

*Puget Sound, WA – ORCA Buoys*

*Please provide the following information and submit to the NOAA DM Plan Repository.*

**Reference to Master DM Plan (if applicable)**

URL of higher-level DM Plan (if any) as submitted to DM Plan Repository:

NANOOS DMP: <https://www.nanoos.org/documents/certification/DMP/2023/NANOOS-DMP.pdf>

**1. General Description of Data to be Managed**

1.1. Name of the Data, data collection Project, or data-producing Program:

Oceanic Remote Chemical Analyzer (ORCA) moorings, part of the Northwest Environmental Moorings lab (NWEM)

1.2. Summary description of the data:

The Oceanic Remote Chemical Analyzer (ORCA) moorings are autonomous profiling systems that collect near real-time water property and atmospheric data in Puget Sound, Washington State. Data are transmitted from the moorings to a server housed at the University of Washington in Seattle, where they are processed, quality controlled, and disseminated.

1.3. Is this a one-time data collection, or an ongoing series of measurements?

This is an ongoing series of measurements, ideally taken once per day during the winter months, and up to 4 times per day during the summer months.

1.4. Actual or planned temporal coverage of the data:

Once per day during the winter; 4 times per day during the summer.

1.5. Actual or planned geographic coverage of the data:

Six (6) buoys throughout the Puget Sound.

ORCA1: 47° 22.5'N, 123° 0.5'W

ORCA2: 47° 25.309'N, 122° 6.755'W

ORCA3: 47° 54.44'N, 122° 37.62'W

ORCA4: 47° 48.205'N, 122° 48.175'W

NPBY1: 47° 45.67'N, 122° 23.83'W

NPBY2: 47° 16.8'N, 122° 43.8'W

1.6. Type(s) of data:

*(e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.).*

Digital numeric data of water property data is collected for water temperature, salinity, pressure, dissolved oxygen concentration, chlorophyll concentration, turbidity, nutrient concentrations, pH, and current velocity. The program also collects digital numeric data of atmospheric data, including wind speed and direction, air temperature, barometric pressure, humidity, and PAR.

1.7. Data collection method(s):

*(e.g., satellite, airplane, unmanned aerial system, radar, weather station, moored buoy, research vessel, autonomous underwater vehicle, animal tagging, manual surveys, enforcement activities, numerical model, etc.)*

Digital numeric data is collected using multiple in situ sensors on a moored buoy, then compiled into files on the buoy controllers. Data files are transmitted via cellular links to the

server, and redundantly stored on the buoy controller until file transfers are verified.

1.8. If data are from a NOAA Observing System of Record, indicate name of system:

NANOOS

1.8.1. If data are from another observing system, please specify: N/A

## **2. Point of Contact for this Data Management Plan (author or maintainer)**

2.1. Name: Seth Travis

2.2. Title: Data Manager

2.3. Affiliation or facility: Northwest Environmental Moorings at the Applied Physics Laboratory at the University of Washington

2.4. E-mail address: setht1@uw.edu

2.5. Phone number:

## **3. Responsible Party for Data Management**

*Program Managers, or their designee, shall be responsible for assuring the proper management of the data produced by their Program. Please indicate the responsible party below.*

3.1. Name: Dana Manalang

3.2. Position Title: Principal Engineer

3.3. Name of current Position holder:

## **4. Resources**

*Programs must identify resources within their own budget for managing the data they produce.*

4.1. Have resources for management of these data been identified?

Yes, resources have been identified. A full-time data manager is assigned to manage this data program, as well as the necessary hardware resources.

4.2. Approximate percentage of the budget for these data devoted to data management (specify percentage or "unknown"):

Funds for salary and hardware are leveraged between NANOOS and other relevant programs. No specific percentage breakdowns have been assigned.

## **5. Data Lineage and Quality**

*NOAA has issued Information Quality Guidelines<sup>1</sup> for ensuring and maximizing the quality, objectivity, utility, and integrity of information which it disseminates.*

5.1. Processing workflow of the data from collection or acquisition to making it publicly accessible (describe or provide URL of description):

The data are managed on a dedicated server at the University of Washington. Once transferred from the buoys, data are processed, plotted, compiled, and posted to the web using custom scripts.

Python scripts are used to convert raw data files into netCDF files, one file for each sampling

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<sup>1</sup> [http://www.cio.noaa.gov/services\\_programs/IQ\\_Guidelines\\_030414.html](http://www.cio.noaa.gov/services_programs/IQ_Guidelines_030414.html)

cast. The raw data files are stored in ASCII formats, while all subsequent data products are stored in netCDF files. Quality control flags are assigned to each point in the cast. The casts are processed to create multiple levels of data product processing, including data gridded onto uniform depth levels, seasonal climatologies, and anomalies from these climatologies. After processing, the files are added to a locally-hosted ERDDAP server for dissemination to data users.

Server hard drives are mirrored automatically. Backup to a local external hard drive occurs weekly, with monthly backup to an external hard drive kept offset. All post-processed profile data are automatically harvested by NANOOS for ingestion and archival into the NANOOS Data Assembly Center (DAC) database (Mayorga et al, 2010) soon after the data files have been updated. This database integrates ORCA data with other regional marine datasets, and serves as a distribution point for access via the NANOOS Visualization System (NVS) and also the US IOOS network.

Near real-time ORCA data for the previous month are available for visualization and direct download via NVS (Mayorga et al, 2010) immediately after ingestion into the NANOOS-APL DAC database. For details, see the NANOOS Data Management Plan, linked at the top of this document.

5.1.1. If data at different stages of the workflow, or products derived from these data, are subject to a separate data management plan, provide reference to other plan:

5.2. Quality control procedures employed (*describe or provide URL of description*):

The casts are subject to automatic quality control procedures by applying QARTOD data flagging (<https://ioos.noaa.gov/project/qartod/>). The QARTOD tests applied to the data include the spike test, flat-line test, gross-range test, and the local-range test. These procedures are applied using the IOOS QARTOD QC python data module. ([https://ioos.github.io/ioos\\_qc/index.html](https://ioos.github.io/ioos_qc/index.html))

To apply the local-range test, values for the local-range bounds are taken from climatological seasonal averages, if available. This data is available on a day-of-year basis. The local-ranges used are taken as the climatological mean plus/minus 6-standard deviations for suspect values, and the climatological mean plus/minus 10-standard deviations for fail values.

An additional test is applied to measurements taken from the CTD (temperature, salinity, density), in which the temperature-salinity (T-S) signal for the upcast is compared to that of the downcast. If these signals are significantly different, then it is assumed that there is an error in the CTD data collection, and all data for the cast is considered to have failed.

Human quality control involves having a data technician regularly review incoming data, and ensuring that the automated quality control procedures are flagging data correctly, as well as providing assurance of sensor calibration and flow of data streams to the web.

As a NANOOS Observing System provider, we follow industry best practices and manufacturer guidance, where applicable, to calibrate, operate, and maintain the equipment used in this effort, and will provide documentation of this upon request. Further, we maintain equipment inventories, shipping logs, and instrument maintenance history logs, as appropriate, that are available upon request.

## 6. Data Documentation

*The EDMC Data Documentation Procedural Directive<sup>2</sup> requires that NOAA data be well documented, specifies the use of ISO 19115 and related standards for documentation of new data, and provides links to resources and tools for metadata creation and validation.*

6.1. Does metadata comply with EDMC Data Documentation directive?

Yes, metadata complies with EDMC Data Documentation directive

6.1.1. If metadata are non-existent or non-compliant, please explain:

6.2. Name of organization or facility providing metadata hosting:

Northwest Environmental Moorings (NWEM) Lab at APL-UW

6.2.1. If service is needed for metadata hosting, please indicate:

6.3. URL of metadata folder or data catalog, if known:

<https://nwem.apl.washington.edu/erddap/index.html>

6.4. Process for producing and maintaining metadata (*describe or provide URL of description*):

All accessible data is stored in netCDF format. As part of the creation of these netCDF files, all metadata is written into the file. In this way, any accessed data will be able to communicate the necessary metadata for evaluating and using the data in the file.

## 7. Data Access

*NAO 212-15 states that access to environmental data may only be restricted when distribution is explicitly limited by law, regulation, policy (such as those applicable to personally identifiable information or protected critical infrastructure information or proprietary trade information) or by security requirements. The EDMC Data Access Procedural Directive<sup>3</sup> contains specific guidance, recommends the use of open-standard, interoperable, non-proprietary web services, provides information about resources and tools to enable data access, and includes a Waiver to be submitted to justify any approach other than full, unrestricted public access.*

7.1. Do these data comply with the Data Access directive? Yes

7.1.1. If the data are not to be made available to the public at all, or with limitations, has a Waiver (Appendix A of Data Access directive) been filed? N/A

7.1.2. If there are limitations to public data access, describe how data are protected from unauthorized access or disclosure: N/A

7.2. Name of organization of facility providing data access:

Northwest Environmental Moorings (NWEM) Lab at APL-UW; NANOOS; NDBC

7.2.1. If data hosting service is needed, please indicate:

7.2.2. URL of data access service, if known:

<https://nwem.apl.washington.edu/erddap/index.html>

7.3. Data access methods or services offered:

ERDDAP Server Hosting for public data access.

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<sup>2</sup> <https://www.nosc.noaa.gov/EDMC/PD.DD.php>

<sup>3</sup> Data Access Directive currently in review; URL to be added.

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Additionally, data are available for download directly from the ORCA website ([https://nwem.apl.washington.edu/prod\\_DataReq.shtml](https://nwem.apl.washington.edu/prod_DataReq.shtml)) after obtaining a password (website provides email link to obtain password; there are no restrictions on obtaining a password).

Recent (last 60 days) data are also available for immediate download from the NANOOS Visualization System (NVS, <https://nvs.nanoos.org>).

Data are shared via NDBC in near-real time, harvested from the NANOOS ERDDAP. The buoy IDs in NDBC are: 46120, 46121, 46122, 46123, 46124, 46125.

7.4. Approximate delay between data collection and dissemination:

Delay between data collection and dissemination is, at a maximum, 6 hours. Once the data has been transmitted and acquired from the buoy, complete data processing will take approximately 20 minutes, with the posted caveat that quality control is an on-going process.

7.4.1. If delay is longer than latency of automated processing, indicate under what authority data access is delayed:

**8. Data Preservation and Protection**

*The NOAA Procedure for Scientific Records Appraisal and Archive Approval describes how to identify, appraise and decide what scientific records are to be preserved in a NOAA archive.*

8.1. Actual or planned long-term data archive location:

*(Specify NODC, NCDC, NGDC, World Data Center (WDC) facility, Other, To Be Determined, Unable to Archive, or No Archiving Intended)*

Data will be archived annual at the National Centers for Environmental Information (NCEI).

8.1.1. If World Data Center or Other, specify:

8.1.2. If To Be Determined, Unable to Archive or No Archiving Intended, explain:

8.2. Data storage facility prior to being sent to an archive facility (if any):

Local redundant HDD storage at the University of Washington lab, with redundant offsite HDD storage. The NANOOS DAC database is hosted at APL-UW in a robust server with automatic daily and staggered database dumps and backups.

8.3. Approximate delay between data collection and submission to an archive facility:

Upload to NCEI annually. Potential for future data agreement with NCEI for automatic archiving monthly.

8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive? Discuss data back-up, disaster recovery/contingency planning, and off-site data storage relevant to the data collection:

Protection from malicious modification or deletion is provided by APL-UW Cyberinfrastructure and security firewalls. As noted above, multiple copies of the data exist on hard drives housed in different locations. If the main system goes down, the archived data and processing code can be deployed from a secondary server to restore data transmission, public access, and archiving procedures.

**9. Additional Line Office or Staff Office Questions**

*Line and Staff Offices may extend this template by inserting additional questions in this section.*

# Data Management Plan

DMP Template v2.0.1 (2015-01-01)

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