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:

Columbia River Inter-Tribal Fish Commission's (CRITFC) Coastal Margin Observation and Prediction (CMOP) observatory network, formerly known as SATURN.

1.2. Summary description of the data:

CMOP (cmop.critfc.org) collects near real-time biogeochemical environmental data in the Columbia River estuary and surrounding coastal waters of Oregon. Seven SATURN stations collect interdisciplinary data; of these, five are fully managed by CMOP, while CMOP only captures data for the remaining two. A varying number of stations (historically as many as eighteen, currently three) collect only physical oceanographic data; all of these are fully managed by CMOP. Several stations collect data from multiple water levels, and one historical station collected high resolution vertical profiles.

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

Ongoing

1.4. Actual or planned temporal coverage of the data:

Endurance stations provide long-term, real-time, high-resolution time series at fixed locations. *Pioneer array* refers to assets that can be deployed on-demand for limited time periods to add spatial scope or spatial resolution to the endurance network. Figure credit: Baptista et al. (2015).

1.5. Actual or planned geographic coverage of the data:

Columbia River estuary from Bonneville Dam to continental shelf off coast of OR. See Baptista et al (2015) for additional details.

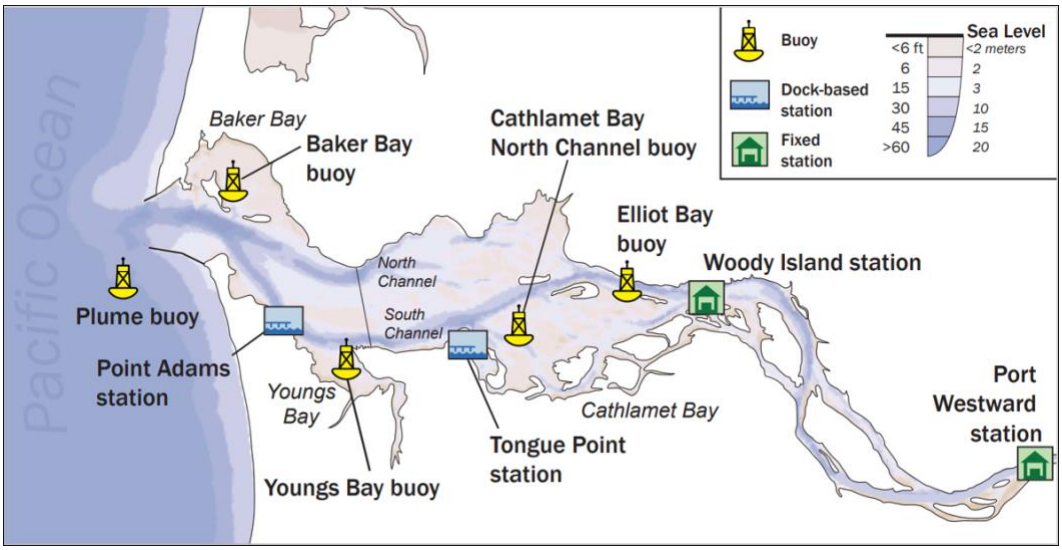

Figure 1: Current CMOP and affiliated stations, located within and near the Columbia River estuary.

1.6. Type(s) of data (e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.):

The program captures digital numeric data, both meteorological data (wind speed and direction, barometric pressure, air temperature) and oceanographic data (temperature, salinity, current speed and direction, water pressure, chlorophyll fluorescence, turbidity, colored dissolved organic material fluorescence, quantum yield, nitrate, pH, pCO2/tCO2, conductivity, dissolved oxygen, phycoerythrin fluorescence).

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.):

Moored buoys, pier-based pumped stations, and piling-mounted stations (SATURN interdisciplinary and physical stations), research vessels (R/V/ Forerunner), and tethered ROV systems (planned).

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

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

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

2.1. Name: Charles Seaton

2.2. Title: Program Coordinator, Coastal Margin Observation and Prediction (CMOP)

2.3. Affiliation or facility: Columbia River Inter-Tribal Fish Commission

2.4. E-mail address: cseaton@critfc.org

2.5. Phone number: (503) 238-0667

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: See above

3.2. Position Title:

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

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

5. **Data Lineage and Quality**

NOAA has issued Information Quality Guidelines[1] 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)*:

Once the data are standardized and accessible, we apply several levels of quality assurance, creating multiple versions of the data. All quality levels are stored and made available. This approach is implemented through a combination of file transfer and archiving, storage of data, creation of metadata and quality assurance metadata in a relational database, and generation of multiple iterations of a NetCDF archive.

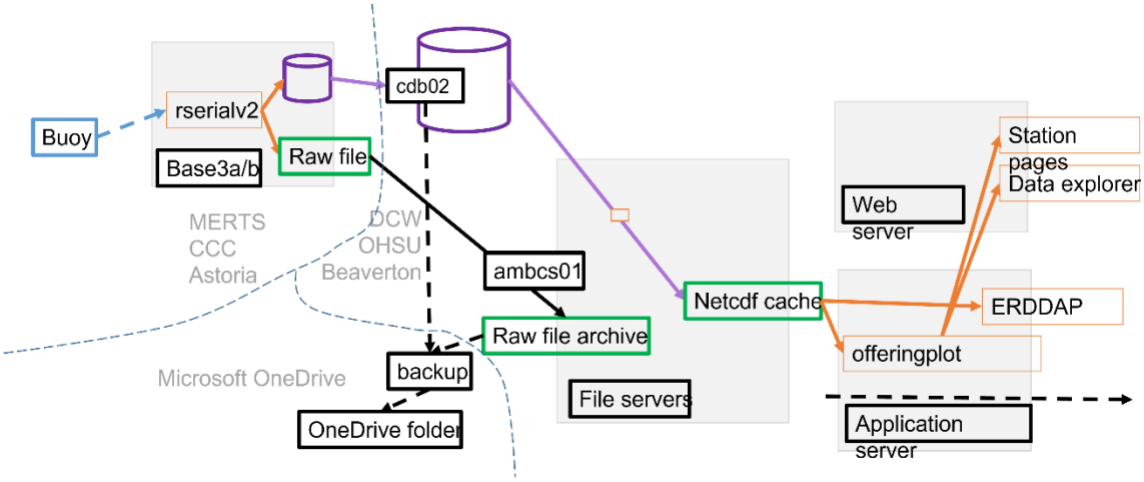

Figure 2: CMOP data management system from buoy to data access

As an example, consider the real-time flow of data from a sensor at SATURN-03. A computer at the station allows data to be received from the instruments in real time, and the data lines are then transmitted over a spread-spectrum radio network and received by duplicate computers at the field office (base3a/b). A program on the field office computers reads the data lines from a serial port, and writes the raw data lines to a file, preceding each raw data line by a timestamp recording when the data line was received. The data from each data line is also processed by the serial port reader to (a) to assign a depth, instrument ID and time

[1] http://www.cio.noaa.gov/services_programs/IQ_Guidelines_030414.html

information; (b) for some instruments, to convert engineering units into scientific units and (c) to write the data to a file and to a local database. The raw (RV0) and initially processed (RV1) files are transferred from the field computer to a central CMOP computer network (ambcs01) in Portland, using the rsync utility, and the data lines in the local database are transferred to a database on the central CMOP network (cdb02).

A processing program on the central computer network reads new lines from the database and further processes them for storage in instrument-specific tables in the database. When data from multiple instruments are required to generate scientifically meaningful results (e.g., dissolved oxygen, where salinity and temperature from conductivity and temperature instrument are required to convert dissolved oxygen voltage into concentration), other programs are run to pull data from the instrument-specific tables, perform the required calculations and load the results into additional instrument-specific tables. As backups of the raw data, the RV0 and RV1 text files are stored on the field computers and on the central CMOP network, and are archived intermittently on a CRITFC Microsoft OneDrive account.

A set of metadata tables describe which instruments are collecting data at SATURN-03 at any given time, and the metadata are used by an additional script to generate NetCDF files containing all received data that were successfully parsed, which are publicly served via ERDDAP. Real-time quality control is used for some variables to generate quality flags, which are stored in the database, and in the NetCDF files.

The near real-time data are ultimately further quality controlled. The quality-control process includes a visual inspection of the data and a review of the data within a historical context as well as in relation to data from other SATURN stations. Results from pre- and post-deployment checks and sensor-specific quality assurance protocols are used to evaluate sensor calibration stability and drift. At some stations, sensor performance and stability are monitored using on-station weekly measurements of aerated deionized water. Additional quality control processes may include calibration against discrete samples, corrections for sensor artifacts, identification of periods of fouling and corrections for sensor drift. A final quality level (on a scale of 1 [excellent] to 5 [bad]) is assigned to the data, and metadata are generated to detail the data quality determination and any corrections applied to the data.

After full quality control of the data is completed, NetCDF files, containing the raw data values, final data values that may have been adjusted during quality control, and data quality flags are generated and served via ERDDAP. For the ERDDAP service, data are divided up into monthly files. Once sensor data from a specific station (e.g. SATURN-03) are in the database and NetCDF files, they can be viewed on the station page, are available for plotting and manipulation in the CMOP Data Explorer, or are downloadable in several different formats on the CMOP website, as well as being accessible via the CMOP ERDDAP server. Near-real-time data in the CMOP ERDDAP server are also ingested by the NANOOS ERDDAP data server and displayed in the NANOOS Visualization System (NVS).

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)*:

Described above in Section 5.1 and available in detail here: QA/QC Information - Coastal Margin Observation and Prediction (critfc.org)

6. **Data Documentation**
The EDMC Data Documentation Procedural Directive[2] *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

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

6.2. Name of organization or facility providing metadata hosting:

CRITFC CMOP and NANOOS

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

6.3. URL of metadata folder or data catalog, if known: ERDDAP - Home Page (stccmop.org)

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

Metadata is recorded manually in the CMOP database for each instrument deployment and during quality assessment. Additional metadata is encoded in the program that generates the netCDF files served via ERDDAP. The ERDDAP server provides access to the metadata in standard ISO formats.

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[3] *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?

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

7.2. Name of organization of facility providing data access:

CMOP, NANOOS, and NOAA (NDBC and NCEI)

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

7.2.2. URL of data access service, if known:

https://data.stccmop.org/erddap/index.html

https://nvs.nanoos.org/Explorer?snapshot=7eaa38c4ba25e4e639ca0b72ea99b

https://www.ndbc.noaa.gov/obs.shtml?lat=46.088672&lon=-

[2] https://www.nosc.noaa.gov/EDMC/PD.DD.php

[3] Data Access Directive currently in review; URL to be added.

124.635555&zoom=7&type=oceans&status=r&pgm=IOOS%20Partners&op=Columbia%20River%20Inter-Tribal%20Fish%20Commission&ls=n

https://www.ncei.noaa.gov/data/oceans/ioos/nanoos/ohsucmop/

7.3. Data access methods or services offered:

File access via NCEI, multiple data access methods via ERDDAP, either through CMOP or NANOOS ERDDAP servers.

7.4. Approximate delay between data collection and dissemination:

Approximately 30 minutes due to latency in automated processing.

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):* 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):

Data are stored locally on CMOP systems in text files, database, and netcdf files, and are intermittently backed up to CRITFC Microsoft OneDrive location.

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

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:

Database and netcdf files are backed up locally and intermittently to OneDrive. Data can be recovered from text files (stored on central CMOP servers, field computer, and OneDrive) in the event the database is corrupted.

9. **Additional Line Office or Staff Office Questions**
Line and Staff Offices may extend this template by inserting additional questions in this section.

10. **Reference List**

Baptista, A. M., Seaton, C., Wilkin, M. P., Riseman, S. F., Needoba, J. A., Maier, D., ... & Simon, H. M. (2015). Infrastructure for collaborative science and societal applications in the Columbia River estuary. Frontiers of Earth Science, 9(4), 659-682.