes the data then encodes all of the observational data into a common format with uniform observational units and time stamps. Quality checks are conducted and the integrated data sets are stored along with a series of flags indicating the results of the various QC checks. MADIS provides several methods for users to access the data to meet their needs. Users can request data from July of 2001, which is when MADIS was first available to the public, to the present.

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Real-time, Historical

C. If real-time, list the QARTOD procedures that are currently applied.

MADIS implements stringent QC procedures on all real-time data (see section below).

D. If real-time, list the QARTOD procedures that are planned for implementation.

n/a

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

QC as delivered from MADIS

F. Describe the data control procedures that were applied by the originator.

MADIS ingests data from NOAA data sources and non-NOAA providers, decodes the data then encodes all of the observational data into a common format with uniform observational units and time stamps. Quality checks are conducted and the integrated data sets are stored along with a series of flags indicating the results of the various QC checks.

Observations in the MADIS database are stored with a series of flags indicating the quality of the observation from a variety of perspectives (e.g. temporal consistency and spatial consistency), or more precisely, a series of flags indicating the results of various quality control (QC) checks. MADIS users and their applications can then inspect the flags and decide whether or not to use the observation.

The QC procedures are, for the most part, provided by the NWS Techniques Specification Package (TSP) 88-21-R2 (1994).

Two categories of QC checks, static and dynamic, are described in the TSP for a variety of observation types, including most of the observations available in the different MADIS datasets. The static QC checks are single-station, single-time checks which, as such, are unaware of the previous and current meteorological or hydrologic situation described by other observations and grids. Checks falling into this category include validity, internal consistency, and vertical consistency. Although useful for locating extreme outliers in the observational database, the static checks can have difficulty with statistically reasonable, but invalid data. To address these difficulties, the TSP also describes dynamic checks which refine the QC information by taking advantage of other available hydrometeorological information. Examples of dynamic QC checks include position consistency, temporal consistency, and spatial consistency.

The TSP also describes single-character "data descriptors" for each observation, which are intended to provide an overall opinion of the quality of the observation by combining the information from the various QC checks. Algorithms used to compute the data descriptor are a function of the types of QC checks applied to the observation, and the sophistication of those checks. Level 1 QC checks are considered the least sophisticated, level 3 the most sophisticated checks.

More information about MADIS quality control is available on their website: https://madis.ncep.noaa.gov/madis_qc.shtml

a. Provide a link to any documented procedures.

RWIS: http://www.roadweather.alaska.gov/iways/roadweather/forms/About.html
MADIS: https://madis.noaa.gov/

G. Describe the data control procedures that were applied by AOOS.

N/A

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data on the AOOS data servers. AOOS also facilitates archival of data to NCEI. However, these data are already being archived by MADIS, and have been since AOOS has been serving the data.

The ADOT&PF openly shares RWIS data with **the National Weather Service**, **the Federal Aviation Administration**, the University of Alaska, and Elmendorf Air Force Base.

MADIS ingests data from NOAA data sources and non-NOAA providers, decodes the data then encodes all of the observational data into a common format with uniform observational units and time stamps. Quality checks are conducted and the integrated data sets are stored along with a series of flags indicating the results of the various QC checks. MADIS provides several methods for users to access the data to meet their needs. Users can request data from July of 2001, which is when MADIS was first available to the public, to the present.

To provide these services, MADIS leverages partnerships with international agencies; federal, state, and local agencies (e.g., states' Departments of Transportation); universities; volunteer networks; and the private sector (e.g., airlines, railroads) to integrate and quality check observations from their stations with those of NOAA.

B. Which long-term data storage facility will be used for preservation?

MADIS runs operationally at the NWS National Centers for Environmental Prediction (NCEP) Central Operations (NCO) as part of the Integrated Dissemination Project (IDP). All MADIS data is being added to NOAA's data archive that is run by the National Environmental Satellite, Data, and Information Service (NESDIS) National Climatic Data Center (NCDC). Research and development efforts are being provided by NOAA's Office of Oceanic and Atmospheric Research (OAR) Earth System Research Laboratory (ESRL) Global Systems Division (GSD).

https://madis.noaa.gov/

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Alaska Harmful Algal Bloom Network (AHAB) was formed in 2017 to provide a statewide approach to HAB awareness, research, monitoring, and response in Alaska. AHAB coordinates a diverse group of coastal stakeholders to address human and wildlife health risks from toxic algal blooms. Alaska is a large state with a large amount of coastline and concentrated areas of people. The State of Alaska monitors and regulates the commercial shellfish industry, yet does not monitor or regulate shellfish for subsistence or recreational harvest. Due to these challenges, regional monitoring programs in Southeast, Southcentral, and in the Aleutians have begun to fill the monitoring void. Each regional organization is working to reduce the risks of HABs through phytoplankton monitoring and shellfish testing. These data provide shellfish and phytoplankton observations collected by AHAB partners at various locations throughout the state. More information about AHAB and the monitoring methods are available on the AHAB website: https://aoos.org/alaska-hab-network/.

B. How many station locations are there for this data stream?

There are 45 sampling locations, which varies from year to year.

C. What are the specific parameters of the data.

The parameters of this data include counts of phytoplankton cells by species and shellfish tissues testing from fixed monitoring locations.

D. Provide information about the sampling platform or instrumentation.

Data are generated using water collection by human with a micron-mesh filter.
The shellfish toxin data are generated through testing in a laboratory.

This data layer contains shellfish toxicity and phytoplankton observations collected in Southeast by Southeast Alaska Tribal Ocean Research (SEATOR) and in Southcentral by the Kachemak Bay National Estuarine Research Reserve (KBNERR) and the NOAA-NCOS Kasitsna Bay Laboratory. Phytoplankton data originate from the SoundToxins database and follow monitoring protocols designed by NOAA's Phytoplankton Monitoring Network. Shellfish are routinely tested by SEATOR for toxins using the Receptor Binding Assay (RBA) technique.

This page is updated as soon as new shellfish information becomes available. The shellfish advisories provided by SEATOR are based on shellfish and phytoplankton observations at each listed location. The FDA regulatory limits of 80 µg toxin/100 g shellfish tissue for paralytic shellfish toxins and 20 ppm for domoic acid are followed. It is not recommended to consume shellfish with higher levels of toxins.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Any data shared on the AOOS site are available publically.

B. In which format(s) were data received by AOOS?

Data, maps and documents are provided as a XLS files directly from originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from three unique access points:

- Web Mapping Service (WMS)
- Web Feature Service (WFS)
- File Downloads (PNG, Shapefile, CSV)

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and Shapefiles. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Shellfish toxicity results are entered into a web-based spreadsheet that is connected to a GeoServer instance on the AOOS data system. When new data become available, the originator triggers a push notification for data to be integrated into PostgreSQL and visualized with custom JSON REST service (JAVA).

Phytoplankton data are retrieved from the SoundToxins HAB Data Entry system using a custom API. Data are made available in the AOOS portals through the access point and via graphic displays generated through internal JSON-format data requests from this service.

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive project and file metadata describing the data and accompanying fields.

G. Are there ethical restrictions to data sharing?

No

a. If so, how will these be resolved?

N/A

H. Who holds intellectual property rights (IPR) to the data?

Southeast Alaska Tribal Ocean Research (SEATOR)

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

Federal, State agency, and Private industry

a. If Federal data source, were changes applied to the data?

No

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Historical

C. If real-time, list the QARTOD procedures that are currently applied.

N/A.

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

Some QC as delivered from the originator(s).

F. Describe the data control procedures that were applied by the originator.

Data collection and QC procedures for project-level data are provided by data providers as ISO-19115 metadata.

a. Provide a link to any documented procedures.

Contact information to the report providers is provided to access any documentation of protocols. (Currently trying to get copies of these documents or links for easier access to QA/QC).

G. Describe the data control procedures that were applied by AOOS.

None applied

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

AOOS will facilitate data archival with NCEI. NCEI currently is not interested in this data stream as is. This may change as the expected incoming phytoplankton count data are added to the portal through the Gulf Watch Program (G-18). Through an agreement with the Gulf Watch Alaska program, AOOS is taking responsibility for archiving these data with DataOne and NCEI via a planned, automated pathway.

B. Which long-term data storage facility will be used for preservation?

DataOne and NCEI.

C. Describe any transformation necessary for data preservation.

Transformations of data will be to non-proprietary file formats to facilitate long-term preservation, including CSV, TXT, XLS, AND NetCDF.

D. List the metadata or other documentation that will be archived with the data.

ISO-19115 or .xml FGDC CSDGM metadata records will be provided by the data collectors prior to archive. Field sampling protocols will also be archived with the data files.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Alyeska Resort provides data from five weather stations located at the base and mid-mountain in Girdwood, Alaska.

Website URL: Real-Time Sensors: Source Alyeska Resort
https://portal.aoos.org/?ls=-DBVD26V#map

B. How many station locations are there for this data stream?

5

60.948272 N, -149.087112 W Maxs Mountain
60.956833 N, -149.061056 W Summit Site
60.972399 N, -149.081899 W Al_Mid_HR
60.969407 N, -149.096638 W ALY_BASE_HR
60.962800 N, -149.070700 W Top of Glacier Bowl Express, AK

C. What are the specific parameters of the data.

The parameters of this data stream include: date, time, air temperature, relative humidity, wind speed and direction, and wind gusts. These are stationary towers, and no GPS (latitude and longitude) is provided in the data stream.

D. Provide information about the sampling platform or instrumentation.

The sampling platform includes meteorological sensors at multiple locations on the Alyeska Resort.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) were data received by AOOS?

Data are harvested from the originators' website:
http://wxstns.net/wxstns/aknet/MAX'S_MTNL.htm

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from two unique access points:
- File Downloads (CSV)
- ERDDAP

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and through ERDDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java, Scala, and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For this data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by the user. Summary statistics may include minimum, maximum and mean values. Seasonal statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?

Metadata are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

Alyeska Resort, private business

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

Private, Individual

a. If Federal data source, were changes applied to the data?

N/A

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Real-time and Historical (Real-time data moved to historical).

C. If real-time, list the QARTOD procedures that are currently applied.

Four of the five required QARTOD tests for weather parameters are being applied by AOOS: Gross Range, Spike, Rate of Change, and Flat Line Tests.

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

Some QC by AOOS, including QARTOD checks.

F. Describe the data control procedures that were applied by the originator.

Data are merely converted by the instruments to engineering units using internally stored calibration and conversion algorithms. These data are from a non-federal real-time data feed and are assumed to have no QC for errors prior to data ingestion by AOOS beyond the simple data conversion.

a. Provide a link to any documented procedures.

N/A (Currently seeking additional Standard Operating Protocols and QA/QC information on methods, type of equipment, sensor QC, etc.).

G. Describe the data control procedures that were applied by AOOS.

For all collected parameters automated QARTOD tests are run by the AOOS Data System after ingesting observation data. Tests are run using the open-source ioos_qc library (https://github.com/ioos/ioos_qc) which implements a suite of QARTOD tests as well as other quality control algorithms. The quality test code and test thresholds are documented and publicly available through the AOOS Data Portal. Refer to AOOS Data Management System plan for further details.

The observations are ingested to the AOOS DMAC system hourly, and a process is run to calculate flags for the following QARTOD tests, depending on the parameter:

- Gross Range Test- checks that values are within reasonable range bounds.

- Spike Test- checks if the difference in values between a data point and its neighbors exceeds a threshold.
- Rate of Change Test- checks if the first order difference of values exceeds a threshold.
- Flat Line Test- checks for consecutively repeated values within a tolerance.

Quality control flags are appended to the original data files once per day and made available at: http://erddap.aoos.org/erddap/search/index.html?page=1&itemsPerPage=1000&searchFor=alyeska

a. Provide a link to any documented procedures.

AOOS implemented QC tests are documented in the AOOS Data Assembly Center and Data Management Plan.

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

AOOS will facilitate data archival with NCEI. This data stream is of interest to NCEI, and once proper metadata requirements are verified, data will be archived there.

B. Which long-term data storage facility will be used for preservation?

NCEI

AOOS will reach also out to see if NWS is interested in these data.

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Aquarius instrument uses three L-band radiometers (each centered at 1.413 GHz), which measure brightness temperature of the ocean. The brightness temperature of the ocean surface is affected by surface temperature, conductivity of the water (salinity), and the roughness of the surface (which is corrected using an onboard scatterometer). Aquarius sea surface salinity (SSS) and wind speed data are produced as daily, weekly and monthly aggregates. Daily data will have sparse spatial coverage as it takes seven days for Aquarius to provide complete coverage of the Earth.

Website URLs:
Salinity: http://portal.aoos.org/#module-metadata/282a9756-9929-41d4-a957-5d49dc6f5f38/1089f5f9-48cc-4df2-ba7e-4afccb668d62

Wind Speed: http://portal.aoos.org/#module-metadata/466dc3dc-4a93-4d62-980c-8c1be3bd6b90/5991fce3-6800-4aad-8602-fc3abef47ae4

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

The parameters of these data include: date, time, sea surface salinity, and sea surface wind speed. Locational values can be ascertained from the visualizations.

D. Provide information about the sampling platform or instrumentation.

This sampling platform is the NASA Aquarius/SAC-D satellite.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) were data received by AOOS?

Data were received as HDF files from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from four unique access points:

- Web Mapping Service (WMS)
- THREDDS
- OPeNDAP
- File Downloads (CSV)

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and NetCDF. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded monthly in its original format from the NASA PO.DAAC site. AOOS converts these files to NetCDF files using custom Java and Scala scripts, and stores the converted data on servers within the AOOS data management system. The source data parameters and units are converted to comply with CF standard units, if those same units are not already utilized in the source data. Refer to Appendix I for CF standards. The time series extraction tool produces a CSV file from the original netCDF files. Summary statistics may be displayed in the graphical displays through interactive user requests. These statistics use temporal binning on daily, weekly, monthly, seasonally and yearly scales and may include minimum, maximum and mean values. However, these statistics are purely for graphical exploration and may not be downloaded.

F. What metadata or contextual information is provided with the data?

Metadata are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

NASA

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

Federal

a. If Federal data source, were changes applied to the data?

Yes

b. If Yes, describe any changes to the data that require documentation?

The file format of the original data was changed.

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
Not Required, Federal Source.

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
QC by originator
See source page for details: http://podaac.jpl.nasa.gov/aquarius

F. Describe the data control procedures that were applied by the originator.
Federal source, not required

a. Provide a link to any documented procedures.
N/A

G. Describe the data control procedures that were applied by AOOS.
No applied AOOS QC. This is a synthesis product made from existing data sources.

a. Provide a link to any documented procedures.
N/A

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

Data are already being archived by originator. See source page for details: http://podaac.jpl.nasa.gov/aquarius

B. Which long-term data storage facility will be used for preservation?
N/A

C. Describe any transformation necessary for data preservation.
N/A

D. List the metadata or other documentation that will be archived with the data.
N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Automatic Identification System (AIS) is a system of onboard transmitters and land-based and satellite-based receivers that allow vessel locations to be broadcast and recorded. AIS operates in the VHF frequency and has the capability of transmitting information in real time which provides major benefits in collision avoidance, vessel tracking, fleet planning and management. In addition to the real time benefits of AIS, historic AIS information is used by Hydrographic organizations to look at trends in traffic routes to assist in hydrographic survey and nautical chart planning.

AOOS currently provides summary data products generated from the raw AIS data: Vessel Voyages and Vessel Traffic Heatmap in its data portal. Products have been developed from raw AIS data available from several sources: US Coast Guard Terrestrial, US Coast Guard Satellite, Marine Cadastre Terrestrial, and Marine Exchange of Alaska Terrestrial.

Website URL: AIS tracks and Vessel Traffic Heat Maps-
https://portal.aoos.org/#search?type_group=all&query=AIS&page=1

B. How many station locations are there for this data stream?

N/A
Data are summarized into data products from numerous stations.

C. What are the specific parameters of the data.

AOOS reports historical data only. It is not a real-time asset. The parameters of this data include: date ,time, ship location (GPS, latitude and longitude), type of vessel, and velocity.

D. Provide information about the sampling platform or instrumentation.

Automatic Information System (AIS) equipment

2. DATA PATHWAY

A. Is a data sharing agreement required?

Yes. MXAK is an AOOS Member. Data Sharing is agreed to as part of membership, as stated in the MOA Section V.(H)
http://www.aoos.org/wp-content/uploads/2011/05/AOOS-MOA-approved-by-AOOS-Founding-Members-Nov-10-2009-1.pdf

B. In which format(s) were data received by AOOS?

US Coast Guard Terrestrial: The data was obtained from the Coast Guard as raw and unprocessed. The data was initially received by NOAA's Office of Coastal Management (OCM) and NOAA's Office of Coast Survey (OCS) requested and received the data from OCM. OCS then provided the data to Axiom Data Science for analysis and product

creation.
US Coast Guard Satellite: The data was obtained from the Coast Guard as raw and unprocessed. The data was initially received by NOAA's Office of Coastal Management (OCM) and NOAA's Office of Coast Survey (OCS) requested and received the data from OCM. OCS then provided the data to Axiom Data Science for analysis and product creation.
Marine Cadastre Terrestrial: The data was downloaded from MarineCadastre.gov, a web site owned by the NOAA Office for Coastal Management. MarineCadastre.gov obtained AIS data from the Coast Guard as raw and unprocessed. Records were filtered to one minute and formatted in zipped, monthly file geodatabases by Universal Transverse Mercator (UTM) zone. In addition to the raw AIS messages from MarineCadastre.gov, Axiom Data Science received a vessel catalog from NOAA Office of Coast Surveys that included the "encrypted" MMSI's used by MarineCadastre.gov, so that actual vessel types could be determined.
Marine Exchange of Alaska Terrestrial: The Marine Exchange of Alaska (MXAK) is a non-profit organization that maintains the only terrestrial AIS network in Alaska. The network is comprised of over 100 AIS receivers, 48 of which are in the Arctic regions. The data was obtained from MXAK directly, and provided to Axiom Data Science for analysis. In addition to the raw AIS messages, MXAK maintains an arctic-specific vessel catalog, which has been quality-checked for valid vessel categories. This catalog was used for generating vessel-traffic heatmaps.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from unique access points:
- Web Mapping Service (WMS)
- Web Feature Service (WFS)
- File Downloads (PNG, Shapefile, CSV)
- THREDDS NetCDF
- THREDDS OPeNDAP

What file formats will be used for sharing data, if different from original?

Vessel Voyages connect individual vessel pings to form a representation of where the vessel traveled over time. Care must be taken to not connect points that are too sparse, and voyages are broken in two if a vessel stops for an extended period of time. Voyages are vector data, represented with a Linestring geometry, and can be downloaded as Shapefiles, CSVs with well-known text, or GeoJSON.

Vessel Traffic Heatmaps represent cumulative vessel traffic in an area over a given period of time. To generate a heatmap, a given area is divided into a grid, and each time a voyage crosses a grid cell, the total vessel count for that cell increments by one. Heatmaps are raster data, and can be downloaded as GeoTIFF or NetCDF, in various resolutions and projections.

Data can be downloaded through the AOOS data portal or through the Axiom AIS Vessel Traffic Data Product page: https://ais.axds.co/#available-datasets.

D. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

The data are delivered directly to AOOS from the originator, the Marine Exchange of Alaska (MXAK). To create interactive visualizations: the flat tables were restructured into relational database and then a geometry was created from latitude and longitude values. Lookup tables were generated for users to explore attributes of interest. The ship_type codes were mapped to labels, and hexagonal coverages were created at 15 zoom levels. These coverages summarized the number of AIS 'pings' within each hexagon per zoom level.

For vessel traffic data products, the transformation process is as follows:

AIS vessel traffic datasets are immense—on the order of 10s of billions of raw messages per year—so traditional data storage and processing techniques are insufficient to deal with data on a global scale. To overcome these limitations, a compute cluster built on top of Apache Spark was used, an open-source engine for large-scale data processing. In addition to Spark, GeoTrellis for distributed spatial processing was also used, such as creating the heatmap rasters, Alluxio to store frequently-used data in memory for quicker access, and Gluster FS for distributed file storage.

AIS data is not processed in a single step; instead, the analysis takes place over several stages in a pipeline. This provides several advantages, namely: a) the entire process does not have to be re-run if one wants to redo the analysis at a single stage, and b) the result of individual stages can be provided as their own data product. For example, while it might take 24 hours to parse and clean the raw messages for a single dataset, it only takes minutes to hours to generate voyages, and minutes to generate a heatmap from those voyages. Thus, this allows for quick bug fixes, tweaking algorithms, or filtering the data in specific ways to generate custom data products.

For more information about data products methods see: https://ais.axds.co/#data-products

E. What metadata or contextual information is provided with the data?

None provided with the data from MXAK. Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

F. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

The individual data providers retain their intellectual property rights to the data streams or code that they provide.

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

Federal (US Coast Guard and Marine Cadastre), NGO (Marine Exchange of Alaska), Private

a. If Federal data source, were changes applied to the data?

N/A

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Historical

C. If real-time, list the QARTOD procedures that are currently applied.

Not required.

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

Some QC as delivered from MXAK. The computing software does editing.
If vessel transmits data incorrectly, AIS is not corrected. If data are not in 183 standard, the data are rejected. Real-time data are monitored by Marine Exchange staff for background noise levels, condition of antenna, etc. The US Coast Guard (USCG) requires 96% operational availability, and all protocols follow USCG.

F. Describe the data control procedures that were applied by the originator.

The procedures follow USCG protocols. Contact the data provider for availability of additional QC information.

a. Provide a link to any documented procedures.

N/A

G. Describe the data control procedures that were applied by AOOS.

No applied AOOS QC. This is a synthesis product made from existing data sources.

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers. AOOS will facilitate data archival with NCEI if requested and with permission of the data originator (private). NCEI has not expressed interest in this data stream.

B. Which long-term data storage facility will be used for preservation?

N/A

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Alaska Ocean Observing System (AOOS) is funding a Marine Exchange project that is adding weather stations to Automatic Identification System (AIS) receiving sites and transmitting weather data over AIS to enhance maritime safety. These weather data are also being fed through the AOOS data portal real-time.

Website URL: Real-Time Sensors, Source: Marine Exchange of Alaska
https://portal.aoos.org/?ls=DvkQpkCr#map

B. How many station locations are there for this data stream?

68 (not including 4 new stations added in 2022) - Not all of these are currently reporting real-time. Some have been discontinued or relocated, but remain in the sensors catalog: https://portal.aoos.org/#metadata/39/sensor_source .

C. What are the specific parameters of the data.

The parameters include date, time, wind speed, wind direction, wind gusts, gust direction, air temperature, relative humidity, precipitation, and pressure. These are land-based stations, and do not provide a GPS (latitude or longitude) reading in the data stream.

D. Provide information about the sampling platform or instrumentation.

The platforms include weather stations mounted to shore-based Automated Identification System (AIS) receiver equipment used to track movements of at-sea vessels. MXAK's choice of weather sensor has been a combined wind speed and weather instrument manufactured by Airmar Technology Corp of New Hampshire - the Airmar 150WX WeatherStations. For moving applications, where true and apparent wind are different, the 150WX includes additional sensors such as a 10Hz GPS and solid-state compass. This sensor is very good value, providing many features in a small package. However, after running some tests in 2018, the MXAK found a similar sensor manufactured by Gill Instruments Ltd, Lymington, UK performed better for their applications.

The MXAK has been since upgrading all their weather stations to the Gill GMX500 - and is nearing completion in 2022. The Gill Windsonic M/Metpak Pro is an upgraded version of the Maximet sensor. These sensors were found to have better specifications (increased accuracy and lower power consumption) and lower EMI (Electromagnetic Interference – noise) during the sensor evaluation (an report provided to AOOS) performed in July 2018.

AIS weather stations are deployed on 10 foot masts, and are visited annually for maintenance (batteries, RF co-axis refits, etc).

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) are data received by AOOS?

Data are received by web harvest from the originator website via HTML.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically, data are available from two unique access points:

- File Downloads (CSV)
- ERDDAP

62 of these station's data are also served real-time by the National Data Buoy Center website, which is a federal data server providing access to real-time weather information of interest to the National Weather Service.

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and through ERDDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested (e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java, Scala, and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For this data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by the user. Summary statistics may include minimum, maximum and mean values. Seasonal statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?
Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the Marine Exchange of Alaska Weather Station page: http://www.mxak.org/weather_stations/index.html

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
Marine Exchange of Alaska

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
Non-Federal, non-Profit

a. If Federal data source, were changes applied to the data?
N/A

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Real-time

C. If real-time, list the QARTOD procedures that are currently applied.
Four of the five required QARTOD tests for weather parameters are being applied by AOOS: Gross Range, Spike, Rate of Change, and Flat Line Tests.

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
Raw

F. Describe the data control procedures that were applied by the originator.
MXAK's approach to providing weather for mariners has been primarily to make near 'real-time' data available. By using cellular modems, it has been possible to have continuous streams of data from the sensor sites. Airmar sensors do not have any on board

rolling average or wind speed gust calculations, therefore, Airmar data are received by our servers, checked for integrity (communications only using a checksum), then averaged using scalar (speed) and true vector averages (direction). An averaging period of 10 minutes has been selected based on IMO standards for environmental messages transmitted by AIS. The highest speed value in the prior 10 minutes is also extracted as the 'peak' wind. Updates to weather parameters available on our website are performed every minute and are transmitted via AIS message 8 from 26 locations (as of December '18). Updates to publicly available csv files are done every 10 minutes.

As the weather stations become fully replaced by Gill sensors, there are other features of the Gill sensor available when using their proprietary GILL protocol that include some advantages and disadvantages and require discussion before implementing. Internal wind speed averaging and 3-second gust measurements are possible. However, WMO algorithms are used to calculate the average wind speed and direction. This means that true vector speed averaging is used instead of scalar averaging as currently used by MXAK. If true vector speed is used, the resultant wind speed averages would be somewhat lower than what we are used to seeing. Speed values would be dependent on the stability of the wind direction. Having available a 3-second gust value may help provide a better overall feel for what the conditions are versus only having a one second peak reading. The primary advantage of using on-board averaging is reduced data volumes and less power consumption at off-grid sites.

Further discussion will be necessary to decide if this is something that we should pursue. Another advantage of using the Gill proprietary protocol is better error detection, as there are more specific error codes available, e.g. x and y measurement axis failures, power supply voltage etc.

Data provided to AOOS are currently converted by the instruments to engineering units using internally stored calibration and conversion algorithms. The data are constantly monitored by the Juneau and Anchorage forecast offices, but these offices do not perform QC on the AK Marine Exchange data source. These data are from a non-federal real-time data feed and are assumed to have no QC for errors prior to data ingestion by AOOS beyond the simple data conversion.

Post-processed data may be available by contacting the data provider directly.

a. Provide a link to any documented procedures.

N/A

G. Describe the data control procedures that were applied by AOOS.

For all collected parameters automated QARTOD tests are run by the AOOS Data System after ingesting observation data. Tests are run using the open-source ioos_qc library (https://github.com/ioos/ioos_qc) which implements a suite of QARTOD tests as well as other quality control algorithms. The quality test code and test thresholds are documented and publicly available through the AOOS Data Portal. Refer to AOOS Data Management System plan for further details.

The observations are ingested to the AOOS DMAC system hourly, and a process is run to calculate flags for the following QARTOD tests, depending on the parameter:

- Gross Range Test- checks that values are within reasonable range bounds.
- Spike Test- checks if the difference in values between a data point and its neighbors exceeds a threshold.
- Rate of Change Test- checks if the first order difference of values exceeds a threshold.
- Flat Line Test- checks for consecutively repeated values within a tolerance.

Quality control flags are appended to the original data files once per day and made available at: https://erddap.aoos.org/erddap/search/index.html?page=1&itemsPerPage=1000&searchFor=marine+exchange

a. Provide a link to any documented procedures.

AOOS Data Assembly Center and Data Management Plan.

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

The MXAK weather data are also served through the National Data Buoy Center (62 stations as of 2022). AOOS is under the impression that NDBC may already be sending data they serve to NCEI. If not, AOOS will facilitate data archival with NCEI.

To facilitate archival of the valuable assets not of interest to NCEI, AOOS plans to also archive data in the DataONE network. More information about DataONE can be found in the Data Management Plan (section 4.4.7) and at https://www.dataone.org/

B. Which long-term data storage facility will be used for preservation?

N/A

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

These spatial data were collected by Community Research Assistants (CRAs) in surveys/interviews with 'high harvesters' (someone who has harvested frequently for the past 15 years or more within their community). Each community selected 4-5 significant subsistence marine species to focus surveys efforts on. Respondents were asked where they went to harvest specific species during the past six months and to circle those locations that represent the search area for that species.

Website URL: https://portal.aoos.org/old/#module-metadata/10d90f26-0154-11e4-bd46-00219bfe5678/47e776b8-3306-11e4-8dee-00219bfe5678

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

The parameters of this data include: Alaskan Native subsistence harvest areas for select species and locations by community/village.

D. Provide information about the sampling platform or instrumentation.

Data was collected in surveys/interviews with Alaska Native community members.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) were data received by AOOS?

Data were received as shapefiles from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be viewed using interactive visualizations. Data files are not available for download.

D. What file formats will be used for sharing data, if different from original?

The data are available for exploration in the AOOS portals via interactive visualizations. The data are not available via download.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

The data were delivered directly to AOOS by the originator, imported to PostgreSQL, and then visualized with custom JSON REST service (JAVA). The original shapefiles were re-projected to EPSG:3572 (Alaska-based polar) for visualization.

F. What metadata or contextual information is provided with the data?
Metadata are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
BSSN is managed by the Aleut International Association and the RAM Group of the University of Alaska Anchorage. For more information please contact Grace Beaujean at graceb_aia@alaska.net

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
University, Private industry, Citizen Survey

a. If Federal data source, were changes applied to the data?
N/A

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
N/A

F. Describe the data control procedures that were applied by the originator.
Not required

a. Provide a link to any documented procedures.
N/A

G. Describe the data control procedures that were applied by AOOS.
Not required

a. Provide a link to any documented procedures.
N/A

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

Long-term data archival N/A

B. Which long-term data storage facility will be used for preservation?
N/A

C. Describe any transformation necessary for data preservation.
N/A

D. List the metadata or other documentation that will be archived with the data.
N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

This site provides public access to real-time hydrometric data collected at over 1800 locations and access to historical data collected at over 7600 stations (active and discontinued) in Canada. These data are collected under a national program jointly administered under federal-provincial and federal-territorial cost-sharing agreements. It is through partnerships that the Water Survey of Canada program has built a standardized and credible environmental information base for Canada.

Website URL: Real-Time Sensor: Source: Canada Water Office: https://portal.aoos.org/?ls=D0mVUR43#map

B. How many station locations are there for this data stream?

584

C. What are the specific parameters of the data.

The parameters of these data include: date, time, stream flow, stream height, and water surface above datum.

D. Provide information about the sampling platform or instrumentation.

This sampling platforms include hydrometric gauging and meteorological stations.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Disclaimer for near real-time and historical water level and streamflow information:

Users should use the information on this website with caution and do so at their own risk. The Government of Canada accepts no liability for the accuracy, availability, suitability, reliability, usability, completeness or timeliness of the data or graphical depictions rendered from the data.

The near real-time information presented on this website is received via satellite or land-line transmissions from hydrometric gauging stations operated by Environment Canada and its Partners. These data are normally posted (in graphical form) within six hours of observation. The data are preliminary and have been transmitted automatically with limited verification and review for quality assurance. Subsequent quality assurance and verification procedures may result in differences between what is currently displayed and what will become the official record.

It is the responsibility of all persons who use this site to independently confirm the accuracy of the data, information, or results obtained through its use.

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Your proceeding beyond this Disclaimer will constitute your acceptance of the terms and conditions outlined above.

B. In which format(s) were data received by AOOS?

Data are received as CSV file from originator website.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically, data are available from two unique access points:

- File Downloads (CSV)
- ERDDAP

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and through ERDDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For this data, no CF-standard names or units exist, therefore custom names of

abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by the user. Summary statistics may include minimum, maximum and mean values. Seasonal statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?
Metadata.txt file provided with the data for each parameter. Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
Canada Water Office

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
Global

a. If Federal data source, were changes applied to the data?
N/A

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Real-time

C. If real-time, list the QARTOD procedures that are currently applied.
N/A

D. If real-time, list the QARTOD procedures that are planned for implementation.
Remaining required tests are planned for implementation within 12 months of certification.

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

QC by originator, link to data source website for more information.

F. Describe the data control procedures that were applied by the originator.

The data shown below is considered raw data and is provided "as-is" with no claim made to its accuracy or its appropriateness to an intended use.

a. Provide a link to any documented procedures.

https://wateroffice.ec.gc.ca/disclaimer_info_e.html

G. Describe the data control procedures that were applied by AOOS.

No data control procedures are currently in place for these data.

a. Provide a link to any documented procedures.

AOOS Data Assembly Center and Data Management Plan.

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

International Data source, so not required to archive in US National Archive at this time.

B. Which long-term data storage facility will be used for preservation?

N/A

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

AOOS supports four University of Alaska Fairbanks (UAF) operated HF Radar (HFR) stations in the Arctic in conjunction with multiple partners. The Alaska HFR data served by AOOS is acquired from the National IOOS HFR data server at Coastal Observing Research and Development Center (CORDC) University of California, San Diego. The CORDC HF radar-derived surface current dataset provides nearshore sea surface velocity measurements.

For a more detailed description, see: http://cordc.ucsd.edu/projects/mapping/documents/principles.php).

Website URL: http://portal.aoos.org/#module-metadata/de91c282-01e2-11e2-ad19-00219bfe5678/9c31793f-cd35-4b29-9be4-1bada207616c

B. How many station locations are there for this data stream?

4

C. What are the specific parameters of the data.

The parameters include calculated surface water velocity.

D. Provide information about the sampling platform or instrumentation.

The sampling platform includes shore-based HF radar systems, and when no grid power supply is available, the use of Remote Power Modules using renewable wind and solar energy, are co-located.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) are data received by AOOS?

Data are available from web harvest to the originator's THREDDS site: http://hfrnet.ucsd.edu/thredds/catalog.html

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from three unique access points:

- Web Mapping Service (WMS)
- THREDDS
- OPeNDAP

D. What file formats will be used for sharing data, if different from original?

Data are shared as WMS and through OPeNDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For these data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by the user. Summary statistics may include minimum, maximum and mean values. Seasonal statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive project and file metadata describing the data and accompanying fields.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

University of Alaska, Fairbanks

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

Federal:
University of Alaska, Fairbanks (UAF) operates these stations.
Data are acquired from the CORDC (UCSD).
UCSD acquires the HFR data directly from UAF HFR platforms.

Alaska HFR data served by AOOS are and will always be acquired from the National IOOS HFR data server at CORDC UCSD.

a. If Federal data source, were changes applied to the data?
N/A

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Near-Real-Time. These data are served as a separate layer and are not part of the Real-Time Sensors catalogue or map on the AOOS Ocean Data Explorer data portal.

C. If real-time, list the QARTOD procedures that are currently applied.
As long as these data are processed and accessed through the HFR Network, they do not require additional QC or QARTOD QC implementations by AOOS.

The following link provides the QC documentation on the UCSD website that describes the quality control performed on HFR Network data:
http://cordc.ucsd.edu/projects/mapping/documents/HFRNet_QC-RTVproc.pdf

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
Quality controls fully implemented by originator.
Delayed mode processed and reported near-real-time.

F. Describe the data control procedures that were applied by the originator.
The HF-Radar Network (HFRNet) acquires surface ocean radial velocities measured by HF-Radar through a distributed network and processes the data to produce synoptic maps of surface currents in near-real time throughout coastal waters of the United States.

Radial data are quality controlled during each of three main processing stages:
1) On-site at the Radar installation during production of georeferenced radial velocities with bearing determination from raw signal voltages;
2) Upon acquisition of radial data by HFRNet Portals; and
3) During processing for production of synoptic surface current maps.

a. Provide a link to any documented procedures.

The following link provides the QC documentation on the UCSD website that fully describes the quality control performed on HFR Network data:
http://cordc.ucsd.edu/projects/mapping/documents/HFRNet_QC-RTVproc.pdf

G. Describe the data control procedures that were applied by AOOS.

After data are ingested, AOOS applies 2 standard QC tests to *HFR current data* only:

1. Syntax Test: checks for parity errors by testing if data can be extracted from the downloaded or scraped data. If no data can be extracted, the test fails, and no data are accessed, served or stored for that record.
2. Gross Range Test: This test checks data values against minimum and maximum values defined for each parameter. Values outside of the prescribed parameter ranges are left in the dataset, but they are not used when autoscaling graphic displays.

a. Provide a link to any documented procedures.

AOOS Data Assembly Center and Data Management Subsystem Plan, Section 4.4.4.

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data on the AOOS data servers. Long-term archiving is the responsibility of HFRadar Network (HFRNet) and the Coastal Observing Research and Development Center (CORDC).

B. Which long-term data storage facility will be used for preservation?

N/A

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

Community-based Observing Networks and Systems (CBONS) is a program administered by the Aleut International Association (AIA) that integrates an indigenous knowledge-based approach with technology to systematically observe and document Arctic environmental and globalization changes including vessel tracking, incursions, Arctic sea ice, and other ecological phenomena. It allows users with satellite phones to text locations, notes, and images to a map layer in real time.

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

Parameters could include anything of interest to a local observer.

D. Provide information about the sampling platform or instrumentation.

The layer relies on human observers.

2. DATA PATHWAY

A. Is a data sharing agreement required?

The integration of CBONs information is made possible by an agreement with Aleut International Association (AIA) through the Arctic Domain Awareness Center, a Homeland Security initiative.

B. In which format(s) was data received by AOOS?

Data was received as multi-media texts from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be explored through interactive visualizations. It is not made available for download.

D. What file formats will be used for sharing data, if different from original?

Data are shared only through visualization in the AOOS data portal. Data files are not available for download.

E. Describe how the data is ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Texts are sent from observers via satellite phones. These texts are routed through Twilio, which serves as an aggregated database and notification service. Information is parsed from the Twilio database into a PostgreSQL database and visualized with custom JSON REST service (JAVA).

F. What metadata or contextual information is provided with the data?
Data are shared in the ADAC portal with a descriptive narrative and contact information for the program's managers.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
Aleut International Association (AIA)

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
NGO

a. If Federal data source, were changes applied to the data?
No

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Citizen Science

C. If real-time, list the QARTOD procedures that are currently applied.
Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
QC by originator

F. Describe the data control procedures that were applied by the originator.
Not required

a. Provide a link to any documented procedures.
N/A

G. Describe the data control procedures that were applied by AOOS.

Not required

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers. If the data provider chooses to archive these data at a national archive in the future, they may do it directly, or using the AOOS-facilitated pathway to NCEI.

B. Which long-term data storage facility will be used for preservation?

N/A

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Cook Inlet Regional Citizens Advisory Council (RCAC) assessed the biodiversity and relative abundance of resident fish populations, or potential winter prey, at two suspected Cook Inlet beluga whale winter feeding areas in Cook Inlet. Benthic trawl surveys were conducted in April and October 2012 from the R/V Pandalus and opportunistic sampling for potential pelagic prey was conducted in April from the Kahtnu. This dataset contains information about the groundfish and invertebrates caught in the trawl surveys.

Website URL: https://portal.aoos.org/?ls=GtM7wBuU#map

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

The parameters include the number of observations across all locations sampled, numbers of individual species found, average length and weight of each species, and the total biomass collected by each trawl.

D. Provide information about the sampling platform or instrumentation.

The sampling platform was a research vessel in Cook Inlet, Alaska.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data was made public through an agreement between the Cook Inlet Regional Citizens Advisory Council (RCAC) and AOOS.

B. In which format(s) were data received by AOOS?

Data was received as shapefiles and XLS files from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from three unique access points:

- Web Mapping Service (WMS)
- Web Feature Service (WFS)
- File Downloads (PNG, Shapefile, CSV)

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and Shapefiles. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data files were provided to AOOS by the Cook Inlet Regional Citizens Advisory Council (RCAC), who originally collected the data. Data was imported to PostgreSQL, visualized with custom JSON REST service (JAVA). The original shapefiles were re-projected to EPSG:3572 (Alaska-based polar) for visualization in the AOOS data portals.

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to final reports describing the cruise and operation.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

Cook Inlet Regional Citizens Advisory Council (CIRCAC)

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

NGO (CIRCAC)

a. If Federal data source, were changes applied to the data?

No

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Historical

C. If real-time, list the QARTOD procedures that are currently applied.

Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

QC by originator

F. Describe the data control procedures that were applied by the originator.

After each successful trawl, the total catch was weighed while still in the codend of the trawl. Then, all groundfish and invertebrates were removed from the trawl, identified to species, counted and weighed in aggregate by species. Since trawl catches during this project were low, a biomass subsampling method was not used to estimate total catch (Gustafson and Bechtol 2005). A sample (n=30) of each dominant groundfish and invertebrate species were then processed to estimate individual wet weight (nearest gram) and length (nearest millimeter). Total length (tip of snout to tip of tail) was measured for all fishes and carapace length was measured to all invertebrates (Butler 1980, Bechtol 2005) if practical.

a. Provide a link to any documented procedures.

N/A

G. Describe the data control procedures that were applied by AOOS.

No applied AOOS QC. This is a synthesis product made from existing data sources.

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

AOOS will facilitate data archival with NCEI. NCEI has expressed interest in these data, and may accept them through the Send2NCEI application.

B. Which long-term data storage facility will be used for preservation?

NCEI if they accept the data.

C. Describe any transformation necessary for data preservation.

To be determined once NCEI agrees to accept data.

D. List the metadata or other documentation that will be archived with the data.

To be determined once NCEI agrees to accept data.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

WMO 46109 - Coastal Data Information Program (CDIP) station 204 data stream consists of coastal environment measurements taken in the vicinity of Lower Cook Inlet, Alaska. The station is operated by AOOS, and funded by AOOS and the USACE CDIP. These data complement CDIP's core mission: measuring, analyzing, archiving, and disseminating coastal environment data for use by coastal engineers, planners, and managers, as well as scientists and mariners.

Website URL: Real-Time Sensor: Source: Alaska Ocean Observing System: https://portal.aoos.org/#metadata/52551/station/data

B. How many station locations are there for this data stream?

1- the Lower Cook Inlet buoy is located at 59.5973,-151.8291

C. What are the specific parameters of the data.

The parameters include GPS, date, time, wave height, peak period, wave direction, wave periodicity, air temperature, and sea surface temperature.

Sometimes, a wave buoy will also include a surface current sensor, providing speed and direction of the surface current.

D. Provide information about the sampling platform or instrumentation.

The platform is a Wave buoy (Datawell Mark 3 directional buoy).

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) are data received by AOOS?

Data available from web harvest to the originator's site: http://cdip.ucsd.edu/?nav=recent&stn=204&units=english&tz=UTC&xitem=pm

C. How can the information be accessed?

The data are made available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically, data are available from two unique access points:
- File Downloads (CSV and NetCDF)
- ERDDAP

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV, NetCDF, and through ERDDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested (e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For this data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by the user. Summary statistics may include minimum, maximum and mean values. Seasonal statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the CDIP website where FGDC-compliant metadata is available.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

Alaska Ocean Observing System and CDIP

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

University Sourced data from CDIP Program (Coastal Data Information Program-University of California, San Diego), which is federally funded through the US Army Corps

of Engineers. CDIP is operated by the Ocean Engineering Research Group (OERG), part of the Integrative Oceanography Division (IOD) at Scripps Institution of Oceanography (SIO).

a. If Federal data source, were changes applied to the data?
N/A

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Real-time

C. If real-time, list the QARTOD procedures that are currently applied.
CDIP is an active member of the QARTOD (Quality Assurance of Real-Time Ocean Data) effort. All CDIP data served by the AOOS Data System, including the AOOS owned lower Cook Inlet CDIP buoy, are all managed by CDIP network through Scripps/UCSD, where extensive buoy validations and other QC tests are performed on the real-time data. Wave measurements checks include: extreme values test, spike test, mean shift test, flat episodes test, mean crossing test, equal peaks test, acceleration test, and period distribution test.

Details on these QC procedures can be found in the linked CDIP QC Documentation. Summary tables of quality control measures that have been developed for both waves and in-situ currents can be accessed at the following link: http://cdip.ucsd.edu/documents/index/product_docs/qc_summaries/waves/waves_table.php

The QC procedures provided by CDIP preclude AOOS from any additional QC implementation or documentation. Regardless, as with all data ingested by AOOS, the standard syntax, gross range and time gap checks are applied to these data (3G).

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
Quality controls fully implemented by CDIP Program.

F. Describe the data control procedures that were applied by the originator.
Extensive buoy validations and other QC tests are performed by CDIP. Wave measurement checks include: extreme values test, spike test, mean shift test, flat episodes test, mean crossing test, equal peaks test, acceleration test, and period distribution test.

a. Provide a link to any documented procedures.
http://cdip.ucsd.edu/?nav=documents&sub=index&units=metric&tz=UTC&pub=public&map_stati=1,2,3&xitem=proc&xtxt=data_QC(http://cdip.ucsd.edu/?nav=documents&sub=index&units=metric&tz=UTC&pub=public&map_stati=1,2,3&xitem=proc&xtxt=data_QC)

G. Describe the data control procedures that were applied by AOOS.

The QC procedures provided by CDIP preclude AOOS from any additional QC implementation or documentation.

a. Provide a link to any documented procedures.

AOOS Data Assembly Center and Data Management Subsystem Plan, Section 4.4.4.

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data on the AOOS data servers.

The CDIP program, which is the source of the data, archives the data and submits all CDIP data to NCEI for long-term preservation.

AOOS will be capable of archiving data with NCEI via a planned, automated pathway, but will not redundantly submit CDIP data to NCEI, unless requested.

B. Which long-term data storage facility will be used for preservation?

NCEI, submitted by CDIP.

C. Describe any transformation necessary for data preservation.

NetCDF

D. List the metadata or other documentation that will be archived with the data.

FGDC-compliant metadata is currently available through CDIP with a link provided through the AOOS data portal.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

This data stream provides paired air and stream temperature information using in-stream loggers linked to a real-time, online interface. Each monitoring station is powered with battery and micro-solar recharging capabilities, using Iridium satellite technology. This project builds on previous work (by Cook Inletkeeper) to understand water temperature patterns in non-glacial salmon streams. This is an important next step in technology, data accessibility and long-term planning needed to engage decision-makers and local Alaskans in the implication of climate change on our freshwater salmon habitat.

Website URL: Historical Sensors: Source: Cook Inletkeeper:
https://portal.aoos.org/#metadata/138/sensor_source

B. How many station locations are there for this data stream?

3

C. What are the specific parameters of the data.

The parameters of this data stream include: date, time, GPS (latitude and longitude), air temperature and stream water temperature.

D. Provide information about the sampling platform or instrumentation.

The sampling platform is a Beaded Stream Standard Digital Temperature Cable.
http://beadedstream.com/products/standard-digital-temperature-cable/

Backup (not real-time) TidbiT v2 data logger from Onset ar often co-deployed:
http://www.onsetcomp.com/products/data-loggers/utbi-001

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) were data received by AOOS?

Retrieved by web harvest from the Beaded Stream (data host) web site

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically, data are available from two unique access points:
- File Downloads (CSV)
- ERDDAP

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and through ERDDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For this data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by the user. Summary statistics may include minimum, maximum and mean values. Seasonal statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

Sue Mauger, Cook Inletkeeper

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

Non-governmental organization

a. If Federal data source, were changes applied to the data?

N/A

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Data were reporting real time from 2015 through 2021, but the three stations are no longer reporting data as of October 2021 (or earlier). So are now considered historical data. .

Historical

C. If real-time, list the QARTOD procedures that are currently applied.

Three of the five required tests were applied by AOOS to the original real-time temperature data: Syntax, Gross Range, and Time-Gap Tests (see 3G).

There are no Stream Temperature QARTOD protocols, though there are water temperature protocols. If these stations become real time in the future, QARTOD Temperature QC tests will be applied to these data.

D. If real-time, list the QARTOD procedures that are planned for implementation.

QARTOD requires two additional tests to real-time temperature and salinity, including a location test and climatology test. The Location Test will be implemented on future real-time data using the GPS (latitude and longitude) location provided in the station data stream (if available…often for fixed stations such as these Cook Inlet Keeper loggers, the information is not provided). The Climatology Test is more rigorous, and currently, the AOOS Data System does not have the historical data in place for these stations to perform meaningful climatology tests. It is a test that may be considered after there are 7+ years of data in the AOOS archive.

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

Some QC by originator

F. Describe the data control procedures that were applied by the originator.

The accuracy of the temperature data logger is verified by evaluating the results of pre- and post-deployment calibration checks. If a temperature logger fails a post-deployment calibration check (i.e. reading from a data logger is greater than 0.3 deg C from the NIST), then another calibration check must be performed. If it fails a second time, then the raw data should be adjusted by the mean difference of the pre- and post- calibration checks results to correct for the instrument bias. Temperature data collected before or after the deployment

period must be deleted from the raw data set since it is not valid data (e.g. the data logger may be recording air temperature data). Field notes from the deployment and retrieval events will provide the dates and times necessary to identify the deployment period. Instantaneous temperature measurements collected during monthly maintenance checks should be compared to the data logger measurements to confirm accuracy goals. The data should be graphed to help identify anomalous data that might result from the data logger not being submerged or being tampered with by humans or wildlife.

Data are compared with Alaska's water temperature criteria to determine if water temperature exceedances have occurred, but no prescribed gross range check is known to be completed by the originator. In the future, a centralized database for Alaska's water temperature data is expected to be available and standardized reporting formats will be developed to enhance comparison across Cook Inlet salmon streams. Note: AOOS does this for this project, and performs adequate QC on their real-time data.

a. Provide a link to any documented procedures.

Project methods reference protocols described in the following three documents:

1) SOP for this project including QC is available in "Water Temperature Data Logger Protocol for Cook Inlet Salmon Streams: https://inletkeeper.org/resources/contents/water-temperature-data-logger-protocol

2) Stream Temperature Data Collection Standards and Protocol for Alaska (Dec 2014) //aknhp.uaa.alaska.edu/wp-content/uploads/2015/01/StreamTemperatureStandardsandProtocolfor-Alaska.pdf and,

3) **Stream temperature data collection standards for Alaska: Minimum standards to generate data useful for regional-scale analyses.** Sue Mauger, Rebecca Shaftel, E. Jamie Trammell, Marcus Geist, Dan Bogan, Stream temperature data collection standards for Alaska: Minimum standards to generate data useful for regional-scale analyses, Journal of Hydrology: Regional Studies, Volume 4, Part B, 2015, Pages 431-438, ISSN 2214-5818, https://doi.org/10.1016/j.ejrh.2015.07.008. (https://www.sciencedirect.com/science/article/pii/S2214581815000932)

G. Describe the data control procedures that were applied by AOOS.

Data are converted on the instruments to output engineering values for temperature for originator files. AOOS ingests these data and applies 3 standard QC tests:

1. Syntax Test: checks for parity errors by testing if data can be extracted from the downloaded or scraped data. If no data can be extracted, the test fails, and no data are accessed, served or stored for that record.
2. Gross Range Test: This test checks data values against minimum and maximum values defined for each parameter. Water temperature range: 20 to 135 deg F. Data that fall outside of the prescribed parameter ranges are rejected and replaced with missing value flags in

data storage connected to access points and the graphic displays.
3. Time-Gap Check: AOOS implements a “time-gap check" that informs observational assets (e.g., weather stations) displayed on its "Real-Time Sensor Map". If no data are received from an existing observational station for four hours, the icon on the map changes from a scaled color to a small grey-shade dot. If no data are received from an existing observational station for one week, the asset is automatically removed from the map, although assets are still made available on a historical sensor map. See 3C.

a. Provide a link to any documented procedures.
AOOS Data Assembly Center and Data Management Subsystem Plan

H. List the procedures taken for data that could not be QC’d as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data on the AOOS data servers.

AOOS will facilitate data archival with NCEI. NCEI is interested in this data stream.

B. Which long-term data storage facility will be used for preservation?
NCEI

C. Describe any transformation necessary for data preservation.
N/A

D. List the metadata or other documentation that will be archived with the data.
N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

Gulf Watch Alaska is the long-term ecosystem monitoring program of the Exxon Valdez Oil Spill Trustee Council. The current five-year, $12 million program began in February 2012 and is the first increment of a program anticipated to span a 20-year period. The program is organized into four related ecosystem monitoring components, which encompass 15 field sampling projects across Lower Cook Inlet, Central Gulf of Alaska, and Prince William Sound. More information: www.gulfwatchalaska.org/

Website URL: http://portal.aoos.org/gulf-of-alaska

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

Numerous parameters are monitored by the Gulf Watch Alaska program, including: temperature at the surface and at various depths in the water column, salinity, dissolved oxygen, currents, nutrients, chlorophyll, phytoplankton and zooplankton, lingering oil levels in the nearshore environment, nearshore species abundance, distribution, community composition, and site-specific environmental data, and the abundance of whales and seabirds, and the distribution and abundance of their prey.

D. Provide information about the sampling platform or instrumentation.

A suite of sampling platforms are utilized. These include: Profiling CTD - Brand: Seabird SEACAT 19; water quality monitoring station; Continuous Plankton Recorder; Vemco temperature logger; echosounder transducer; plankton nets; ship-based surveys; human-based observations in the nearshore and pelagic environments; and in situ experiments.

2. DATA PATHWAY

A. Is a data sharing agreement required?

This material is based upon work funded by multiple entities, including the Exxon Valdez Oil Spill Trustee Council. Any opinions, findings, conclusions, or recommendations expressed herein are those of the author(s) and do not necessarily reflect the views or positions of funding entities. Standard scientific norms for attribution, credit, and potential co-authorship should be followed when using these data including to the Owners, Exxon Valdez Oil Spill Trustee Council and other sources of funding. Please let the Owner know when these data are used.

B. In which format(s) were data received by AOOS?

Data are provided in their native file formats directly from originator. The originator submits data to the AOOS Research Workspace and then uses an auto-publication pathway to make the data publically available through the AOOS Gulf of Alaska data portal.

C. How can the information be accessed?

This project-specific data are available through the AOOS data portal in the native file formats provided by the data owner.

D. What file formats will be used for sharing data, if different from original?

Data are shared in the original native file format as submitted by the originator. Data are available for download in the public-facing AOOS Gulf of Alaska portal, but not by exploration via interactive, graphical visualizations. The exception is the Gulf Watch Alaska Humpback Observations. This format is different than the original to accommodate interactive visualizations in the AOOS Gulf of Alaska data portal.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data were uploaded by the originator to the AOOS Research Workspace using their secure user account. Data files are stored on servers in the AOOS data management system. The user elects data files to push from the Workspace to the AOOS Gulf of Alaska data portal for public-access. Data are available in the AOOS Gulf of Alaska portal through the access point but not via graphic display (with the exception of humpback whales). Data files may be downloaded by the user from the AOOS data portal. A user request for a particular file pulls the data from the server cache. For interactive visualizations of humpback whale observations, flat table data was restructured into a relational database and a geometry was created from latitude and longitude values. Lookup tables were generated for users to explore the attributes of interest. Additionally, the seasons in which data was collected was mapped to filterable menus. Observations were then summarized into a hexagonal heat map with coverage at 15 zoom levels. Observations were summarized into colored hexagons at each zoom level. The color of the hexagon varies relative to the total number of observations within that hexagon.

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive project and file metadata describing the data and accompanying fields.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

Exxon Valdez Oil Spill Trustee Council

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

Various: Federal, State, University, NGO, and Private individual

a. If Federal data source, were changes applied to the data?

No

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Historical

C. If real-time, list the QARTOD procedures that are currently applied.

Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

Some QC as delivered from the originator(s) and will be presented with the metadata.

F. Describe the data control procedures that were applied by the originator.

QC methods are described by project in the field sampling protocols. Protocols are published to the AOOS data portal alongside data files and reported in the metadata.

a. Provide a link to any documented procedures.

N/A

G. Describe the data control procedures that were applied by AOOS.

None applied

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Through an agreement with the Gulf Watch Alaska program, AOOS is taking responsibility for archiving these data with the Research Workspace DataONE Member Node via a

planned, automated pathway. Data are archived at a period of one to five years, depending on the data set. See: https://search.dataone.org/portals/RW

B. Which long-term data storage facility will be used for preservation?

DataONE

C. Describe any transformation necessary for data preservation.

Transformations of data to non-proprietary file formats occurs to facilitate long-term preservation, including CSV, TXT, XLS, and NetCDF.

D. List the metadata or other documentation that will be archived with the data.

ISO-19115 or .xml FGDC CSDGM metadata records are provided by the data collectors prior to archive. Field sampling protocols are also archived with the data files.

G-19

REGIONAL DATA STREAM PLAN: EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL, PRINCE WILLIAM SOUND PACIFIC HERRING RESEARCH AND MONITORING (HRM) PROGRAM, AUGUST 2022

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Herring Monitoring and Research Program provides critical information, such as evaluations of recruitment, trends in disease, how ocean conditions affect recruitment, and relative productivity of various nursery bays. Research may also lead to a better understanding of the role of disease, predictability of disease outbreaks, and potential disease management practices that reduce disease impacts. Monitoring of herring populations, quantification and measurement of critical life-history attributes will allow for the development of better predictive models of herring stocks that lead to adaptive fisheries management practices, and longer-term sustainability of the stock. This supportive information can then be used if active intervention were to be implemented in the future. The Herring Monitoring and Research Program is administered with a five-year contract through NOAA. Over 25 principal investigators are engaged in over 20 individual research projects. More information: http://pwssc.org/herring-research-and-monitoring/.

Website URL: http://portal.aoos.org/gulf-of-alaska

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

Numerous parameters are monitored by the HRM program, including: herring biology, spawn observations, herring biomass estimates, herring age sex length, commercial harvest volumes, oceanographic measurements, herring habitat characterizations, and incidental marine mammal observations.

D. Provide information about the sampling platform or instrumentation.

A suite of sampling platforms are utilized. These include: Profiling CTD - Brand: Seabird SEACAT 19; temperature loggers; echosounder transducer; plankton nets; ship-based surveys; human-based observations in the nearshore and pelagic environments; fixed wing airplane for aerial surveys, and in situ experiments.

2. DATA PATHWAY

A. Is a data sharing agreement required?

This material is based upon work funded by multiple entities, including the Exxon Valdez Oil Spill Trustee Council. Any opinions, findings, conclusions, or recommendations expressed herein are those of the author(s) and do not necessarily reflect the views or positions of funding entities. Standard scientific norms for attribution, credit, and potential co-authorship should be followed when using these data including to the Owners, Exxon Valdez Oil Spill Trustee Council and other sources of funding. Please let the Owner know when these data are used.

B. In which format(s) were data received by AOOS?

Data are provided in their native file formats directly from originator. The originator submits data to the AOOS Research Workspace and then uses an auto-publication pathway to make the data publically available through the AOOS Gulf of Alaska data portal. For visualized datasets, the data was received as shapefiles directly from the originator.

C. How can the information be accessed?

This project-specific data are available through the AOOS data portal in the native file formats provided by the data owner. Additionally, a subset of the data, including herring spawn, aerial survey route, herring biomass, and incidental marine mammals observations, are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically, these later datasets are available from three unique access points: Web Mapping Service (WMS); Web Feature Service (WFS); and File Downloads (PNG, Shapefile, CSV).

D. What file formats will be used for sharing data, if different from original?

Data are shared in the original native file format as submitted by the originator. Data are available for download in the public-facing AOOS Gulf of Alaska portal, but not by exploration via interactive, graphical visualizations. The exception is the Spawn/Survey route/ Biomass/Marine mammals file observations. This format is different than the original to accommodate interactive visualizations in the AOOS Gulf of Alaska data portal.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are uploaded by the originator to the AOOS Research Workspace using their secure user account. Data files are stored on servers in the AOOS data management system. The user elects data files to push from the Workspace to the AOOS Gulf of Alaska data portal for public-access. Data are available in the AOOS Gulf of Alaska portal through the access point but not via graphic display (with the exception of some herring data files, mentioned previously). Data files may be downloaded by the user from the AOOS data portal. A user request for a particular file pulls the data from the server cache. For interactive visualizations of herring biomass observation, spawning locations, and commercial harvest data, flat tables were restructured into a relational database and a geometry was created from latitude and longitude values. Lookup tables were generated for user to explore the attributes of interest. Additionally, individual marine mammal species observations were mapped to labels. These observations were then summarized into a hexagonal heat map with coverage at 15 zoom levels. Observations were summarized into colored hexagons at each zoom level. The color of the hexagon varies relative to the total number of observations within that hexagon.

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive project and file metadata describing the data and accompanying fields. For visualized data, metadata records are available as FGDC Content Standard for Digital Geospatial Metadata FGDC-STD-001-1998.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
Exxon Valdez Oil Spill Trustee Council

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
Various: Federal, State, University, NGO, and Private individual

a. If Federal data source, were changes applied to the data?
No

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
Some QC as delivered from the originator(s) and presented with metadata.

F. Describe the data control procedures that were applied by the originator.
QC methods are described by project in the field sampling protocols. Protocols are published to the AOOS data portal alongside data files and reported in the metadata.

a. Provide a link to any documented procedures.
N/A

G. Describe the data control procedures that were applied by AOOS.
None applied

a. **Provide a link to any documented procedures.**
N/A

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Through an agreement with the HRM program, AOOS is taking responsibility for archiving these data with the Research Workspace DataONE Member Node via a planned, automated pathway. Data are archived at a period of one to five years, depending on the data set. See: https://search.dataone.org/portals/RW

B. Which long-term data storage facility will be used for preservation?
DataONE

C. Describe any transformation necessary for data preservation.
Transformations of data to non-proprietary file formats occurs to facilitate long-term preservation, including CSV, TXT, XLS, AND NetCDF.

D. List the metadata or other documentation that will be archived with the data.
ISO-19115 or .xml FGDC CSDGM metadata records are provided by the data collectors prior to archive. Field sampling protocols are also archived with the data files.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

Interannual variations in temperature and salinity on the northern Gulf of Alaska (GAK) shelf reflect environmental changes that affect this marine ecosystem. Quantifying and understanding this variability requires a long time series such as the 32-year record at hydrographic station GAK 1 near Seward (See REGIONAL DATA STREAM PLAN: OCEANOGRAPHIC STATION: GAK1). The PMEL Ocean Acidification (OA) program has maintained 4 OA moorings in Alaska; GAKOA, which augments the GAK 1 time series with a separate stand alone, near-surface mooring containing a MAPCO2 system and a subsurface CTDs and seawater pH sensors; the M2 in the Bering Sea with similar configuration as GAKOA mooring; and three other moorings that were discontinued in early 2016 in Southeast AK, Kodiak, and station M8 (though historical data available).

Measuring pH in addition to pCO2 allows changes associated with ocean acidification (OA) to be more accurately and precisely assessed and forecasted.

The OA mooring program in Alaska has been developed through a consortium of agencies including the National Science Foundation, NOAA, the North Pacific Research Board, and the Alaska Ocean Observing System (AOOS), and is the centerpiece of the research program within the Ocean Acidification Research Center at UAF.

Website URL: Real-Time Sensor: Source: NOAA PMEL: https://portal.aoos.org/#metadata/2026/sensor_source

B. How many station locations are there for this data stream?

4 historical (GAK OA; M2; SE AK; Kodiak) (temperature, salinity, pressure, dissolved oxygen).

C. What are the specific parameters of the data.

The parameters of this data stream include: date, time, GPS, atmospheric boundary layer and surface ocean CO_2 partial pressure (pCO_2) and pH. temperature (TSG_T) (subsurface and near-bottom), salinity (TSG_S) (subsurface and near-bottom), dissolved oxygen, and pCO2/pH (subsurface and near-bottom from secondary sensors to the surface pCO2).

Currently, the pCO2 and pH data are not being reported on the AOOS data portal.

D. Provide information about the sampling platform or instrumentation.

The typical OA mooring includes a surface buoy equipped with a real-time reporting, MAPCO2 system to measure the atmospheric boundary and surface ocean CO2 partial pressure. The real-time pCO2 data are not reported in real-time on the AOOS data portals, as they require post-processing by NOAA. These data, when released, become part of the historical record.

The subsurface mooring consists of internally recording instruments, with subsurface CTDs reporting real-time, whereas near-bottom data are recovered during the annual maintenance of these moorings. The surface instruments can report data real-time to provide temperature, salinity and pressure, and sometimes oxygen. They include two Sea-Bird Electronic's SeaCAT CTDs (SBE 16+) to measure temperature, conductivity and pressure (used for computing salinity), and two autonomously recording combination pCO2 / pH systems (SAMI by SundBurst Sensors). The SAMI uses an in situ spectrophotometric method that can measure pCO2 and pH with a reported accuracy of 0.003 pH units. The M2 mooring is equipped with an SBE 43 Clark Electrode dissolved oxygen sensor on the subsurface CTD.

2. DATA PATHWAY

A. Is a data sharing agreement required?

No, these data are available publically.

B. In which format(s) are data received by AOOS?

Specifically the data are harvested from the originators' website as CSV file with converted engineering units: http://www.pmel.noaa.gov/co2/story/GAKOA; http://www.pmel.noaa.gov/co2/story/M2+OA+Mooring

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically, data are available from two unique access points:

- File downloads (CSV)
- ERDDAP

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and through ERDDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested (e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For this data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by the user. Summary statistics may include minimum, maximum and mean values. Seasonal statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?
Metadata are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
NOAA Pacific Marine Environmental Laboratory (NOAA-PMEL)

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
Federal

a. If Federal data source, were changes applied to the data?
Yes

b. If Yes, describe any changes to the data that require documentation?
The file format of the original data (CSV) was changed so it is also accessible using the ERDDAP service.

B. Indicate the data reporting type (e.g. real-time, historical).
Historical records.

C. If real-time, list the QARTOD procedures that are currently applied.
These data are from a Federal source, and therefore, AOOS is not required to provide further QC documentation or QARTOD implementation. However, AOOS currently applies three standard QC procedures to all real-time and historical observation data before they are displayed or stored in the AOOS Data System (see 3G).

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

All data reported from this source is QC'd by originator.

F. Describe the data control procedures that were applied by the originator.

Contact the data provider for availability of QC information.
http://www.pmel.noaa.gov/co2/story/Coastal+Moorings

a. Provide a link to any documented procedures.

N/A

G. Describe the data control procedures that were applied by AOOS.

AOOS currently applies three standard QC procedures to real-time and historical observation data before they are displayed or stored in the AOOS Data System. These tests include the following:

1. *Syntax Test:* Each regional data source uses unique syntax to transfer data. Some (e.g., Canada Water Office) have standardized data storage protocols and provide files whereas others (e.g., Alyeska Weather stations) are merely html web pages that are scraped for data. Therefore, each regional source requires a custom syntax test, which merely checks for parity errors by testing if data can be extracted from the downloaded or scraped data. If no data can be extracted, the test fails, and no data are accessed, served or stored for that record.
2. *Gross Range Test:* This test checks data values against minimum and maximum values defined for each parameter. In addition to parameters outlined in QARTOD manuals, AOOS performs gross range tests for parameters listed in Appendix H including water temperature, salinity, oxygen saturation values and pH. Values outside of the prescribed parameter ranges are rejected and replaced with missing value flags in data storage connected to access points and the graphic displays.
3. *Time-Gap Check:* AOOS implements a *"time-gap check"* that informs observational assets (e.g., weather stations) displayed on its "Real-Time Sensor Map". If no data are received from an existing observational station for four hours, the icon on the map changes from a scaled color to a small grey-shade dot. If no data are received from an existing observational station for one week, the asset is automatically removed from the map, although assets are still made available on a historical sensor map.

a. Provide a link to any documented procedures.

AOOS Data Assembly Center and Data Management Plan (2016)

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

NOAA

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data on the AOOS data servers.

Data are archived by NOAA with the Carbon Dioxide Information Analysis Center (CDIAC). Full metadata record available there.

B. Which long-term data storage facility will be used for preservation?

Carbon Dioxide Information Analysis Center (CDIAC)

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

Full metadata record available at the CDIAC.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

This site documents Inupiaq (Alaska Native) place names for physical and cultural features in the coastal region of northwest Alaska. These features are mapped to provide a spatial reference.

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

The parameters include the native names of areas of physical and/or cultural importance to Alaskan Native communities for subsistence-use purposes.

D. Provide information about the sampling platform or instrumentation.

These spatial data were collected by Community Research Assistants (CRAs) in surveys/interviews with Alaska native elders.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically at the following link:

Northwest Arctic Borough Data Portal/Inupiaq Place Names

B. In which format(s) were data received by AOOS?

Data were received as shapefile from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from three unique access points:

- Web Mapping Service (WMS)
- Web Feature Service (WFS)
- File Downloads (PNG, Shapefile)

D. What file formats will be used for sharing data, if different from original?

The data are available for exploration in the AOOS portals via interactive visualizations. The data are available for download as shapefile for PNG.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Delivered directly to AOOS from originator, imported to PostgreSQL, visualized with custom JSON REST service (JAVA). The original shapefiles were re-projected to EPSG:3572 (Alaska-based polar) for visualization in the AOOS data portals.

F. What metadata or contextual information is provided with the data?
Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
N/A

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
University and private industry

a. If Federal data source, were changes applied to the data?
N/A

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
N/A

F. Describe the data control procedures that were applied by the originator.
N/A

a. **Provide a link to any documented procedures.**
N/A

G. Describe the data control procedures that were applied by AOOS.
No applied AOOS QC. This is a synthesis product made from existing data sources.

a. **Provide a link to any documented procedures.**
N/A

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

No archive planned.

B. Which long-term data storage facility will be used for preservation?
N/A

C. Describe any transformation necessary for data preservation.
N/A

D. List the metadata or other documentation that will be archived with the data.
N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

Socioeconomic survey results and analysis including population, education, and employment information for 35 Arctic Alaskan villages. These data were compiled by the Institute of Social and Economic Research (ISER), University of Alaska, Anchorage from a variety of sources including the Alaska Department of Labor and Workforce Development, Research and Analysis Section, Alaska Geographic Differential Study, ADF&G Subsistence Division, the American Community Survey (ACS), Arctic Observation Network (AON) Social Indicator Database, and the U.S. Census.

Website URL: http://portal.aoos.org/#module-metadata/f55d3ecc-aa4e-11e3-925c-00219bfe5678/a5b585ce-a9c1-11e3-9cd3-00219bfe5678

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

The parameters include human population size, total and by race (self-identified) over time; employment by place of residence; income; education; living cost; fuel price; language; subsistence harvest by species; commercial fishing activity; and tax revenue.

D. Provide information about the sampling platform or instrumentation.

Platforms include various existing socioeconomic sources including, US census data, labor and workforce development, American Community, Alaska Commercial Fisheries Entry Commission, Alaska Dept of Fish and Game Community Subsistence Information System, and the Alaska Taxable Database.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) were data received by AOOS?

Data were received as XLS files from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be viewed using interactive visualizations. Data files are not available for download.

D. What file formats will be used for sharing data, if different from original?

Data are available as graphic visualization in the portal. Data files are unable to be downloaded by users.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Excel spreadsheet workbooks were imported to PostgreSQL and combined into a master table to enable dynamic query functionality of data in the portal. A custom Play service was written to feed query results as JSON to the data portal for visualization.

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

These data were compiled by the Institute of Social and Economic Research (ISER), University of Alaska, Anchorage from a variety of sources including the Alaska Department of Labor and Workforce Development, Research and Analysis Section, Alaska Geographic Differential Study, ADF&G Subsistence Division, the American Community Survey (ACS), Arctic Observation Network (AON) Social Indicator Database, and the U.S. Census.

I. Describe any effect of IPR on data access.

None

3. DATA SOURCE AND QUALITY CONTROL

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

University

a. If Federal data source, were changes applied to the data?

N/A

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Historical

C. If real-time, list the QARTOD procedures that are currently applied.

None required.

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

QC by originator

F. Describe the data control procedures that were applied by the originator.

Contact the data provider for availability of QC information.

a. Provide a link to any documented procedures.

N/A

G. Describe the data control procedures that were applied by AOOS.

No applied AOOS QC. This is a synthesis product made from existing data sources.

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

No plan for archiving this data stream.

B. Which long-term data storage facility will be used for preservation?

N/A

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The King Island wave buoy (NDBC WMO Station 48114) data stream consists of coastal environment measurements taken 30 NM west of King Island, AK in the Bering Sea. The buoy streams real-time information on waves, air surface temperature, and sea surface temperature on an hourly basis. The station was operated by AOOS for one year in 2015, and logistically supported by NOAA, the Norton Sound Economic Development Corporation, and Alaska Sea Grant. This real time reporting buoy was seasonally deployed (summer only) due to its high latitude location, in 2015, but has not been in the water since it was recovered in October 2015.

Website URL: Historical Sensor: Source: Alaska Ocean Observing System: https://portal.aoos.org/#metadata/20063/station/data

B. How many station locations are there for this data stream?

1, The King Island Buoy - WMO ID 48114

C. What are the specific parameters of the data.

Parameters include GPS, date, time, water temperature, wave height, wave direction, wave periodicity, and air temperature.

D. Provide information about the sampling platform or instrumentation.

The platform is a wave and meteorological buoy (AXYS Watchmate buoy equipped with a Triaxys (three-axis) directional wave sensor system).

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) are data received by AOOS?

The data are received as Iridium emails with attached binary file to lance@axiomalaska.com. An example message includes:
$W5M5A,160718,172500,810d01d7496193a5,3,0.01,0.02,25,17,57*17

Example: Here is a file created in the data ftp. This file is created by taking the one line from the iridium attachment and adding to this file. Decoding this file is some work. There are three types of lines in the file. You can tell the line-type by the 5th column. The 5th column will have either 1, 2, or 3 for the type. The "*19" at the end of the line is the checksum (ignore this).

Type 1:

column headers:"$W5M5A", "yyMMdd","HHmmss", "device ID", "type ID", "lat", "lon", "air_temp", "wind_spd_1", "wind_dir_1", "wind_gust_1", "wind_spd_2", "wind_dir_2", "wind_gust_2", "water_temp"
example
$W5M5A,140819,090000,810d01d7496193a5,1,6500.2533N,16844.8520W,10.9,,,,,,,10.0*19

Type 2:
column headers: "$W5M5A", "yyMMdd","HHmmss", "device ID", "type ID", <Do not know what the other columns are>
example $W5M5A,160616,091000,810d01d7496193a5,2,12.45,12.54,0.08,,-0.05,3.5,12.32,1466067575,22084,5,105,0,0,,74.91,945236*0C

Type 3:
column headers:"$W5M5A", "yyMMdd","HHmmss", "device ID", "type ID", "sig hgt", "max hgt", "period", "direction", "spread"
example $W5M5A,160615,172500,810d01d7496193a5,3,,,,,*1B

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically, data are available from two unique access points:
- File Downloads (CSV)
- ERDDAP

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and through ERDDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For this data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by

the user. Summary statistics may include minimum, maximum and mean values. Seasonal statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?

After AOOS performs standard QC checks and stores data in sensor service cache, data are sent from sensor service cache to NDBC. Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the NDBC website where FGDC-compliant metadata are available.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

Alaska Ocean Observing System

I. Describe any effect of IPR on data access.

None

3. DATA SOURCE AND QUALITY CONTROL

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

AOOS Funded Wave Buoy, NGO

AOOS provides data to NDBC, a Federal data source: National Data Buoy Center (NDBC) also shared data from the 2015 deployment for wave observations. NDBC also hosts historical observations of meteorological variables for 2014, prior to AOOS operations of just the wave buoy at same location:
https://www.ndbc.noaa.gov/station_page.php?station=48114
Standard NDBC data quality control checks were likely applied to these data prior to posting on the NDBC website..
Data descriptions presented by NDBC are available here:
https://www.ndbc.noaa.gov/measdes.shtml

NDBC Data Management: Real Time files generally contain the last 45 days of "Realtime" data - data that went through automated quality checks and were distributed as soon as they were received. Historical files have gone through post-processing analysis and represent the data sent to the archive centers. The formats for both are generally the same, with the major difference being the treatment of missing data. Missing data in the Realtime files are denoted by "MM" while a variable number of 9's are used to denote missing data in the Historical files, depending on the data type (for example: 999.0 99.0).

a. If Federal data source, were changes applied to the data?

N/A

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Was originally Real Time (2015), but buoy was seasonal and has not been deployed since 2015.

Historical

C. If real-time, list the QARTOD procedures that are currently applied.

QARTOD status for this Data Stream varies by parameter (as of 2015):

Three of the five required tests were applied to all parameters in 2015, prior to full QARTOD implementation at AOOS. These tests include: Syntax, Gross Range, and Time-Gap Tests (see 3G below). One of the five required tests is applied to wave period: Syntax Test.

Update 2022: If this buoy station is ever redeployed, QARTOD protocols for real time data streams will be updated. There are currently no plans to redeploy this asset, which is no long on-site in Nome. However, a different asset may take its place at some future time.

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

Some QC.

F. Describe the data control procedures that were applied by the originator.

Data are converted on the buoy computer to output engineering values for waves and temperature. After data are ingested, AOOS applied 3 standard QC tests:

1. Syntax Test: checks for parity errors by testing if data can be extracted from the downloaded or scraped data. If no data can be extracted, the test fails, and no data are accessed, served or stored for that record.
2. Gross Range Test: This test checks data values against minimum and maximum values defined for the following parameters (Appendix H): Wave height range (0-20 meters); wave direction range (-360 to 360 degrees); surface water temperature (20-135 deg F). Wave Period is currently not gross range tested by AOOS. A gross range tests is completed for air temperature range (-130 to 135 deg F). Values outside of the prescribed parameter ranges are rejected and replaced with missing value flags in data storage connected to access points and the graphic displays.

3. Time-Gap Check: AOOS implements a “time-gap check" that informs observational assets (e.g., weather stations) displayed on its "Real-Time Sensor Map". If no data are received from an existing observational station for four hours, the icon on the map changes from a scaled color to a small grey-shade dot. If no data are received from an existing observational station for one week, the asset is automatically removed from the map, although assets are still made available on a historical sensor map.

a. Provide a link to any documented procedures.
AOOS Data Assembly Center and Data Management Subsystem Plan, Section 4.4.4.

G. Describe the data control procedures that were applied by AOOS.
Refer to Section 3C and 3F for details.

a. Provide a link to any documented procedures.
AOOS Data Assembly Center and Data Management Plan.

H. List the procedures taken for data that could not be QC’d as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Though AOOS provided these data to the National Data Buoy Center, AOOS is responsible for archiving these data with NCEI via a planned, automated pathway.

B. Which long-term data storage facility will be used for preservation?
NCEI, NDBC

C. Describe any transformation necessary for data preservation.
NetCDF

D. List the metadata or other documentation that will be archived with the data.
N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

This site includes the Nimbus-7 SMMR and DMSP SSM/I-SSMIS Passive Microwave Data, which provides high-quality sea ice concentrations every other day from October 26, 1978 to July 9, 1987 and daily from July 10 to December 31, 2010. This data set is generated from brightness temperature data and is designed to provide a consistent time series of sea ice concentrations spanning the coverage of several passive microwave instruments.The data are provided in the polar stereographic projection at a grid cell size of 25 x 25 km. Also included is the Near-Real-Time DMSP SSM/I-SSMIS data, which provides best-estimate daily sea ice concentrations from January 1, 2011 to the present.

Website URL: http://portal.aoos.org/#module-metadata/391183ee-827e-11e1-a4f3-00219bfe5678/c4d14166-cae8-4bb0-8cd5-fc876f07d63c

Multisensor Analyzed Sea Ice Extend (MASIE): http://portal.aoos.org/#module-metadata/05113e8c-ea25-11e0-a998-0019b9dae22b/ba74f14c-ea25-11e0-986a-0019b9dae22b

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

The parameters of this data include date, time, and sea ice concentration.

D. Provide information about the sampling platform or instrumentation.

The sampling platforms are DMSP 5D-2/F11, DMSP 5D-2/F13, DMSP 5D-2/F8, DMSP 5D-3/F17, NIMBUS-7, which include the SMMR, SSM/I, SSMIS sensors.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) were data received by AOOS?

Data were received as flat binary files (1-byte scaled, unsigned integers) in polar stereographic projections.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from four unique access points:

- Web Mapping Service (WMS)
- THREDDS

- OPeNDAP
- File Downloads (CSV)

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and NetCDF. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded daily in its original format from the NSIDC site. AOOS converts these files to NetCDF files using custom Java and Scala scripts, and stores the converted data on servers within the AOOS data management system. Data are made available in the AOOS portals through the access points and via graphic display. Graphical map displays are generated through internal data requests from the sensor service in JSON format. Program code handles the connection of data from the server to graphic display in the portal. A time series extraction tool uses a JSON request to pull values out of the netCDF files for multiple times at a specific location. Extracted data are provided as CSV. Gridded data files may be downloaded by the user from the AOOS data portal. A user request for a WMS file will provide a georeferenced image tile for use with common web mapping services. A user request for THREDDS or OPeNDAP uses that respective service to request full or partial data files in netCDF format.

F. What metadata or contextual information is provided with the data?

Metadata are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

National Snow and Ice Data Center (NSIDC)

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

Federal

a. If Federal data source, were changes applied to the data?

Yes

b. If Yes, describe any changes to the data that require documentation?
The file format of the original data was changed.

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
Not Required

D. If real-time, list the QARTOD procedures that are planned for implementation.

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
QC by originator

F. Describe the data control procedures that were applied by the originator.
Federal source

a. Provide a link to any documented procedures.
N/A

G. Describe the data control procedures that were applied by AOOS.
No applied AOOS QC. This is a synthesis product made from existing data sources.

a. Provide a link to any documented procedures.
N/A

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
NSIDC already archives these data.
This is a synthesis product made from existing data sources. Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

B. Which long-term data storage facility will be used for preservation?
N/A

C. Describe any transformation necessary for data preservation.
N/A

D. List the metadata or other documentation that will be archived with the data.
N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

These data track the seasonal and inter annual changes in marine carbonate chemistry along the Seward Hydrographic Line and within Prince William Sound, Alaska. The data are bottle binned ocean acidification data and depth binned ocean acidification and CTD data collected from cruises conducted in May and September 1998-2014.

Website URL: Ocean Acidification Measurements
https://portal.aoos.org/#search?type_group=platform&query=seward%20line&page=1

See also G-18, Exxon Valdez Oil Spill Trustee Council, Gulf Watch Alaska Long-Term Monitoring Program.

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

The parameters include: station number, time, latitude, longitude, bottle, bottom_depth, water_pressure, water_temperature, salinity, phosphate, silicate, nitrite, ammonia, nitrate, dissolved_inorganic_carbon, total_alkalinity, pH, pCO2, omega_calcite, omega_aragonite, dissolved_oxygen, depth.

D. Provide information about the sampling platform or instrumentation.

The sampling platforms include CTD and bottle sampling of ocean water at various depths.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) were data received by AOOS?

Data are provided in their native file formats directly from originator. The originator submits data to the AOOS Research Workspace and then uses an auto-publication pathway to make the data publically available through the AOOS Gulf of Alaska data portal (See Data Stream Plan G-18).

C. How can the information be accessed?

This project-specific data are available through the AOOS data portal in the native file formats provided by the data owner.

D. What file formats will be used for sharing data, if different from original?

Data are shared in the original native file format as submitted by the originator. Data are also available for download in the public-facing AOOS data portals in the following formats:

- CSV
- GeoJSOn
- KML
- Shapefile
- netCDF

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are uploaded by the originator to the AOOS Research Workspace using a secure user account. Data files are stored on servers in the AOOS data management system. The user elects data files to push from the Workspace to the AOOS Ocean Data Explorer portal for public-access. For graphic display, the original processed CTD data in ASCII format were converted to NetCDF files in the AOOS Data System and visualized with custom JSON REST service (JAVA). Data files may be downloaded by the user from the AOOS data portal. A user request for a particular file pulls the data from the server cache.

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive project and file metadata describing the data and accompanying fields.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

University of Alaska Fairbanks, Ocean Acidification Research Center (OA data)
University of Alaska Fairbanks, School of Fisheries and Ocean Sciences (SFOS), other oceanographic data

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

University

a. If Federal data source, were changes applied to the data?

N/A

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
N/A

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
QC by originator, and will accompany data with metadata.

F. Describe the data control procedures that were applied by the originator.
Details on QC are available from the originators of the data, but will be made available with the metadata once submission is completed.

See Data Stream G-18: QC methods are described by project in the field sampling protocols. Protocols are published to the AOOS data portal alongside data files and reported in the metadata.

a. Provide a link to any documented procedures.
N/A

G. Describe the data control procedures that were applied by AOOS.
N/A

a. Provide a link to any documented procedures.
AOOS Data Assembly Center and Data Management Subsystem Plan, Section 4.4.4.

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Through an agreement with the Gulf Watch Alaska program, AOOS is taking responsibility for archiving these data with the Research Workspace DataONE Member Node via a planned, automated pathway. Data are archived at a period of one to five years, depending on the data set. See: https://search.dataone.org/portals/RW

B. Which long-term data storage facility will be used for preservation?
DataONE

C. Describe any transformation necessary for data preservation.

Transformations of data will be to non-proprietary file formats to facilitate long-term preservation, including CSV, TXT, XLS, and NetCDF.

D. List the metadata or other documentation that will be archived with the data.

ISO-19115 or .xml FGDC CSDGM metadata records are provided by the data collectors prior to archive. Field sampling protocols are also archived with the data files.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

Temperature and salinity profiles in relation to depth have been taken at the oceanographic station GAK1 beginning in December, 1970. This multi-decade time series of oceanographic data is one of the longest in the North Pacific for any location. This data stream contains a 46-year time series of temperature and salinity measurements at hydrographic station GAK1, sampled over the years using multiple platforms (via ship and moorings). The data set starts in 1970, and now consists of monthly CTDs and a year-round mooring with 6 - 7 temperature/conductivity recorders distributed throughout the water column. The project provides CTD data (conductivity, temperature, depth), discharge data, and moored temperature and salinity data at the GAK1 station. The GAK1 mooring is located at 59 degrees 51' North and 149 degrees 30' West. Water depth is 261 m.

Website URL: http://portal.aoos.org/gulf-of-alaska#metadata/3c4ecb88-6436-4312-8281-ed584e020b0e/project

B. How many station locations are there for this data stream?

1

C. What are the specific parameters of the data.

Parameters include date, time, conductivity, temperature, depth, discharge, pressure, and moored temperature and salinity.

D. Provide information about the sampling platform or instrumentation.

The more recent data were collected from multiple ship-based observations, monthly CTD profiles (since 1990), and time-series data from the GAK1, year-round, non-real-time mooring.

http://www.ims.uaf.edu/gak1/

http://www.gulfwatchalaska.org/monitoring/environmental-drivers/gulf-of-alaska-mooring-gak1-monitoring/

2. DATA PATHWAY

A. Is a data sharing agreement required?

Yes. Ongoing data are managed and made public by AOOS through a grant from the Exxon Valdez Oil Spill Trustee Council.

B. In which format(s) are data received by AOOS?

Data are provided as ASCII files directly from originator. The originator submits data to the AOOS Research Workspace and then uses an auto-publication pathway to make the data available through the AOOS Gulf of Alaska data portal.

C. How can the information be accessed?

This project-specific data are available through the AOOS data portal in the native file formats (ASCII) provided by the data owner.

D. What file formats will be used for sharing data, if different from original?

Data are shared in the same format as submitted by the originator. Data are available for download in the AOOS portal but not by exploration via interactive, graphical visualizations.

E. Describe how the data are ingested (e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are uploaded by the originator to the AOOS Research Workspace using their secure user account. Data files are stored on servers in the AOOS data management system. The user elects data files to push from the Workspace to the AOOS Gulf of Alaska data portal for public-access. Data are available in the AOOS Gulf of Alaska portal through the access point but not via graphic display. Data files may be downloaded by the user from the AOOS data portal. A user request for CSV file pulls the data from the server cache.

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive project and file metadata describing the data and accompanying fields.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

These data may be freely used, but users are requested to please contact the originator with user information about data application and publications that result so the principals can keep their website updated and so they can continue keeping this time series funded.

H. Who holds intellectual property rights (IPR) to the data?

The most recent data were provided by Dr. Tom Weingartner of the Institute of Marine Science, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks in support of long-term monitoring at Gulf of Alaska oceanographic station GAK1.
University of Alaska Fairbanks

I. Describe any effect of IPR on data access.

None

3. DATA SOURCE AND QUALITY CONTROL

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

University, Researcher

a. If Federal data source, were changes applied to the data?

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
N/A

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
Some QC as delivered from the originator(s), and some QC by AOOS (3G).

F. Describe the data control procedures that were applied by the originator.
Detailed processing and QC procedures are available from the project PIs and some is documented on the project websites:

http://www.ims.uaf.edu/gak1/

http://www.gulfwatchalaska.org/monitoring/environmental-drivers/gulf-of-alaska-mooring-gak1-monitoring/

The mooring is serviced annually and all instruments (SBE 37 microcats) are calibrated at the manufacturer's facility following recovery. Typical expected temperature and salinity accuracies are +/- 0.02 in degrees C and PSU. Dates and times are listed in GMT. Data files are self-documented with the manufacturer's header records and additional notes as necessary.

After data conversion using the most recent calibrations, post processing followed by data corrections based on drift from post-recovery calibrations are completed, and the final step in the QC is hand-editing (manually) to remove data spikes and other "bad" measurements (not-automated). Only Pressure, Depth, Temperature, and Salinity fields are de-spiked.

Bad data points are replaced with delimiter 'NaN' in the data file.

a. Provide a link to any documented procedures.
N/A (These data were supplied as Metadata with the datastream)

G. Describe the data control procedures that were applied by AOOS.
None applied

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Through an agreement with the Gulf Watch Alaska program, AOOS is taking responsibility for archiving these data with the Research Workspace DataONE Member Node via a planned, automated pathway. Data are archived at a period of one to five years, depending on the data set. See: https://search.dataone.org/portals/RW

B. Which long-term data storage facility will be used for preservation?

DataONE

C. Describe any transformation necessary for data preservation.

None

D. List the metadata or other documentation that will be archived with the data.

ISO-19115 or .xml FGDC CSDGM metadata records are provided by the data collectors prior to archive. Field sampling protocols are also archived with the data files.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Russian American Long-Term Census of the Arctic (RUSALCA) (RUSALCA) is a NOAA program providing a variety of oceanographic data from the Bering Strait and Chukchi Seas. This dataset contains processed CTD data (temperature, salinity, oxygen) from the 2000, 2004, 2007, 2009, and 2012 research cruises.

Website URL: http://portal.aoos.org/#module-metadata/d98e5730-762e-11e2-9d97-00219bfe5678/a80b762a-780b-4e6d-a175-54a21f3ae227

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

Parameters include date, time, temperature, salinity, fluorescence and dissolved oxygen.

D. Provide information about the sampling platform or instrumentation.

The dataset was generated from ship-based observations.

2. DATA PATHWAY

A. Is a data sharing agreement required?

RUSALCA data shared through AOOS portals are available publicly without restriction. RUSALCA researchers request that any works or publications that result from reuse or analysis of RUSALCA data cite the original data and its producers.

B. In which format(s) were data received by AOOS?

Data were received as original CTD ASCII files from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be explored through interactive visualizations. It is not made available for download.

D. What file formats will be used for sharing data, if different from original?

Data are shared only through visualization in the AOOS data portal. Data files are not available for download.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Delivered directly to AOOS from originator, original processed CTD data in ASCII format were converted to NetCDF files in the AOOS Data System and visualized with custom JSON REST service (JAVA).

F. What metadata or contextual information is provided with the data?
Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the RUSALCA website.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
Russian American Long-Term Census of the Arctic (RUSALCA) - NOAA

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
Federal

a. If Federal data source, were changes applied to the data?
Yes

b. If Yes, describe any changes to the data that require documentation?
The file format of the original data was changed.

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.
Not required

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
QC by originator

F. Describe the data control procedures that were applied by the originator.
Federal source, not required

a. Provide a link to any documented procedures.
N/A

G. Describe the data control procedures that were applied by AOOS.

AOOS applies 3 standard QC tests to real-time and historical data:

1. Syntax Test: checks for parity errors by testing if data can be extracted from the downloaded or scraped data. If no data can be extracted, the test fails, and no data are accessed, served or stored for that record.
2. Gross Range Test: This test checks data values against minimum and maximum values defined for each parameter. Water temperature range: 20-135 deg F; practical salinity 0-50; Values outside of the prescribed parameter ranges are rejected and replaced with missing value flags in data storage connected to access points and the graphic displays. Other parameters that have gross range checks applied are listed in Appendix H.
3. Time-Gap Check: AOOS implements a “time-gap check" that informs observational assets (e.g., weather stations) displayed on its "Real-Time Sensor Map". If no data are received from an existing observational station for four hours, the icon on the map changes from a scaled color to a small grey-shade dot. If no data are received from an existing observational station for one week, the asset is automatically removed from the map, although assets are still made available on a historical sensor map.

a. Provide a link to any documented procedures.

AOOS Data Assembly Center and Data Management Subsystem Plan, Section 4.4.4.

H. List the procedures taken for data that could not be QC’d as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

Through an agreement with the NOAA RUSALCA Program, AOOS is taking responsibility for archiving these RUSALCA data with NCEI via a planned, automated pathway.

B. Which long-term data storage facility will be used for preservation?

NCEI

C. Describe any transformation necessary for data preservation.

NetCDF

D. List the metadata or other documentation that will be archived with the data.

ISO-19115 metadata will be provided by data collector prior to archive.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Russian American Long-Term Census of the Arctic (RUSALCA) is a NOAA program providing a variety of oceanographic data from the Bering Strait and Chukchi Seas. This data set contains 1,853 records of fish caught in the Chukchi Sea by bottom otter trawl by RUSALCA in 2004. Each record comprises the species name, length, and collection locality and depth caught for one individual fish.

Website URL: http://portal.aoos.org/#module-metadata/d3bbc7ec-c409-11e2-90ca-00219bfe5678/aa2c0cbe-c3f7-11e2-a208-00219bfe5678

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

Parameters include taxonomy and counts of fish species.

D. Provide information about the sampling platform or instrumentation.

The dataset was generated from ship-based observations.

2. DATA PATHWAY

A. Is a data sharing agreement required?

RUSALCA data shared through AOOS portals are available publicly without restriction. RUSALCA researchers request that any works or publications that result from reuse or analysis of RUSALCA data cite the original data and its producers.

B. In which format(s) were data received by AOOS?

Data were received as shapefiles and XLSX files from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be explored through interactive visualizations. It is not made available for download.

D. What file formats will be used for sharing data, if different from original?

Data are shared only through visualization in the AOOS data portal. Data files are not available for download.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Delivered directly to AOOS from originator as XLSX, imported to PostgreSQL, visualized with custom JSON REST service (JAVA).

F. What metadata or contextual information is provided with the data?
Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the RUSALCA website.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
Russian American Long-Term Census of the Arctic (RUSALCA) - NOAA

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
Federal

a. If Federal data source, were changes applied to the data?
Yes

b. If Yes, describe any changes to the data that require documentation?
The file format of the original data was changed.

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.
Not required

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
QC by originator

F. Describe the data control procedures that were applied by the originator.
Federal source, not required

a. Provide a link to any documented procedures.
N/A

G. Describe the data control procedures that were applied by AOOS.

N/A

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

Through an agreement with the NOAA RUSALCA Program, AOOS is taking responsibility for archiving these RUSALCA data with NCEI via a planned, automated pathway.

B. Which long-term data storage facility will be used for preservation?

NCEI

C. Describe any transformation necessary for data preservation.

NetCDF

D. List the metadata or other documentation that will be archived with the data.

ISO-19115 metadata will be provided by data collector prior to archive.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Russian American Long-Term Census of the Arctic (RUSALCA) is a NOAA program providing a variety of oceanographic data from the Bering Strait and Chukchi Seas. This data set provides quantitative data on the condition of benthic epifaunal abundance and biomass from the Chukchi shelf and examines the influence of environmental variables on epifaunal communities. 45 beam trawl samples were collected in the Russian and US sectors of the Chukchi Sea in 2004, 2007 and 2008. A plumb staff beam trawl (after Gunderson & Ellis 1986) with 2.26 m effective opening and net mesh of 7 mm with a 4 mm cod end liner was used for epibenthic collections. Gross abundance estimates ranged from 229-70,879 ind 1000 m-2, and gross biomass estimates ranged from 1,628-217,023 gww 1000 m-2. Overall, abundance and biomass were dominated by echinoderms (66 per cent, 45 per cent) and crustaceans (17 per cent, 31 per cent). The ophiuroid Ophiura sarsi and the snow crab Chionoecetes opilio overwhelmingly dominated abundance and biomass. The holothurian Myriotrochus rinkii also occurred in large numbers, and the urchin Strongylocentrotus pallidus was another major contributor to biomass. A total of 165 taxa (mostly species) were identified, with the highest number of Mollusca (45) and Crustacea (33). Cluster analysis identified six distinct groups plus six unique stations with 54-88% between-cluster dissimilarity, separated largely based on substrate type and latitude.

Website URL: http://portal.aoos.org/#module-metadata/d3bbcdbe-c409-11e2-aece-00219bfe5678/aa2c0ec6-c3f7-11e2-9184-00219bfe5678

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

Parameters include taxonomy and weight of benthos species.

D. Provide information about the sampling platform or instrumentation.

The dataset was generated from ship-based observations.

2. DATA PATHWAY

A. Is a data sharing agreement required?

RUSALCA data shared through AOOS portals are available publicly without restriction. RUSALCA researchers request that any works or publications that result from reuse or analysis of RUSALCA data cite the original data and its producers.

B. In which format(s) were data received by AOOS?

Data were received as shapefiles and XLSX files from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be explored through interactive visualizations. It is not made available for download.

D. What file formats will be used for sharing data, if different from original?
Data are shared only through visualization in the AOOS data portal. Data files are not available for download.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.
Delivered directly to AOOS from originator as XLSX, imported to PostgreSQL, visualized with custom JSON REST service (JAVA).

F. What metadata or contextual information is provided with the data?
Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the RUSALCA website.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
Russian American Long-Term Census of the Arctic (RUSALCA) - NOAA

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
Federal

a. If Federal data source, were changes applied to the data?
Yes

b. If Yes, describe any changes to the data that require documentation?
The file format of the original data was changed.

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.
Not required

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
QC by originator

F. Describe the data control procedures that were applied by the originator.
Federal source, not required

a. Provide a link to any documented procedures.
N/A

G. Describe the data control procedures that were applied by AOOS.
N/A

a. Provide a link to any documented procedures.
N/A

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

Through an agreement with the NOAA RUSALCA Program, AOOS is taking responsibility for archiving these RUSALCA data with NCEI via a planned, automated pathway.

B. Which long-term data storage facility will be used for preservation?
NCEI

C. Describe any transformation necessary for data preservation.
NetCDF

D. List the metadata or other documentation that will be archived with the data.
ISO-19115 metadata will be provided by data collector prior to archive.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Russian American Long-Term Census of the Arctic (RUSALCA) is a NOAA program providing a variety of oceanographic data from the Bering Strait and Chukchi Seas. This dataset contains nutrient analyses data from the 2004, 2005, 2007, 2009, and 2010 research cruises.

Website URL: http://portal.aoos.org/#module-metadata/574f01c4-77c9-11e2-8ecf-00219bfe5678/562d3084-7794-11e2-9fa0-00219bfe5678

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

Parameters include Latitude and Longitude (GPS), PO4, SiO4, and NO2 concentrations.

D. Provide information about the sampling platform or instrumentation.

The dataset was generated from ship-based observations.

2. DATA PATHWAY

A. Is a data sharing agreement required?

RUSALCA data shared through AOOS portals are available publicly without restriction. RUSALCA researchers request that any works or publications that result from reuse or analysis of RUSALCA data cite the original data and its producers.

B. In which format(s) were data received by AOOS?

Data were received as shapefiles and XLSX files from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be explored through interactive visualizations. It is not made available for download.

D. What file formats will be used for sharing data, if different from original?

Data are shared only through visualization in the AOOS data portal. Data files are not available for download.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Delivered directly to AOOS from originator as XLSX, imported to PostgreSQL, visualized with custom JSON REST service (JAVA).

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the RUSALCA website.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
Russian American Long-Term Census of the Arctic (RUSALCA) - NOAA

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
Federal

a. If Federal data source, were changes applied to the data?
Yes

b. If Yes, describe any changes to the data that require documentation?
The file format of the original data was changed.

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.
Not required

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
QC by originator

F. Describe the data control procedures that were applied by the originator.
Federal source, not required

a. Provide a link to any documented procedures.
N/A

G. Describe the data control procedures that were applied by AOOS.

N/A

a. **Provide a link to any documented procedures.**
N/A

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

Through an agreement with the NOAA RUSALCA Program, AOOS is taking responsibility for archiving these RUSALCA data with NCEI via a planned, automated pathway.

B. Which long-term data storage facility will be used for preservation?
NCEI

C. Describe any transformation necessary for data preservation.
NetCDF

D. List the metadata or other documentation that will be archived with the data.
ISO-19115 metadata will be provided by data collector prior to archive.

G-31
REGIONAL DATA STREAM PLAN: RUSALCA ZOOPLANKTON COMMUNITY SURVEYS, AUGUST 2022

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Russian American Long-Term Census of the Arctic (RUSALCA) is a NOAA program providing a variety of oceanographic data from the Bering Strait and Chukchi Seas. The RUSALCA expedition seeks to represent an extensive survey and census of zooplankton species in the Bering Strait through the southern and western Chukchi Sea and the East Siberian Sea, with the a goal of describing transport patterns of Pacific zooplankton into the Arctic and serving as a both a baseline and time series for future studies on ecosystem change in this climatically sensitive region. Samples were collected in August of 2004 from the Chukchi Sea along three transects between Alaska and Russia, and along four high-speed transects across the axis of Herald Valley, from 33 distinct sampling locations. Samples were collected using 150 and 53 um-mesh Bongo nets hauled vertically at depths ranging between the surface and 3 m from the sea floor.

Website URL: http://portal.aoos.org/#module-metadata/193b38ca-7a13-11e2-8c6d-00219bfe5678/e9afc13e-7a17-11e2-923e-00219bfe5678

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

Parameters include relative abundance of all sampled species by abundance and biomass.

D. Provide information about the sampling platform or instrumentation.

The dataset was generated from ship-based observations.

2. DATA PATHWAY

A. Is a data sharing agreement required?

RUSALCA data shared through AOOS portals are available publicly without restriction. RUSALCA researchers request that any works or publications that result from reuse or analysis of RUSALCA data cite the original data and its producers.

B. In which format(s) were data received by AOOS?

Data were received as shapefiles and XLSX files from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from three unique access points:

- Web Mapping Service (WMS)
- Web Feature Service (WFS)
- File Downloads (PNG, Shapefile, CSV)

D. What file formats will be used for sharing data, if different from original?
Data are shared as CSV and Shapefiles. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.
Delivered directly to AOOS from originator as XLSX, imported to PostgreSQL, visualized with custom JSON REST service (JAVA).

F. What metadata or contextual information is provided with the data?
Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the RUSALCA website.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
Russian American Long-Term Census of the Arctic (RUSALCA) - NOAA

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
Federal

a. If Federal data source, were changes applied to the data?
Yes

b. If Yes, describe any changes to the data that require documentation?
The file format of the original data was changed.

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.
Not required

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
QC by originator

F. Describe the data control procedures that were applied by the originator.
Federal source, not required

a. Provide a link to any documented procedures.
N/A

G. Describe the data control procedures that were applied by AOOS.
N/A

a. Provide a link to any documented procedures.
N/A

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

Through an agreement with the NOAA RUSALCA Program, AOOS is taking responsibility for archiving these RUSALCA data with NCEI via a planned, automated pathway.

B. Which long-term data storage facility will be used for preservation?
NCEI

C. Describe any transformation necessary for data preservation.
NetCDF

D. List the metadata or other documentation that will be archived with the data.
ISO-19115 metadata will be provided by data collector prior to archive.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Russian American Long-Term Census of the Arctic (RUSALCA) is a NOAA program providing a variety of oceanographic data from the Bering Strait and Chukchi Seas. This data set contains 814 zooplankton records collected by RUSALCA in 2004 using 150 µm plankton nets. Each record in the database contains the station location and name, collected zooplankton taxa and corresponding abundance and biomass.

Website URL:http://portal.aoos.org/#module-metadata/248e1ba6-c3f7-11e2-aca9-00219bfe5678/aa2c0638-c3f7-11e2-ad34-00219bfe5678

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

Parameters include station location and name, collected zooplankton taxa and corresponding abundance and biomass.

D. Provide information about the sampling platform or instrumentation.

The dataset was generated from ship-based observations.

2. DATA PATHWAY

A. Is a data sharing agreement required?

RUSALCA data shared through AOOS portals are available publicly without restriction. RUSALCA researchers request that any works or publications that result from reuse or analysis of RUSALCA data cite the original data and its producers.

B. In which format(s) were data received by AOOS?

Data was received as shapefiles and XLSX files from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be explored through interactive visualizations. It is not made available for download.

D. What file formats will be used for sharing data, if different from original?

Data are shared only through visualization in the AOOS data portal. Data files are not available for download.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Delivered directly to AOOS from originator as XLSX, imported to PostgreSQL, visualized with custom JSON REST service (JAVA).

F. What metadata or contextual information is provided with the data?
Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the RUSALCA website.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
Russian American Long-Term Census of the Arctic (RUSALCA) - NOAA

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
Federal

a. If Federal data source, were changes applied to the data?
Yes

b. If Yes, describe any changes to the data that require documentation?
The file format of the original data was changed.

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.
Not required

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
QC by originator

F. Describe the data control procedures that were applied by the originator.
Federal source, not required

a. Provide a link to any documented procedures.
N/A

G. Describe the data control procedures that were applied by AOOS.

N/A

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

Through an agreement with the NOAA RUSALCA Program, AOOS is taking responsibility for archiving these RUSALCA data with NCEI via a planned, automated pathway.

B. Which long-term data storage facility will be used for preservation?

NCEI

C. Describe any transformation necessary for data preservation.

NetCDF

D. List the metadata or other documentation that will be archived with the data.

ISO-19115 metadata will be provided by data collector prior to archive.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

This dataset was provided by the Copper River Knowledge System (CRKS) CD version 1.1 and shows locations of radio-tracked Chinook and sockeye salmon from studies of fish distribution in the Copper River, Alaska. From 2000–2007, radiotelemetry methods were used by the Alaska Department of Fish and Game for the purposes of estimating spawning distribution, run timing, and inriver abundance of adult Chinook (Oncorhynchus tshawytscha) and sockeye (Oncorhynchus nerka) salmon stocks in the Copper River, Alaska. in the Copper River, Alaska. Salmon were captured in fish wheels in the lower Copper River and fitted with radio transmitters. Radio-tagged fish were tracked to upriver destinations using a combination of ground-based receiving stations and aerial tracking techniques. These data show the locations of radio-tracked Chinook and sockeye salmon over the course of the study.

Website URL: http://portal.aoos.org/#module-metadata/5d0c1963-75f5-408d-87e3-9db4de8f6e2b/ee8bdab4-ea24-11e0-a6d7-0019b9dae22b

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

The parameters include the date, time, and the locations of radio-tracked Chinook and sockeye salmon from studies of fish movement and distribution in the Copper River, Alaska

D. Provide information about the sampling platform or instrumentation.

The sampling platforms are both fixed (ground-based) and mobile (aerial) radio receivers.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically. The information presented in this and accompanying CD-ROMs was derived from actual GIS data and other associated information of public record. Ecotrust makes no warranties or representations whatsoever regarding the quality, content, completeness, adequacy, or accuracy of the data and information included, and have not field verified the data or analyses. No conclusions are implied by any of the information in these CD-ROMs. With proper field verification and broader expert discussion the data included here can be applied as a useful analytical and decision support tool.
While all data have certain spatial and thematic accuracy limitations, major suspected data errors should be brought directly to the attention of the creator of the data layer.

Your assistance in identifying additional data and/or correcting data errors would be gratefully appreciated. Please see the feedback page.

Ecotrust shall not be liable for any activity involving the CD-ROM or the information and software contained with respect to the following:

Lost profits, lost savings or any other consequential damages. The fitness of the data or product for a particular purpose. The installation of the product, its use or the results obtained.

B. In which format(s) were data received by AOOS?

Data were received from the originator using the Copper River Knowledge System CD version 1.1.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from three unique access points:

- Web Mapping Service (WMS)
- Web Feature Service (WFS)
- File Downloads (PNG, Shapefile, CSV)

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV, shapefile, and PNG files. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from source to the AOOS data management system. The locations of radio-tracked salmon over the course of the study are plotted on the map using the coordinates provided in the original data.

Data are available in the AOOS portals through the access points and via graphic display. Graphic displays are generated through internal data requests from the sensor service in JSON format. Program code handles the connection of data from the server to graphic display in the portal. Graphic displays are point locations of radio tagged salmon detections.

Data files may be downloaded by the user from the AOOS data portal. A user request for CSV file request pulls the data from the server cache.

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?
Ecotrust

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
Non-governmental organization

a. If Federal data source, were changes applied to the data?
N/A

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
N/A

F. Describe the data control procedures that were applied by the originator.
Documentation of methods are available via online documents:
http://www.sf.adfg.state.ak.us/fedaidpdfs/fds05-50.pdf
http://www.arlis.org/docs/vol1/105858342.pdf

Contact the data provider for availability of further QC information.

a. Provide a link to any documented procedures.
N/A

G. Describe the data control procedures that were applied by AOOS.
No applied AOOS QC. This is a synthesis product made from existing data sources.

a. Provide a link to any documented procedures.
N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

AOOS will facilitate data archival with NCEI. NCEI has expressed interest in these data, and may accept them through the Send2NCEI application.

B. Which long-term data storage facility will be used for preservation?

NCEI

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Shell Ice & Weather Advisory Center (SIWAC) provides focused and operation-driven sea ice forecasts for Shell management. SIWAC produces relatively high-resolution interpretations of sea ice conditions for the Alaska Beaufort Sea and Chukchi Sea shelf areas using multiple base-level data sets. Historical sea ice interpretations back to June 2010 have been made available to the public through AOOS.

Portal url: https://portal.aoos.org/old/#module-metadata/f55d3aee-aa4e-11e3-bc55-00219bfe5678/a5b581f0-a9c1-11e3-94ee-00219bfe5678

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

The parameters include date, time, relative sea ice concentration, age, and attributes.

D. Provide information about the sampling platform or instrumentation.

N/A

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data visualizations were made public through a bilateral agreement with Shell.

B. In which format(s) was data received by AOOS?

Data was received as geodatabase files from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be explored through interactive visualizations. It is not made available for download.

D. What file formats will be used for sharing data, if different from original?

Data are shared only through visualization in the AOOS data portal. Data files are not available for download.

E. Describe how the data is ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data files were provided directly by Shell. Data was imported to PostgreSQL, visualized with custom JSON REST service (JAVA).

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to Shell Ice & Weather Advisory Center (SIWAC).

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
Shell Ice & Weather Advisory Center (SIWAC)

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
Private industry

a. If Federal data source, were changes applied to the data?
No

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
QC by originator

F. Describe the data control procedures that were applied by the originator.
Contact the data provider for availability of QC information.

a. Provide a link to any documented procedures.
N/A

G. Describe the data control procedures that were applied by AOOS.

No applied AOOS QC. This is a synthesis product made from existing data sources.

a. Provide a link to any documented procedures.
N/A

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers. If the data provider chooses to archive these data at a national archive in the future, they may do it directly, or using the AOOS-facilitated pathway to NCEI.

It is currently not the intention of the data provider to archive this information in a national archive.

B. Which long-term data storage facility will be used for preservation?
N/A

C. Describe any transformation necessary for data preservation.
N/A

D. List the metadata or other documentation that will be archived with the data.
N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

Scenarios Network for Alaska & Arctic Planning (SNAP) historical air temperature data are derived from Climate Research Unit (CRU) time-series (TS) 3.1 data, which includes data from 1901–2009. The CRU TS3.1 data set is based on an archive of climate data provided by more than 4000 weather stations distributed around the world. They allow variations in climate to be studied, and include variables such as cloud cover, diurnal temperature range, frost day frequency, precipitation, daily mean temperature, monthly average daily maximum temperature, vapour pressure and wet day frequency. CRU TS3.1 data are calculated on a 0.5x0.5 degree grid, which SNAP downscales to a 2.0x2.0 km grid cells.\n\nScenarios Network for Alaska & Arctic Planning (SNAP) historical total precipitation data are derived from Climate Research Unit (CRU) time-series (TS) 3.0 data, which includes data from 1901–2006. The CRU TS3.0 data set is based on an archive of climate data provided by more than 4000 weather stations distributed around the world. They allow variations in climate to be studied, and include variables such as cloud cover, diurnal temperature range, frost day frequency, precipitation, daily mean temperature, monthly average daily maximum temperature, vapour pressure and wet day frequency. CRU TS3.0 data are calculated on a 0.5x0.5 degree grid, which SNAP downscales to a 2.0x2.0 km grid cells. (Note: Total precipitation is based on CRU TS3.0 data because of a systematic error in the 3.1 precipitation data.)

Website URL: http://portal.aoos.org/#module-metadata/d8b0e2d8-07c7-11e5-8d38-00265529168c/ba7481d0-ea25-11e0-9025-0019b9dae22b

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

The parameters of these data include: monthly average air temperature and monthly total precipitation

D. Provide information about the sampling platform or instrumentation.

N/A

2. DATA PATHWAY

A. Is a data sharing agreement required?

SNAP releases this data under Creative Commons license, Attribution 4.0 International (CC by 4.0). The user is free to:
Share — copy and redistribute the material in any medium or format
Adapt — remix, transform, and build upon the material for any purpose, even commercially.

The licensor cannot revoke these freedoms upon agreement to the following terms:
Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.
No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

Notices:
You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation.
No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material.

B. In which format(s) were data received by AOOS?

Data were received as original ASCII files from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from four unique access points:
- Web Mapping Service (WMS)
- THREDDS
- OPeNDAP
- File Downloads (CSV)

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and NetCDF. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

The data were downloaded from the source as one zip file with a text file per month. The data were converted to NetCDFs and stored on additional servers within the AOOS system. AOOS converted these files to NetCDF files using custom Java and Scala scripts, and stores the converted data on servers within the AOOS data management system. Data are made available in the AOOS portals through the access points and via graphic display. Graphical map displays are generated through internal data requests from the sensor service in JSON format. Program code handles the connection of data from the server to graphic display in the portal. A time series extraction tool uses a JSON request to pull values out of the netCDF files for multiple times at a specific location. Extracted data are provided as CSV. Gridded data files may be downloaded by the user from the AOOS data portal. A user request for a WMS file will provide a georeferenced image tile for use with common web mapping services. A user request for THREDDS or OPeNDAP uses that respective service to request full or partial data files in netCDF format.

F. What metadata or contextual information is provided with the data?
SNAP provides overview information and XML metadata record in ISO19139 format: http://ckan.snap.uaf.edu/dataset/historical-monthly-and-derived-precipitation-products-2-km-cru-ts/resource/fd18c5c7-7daf-49af-a4a8-5061382a7d65. Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
Tom Kurkowski, Scenarios Network for Alaska and Arctic Planning (SNAP)

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
University

a. If Federal data source, were changes applied to the data?
N/A

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Historical

C. If real-time, list the QARTOD procedures that are currently applied.
Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
QC by originator

F. Describe the data control procedures that were applied by the originator.
This is a data product based on an accepted, community standard of climate data. Contact the data source for availability of quality controlled data.

a. **Provide a link to any documented procedures.**
N/A

G. Describe the data control procedures that were applied by AOOS.
No applied AOOS QC. This is a synthesis product made from existing data sources.

a. **Provide a link to any documented procedures.**
N/A

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

AOOS will facilitate data archival with NCEI. However, the SNAP datasets that make up these products may already be actively archived. NCEI might have the temperature and precipitation SNAP data through another source. AOOS and NCEI are looking into this and will inform the status in a Data Stream Update.

B. Which long-term data storage facility will be used for preservation?
NCEI if not already there.

C. Describe any transformation necessary for data preservation.
N/A

D. List the metadata or other documentation that will be archived with the data.
N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

The Historical Sea Ice Atlas was a joint project funded by the Alaska Ocean Observing System (AOOS), the Alaska Center for Climate Assessment and Policy (ACCAP), and the Scenarios Network for Alaska and Arctic Planning (SNAP). It aggregates a wide variety of sea ice observations and measurements, from whaling ship logbooks from 1850 to near real-time passive microwave satellite data in the present, to generate a sea ice time series over 150 years long for the seas surrounding the state of Alaska, USA. This resource can be used to explore the trends in sea ice extent and concentration at multiple scales through time.

Website URL: http://portal.aoos.org/#module-metadata/8e007272-4b5b-11e4-b73e-00219bfe5678/24bbffda-d2d5-40f9-b22d-f0c968f0eacc

B. How many station locations are there for this data stream?

N/A

C. What are the specific parameters of the data.

The parameters of this data stream include: sea ice concentration, time, latitude, longitude

D. Provide information about the sampling platform or instrumentation.

N/A

2. DATA PATHWAY

A. Is a data sharing agreement required?

SNAP releases these data under Creative Commons license, Attribution 4.0 International (CC by 4.0). The user is free to:
Share — copy and redistribute the material in any medium or format
Adapt — remix, transform, and build upon the material for any purpose, even commercially.

The licensor cannot revoke these freedoms upon agreement to the following terms:
Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.
No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

Notices:
You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation.
No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material.

B. In which format(s) were data received by AOOS?

Data were received as NetCDF files from the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from two unique access points:

- Web Mapping Service (WMS)
- File Downloads (CSV)

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and NetCDF. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data is ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded as NetCDF files from source to servers within the AOOS data management system. Data are made available in the AOOS portals through the access points and via graphic display. Graphical map displays are generated through internal data requests from the sensor service in JSON format. Program code handles the connection of data from the server to graphic display in the portal. A time series extraction tool uses a JSON request to pull values out of the netCDF files for multiple times at a specific location. Extracted data are provided as CSV. Gridded data files may be downloaded by the user from the AOOS data portal. A user request for a WMS file will provide a georeferenced image tile for use with common web mapping services. The source data parameters and units are converted to comply with CF standard units, if those same units are not already utilized in the source data. Refer to Appendix I for CF standards.

F. What metadata or contextual information is provided with the data?

SNAP provides overview information and XML metadata record in ISO19139 format: http://ckan.snap.uaf.edu/dataset/historical-sea-ice-atlas-observed-estimates-of-sea-ice-concentration-in-alaska-waters/resource/636bf1b1-1ce5-4dd9-a835-1959bd08029f

Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

Tom Kurkowski, Scenarios Network for Alaska and Arctic Planning (SNAP)

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

University

a. If Federal data source, were changes applied to the data?

N/A

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Historical

C. If real-time, list the QARTOD procedures that are currently applied.

Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

QC by originator

F. Describe the data control procedures that were applied by the originator.

QC methods are fully described in the SNAP metadata records. In brief: "Gaps in temporal or spatial resolutions were filled in with spatial and temporal analog month approaches. Note the monthly values from January 1954 - December 2013 are the week 2 values from the weekly time series. They are provided in the monthly time series for ease of use in monthly midpoint analyses. The January 2014 - December 2015 monthly time series data have been regridded and processed to match the January 1954 - December 2013 series from the NSIDC 0051 Sea Ice Concentrations from Nimbus-7 SMMR and DMSP SSM/I-SSMIS Passive Microwave Data, Version 1, which were accessed from the NSIDC website (http://nsidc.org/data/docs/daac/nsidc0051_gsfc_seaice.gd.html).

The further post-processing and regridding of the NSIDC product was a non-standard process. It involved initially warping the polar stereographic data to a pacific centered WGS84 crs, converting the sea ice concentration values to points and performing a spline interpolation across the entire domain. This interpolated raster was then filled further around the land-sea divide where there was a mismatch between the NSIDC mask and the Sea Ice Atlas mask. The filling was performed by taking the average of the surrounding sea ice concentration pixels and filling the missing locations. These locations have been flagged in the source band (band 2) to keep track of what was modified from the NSIDC 0051 for

this purpose. These data are a compilation of data from many sources integrated into a single gridded product. The sources of data for each grid cell have changed over the years from infrequent land/sea observations, to observationally derived charts, to satellite data for the most recent decades. Temporal and spatial gaps within observed data are filled with analog month approaches. Please note that large portions of the pre-1953, and almost all of the pre-1900 data, are either analog or interpolated data and the user is cautioned to use these data with care. The temporal and spatial inhomogeneities in the data sources that went into the construction of this dataset require that any historical analysis of the data are done with caution and an understanding of the limitations of the data. Methods of data compilation varied by data source, but included visual interpretation of hard copy map notation and legends, scanning, digitization, geo-rectification into digital geospatial products, reprojection, and also resampling into a common resolution. To standardize the data onto a common spatial grid, the resampling methodology utilized the centroid of the target 1/4 x 1/4 grid cell as the location to extract the value from the underlying data source."

a. Provide a link to any documented procedures.
http://ckan.snap.uaf.edu/dataset/historical-sea-ice-atlas-observed-estimates-of-sea-ice-concentration-in-alaska-waters

G. Describe the data control procedures that were applied by AOOS.
No applied AOOS QC. This is a synthesis product made from existing data sources.

a. Provide a link to any documented procedures.
N/A

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Data were aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores these data on the AOOS data servers.

AOOS will facilitate data archival with NCEI. NCEI may have interest in this Atlas data stream, and will reach out to a few other NCEI people to see if this is something they want to archive.

B. Which long-term data storage facility will be used for preservation?
NCEI if they will accept these data.

C. Describe any transformation necessary for data preservation.
To be determined.

D. List the metadata or other documentation that will be archived with the data.
N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

Researchers at the University of Alaska Fairbanks School of Fisheries and Ocean Sciences (UAF-SFOS) developed and deployed a moored sensor package attached to a detachable surface buoy to provide real-time data on vertical temperature and salinity water column structure prior to and during freeze-up. The mooring was deployed on September 6, 2015 approximately 76 miles NNW of Wainwright in the Chukchi Sea, and again on August 14, 2017 in the Russian Waters of the Chukchi Sea.

Prior to ice inundation over the mooring, which would put the mooring at risk of loss, a signal to release the surface buoy was sent in the fall. The surface float equipped with a sea-surface temperature sensor were then drifting free, and sensors at depth were disconnected. The remaining instruments on the mooring, which were reporting data real-time, continue to report their last measured value, and these sensors continue to record data internally below the ice cover until the mooring is recovered the following year.

This trial buoy had two successful deployments, the original in 2015 and a 2nd year-long deployment in 2017 (July 11-Nov 8, 2017). The 2015 subsurface mooring was never recovered.

WMO 4801730 was assigned to this real-time station in 2017 only.

Website URL: Historical Sensors: Source: UAF School of Fisheries and Ocean Sciences
https://portal.aoos.org/?ls=tH_Th0V5#map?page=1&tagId=&q=Ice%2520detection%2520buoy&tags=&lg=467dd946-87aa-11e3-9eb2-00219bfe5678

Project Page: http://www.aoos.org/ice-detection-buoy/
Data Plot: http://www.aoos.org/ice-detection-buoy/#data-access

B. How many station locations are there for this data stream?

2 (2015-16; 2017-18)

C. What are the specific parameters of the data.

The parameters include a date/time stamp, a GPS position (Latitude and Longitude), surface water temperature, and subsurface water temperature, conductivity (both used to compute salinity) at 8, 20, 30 and 40 m depths.

D. Provide information about the sampling platform or instrumentation.

The platform is a mooring with a remotely detachable surface buoy containing Iridium satellite communications and a burn wire. The mooring consists of an inductive cable, four SBE 37 IM microCAT CTDs deployed on the line at 8, 20, 30, 40 m depths, a subsurface

floatation, and a bottom weight with acoustic release assembly. A webcam was deployed on the buoy, but images were not transmitted to AOOS.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) are data received by AOOS?

This station real-time data are in the format of CSV.

C. How can the information be accessed?

AOOS accesses the data from http://api.pacificgyre.com/api2/getData.aspx, which requires a username and password.

The data are made available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically, data are available from two unique access points:

- File Downloads (CSV)
- ERDDAP

Currently, only the data that reported in real-time are available. Year-round data from the mooring after real-time data ceased are to be uploaded via the Research Workspace with the Chukchi Sea Ecosystem Observatory (CEO) mooring data.

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and through ERDDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java, Scala, and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For this data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by the user. Summary statistics may include minimum, maximum and mean values. Seasonal

statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?
The real-time data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the AOOS-UAF Project Page: https://aoos.org/project-page/projects-marine-operations/ice-detection-buoy/

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
University of Alaska Fairbanks

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
University

a. If Federal data source, were changes applied to the data?
N/A

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Although this mooring reported data in real-time, this Data Stream Plan is currently only relevant for the Historical Record. If a new Ice Detection Buoy is deployed in the future, this plan will be modified or a new plan developed to document QC for Real-Time temperature and salinity data reported according to QARTOD.

C. If real-time, list the QARTOD procedures that are currently applied.
Three of the five required tests were applied by AOOS to the original real-time temperature and salinity data: Syntax, Gross Range, and Time-Gap Tests (see 3G).

D. If real-time, list the QARTOD procedures that are planned for implementation.

There are five required tests for in-situ temperature and salinity identified by QARTOD, of which three are currently implemented by the AOOS Data System -- the syntax, gross range and time gap tests (see 3G). A version of the Timing Gap Test, which with QARTOD, is intended to ensure ingestion of minimum hourly time series, is performed by AOOS. The AOOS version of the timing gap test changes the station color to a gray shade ("shade-flags") on the real-time sensors map display after 4 hours of missed data reports, and removes the station from the map (though not the archive) after a week of missed reports. Once the station is removed from the Real-time Sensor map, all prior data are made available through the Historical sensor catalogue.

QARTOD requires two additional tests to real-time temperature and salinity, including a location test and climatology test. The Location Test will be implemented on future real-time data using the GPS (latitude and longitude) location provided in the station data stream. The Climatology Test is more rigorous, and currently, the AOOS Data System does not have the historical data in place for this mooring to perform meaningful climatology tests. It is a test that may be considered if this real time station becomes active again and only after there are 7+ years of data in the AOOS archive.

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

Some QC by originator and AOOS.

F. Describe the data control procedures that were applied by the originator.

Data were reported real-time directly from the instrument platform via inductive modem. Data were recorded by the CTD in hexidecimal format, and converted to temperature, conductivity engineering units, both of which are used to compute salinity. Onboard conversions and salinity computations use the most recent calibration coefficients for each sensor, which are programmed into instrument's computer to allow real-time reporting of accurate engineering outputs directly from the instrument. Then data are received in CSV format from the project website (see 2.) No additional processing is performed on the real-time data stream at this point, other than the standard QC checks performed by AOOS. See 3G.

a. Provide a link to any documented procedures.

AOOS Data Assembly Center and Data Management Subsystem Plan

G. Describe the data control procedures that were applied by AOOS.

AOOS applied 3 standard QC tests available at the time data were reporting real-time to the temperature and salinity data from this mooring:

1. Syntax Test: checks for parity errors by testing if data can be extracted from the downloaded or scraped data. If no data can be extracted, the test fails, and no data are accessed, served or stored for that record.
2. Gross Range Test: This test checks data values against minimum and maximum values defined for each parameter. Water temperature range: 20-135 deg F; practical salinity 0-50; Values outside of the prescribed parameter ranges are rejected and replaced with missing value flags in data storage connected to access points and the graphic displays.

3. Time-Gap Check: AOOS implements a “time-gap check" that informs observational assets (e.g., weather stations) displayed on its "Real-Time Sensor Map". If no data are received from an existing observational station for four hours, the icon on the map changes from a scaled color to a small gray-shade dot. If no data are received from an existing observational station for one week, the asset is automatically removed from the map, although assets are still made available on a historical sensor map.

a. Provide a link to any documented procedures.

AOOS Data Assembly Center and Data Management Subsystem Plan, Section 4.4.4.

H. List the procedures taken for data that could not be QC’d as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

AOOS will facilitate data archival with NCEI. Data likely will be combined with the Chukchi Sea Ecosystem Observatory (CEO) data archive when those non-real-time moored data are finalized for public access.

The 2017 installation fed real-time data directly through the National Weather Service GTS, and therefore, is already archived by NOAA. AOOS will work with the NWS to determine other appropriate archival locations. These data did not include the remaining year-round data that did not report in real-time.

B. Which long-term data storage facility will be used for preservation?

NCEI, and AOOS will work with the NWS to determine other appropriate archival locations.

C. Describe any transformation necessary for data preservation.

To be determined.

D. List the metadata or other documentation that will be archived with the data.

To be determined.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

This page provides access to environmental climate data from research sites spanning from the Northern foothills of the Brooks Range to the Coastal Plain of Alaska, near Prudhoe Bay. Most sites are within the Kuparuk River watershed.

Website URL: Source UAF Water and Environmental Research Center
https://portal.aoos.org/#metadata/22/sensor_source

B. How many station locations are there for this data stream?

51

C. What are the specific parameters of the data.

The parameters include date, time, GPS (Latitude and Longitude), wind speed, wind direction, air temperature, snow depth, precipitation, and dew point. Additionally, some stations include webcams

D. Provide information about the sampling platform or instrumentation.

Campbell Scientific 21X and CR10X data loggers were used to record and process data at all sites. Wind speed was measured using a Weathertronics anemometer. Wind direction was measured with a model 024a Met One Wind Direction Sensor at all sites. Air temperature and relative humidity were measured using a Campbell Scientific Model 207 Temperature and Relative Humidity Probe. The relative humidity component utilizes a Phys-Chemical Research Corporation PCRC humidity transducer. Snowpack depth and water equivalent were measured using an Adirondak snow sampler, CRREL snow depth probe and manual graduated snow depth probes.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) were data received by AOOS?

Data are received by web harvest from the originator website.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically, data are available from two unique access points:
- File Downloads (CSV)
- ERDDAP

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV and through ERDDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For this data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by the user. Summary statistics may include minimum, maximum and mean values. Seasonal statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?

Data is shared in the AOOS portals with descriptive narratives describing the data and linking back to the originator's site. Metadata documentation is also available from the originator's site here: http://ine.uaf.edu/werc/projects/NorthSlope/northslope.html

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

University of Alaska Fairbanks
Institute of Northern Engineering
Water and Environmental Research Center

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

University

a. If Federal data source, were changes applied to the data?

N/A

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Historical

C. If real-time, list the QARTOD procedures that are currently applied.

N/A

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

Some QC by originator

F. Describe the data control procedures that were applied by the originator.

Contact the data provider for availability of QC information.

a. Provide a link to any documented procedures.

N/A

G. Describe the data control procedures that were applied by AOOS.

No applied AOOS QC.

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers.

AOOS will contact Horacio Toniolo to see if these data are being actively archived. If not, AOOS will facilitate data archival with NCEI.

B. Which long-term data storage facility will be used for preservation?

If not already archived, NCEI.

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

These sensors provide video images taken from Webcams stationed at various geographical locations of interest in Alaska, including roadways, volcanoes, rivers, harbors, and more.

Website URL: Real-Time Sensors: Sensors: WebCam*:
https://portal.aoos.org/?ls=niEpElAX#map

B. How many station locations are there for this data stream?

- AKDNR: 1 location
- AKDOT: 43 locations (stations)
- PWS OSRI: 6 locations
- City of Nome: 1 location
- North Coast: 35 locations
- CIRCAC: 1 location
- CVT: 13 locations
- CALON: 3 locations
- F-CFNAIC: 2 locations
- WERC: 8 locations

C. What are the specific parameters of the data.

The parameters include date, time, and video images taken of roadways (Alaska Dept of Transportation (AKDOT); active volcanoes (Alaska Volcano Observatory/North Coast); Kenai River mouth (Cook Inlet Regional Citizen's Advisory Council (CIRCAC)); harbors (Alaska Harbor Observation Network (AHON)); and other geographic locations (Copper Valley Telecom (CVT) and (NSF Circum-Arctic Lakes Observation Network (CALON)).

D. Provide information about the sampling platform or instrumentation.

The platforms include bridges, light posts, camera tripods, etc. that support a Webcam.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) are data received by AOOS?

Video images are received as JPG or PNG from the originator's webcam sites.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically the data are available from one unique access point: - File Downloads (JPG)

D. What file formats will be used for sharing data, if different from original?

All images are converted to JPG for sharing.

E. Describe how the data are ingested (e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Images are displayed in the portal, and downloaded from source, converted to JPEG and stored in the memory cache. New Webcam Imagery can be added upon user request.

F. What metadata or contextual information is provided with the data?

CIRCAC, North Coast, AHON, CALON, and CVT do not provide metadata for their webcams. The Road Weather Information System (RWIS) operated by the AKDOT, provides overview information and a glossary describing each sensor measurement. Images are shared in the AOOS portals with titles and links to the originator's webpages.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

AKDOT & Public Facilities; CIRCAC; Alaska Volcano Observatory/North Coast; CVT; AHON; CALON

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

State agency (AKDOT); University (North Coast, CALON); Private industry (CIRCAC, CVT); NGO (CIRCAC,AHON)

a. If Federal data source, were changes applied to the data?

N/A

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Real-time

C. If real-time, list the QARTOD procedures that are currently applied.

QARTOD not applicable to camera images.

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

N/A

F. Describe the data control procedures that were applied by the originator.

Contact the data provider for availability of QC information.

a. Provide a link to any documented procedures.

N/A

G. Describe the data control procedures that were applied by AOOS.

N/A

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

No archive planned. Data images are not saved by AOOS.

B. Which long-term data storage facility will be used for preservation?

N/A

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

These sensors provide water level observations taken from gauges stationed on coastlines and in rivers and estuaries across Alaska to provide information on the height of water through time. With AOOS funding, AK DNR's Division of Geological and Geophysical Surveys (DGGS) in cooperation with the National Weather Service, and JOA Surveys and Orion Space Solutions, have placed water level observing instruments in or near communities along the Bering Sea coastline and other coastal communities in Alaska lacking water level observations. These instruments are intended to enhance the NWS storm surge forecasts in this region. In addition to these gauges, the National Weather Service maintains sensor services and prepares its forecasts in collaboration with agencies like the US Geological Survey, US Bureau of Reclamation, US Army Corps of Engineers, Natural Resource Conservation Service, National Park Service, ALERT Users Group, Bureau of Indian Affairs, and many state and local emergency managers across the country. These non-NWLON sensors augment the NOAA CO-OPS National Water Level Observing Network in Alaska.

Website URL: Real-Time Sensors: Sensor: Water Level
https://water-level-watch.portal.aoos.org/?ls=vF9if41O#map

B. How many station locations are there for this data stream?

159 Total water level stations from all sources.

All federal (NWLON) and non-federal (non-NWLON) water level data are made available through the Alaska Water Level Watch Portal for easier discovery, but can also be found on the main AOOS Ocean Data explorer. Non-NWLON assets AOOS supports and hosts data for include:

- Alaska DGGS- 9 operational real-time stations, 7 of which are active as of August 2022.
- JOA Surveys- 2 real-time water level stations, plus JOA provides processed water level data from one UAF owned GNSS-R station in Peterson Bay.
- UNAVCO/AOOS, UNAVCO, and Orion Space Solutions - 2 real-time GNSS-R (GPS Reflectometry) water level observing stations, and Orion Space Solutions also provided information for computing water levels in real-time at 2 existing UNAVCO locations.
- University of Alaska Fairbanks- 1 real-time GNSS-R station at Peterson Bay, and 2 historical stations (including Shaktoolik).
- And other federal sources: Kachemak Bay National Estuarine Research Reserve (KBNERR), National Water Level Observation Network (NWLON), NOAA Center for Operational Oceanographic Products and Services (CO-OPS), NOAA Office of Coastal Management

C. What are the specific parameters of the data.

The parameters include date, time, GPS (latitude and longitude), and water level (or derived water level as with GNSS-R methods).

D. Provide information about the sampling platform or instrumentation.

The active non-federal real-time platforms and instruments vary by data provider. Below summarized the three main groups working with AOOS.

- Alaska Department of Natural Resources DGGS stations are all satellite-telemetered ultrasonic gauges - iGages and downward looking acoustic radars (iRadars), both built and tested by Stillwater Technologies, and ultrasonic Judd sensors.
    - The iGage sensor, made by Stillwater Technologies, is an innovative low-cost water level gauge that is easily deployed on bridges and other structures to measure water levels. It provides real-time data through the Iridium satellite network.
    - The iRadar low-cost water level gauge is also made by Stillwater Technologies, and is easily deployed on bridges and other structures to measure water levels. The iRadar provides greater range (0-70m), and higher precision than the iGage, through increased size and cost. It provides real-time data through the Iridium satellite network.
    - Judd sensors, manufactured by ONSET, measure the distance from the sensor to a target. The sensor works by measuring the time required for an ultrasonic pulse to travel to and from a target surface. An integrated temperature probe with solar radiation shield, provides an air temperature measurement for properly compensating the distance measured. An embedded microcontroller calculates a temperature compensated distance and performs error checking.

- JOA survey instrument types vary by location:
    - Naknek, AK: two vented pressure side-by-side bubble gauges. Having two gauges is typical practice for long term stations so there is redundancy in the observations in order to reduce the potential for data gaps. Only one gauge is reporting on the AOOS data portal.
    - Peterson Bay, AK: JOA is processing and providing converted satellite GNSS-R* derived water level data. The GNSS-R station is operated and maintained by UNAVCO PBO Program.
    - In 2023, JOA will also be providing data stream for the UNAVCO/AOOS GNSS-R Station at St. Michaels (duplicate processing using different algorithms to Orion Space Solutions).
    - Dillingham, AK: two water level gauges are deployed using two different technologies - Gauge 1 and Guage 2 (both report on the AOOS data portal). Having two gauges is typical practice for long term stations so there is redundancy in the observations in order to reduce the potential for data gaps.
        - Dillingham Water Level Gauge 1 - a bubble gauge
        - Dillingham Water Level Gauge 2 - a downward looking radar gauge
- Orion Space Solutions (OSS) build GPS-R instruments and also have provided data processing algorithms for the existing UNAVCO/AOOS GNSS-R installation at St. Michaels, and the UNAVCO operated station at Cape Spencer. These data processing algorithms are used by Axiom to pass derived water level measurements to the AOOS data portal, but these data are still preliminary, as we evaluate alternative algorithms

(See JOA Surveys) and acquire enough data to estimate tidal datums to correctly level the final water level values.

- Orion Space Solutions and AOOS installed an ASTRA GPS Receiver water level station in Utqiagvik in the fall of 2022, using a refurbished ASTRA GPS receiver originally tested in Seward and Homer, Alaska as part of an AOOS project.

**GNSS-R is a satellite remote sensing technique that uses surface-reflected GNSS signals to infer information about the Earth's surface, in this case to estimate water level variations.*

2. DATA PATHWAY

A. Is a data sharing agreement required?

No. Data are available publically.

B. In which format(s) were data received by AOOS?

- Alaska DNR-DGGS stations: Data are harvested by AOOS from a Stillwater Technologies API.
- JOA stations: Data are harvested from a JOA API, including the Peterson's Bay GNSS-R station data.
- Orion Space Solutions (OSS) instruments: raw instrument data are downloaded from the UNAVCO FTP site and converted to netCDF files for storage on AOOS data servers by Axiom Data Science for the stations that OSS data processing algorithms are used by Axiom Data Science to process data outputs to water levels (St. Michaels, Cape Spencer).
    - OSS also has installed a water level GPS reflectometry station in Utqiagvik, and with the goal for onboard real-time data processing that will provide real-time water level data. These data are still being collected and assessed for corrections through OSS, and tidal datums are being computed prior to being made available in real-time, but periods of preliminary data are already being made available on the AOOS Data Portal.

C. How can the information be accessed?

The data are available through the AOOS data portal and the Alaska Water Level Watch data portal (https://water-level-watch.portal.aoos.org/#), where they can be downloaded or explored through interactive visualizations. Specifically, data are available from several unique access points:
- File Downloads (CSV and NetCDF)
- ERDDAP

ADNR water level data (from Stillwater Technologies) are also made available through the NOAA NWS Alaska Pacific River Forecast Center website.
https://www.weather.gov/aprfc/

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV, NetCDF, and through ERDDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested (e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java and Python scripts are used to convert data formats suitable for internal and external interoperability services. For the UNAVCO stations, a custom processing code is used to convert the raw RIO instrument data into netCDF files. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For this data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} are used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by the user. Summary statistics may include minimum, maximum and mean values. Seasonal statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?

Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the metadata page for each sensor. For AKDNR-DGGS and JOA stations submitted to AOOS, data originators complete a station information form that is made available on the station page. The form contains information about the water level station location, sensor information, vertical controls, local tidal datum establishment, error analysis, and telecommunication equipment. See example: https://water-level-watch.portal.aoos.org/#metadata/119627/station/info

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

The individual data providers retain their intellectual property rights to the data streams or code that they provide.

I. Describe any effect of IPR on data access.

None

3. DATA SOURCE AND QUALITY CONTROL

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

AKDNR- DGGS is a state agency, JOA surveys is a private company (but typically installs data loggers for a wide variety of state and federal agencies, as well as for AOOS), Orion Space Solutions is a private company who specializes in GPS monitoring of space weather, and has been working with AOOS and the NWS to further develop GPS and GNSS-R instrumentation capacities for making real-time water level observations.

.

a. If Federal data source, were changes applied to the data?

N/A

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Real-time

C. If real-time, list the QARTOD procedures that are currently applied.

Three of the AKDNR-DGGS water level stations are reported through the NOAA Alaska-Pacific River Forecast Center (APRFC), which is a federal sourced data stream (Kuskokwim, Deering, Bethel).

For the remaining non-NWLON stations, QARTOD is completed at AOOS as follows:

The observations are ingested to the AOOS DMAC System daily, and a process is run to calculate flags for the following QARTOD tests:

- Gross Range Test- checks that values are within reasonable range bounds.
- Spike Test- checks if the difference in values between a data point and its neighbors exceeds a threshold.
- Rate of Change Test- checks if the first order difference of values exceeds a threshold.
- Flat Line Test- checks for consecutively repeated values within a tolerance.

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

Some QC is provided by providers, as they evaluate performance of the systems, and track issues.

F. Describe the data control procedures that were applied by the originator.

Alaska DGGS and JOA provides some visual checks to data, and will notify AOOS when there are egregious errors (e.g., a water level sensor "goes dry" and icing, they've re-corrected the data, etc.), but they do not provide any programmatic flagging of the data.

a. **Provide a link to any documented procedures.**
N/A

G. Describe the data control procedures that were applied by AOOS.

For all collected parameters automated QARTOD tests are run by the AOOS Data System after ingesting observation data. Tests are run using the open-source ioos_qc library (https://github.com/ioos/ioos_qc) which implements a suite of QARTOD tests as well as other quality control algorithms. The quality test code and test thresholds are documented and publicly available through the AOOS Data Portal. Test thresholds were informed by the data originator for these stations. Refer to the AOOS Data Management System plan for further details.

The observations are ingested to the AOOS DMAC System daily, and a process is run to calculate flags for the following QARTOD tests:

- Gross Range Test- checks that values are within reasonable range bounds.
- Spike Test- checks if the difference in values between a data point and its neighbors exceeds a threshold.
- Rate of Change Test- checks if the first order difference of values exceeds a threshold.
- Flat Line Test- checks for consecutively repeated values within a tolerance.

Quality control flags are appended to the original data files once per day and made available through the AOOS ERDDAP server:
https://erddap.aoos.org/erddap/search/index.html?page=1&itemsPerPage=1000&searchFor=water+level

a. **Provide a link to any documented procedures.**
AOOS Data Assembly Center and Data Management Plan, Section 4.4.4

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. STEWARDSHIP AND PRESERVATION POLICIES

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data on the AOOS data servers, and provided data through the Alaska Water Level Watch..

Archive for federally-sourced data follows NOAA National Weather Service guidelines and federal archiving is completed by the NOAA NWS.

Currently, NOAA NWS and CO-OPS do not host non-NWLON water level data.

ADNR water level data are also currently available through a federal source, the Alaska Pacific River Forecast Center (APRFC), which is a NOAA data serve, and therefore, AOOS will not duplicate archival of these particular data sets.

Two water level stations data from Naknek and Diillingham will be directed to NCEI for archival.

The GNSS-R water level stations are considered research and development stations, and currently are implementing QARTOD, but are not processed or leveled to datums consistently. Once these stations are deemed ready for archive (when suitable datums are applied to the converted water level outputs), they can also be prepared for NCEI archival.

B. Which long-term data storage facility will be used for preservation?

NCEI when applicable (See 4. A.).

C. Describe any transformation necessary for data preservation.

The GNSS-R station data require standard leveling to an acceptable datum. Until that is achieved, these data will not be ready for archive. The ADNR water level data are already being archived through the APRFC.

D. List the metadata or other documentation that will be archived with the data.

Metadata accompanied with the data sets to be archived with NCEI (Naknek and Dillingham) are available on the station page and will be supplied at the time of archival.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

Glider observations are supported collaboratively by the University of Alaska Fairbanks-College of Fisheries and Ocean Science (UAF-CFOS)and AOOS with funding from NOAA. AOOS has one actively deployed glider, and nine completed glider missions.

Three active gliders are maintained through the AOOS Data System: AOOS Regional Glider Component: Marine Mammals (595), AOOS Gliders in Support of Fisheries Management (507), and AOOS Gliders in Support of Fisheries Management (191).

Portal url: https://portal.aoos.org/#search?type_group=platform&tag|tag=gliders&page=1

B. How many station locations are there for this data stream?

There is one active gliders with the following deployments:

Mission	Location	Begin	End
Slocum Glider unit_595 Deployed on 2022-07-30	Bering Sea	7/30/2022	Ongoing

Complete glider missions:

Mission	Location	Begin	End
Slocum Glider unit_191 Deployed on 2015-07-11	Chukchi Sea	7/11/2015`	9/8/2015
Slocum Glider unit_191 Deployed on 2016-07-10	Bering/Chukchi Sea	7/10/2016	10/4/2016
Slocum Glider unit_595 Deployed on 2017-07-13	Bering Sea	7/12/2017	8/20/2017
Slocum Glider unit_595 Deployed on 2018-08-04	Bering/Chukchi Sea	8/3/20189	9/24/2018

Slocum Glider unit_191 Deployed on 2021-03-23	Prince William Sound	3/23/2021	4/21/2021
Slocum Glider unit_191 Deployed on 2021-01-25	Prince William Sound	1/25/2021	2/23/2021
Slocum Glider unit_595 Deployed on 2021-07-11	Bering/Chukchi Sea	7/12/2021	9/11/2021
Slocum Glider unit_507 Deployed on 2022-06-04	Gulf of Alaska	6/4/2022	7/14/2022
Slocum Glider unit_507 Deployed on 2022-02-12	Gulf of Alaska	2/11/2022	4/11/2022

C. What are the specific parameters of the data.

The glider parameters depend upon the payload. All gliders include time, latitude, longitude, depth, density, sea_water_electrical conductivity, sea_water_practical_salinity, sea_water_velocity_u_component, sea_water_velocity_v_component, sea_water_pressure, sea_water_depth, and temperature.

D. Provide information about the sampling platform or instrumentation.

The Nemesis deployments use a Teledyne Webb Slocum glider, equipped with a Seabird Slocum Glider Payload CTD and Wetlabs FLNTUSLC Fluorometer. More information about Teledyne Slocum gliders.

2. DATA PATHWAY

A. Is a data sharing agreement required?

The data may be used and redistributed for free but is not intended for legal use, since it may contain inaccuracies. Neither the data Contributor, ERD, NOAA, nor the United States Government, nor any of their employees or contractors, makes any warranty, express or

implied, including warranties of merchantability and fitness for a particular purpose, or assumes any legal liability for the accuracy, completeness, or usefulness, of this information.

B. In which format(s) was data received by AOOS?

Teledyne binary files

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Data are available for download from four unique access points:

- ERDDAP
- CSV (raw and profile)
- KML
- Shapefile
- JSON
- NetCDF

D. What file formats will be used for sharing data, if different from original?

Data are shared through the AOOS ERDDAP and available for download in CSV, JSON, or NetCDF formats. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data is ingested (e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are submitted via FTP to the IOOS NGDAC for real-time data assimilation, distribution, and archiving. All gliders are issued WMO numbers to permit data sharing via NOAA/IOOS. The U.S. IOOS National Glider Data Assembly Center (NGDAC) accepts a simple NetCDF file containing water column measurements collected by a glider during a single profile. Data are telemetered via Iridium and Argos. Data are received from Teledyne as a teledyne binary file. Groups of these NetCDF files, gathered during a deployment (also known as a trajectory), are uploaded to the NGDAC by individual glider operators. Once they arrive at the NGDAC, the files are validated for compliance, aggregated into a single dataset representing the deployment/trajectory and distributed via ERDDAP and THREDDS end-points. The data sets served by the NGDAC provide access to the trajectory/deployment data both as time-series and on a profile-by-profile basis. Binary files are transformed into a netCDF that meets the requirements to be submitted to the IOOS NGDAC.

Following curation and quality control at IOOS NGDAC, deployments are ingested into the AOOS portal from the IOOS NGDAC ERRDAP server using the .ncCF response type for visualization and presentation in the portals. Data are hosted on IOOS Glider DAC ERDDAP servers.

F. What metadata or contextual information is provided with the data?

Metadata is available from the glider pages in the AOOS data portal. Example link:

https://gliders.ioos.us/erddap/info/unit_595-20220730T0000/index.html

G. Are there ethical restrictions to data sharing?
No. This data may be redistributed and used without restriction.

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
AOOS and The University of Alaska Fairbanks College of Fisheries and Ocean Science

I. Describe any effect of IPR on data access.
None, data are public.

3. DATA SOURCE AND QUALITY CONTROL

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
University

a. If Federal data source, were changes applied to the data?
No

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Near real-time

C. If real-time, list the QARTOD procedures that are currently applied.
N/A

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
Some QC (by provider or IOOS Glider DAC)

F. Describe the data control procedures that were applied by the originator.
The IOOS Glider DAC defaults to whatever checks the glider operator performs since they have local knowledge of the operating environment. If the providers do not perform checks and submit the glider profiles without QC, the DAC provides an automated process to do the following required checks on the Temperature and Salinity observations:

1.Flat Line Test - Required
2. Rate of Change Test - Required

3. Gross Range Test - Required

   a. **Provide a link to any documented procedures.**
      NGDAC Documentation

G. Describe the data control procedures that were applied by AOOS.
None

   a. **Provide a link to any documented procedures.**
      N/A

H. List the procedures taken for data that could not be QC'd as directed.
Data are presented as they are received from the US IOOS NGDAC.

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Once a glider deployment is completed the data provider has the option to archive the dataset with the National Centers for Environmental Information national ocean archive.

B. Which long-term data storage facility will be used for preservation?
NCEI

C. Describe any transformation necessary for data preservation.
N/A

D. List the metadata or other documentation that will be archived with the data.
N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

WMO 46265 - Coastal Data Information Program (CDIP) station 241 data stream consists of coastal environment measurements taken in the vicinity of Nome, Alaska. The station is operated by AOOS, and funded by AOOS/USACE. These data complement CDIP's core mission: measuring, analyzing, archiving, and disseminating coastal environment data for use by coastal engineers, planners, and managers, as well as scientists and mariners.

Website URL: Real-Time Sensor: Source: Alaska Ocean Observing System: https://portal.aoos.org/#metadata/103399/station/data

WMO 46264 - Coastal Data Information Program (CDIP) station 236 data stream consists of coastal environment measurements taken in the vicinity of Kodiak, Alaska. The station was installed by the National Renewable Energy Laboratory (NREL) in 2017, and operated-maintained by AOOS and CDIP (USACE) from 2018-2021. These data complement CDIP's core mission: measuring, analyzing, archiving, and disseminating coastal environment data for use by coastal engineers, planners, and managers, as well as scientists and mariners.

Website URL: Real-Time Sensor: Source: Alaska Ocean Observing System: https://portal.aoos.org/#metadata/75578/station/data

B. How many station locations are there for this data stream?

241- Nome, AK is located at 64 28.422' (N), 165 28.662' (W)

236 - Kodiak, AK is located at 57 28.767' (N), 151 41.718' (W)

C. What are the specific parameters of the data.

The parameters include GPS, date, time, wave height, peak period, wave direction, wave periodicity, sea surface temperature. Current speed was also a parameter on the Nome CDIP Buoy in Years 1 and 2 of that deployment. Subsequent buoys sent to Nome for turnaround did not include surface current.

D. Provide information about the sampling platform or instrumentation.

The platform is a Wave buoy (Datawell Mark 3 directional buoy).

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) are data received by AOOS?

Data available from web harvest to the originator’s site:

Nome:
https://cdip.ucsd.edu/themes/cdip?zoom=auto&tz=UTC&ll_fmt=dm&numcolorbands=10&palette=cdip_classic&high=6.096&r=999&un=1&pb=1&d2=p9&u2=p_id:p9:mode:all:s:241:st:1

Kodiak:
https://cdip.ucsd.edu/themes/cdip?zoom=auto&tz=UTC&ll_fmt=dm&numcolorbands=10&palette=cdip_classic&high=6.096&r=999&un=1&pb=1&d2=p9&u2=p_id:p9:mode:all:s:236:st:1

C. How can the information be accessed?

The data are made available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically, data are available from several unique access points:
- File Downloads (CSV)
- ERDDAP
- NetCDF

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV, NetCDF, and through ERDDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested (e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For this data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by the user. Summary statistics may include minimum, maximum and mean values. Seasonal statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?
Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the CDIP website where FGDC-compliant metadata is available.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
Alaska Ocean Observing System

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
University Sourced data from CDIP Program (Coastal Data Information Program- University of California, San Diego). CDIP is operated by the Ocean Engineering Research Group (OERG), part of the Integrative Oceanography Division (IOD) at Scripps Institution of Oceanography (SIO).

a. If Federal data source, were changes applied to the data?
N/A

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Real-time and Historical data

Nome produces real-time data only seasonally during open water (ice-free) conditions, usually July - October.

Kodiak operated continuously through November of 2021, afterwhich the buoy was recovered. There are no plans to redeploy at this location, so the data for Kodiak are only historical as of November 2021.

C. If real-time, list the QARTOD procedures that are currently applied.
CDIP is an active member of the QARTOD (Quality Assurance of Real-Time Ocean Data) effort. All CDIP data served by the AOOS Data System, including the AOOS Nome CDIP buoy, are all managed by CDIP network through Scripps/UCSD, where extensive buoy validations and other QC tests are performed on the real-time data. Wave measurements

checks include: extreme values test, spike test, mean shift test, flat episodes test, mean crossing test, equal peaks test, acceleration test, and period distribution test.

Details on these QC procedures can be found in the linked CDIP QC Documentation. Summary tables of quality control measures that have been developed for both waves and in-situ currents can be accessed at the following link: http://cdip.ucsd.edu/documents/index/product_docs/qc_summaries/waves/waves_table.php

The QC procedures provided by CDIP preclude AOOS from any additional QC implementation or documentation. Regardless, as with all data ingested by AOOS, the standard syntax, gross range and time gap checks are applied to these data (3G).

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

Quality controls fully implemented by CDIP Program.

F. Describe the data control procedures that were applied by the originator.

Extensive buoy validations and other QC tests are performed by CDIP. Wave measurement checks include: extreme values test, spike test, mean shift test, flat episodes test, mean crossing test, equal peaks test, acceleration test, and period distribution test.

a. Provide a link to any documented procedures.

http://cdip.ucsd.edu/?nav=documents&sub=index&units=metric&tz=UTC&pub=public&map_stati=1,2,3&xitem=proc&xtxt=data_QC(http://cdip.ucsd.edu/?nav=documents&sub=index&units=metric&tz=UTC&pub=public&map_stati=1,2,3&xitem=proc&xtxt=data_QC)

G. Describe the data control procedures that were applied by AOOS.

The QC procedures provided by CDIP preclude AOOS from any additional QC implementation or documentation.

a. Provide a link to any documented procedures.

AOOS Data Assembly Center and Data Management Subsystem Plan, Section 4.4.4.

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. STEWARDSHIP AND PRESERVATION POLICIES

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data on the AOOS data servers.

The CDIP program, which is the source of the data, archives the data and submits all CDIP data to NCEI for long-term preservation.

AOOS will be capable of archiving data with NCEI via a planned, automated pathway, but will not redundantly submit CDIP data to NCEI, unless requested.

B. Which long-term data storage facility will be used for preservation?

NCEI, submitted by CDIP.

C. Describe any transformation necessary for data preservation.

NetCDF

D. List the metadata or other documentation that will be archived with the data.

FGDC-compliant metadata is currently available through CDIP with a link provided through the AOOS data portal.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

These data are collected by the Coastal Observation and Seabird Survey Team (COASST) - a nationally recognized citizen science project in which participants and scientists partner to collect, verify, and use highly accurate, standardized, and effort-controlled beached bird data. COASST established monitoring of beached birds in Alaska in 2006 and has since partnered with a number of agencies and organizations in Alaska to improve and expand its coverage. Beaches have been surveyed across the four Large Marine Ecosystems of the North Pacific: Gulf of Alaska, Aleutian Islands, East Bering Sea, Northern Bering/Chukchi Sea. Surveys are performed monthly in the majority of locations. At more remote and/or northern sites in the Aleutian Islands, Bering Sea and Chukchi Sea, sites are only monitored in summer.

The data are available in the AOOS data portal at this link.

B. How many station locations are there for this data stream?

There are 204 beach sampling locations.

C. What are the specific parameters of the data.

The parameters of this data include: count by species and survey effort. Data can also be filtered spatially, temporally, and by taxonomy.

D. Provide information about the sampling platform or instrumentation.

Data are presented as beached bird species by beach surveyed. All data collection sites are fixed in space, and with known "begin" and "end" spatial coordinates. Participants submit information on the number, identity, and condition of beached bird carcasses. These data are independently reviewed by an expert data verifier. Bird carcasses are marked, and birds that have been found on a previous survey ("refound" birds) are noted separately on subsequent surveys.

Details regarding the survey methods can be found: https://data.coasst.org/

2. DATA PATHWAY

A. Is a data sharing agreement required?

The COASST dataset is available upon request. Contact the Science Coordinator at coasst@uw.edu with a request. More information about data sharing policies is available in the COASST Code of Conduct, viewable here: https://coasst.org/code-of-conduct/.

B. In which format(s) was data received by AOOS?

Data were received as CSV files delivered to AOOS via the Research Workspace, as served by the originator.

C. How can the information be accessed?

The data are available through the AOOS data portal, where it can be viewed using interactive visualizations. Data files are also available for download from several unique access points: Web Mapping Service (WMS); Web Feature Service (WFS); and File Downloads (PNG, Shapefile, CSV).

D. What file formats will be used for sharing data, if different from original?

The data are available through the AOOS data portal, where it can be viewed using interactive visualizations. Data files cannot be downloaded from the portal, instead the user can be redirected to the COASST data portal to request data access.

E. Describe how the data is ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the CeNCOOS data portal.

The data were delivered via CSV file by the originator, imported to PostgreSQL, and then visualized with custom JSON REST service (JAVA). For interactive visualizations of survey data, flat tables were restructured into a relational database and a geometry was created from latitude and longitude values. Lookup tables were generated for user to explore the attributes of interest. Additionally, observations were mapped to labels. These observations were then summarized into a hexagonal heat map with coverage at 15 zoom levels. Observations were summarized into colored hexagons at each zoom level. The color of the hexagon varies relative to the total number of observations within that hexagon.

For visual representation of data summaries in the Alaska Ocean Observing System (AOOS) mapping interface, counts of birds were summarized into an encounter rate for species = average birds per km. Python processing scripts were used to calculate encounter rate as: (1) Apply date and location filters to obtain surveys (given by unique survey ID's) within that spatio-temporal bound (2) Process data into survey-specific survey effort in terms of beach length, and counts of newfound birds, applying any taxonomic filters, and then calculate survey encounter rate (ER = count/beach length)
The following biodiversity indices were calculated for datasets that include sample/collection event id and species identifier (scientific name, common name, ITIS TSN, or WoRMS Aphia ID). Indices were calculated at a local and regional scales (alpha and gamma diversity, respectively).

F. What metadata or contextual information is provided with the data?

Metadata are shared in the AOOS portal with descriptive narratives describing the data and linking back to the originator's site. The metadata can also be accessed: https://researchworkspace.com/api/metadata/export/5faf14b3c5f225002ff0b6a9/19115-zip

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

University of Washington, COASST

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

University

a. If Federal data source, were changes applied to the data?

N/A

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Historical

C. If real-time, list the QARTOD procedures that are currently applied.

Not required

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

Some QC as delivered from the originator(s).

F. Describe the data control procedures that were applied by the originator.

N/A

a. Provide a link to any documented procedures.

N/A

G. Describe the data control procedures that were applied by AOOS.

N/A

a. Provide a link to any documented procedures.

N/A

H. List the procedures taken for data that could not be QC'd as directed.

N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data was aggregated for visualization and exploration with other layers in the AOOS data portal. If the data provider chooses to archive these data at a national archive in the future, they may do it directly, or using the AOOS-facilitated pathway to NCEI.

B. Which long-term data storage facility will be used for preservation?

N/A

C. Describe any transformation necessary for data preservation.

N/A

D. List the metadata or other documentation that will be archived with the data.

N/A

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

Researchers at the University of Alaska Fairbanks and the UNCW - Coastal Ocean Research and Monitoring Program (CORMP) have deployed a number of SOFAR Spotter waves buoys in various locations across Alaska. The Spotter metocean buoy collects and transmits wave, wind, sea surface temperature, and barometric pressure data in real-time. Buoys are deployed for short periods of time before being retrieved and deployed in another location.

Website URL:
https://portal.aoos.org/?ls=MzkupqKZ#map

B. How many station locations are there for this data stream?

There have been 8 wave buoy deployments in Alaska.

University of Alaska Fairbanks:
Dillingham Wave Buoy (May-July 2021)
Foggy Island Dinkum Wave Buoy (Aug 2019, Aug 2020)
Foggy Island STLD2 Wave Buoy (Aug 2019, Aug 2020)
Naknek Wave Buoy (Sept -Nov 2021)
Nelson Lagoon (Inner) Wave Buoy (Oct - Nov 2021)
Nelson Lagoon (Outer) Wave Buoy (Nov 2021)

UNCW - Coastal Ocean Research and Monitoring Program (CORMP):
Skan Bay Inner Wave Buoy (Aug 2021, Aug 2022 - present)
Skan Bay Outer Wave Buoy Aug 2021, Aug 2022 - present)

C. What are the specific parameters of the data.

The parameters include a date/time stamp, a GPS position (Latitude and Longitude), surface water temperature, wave period, wave direction, and wave height. The specific definition of parameters calculated by Spotter are here:
https://content.sofarocean.com/hubfs/Spotter%20product%20documentation%20page/Sofar%20-%20Technical_Reference_Manual.pdf

D. Provide information about the sampling platform or instrumentation.

This platform is a turnkey marine sensing device that gathers wave, wind, sea surface temperature, and barometric pressure data, and delivers insights via Sofar's Spotter Dashboard and API. Spotter collects 3D displacement time series, and calculates the wave spectrum. Spotter comes equipped with a compact, digital temperature sensor to provide high-fidelity Sea Surface Temperature (SST) measurements. The barometer measures atmospheric pressure at the sea surface with rated accuracy.

Specifications can be accessed at: https://assets.website-files.com/6195779003438046f0c9adde/62d75d65671fc65363e28e7f_Spotter-3pager.pdf.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Data are available publically.

B. In which format(s) are data received by AOOS?

The Spotter Sensor API provides access to weather and surface data via an HTTPs JSON API.

C. How can the information be accessed?

AOOS accesses the data from the Sofar dashboard (https://api.sofarocean.com/api/latest-data?spotterId=:spotterId), which requires a username and password. The data are made available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically, data are available from two unique access points:

- File Downloads (CSV and NetCDF)
- ERDDAP

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV, NetCDF, and through ERDDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Data are downloaded from the source to the AOOS storage. Custom Java and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For this data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by the user. Summary statistics may include minimum, maximum and mean values. Seasonal statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?
Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the Sofar website.

G. Are there ethical restrictions to data sharing?
No

a. **If so, how will these be resolved?**
N/A

H. Who holds intellectual property rights (IPR) to the data?
University of Alaska Fairbanks and UNCW CORMP

I. Describe any effect of IPR on data access.
None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)
University

a. If Federal data source, were changes applied to the data?
N/A

b. If Yes, describe any changes to the data that require documentation?
N/A

B. Indicate the data reporting type (e.g. real-time, historical).
Real-time

C. If real-time, list the QARTOD procedures that are currently applied.
Three of the five required tests were applied by AOOS to the original real-time temperature and salinity data: Syntax, Gross Range, and Time-Gap Tests (see 3G).

D. If real-time, list the QARTOD procedures that are planned for implementation.
N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)
Some QC by originator and AOOS.

F. Describe the data control procedures that were applied by the originator.
Data are reported real-time directly from the instrument platform. Then data are received in CSV format from the project website (see 2.) No additional processing is performed on the real-time data stream at this point, other than the standard QC checks performed by AOOS. See 3G.

a. **Provide a link to any documented procedures.**
AOOS Data Assembly Center and Data Management Subsystem Plan

G. Describe the data control procedures that were applied by AOOS.

For all collected parameters automated QARTOD tests are run by the AOOS Data System after ingesting observation data. Tests are run using the open-source ioos_qc library (https://github.com/ioos/ioos_qc) which implements a suite of QARTOD tests as well as other quality control algorithms. The quality test code and test thresholds are documented and publicly available through the AOOS Data Portal. Test thresholds were informed by the data originator for these stations. Refer to the AOOS Data Management System plan for further details.

The observations are ingested to the AOOS DMAC System daily, and a process is run to calculate flags for the following QARTOD tests:

- Gross Range Test- checks that values are within reasonable range bounds.
- Spike Test- checks if the difference in values between a data point and its neighbors exceeds a threshold.
- Rate of Change Test- checks if the first order difference of values exceeds a threshold.
- Flat Line Test- checks for consecutively repeated values within a tolerance.

Quality control flags are appended to the original data files once per day and made available through the AOOS ERDDAP server:
https://erddap.aoos.org/erddap/search/index.html?page=1&itemsPerPage=1000&searchFor=sofar

a. **Provide a link to any documented procedures.**
AOOS Data Assembly Center and Data Management Subsystem Plan, Section 4.4.4.

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?

Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers. These assets are not funded by AOOS, and originate from research projects funded by other federal agencies (BOEM and NSF). AOOS is not responsible for long-term archival of these data assets, but will identify in this data stream plan long-term archival locations for these data when made available by the originator.

AOOS can and will facilitate data archival with NCEI if no other long-term archival plans are in place, pending available resources. Given these are federally funded research projects, the originator should have a data management plan in place and is responsible for long-term data archival per their contracts. AOOS will not duplicate archival efforts for

other federally funded agencies unless requested to assist in doing so, pending available resources within AOOS.

B. Which long-term data storage facility will be used for preservation?

Data are to be archived by the data originators who are funded under separate federal grants and implementing their project data management plans, of which AOOS is not funded (BOEM and NSF).

C. Describe any transformation necessary for data preservation.

To be determined by the data originator and their federal contract agreements.

D. List the metadata or other documentation that will be archived with the data.

To be determined by the data originator and their federal contract agreements.

1. DATA AND INFORMATION TYPES

A. Provide a contextual description of the data stream.

A 3 mooring array called the Gulf of Alaska Ecosystem Observatory was deployed by the Northern Gulf of Alaska LTER project. Moored dataloggers in the Gulf of Alaska collected high-resolution biological, physical, and chemical data year-round from 2019 to 2021. Although co-located and multi-disciplinary time series data are rare for any continental shelf, understanding time-dependent marine processes and ecosystems requires measurements like these.

To solve the problem of the under-sampled ocean, the University of Alaska Fairbanks have deployed a moored ecosystem observatory – an array of 3 moorings measuring diverse parameters. The collected data probe the inner workings of the marine ecosystem from the perspectives of multiple disciplines, multiple trophic levels, and multiple time scales. The array measures: ocean currents, atmospheric winds, temperature, and salinity, which regulate ocean stratification.

Only a few of the sensors are reporting real-time to the AOOS Data Portal.

Website URL: https://portal.aoos.org/#metadata/87/sensor_source

B. How many station locations are there for this data stream?

Currently, there have been 2 buoy deployments that make up this data stream, both of which have some real-time reporting sensors. The third mooring does not report real time, and AOOS currently does not have data hosted on the data portal from this mooring (GEO-2). (Note: Data stream will be updated when AOOS starts hosting GEO-2 data).

- Gulf of Alaska Ecosystem Observatory GEO1 (59.0142,-148.6902) : July 2019 - December 2019
- Gulf of Alaska Ecosystem Observatory GEO3 (59.0165,-148.6966) : July 2019 - September 2021

C. What are the specific parameters of the data.

The parameters provided thus far for GEO-1 include a date/time stamp, a GPS position (Latitude and Longitude), air temperature, wind speed and direction, atmospheric pressure, chlorophyll, dew point, humidity, and radiative flux: downwelling photosynthetic photon flux in sea water. GEO-3 also provided the same parameters as GEO-1, but also included outputs for water temperature, conductivity, and seawater pressure and salinity (computed using temp, cond, and pressure).

D. Provide information about the sampling platform or instrumentation.

In 2019, three moorings were deployed. Two surface buoys (GEO-1 and GEO-3) included a sensor package from PacificGyre that transmitted meteorological and oceanographic data in

real-time via an Iridium satellite link. In subsequent years, the buoys were redeployed. Only GEO3 continued the real-time feed through 2021.

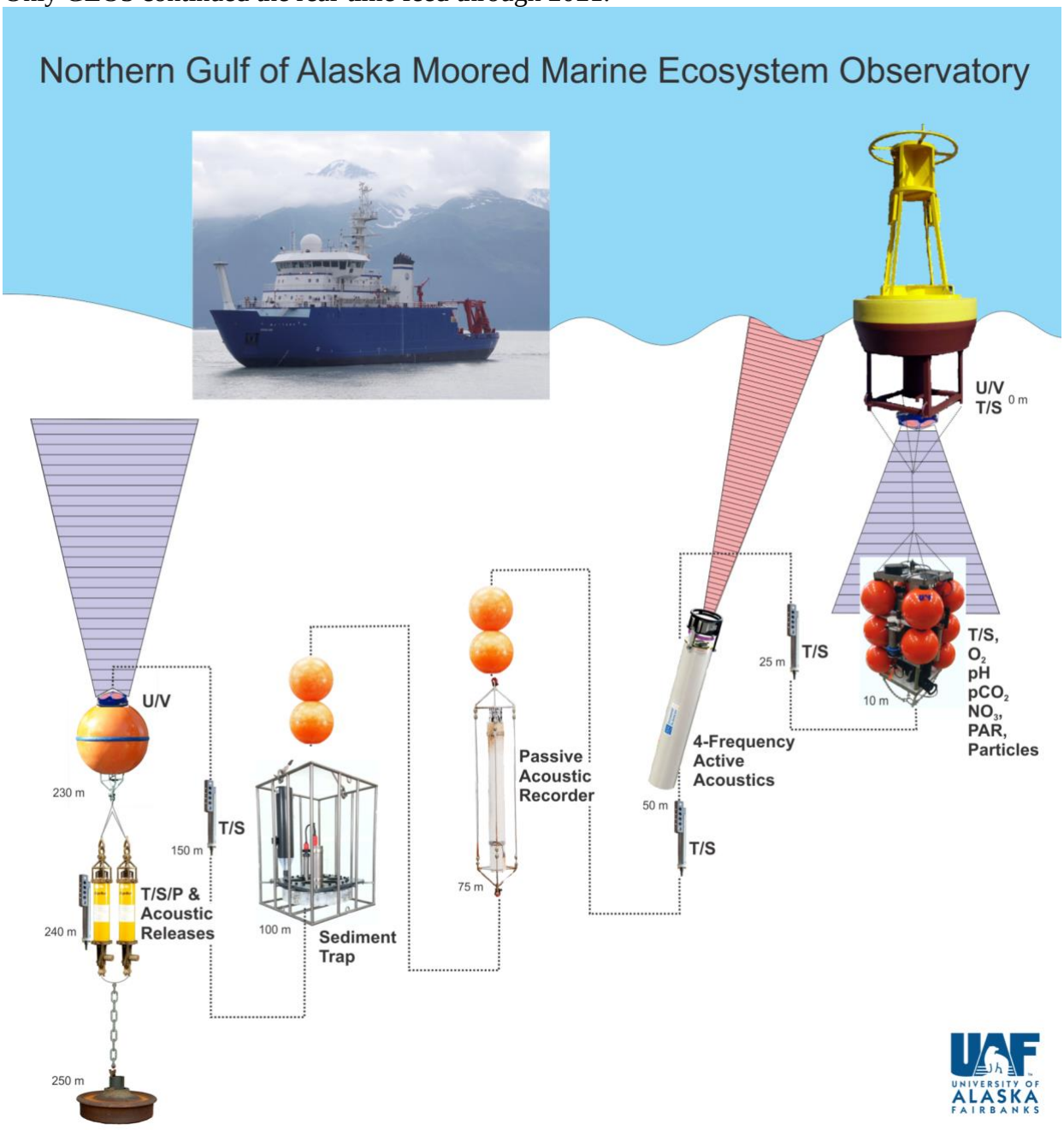

Image of GEO-3: This mooring is part of a 3 mooring array called the Gulf of Alaska Ecosystem Observatory deployed by the Northern Gulf of Alaska LTER project. It was initially deployed in the summer of 2019. During that winter, it was subjected to high waves which knocked out some sensors. Because the mooring was still communicating with its manufacturer, PacificGyre, we continued collecting data in the hope that some good data might be collected. However, the sensors never recovered, so data collection was disabled in January, 2020.

This mooring was redeployed in the summer of 2020. But during the winter of 2020, the buoy broke loose from the mooring and spent some time adrift. It was deactivated in December 2020 after it ran aground. The mooring was redeployed again in the summer of 2021.

The station displays for GEO-1 and GEO-3 both show real-time data with QARTOD error checking. Most of the instruments on these moorings also record data internally.

2. DATA PATHWAY

A. Is a data sharing agreement required?

Real-time data are available publically.
Non-real-time data will be made public once available.

B. In which format(s) are data received by AOOS?

The Pacific Gyrs API provided real-time access to weather and surface data via an Iridium link.

C. How can the information be accessed?

The data are made available through the AOOS data portal, where it can be downloaded or explored through interactive visualizations. Specifically, data are available from two unique access points:
- File Downloads (CSV and NetCDF)
- ERDDAP

D. What file formats will be used for sharing data, if different from original?

Data are shared as CSV, NetCDF, and through ERDDAP. Data are also available for exploration in the AOOS portals via interactive, graphical visualizations.

E. Describe how the data are ingested(e.g. the flow of data from source to AOOS data portals) and any transformations or modifications made to share data in the AOOS data portal.

Real-time data were downloaded from the source to the AOOS storage. Custom Java and Python scripts are used to convert data formats suitable for internal and external interoperability services. Data are made available in the AOOS portals through the access points and via graphic displays generated through internal JSON-format data requests from these services.

Graphic displays include a mapping service, customized interactive visualizations, and time-series plots of the unit values wherein each parameter is graphed independently. Back-end scripts handle the conversion of visualized data from CF standards to other, non-CF units that may be requested by the user. Data files may be downloaded by the user from the AOOS data portal. A user request for a CSV file request pulls the data from the server cache. A user request for ERDDAP pulls data from the ERDDAP service using the same cache. For this data, no CF-standard names or units exist, therefore custom names of abundance_of_{scientific_name} were used. Refer to Appendix I for CF standards.

Summary statistics generated within the interactive graphical displays may be requested by

the user. Summary statistics may include minimum, maximum and mean values. Seasonal statistics, available on time series longer than 3 years, include mean, and 10th and 90th percentiles. Note: the number of points visually available to interactive users from the source data are limited when necessary using temporal binning, such as daily, weekly, monthly, seasonally and yearly.

F. What metadata or contextual information is provided with the data?

Real-time data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the NGA LTER website.

G. Are there ethical restrictions to data sharing?

No

a. **If so, how will these be resolved?**

N/A

H. Who holds intellectual property rights (IPR) to the data?

University of Alaska Fairbanks

I. Describe any effect of IPR on data access.

None

3. Data Source and Quality Control

A. Indicate the data source type (i.e. Federal, Non-Federal, University, State Agency, Local Municipality, Military Establishment (branch), private industry, NGO, non-Profit, Citizen Science, Private individual)

University (funding sources multiple including AOOS, NSF, EVOSTC, others).

a. If Federal data source, were changes applied to the data?

N/A

b. If Yes, describe any changes to the data that require documentation?

N/A

B. Indicate the data reporting type (e.g. real-time, historical).

Real-time and Historical data, and non-real time data
Real-time data from one of the buoys reported weather, chlorophyll and radiative flux (GEO-1). GEO-1 reported real-time July 2019 through December 2019.

GEO-3 was reporting out the same variables as GEO-1, plus real-time temperature, conductivity, seawater pressure and derived salinity (GEO-3). GEO-3 reported real-time intermittently from 2019 through September 2021.

Non-real-time (historical) data are expected to be added to these station data displays once the data have been processed and quality controlled by the PIs. Variables added to the Gulf of Alaska Ecosystem Observatory data stream will be updated when the data are provided to AOOS for publication on the data portal.

C. If real-time, list the QARTOD procedures that are currently applied.

Gross range test, flat-line test, rate of change test and spike tests were conducted:

- GEO-1 weather parameters (wind speed and direction, air temperature, atmospheric pressure, dew point, humidity), as well as on the real-time chlorophyll and radiative flux parameters. https://portal.aoos.org/#metadata/100703/station/inventory
- GEO-3 weather parameters (wind speed and direction, air temperature, atmospheric pressure, dew point, humidity), as well as on water temperature, conductivity, salinity, chlorophyll, radiative flux, sea water pressure. https://portal.aoos.org/#metadata/100704/station/inventory

D. If real-time, list the QARTOD procedures that are planned for implementation.

N/A

E. What is the status of the reported data? (e.g. raw, some QC, incomplete, delayed mode processed but not QC'd)

Some QC by originator and QARTOD implemented by AOOS.

F. Describe the data control procedures that were applied by the originator.

Data are reported real-time directly from the instrument platform. Then data are received in CSV format from the project website (see 2.) No additional processing is performed on the real-time data stream at this point, other than the standard QC checks performed by AOOS. See 3G.

a. Provide a link to any documented procedures.

AOOS Data Assembly Center and Data Management Subsystem Plan

G. Describe the data control procedures that were applied by AOOS.

For all collected parameters automated QARTOD tests are run by the AOOS Data System after ingesting observation data. Tests are run using the open-source ioos_qc library (https://github.com/ioos/ioos_qc) which implements a suite of QARTOD tests as well as other quality control algorithms. The quality test code and test thresholds are documented and publicly available through the AOOS Data Portal. Test thresholds were informed by the data originator for these stations. Refer to the AOOS Data Management System plan for further details.

The observations are ingested to the AOOS DMAC System daily, and a process is run to calculate flags for the following QARTOD tests:

- Gross Range Test- checks that values are within reasonable range bounds.
- Spike Test- checks if the difference in values between a data point and its neighbors exceeds a threshold.
- Rate of Change Test- checks if the first order difference of values exceeds a threshold.
- Flat Line Test- checks for consecutively repeated values within a tolerance.

Quality control flags are appended to the original data files once per day and made available through the AOOS ERDDAP server:
https://erddap.aoos.org/erddap/search/index.html?page=1&itemsPerPage=1000&searchFor=Gulf+of+Alaska+Ecosystem+Observatory

a. Provide a link to any documented procedures.
AOOS Data Assembly Center and Data Management Subsystem Plan, Section 4.4.4.

H. List the procedures taken for data that could not be QC'd as directed.
N/A

4. Stewardship and Preservation Policies

A. Who is responsible for long-term data archiving?
Data are aggregated for visualization and exploration with other layers in the AOOS data portal. AOOS stores the real-time and historical data internally using the AOOS data servers. AOOS will facilitate data archival with NCEI once the other non-real-time data are finalized and ready for archival.

B. Which long-term data storage facility will be used for preservation?
NCEI, and AOOS will work with the NWS to determine other appropriate archival locations for any of the real-time data.

C. Describe any transformation necessary for data preservation.
To be determined.

D. List the metadata or other documentation that will be archived with the data.
To be determined.