**NOAA Technical Information Series NESDIS DSMR-00080**
**Version 1.0**

doi: 10.25923/fpj1-5j68

# Data Stewardship Maturity Report for Wake Island, Pacific Islands 1/3 arc-second MHW Coastal Digital Elevation Model

| Table 1 Legend | | | | |
|---|---|---|---|---|
| Level 1 | Level 2 | Level 3 | Level 4 | Level 5 |
| Ad Hoc | Minimal | Intermediate | Advanced | Optimal |
| Little or no management | Limited Management | Defined Management, partially implemented | Well-defined Management, fully implemented | Full Management, audited, measured, controlled |

| Table 1. Scores for the Nine DSMM Key Components at a Glance | | |
|---|---|---|
| Preservability - 5 | Accessibility - 4.5 | Usability - 3 |
| Production Sustainability - 4 | Data Quality Assurance - 3 | Data Quality Control/Monitoring - 3.5 |
| Data Quality Assessment - 2.5 | Transparency/Traceability - 2.5 | Data Integrity - 3.5 |

NOAA National Centers for Environmental Information January 2020

**U.S. DEPARTMENT OF COMMERCE**
National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Cover Image: Data Stewardship Rating Diagram for Wake Island, Pacific Islands 1/3 arc-second MHW Coastal Digital Elevation Model

Shades of green are used to represent level 1 through level 5 ratings; denoting Ad Hoc, Minimal, Intermediate, Advanced, and Optimal stages for each of the nine key components, respectively. The dark green level indicates all the practices are completely satisfied. The lighter green levels indicate only some of the practices are satisfied. The lightest green level indicates none of the practices are satisfied.

The stewardship maturity of NCEI data product, Wake Island, Pacific Islands 1/3 arc-second MHW Coastal Digital Elevation Model, is assessed based on a reference stewardship maturity framework. The current maturity ratings of Wake Island, Pacific Islands 1/3 arc-second MHW Coastal Digital Elevation Model are at Level 1 or higher for all nine key components with zero Level 1, two Level 2, four Level 3, two Level 4, and one Level 5 key components.

NOAA Technical Information Series NESDIS DSMR-00080 Version 1.0

The National Environmental Satellite, Data, and Information Service (NESDIS) manages the Nation's civil Earth-observing satellite systems, as well as global national data bases for meteorology, oceanography, geophysics, and solar-terrestrial sciences. From these sources, it develops and disseminates environmental data and information products critical to the protection of life and property, national defense, and the national economy, energy development and distribution, global food supplies, and the development of natural resources.

Publication in the NOAA Technical Memorandum series does not preclude later publication in scientific journals in expanded or modified form. The NESDIS series of NOAA Technical Reports is a continuation of the former NESS and EDIS series of NOAA Technical Reports and the NESC and EDS series of Environmental Science Services Administration (ESSA) Technical Reports.

Copies of earlier reports may be available by contacting NESDIS Chief of Staff, NOAA/ NESDIS, 1335 East-West Highway, SSMC1, Silver Spring, MD 20910, (301) 713-3578.

## ASSESSMENT REVISION HISTORY

| Revision | Description | Date |
|---|---|---|
| V01r00 | Initial Release | 12/08/2021 |

**NOAA Technical Information Series NESDIS DSMR-00080**

**Version 1.0**

doi: 10.25923/fpj1-5j68

# Data Stewardship Maturity Report for Wake Island, Pacific Islands 1/3 arc-second MHW Coastal Digital Elevation Model

Paul Lemieux III, Katy Luquire
NOAA's National Centers of Environmental Information (NCEI)
151 Patton Avenue, Asheville, NC 28801, (828) 271-4800

**Recommended Citation**

Paul Lemieux III, Katy Luquire. (2021), Data Stewardship Maturity Report for Wake Island, Pacific Islands 1/3 arc-second MHW Coastal Digital Elevation Model

NOAA Technical Information Series NESDIS DSMR-00080 Version 1.0, 19pp., doi: 10.25923/fpj1-5j68

**Table of Contents**

**List of Tables**

**Preface**

In response to the President's Open Government Initiative and related policies, NOAA has committed to providing improved public access to all of its environmental information, to enable research and commercial innovation through ease of data discovery and use [*Casey*, 2016].

OneStop supports NOAA's efforts by leveraging existing access technologies and infusing specific innovations to provide improved discover, access, and visualization services for NOAA's data. Also, OneStop is viewed by a NESDIS as a pathfinder effort with an initial focus on selected high-priority datasets from NESDIS and other program data meeting OneStop standards, but eventually scalable across NOAA's data. Lastly, OneStop is implementing the USGEO Common Framework for Earth Observation Data and leveraging/supporting the NOAA Big Data Project (BDP) and Big Earth Data Initiative (BEDI) [*Casey*, 2016].

As with any process of improvement planning, agencies need to find out where they are in terms of their compliance to the federal regulations and what they need to do if any areas of non-compliance are identified. To this end, a unified framework would be beneficial for assessing the current stage of stewardship practices applied to individual datasets and for providing a road map that will guide future investments towards enhanced stewardship of environmental datasets. The value and quality of a dataset depends in part on the stewardship practices applied after its development and production. Therefore, a unified framework providing a holistic view of the quality of stewardship practices applied to individual datasets is beneficial to data stewards and users [*Casey*, 2016].

The Data Stewardship Maturity Matrix (DSMM), jointly developed by domain (data management, technology, and science) subject matter experts from NOAA's National Centers for Environmental Information (NCEI) and Cooperative Institute for Climate and Satellites – North Carolina (CICS-NC), provides such a consistent framework [*Peng et al.,* 2016]. The DSMM, leveraging institutional knowledge and community practices and standards, defines a graduated maturity scale for each of nine key components of scientific data stewardship to enable a consistent assessment of the measureable stewardship practices applied to a given data set or product.

The NOAA data stewardship maturity technical series captures stewardship maturity assessment results for individual datasets, provides consistent representation and citable documents of those assessments, ensures transparency, and allows better data quality information integration and content-based search and discovery of NOAA data.

# NOAA Technical Report NESDIS DSMR-00080 Version 1.0

# Data Stewardship Maturity Report for Wake Island, Pacific Islands 1/3 arc-second MHW Coastal Digital Elevation Model

## 1. Introduction

### 1.1 Purpose

The purpose of this document is to describe the results of stewardship maturity assessment for NOAA Climate Data Record for Mean Layer Temperature (Upper Troposphere & Lower Stratosphere from UCAR, Version 2, utilizing the Scientific Data Stewardship Maturity Matrix or DSMM [Peng, et al, 2016]. DSMM defines levels of stewardship maturity stages for Preservability, Accessibility, Usability, Production Sustainability, Data Quality Assurance, Data Quality Control/Monitoring, Data Quality Assessment, Transparency/Traceability, and Data Integrity key components. Each of these components is ranked from 'Ad hoc' to 'Optimal' (see Appendix I). This report is based on evaluation performed by NOAA OneStop metadata specialists working with Subject Matter Experts and utilizing the DSMM template [Peng, 2016].

### 1.2 Scope

Assessing stewardship maturity - the current state of how datasets are documented, preserved, stewarded, and made accessible publicly, is a critical step towards meeting U.S. federal regulations, organizational requirements, and user needs [Peng et al., 2016]. The goal of this document is to provide consistent and transparent stewardship maturity information to data users and decision-makers.

### 1.3 Dataset Abstract

NOAA's National Geophysical Data Center (NGDC) is building high-resolution digital elevation models (DEMs) for select U.S. coastal regions. These integrated bathymetric-topographic DEMs are used to support tsunami forecasting and modeling efforts at the NOAA Center for Tsunami Research, Pacific Marine Environmental Laboratory (PMEL). The DEMs are part of the tsunami forecast system SIFT (Short-term Inundation Forecasting for Tsunamis) currently being developed by PMEL for the NOAA Tsunami Warning Centers, and are used in the MOST (Method of Splitting Tsunami) model developed by PMEL to simulate tsunami generation, propagation, and inundation. Bathymetric, topographic, and shoreline data used in DEM compilation are obtained from various sources, including NGDC, the U.S. National Ocean Service (NOS), the U.S. Geological Survey (USGS), the U.S. Army Corps of Engineers (USACE), the Federal Emergency Management Agency (FEMA), and other federal, state, and local government agencies, academic institutions, and private companies. DEMs are

referenced to the vertical tidal datum of Mean High Water (MHW) and horizontal datum of World Geodetic System 1984 (WGS84). Grid spacings for the DEMs range from 1/3 arc-second (~10 meters) to 3 arc-seconds (~90 meters).

### 1.4 Document Maintenance

This document is generated and maintained by NOAA's National Centers for Environmental Information. More on policy is available at https://www.ncei.noaa.gov/.

## 2. Results

The data stewardship maturity assessment information is summarized in Table 1. Each component is displayed along with its corresponding score in a color-coded table.

| Table 2. Dataset and Data Stewardship Maturity Assessment Metadata | |
|---|---|
| **Dataset Title** | Wake Island, Pacific Islands 1/3 arc-second MHW Coastal Digital Elevation Model |
| **Dataset Information URL** | https://www.ncei.noaa.gov/metadata/geoportal/rest/metadata/item/gov.noaa.ngdc.mgg.dem:634/html |
| **Data Provider POC (Name; E-mail; Affiliation)** | NOAA National Centers for Environmental Information (NCEI), dem.info@noaa.gov |
| **Dataset POC (Name; E-mail; Affiliation)** | Barry Eakins, Barry.Eakins@noaa.gov, NOAA National Centers for Environmental Information; Dan Kowal, Dan.Kowal@noaa.gov, NOAA National Centers for Environmental Information (NCEI) |
| **SMM Version (Document ID and Version Number)** | NCDC-CICS-SMM_0001_Rev.1 12/09/2014 |
| **SMM POC (Name; E-mail; Affiliation)** | Ge Peng, ge.peng@uah.edu, University of Alabama-Huntsville |
| **SMM Template Version (Document ID and Version Numbers)** | NCDC-CICS-SMM_0001_Rev.1 v4.0 06/23/2015 |
| **SMM Template POC** | Ge Peng, ge.peng@uah.edu, University of Alabama-Huntsville |
| **SMM Assessment Version (v<nn>r<mm>, e.g., v01r00)** | v02r02 |
| **SMM Assessment Date (MM/DD/YYYY)** | 03/01/2017 |
| **SMM Assessment POC (Name; E-mail; Affiliation)** | Paul Lemieux III, paul.lemieux@noaa.gov, Earth Resources Technology, Inc. |
| **Stewardship Maturity Ratings (each key component) (kc1/kc2/kc3/kc4/kc5/kc6/kc7/kc8/kc9)** | 5 / 4.5 / 3 / 4 / 3 / 3.5 / 2.5 / 2.5 / 3.5 |
| **SMM Original Assessment Date (MM/DD/YYYY)** | 06/20/2016 |
| **SMM Original Assessment POC (Name; E-mail; Affiliation)** | Paul Lemieux III, paul.lemieux@noaa.gov, Earth Resources Technology, Inc. |
| **SMM Last Modified Date (MM/DD/YYYY)** | 09/29/2021 |
| **SMM Last Modification POC (Name; E-mail; Affiliation)** | Katy Luquire, catherine.luquire@noaa.gov , CASE Consultants International |
| **SMM Modified Date (MM/DD/YYYY)** | 04/23/2019 |
| **SMM Modification POC (Name; E-mail; Affiliation)** | Paul Lemieux III, paul.lemieux@noaa.gov, Riverside Technology, Inc. |

| Table 3. Stewardship Maturity Levels and Detailed Justifications for Each of Nine DSMM Key Components for the Dataset. | |
|---|---|
| DSMM Key Component | Stewardship Maturity Rating, Justification, and Comments |
| **Preservability** | Level 5<br>▪ Conforms to NCEI archive guidelines which are OAIS RM and NARA compliant.<br>▪ Conforms to ISO 19115-2 metadata standards.<br>▪ Plans in place to upgrade to newer ISO 19115-1 metadata standard.<br>▪ Products managed per the submission agreement (SA).<br>▪ Archive procedures and processes are managed and Trustworthy Digital Repositories (TDR) audit in place.<br>▪ Annual reviews per the SA.<br><br>Comments:<br>The assessment does not apply to the source data used to create this DEM. |
| **Accessibility** | Level 4.5<br>▪ DEMs available through multiple data services (search forms, mapping, geoportal): https://www.ngdc.noaa.gov/mgg/coastal/coastal.html<br>▪ Each DEM is a collection and individual DEMs are discoverable by different attributes.<br>▪ Dissemination reports available internally but not online.<br>▪ New technology for OneStop search and discovery planned (i.e. ElasticSearch, Hyrax Servers, etc.) This dataset is part of the DEM data group that will be OneStop ready<br><br>Comments:<br>No comments |
| **Usability** | Level 3<br>▪ Community standard format (ASCII) and metadata (ISO 19115).<br>▪ Source code from MBSystem, primary software used for generating DEMs is available as community software but other source code of COTs software used in the process is not available due to licensing agreements.<br>▪ DEM development report [Grothe, Taylor, Eakins, et al., 2010] describing workflows are available online: https://www.ncei.noaa.gov/metadata/geoportal/rest/metadata/item/gov.noaa.ngdc.mgg.dem:634/html<br><br>Comments:<br>No subsetting or aggregating options available<br>No known external rankings |
| **Production Sustainability** | Level 4<br>▪ Coastal Science Team is a NOAA internal group dedicated to supporting DEMs.<br>▪ Contracts negotiated annually for DEMs with funding programs.<br>▪ Product improvement process based on user feedback in place.<br><br>Comments:<br>No comments |

| Table 3. Stewardship Maturity Levels and Detailed Justifications for Each of Nine DSMM Key Components for the Dataset. | |
|---|---|
| DSMM Key Component | Stewardship Maturity Rating, Justification, and Comments |
| **Data Quality Assurance** | Level 3<br>▪ Metadata and technical reports describe quality assessments performed on the products.<br>▪ Evaluation of source data and “defect detection” are critical parts of DEM development.<br>▪ For additional data quality assessment information see the DEM Development Report [Grothe, Taylor, Eakins, et al., 2010] available online here: https://www.ncei.noaa.gov/metadata/geoportal/rest/metadata/item/gov.noaa.ngdc.mgg.dem:634/html<br><br>Comments:<br>No known external reviews |
| **Data Quality Control/ Monitoring** | Level 3.5<br>▪ DQA procedures [Grothe, Taylor, Eakins, et al., 2010] are defined and available online here: https://www.ncei.noaa.gov/metadata/geoportal/rest/metadata/item/gov.noaa.ngdc.mgg.dem:634/html<br>▪ Evaluation of source data and “defect detection” are paramount in the development of the DEMs.<br><br>Comments:<br>User feedback process in place |
| **Data Quality Assessment** | Level 2.5<br>▪ Research assessment in the DEM development report [Grothe, Taylor, Eakins, et al., 2010] available online here: https://www.ncei.noaa.gov/metadata/geoportal/rest/metadata/item/gov.noaa.ngdc.mgg.dem:634/html<br>▪ Some operational products are assessed by the modelling community.<br><br>Comments:<br>No known external reviews |
| **Transparency / Traceability** | Level 2.5<br>▪ Software information available internally but not online due to licensing agreements.<br>▪ Technical report [Grothe, Taylor, Eakins, et al., 2010] available online that document workflows: https://www.ncei.noaa.gov/metadata/geoportal/rest/metadata/item/gov.noaa.ngdc.mgg.dem:634/html<br>▪ Product information available in literature [Eakins and Grothe, 2014] available online here: https://doi.org/10.2112/JCOASTRES-D-13-00192.1<br>▪ OID assigned: gov.noaa.ngdc.mgg.dem:634<br><br>Comments:<br>No DOI assigned<br>DEMs are not under any CM |
| **Data Integrity** | Level 3.5<br>▪ The archive compressed source data and DEM final products. The compressed file contains an internal checksum which could be used for obtaining MD5 checksums for AIPs.<br>▪ Final DEMs and support data goes through NCEI’s Enterprise Ingest systems, checksums are computed per SIP, verified and stored in a tracking database with other information from the AIP.<br><br>Comments:<br>No comments |

## 3. Acknowledgment

This work is supported by the NOAA OneStop Project.

We thank the dataset POCs for their valuable input, as well as the collaborative efforts of the OneStop teams, especially the Metadata team. We would also like to show appreciation to Ge Peng for her contributions.

The draft of this data stewardship maturity report is systematically generated by a tool created by Kieran Hodnett and populated with the stewardship maturity assessment done by the author(s) of this report. The tool was developed based on a Word template created collaboratively by Robert Partee II, Raisa Ionin, Paul Lemieux III, Ge Peng, Don Collins, and Sonny Zinn with helpful input from the NOAA Central Library and the NCEI Communication Team.

## 4. References


Casey, K. (2016), The NOAA OneStop data discover and access framework project, Version:June 3, 2016. https://cdn.ioos.noaa.gov/media/2017/12/OneStop-IOOS-DMAC-03-June-2016.pdf

Peng, G. (2015) The scientific data stewardship maturity assessment model template, Version: NCDC-CICS-SMM-0001-Rev.1 v4.0 6/23/2015. doi:10.6084/m9.figshare.1211954.

Peng, G., J.L. Privette, E.J. Kearns, N.A. Ritchey, and S. Ansari (2015), A unified framework for measuring stewardship practices applied to digital environmental datasets, *Data Science Journal*, 13, 231-253, doi: 10.2481/dsj.14-049.

Peng, G., J. Lawrimore, V. Toner, C. Lief , R. Baldwin, N. Ritchey, D. Brinegar, and S. A. Delgreco (2016) assessing stewardship naturity of the global historical climatology network-monthly (GHCN-M) dataset: use case study and lessons learned, D-Lib Magazine, 22, doi:10.1045/november2016-peng.

Grothe, P., Taylor, L., Eakins, B., Carignan, K., Warnken, R., Lim, E., and Caldwell, R., (2010), Digital elevation models of Wake Island: procedures, data sources and analysis, NOAA Technical Memorandum NESDIS NGDC-32, NOAA National Centers for Environmental Information, Boulder, CO., retrieved online: https://www.ncei.noaa.gov/metadata/geoportal/rest/metadata/item/gov.noaa.ngdc.mgg.dem:634/html (Accessed 01 March 2017).

Eakins, B., and Grothe, P., (2014), Challenges in building coastal digital elevation models, _Journal of Coastal Research_, 30(5), 942—953, doi:10.2112/JCOASTRES-D-13-00192.1.

## Appendix I: The Scientific Data Stewardship Maturity Matrix (DSMM)

Table A1: This matrix (Version: NCDC-CICS-SMM-0001-Rev.1. 12/09/2014) describes the criterion used to evaluate data stewardship maturity for each of the nine DSMM key components [*Peng et al.*, 2015].

| **DSMM Component** | **Level 1** ***Ad hoc*** Little or no management | **Level 2** ***Minimal*** Limited management | **Level 3** ***Intermediate*** Defined management, partially implemented | **Level 4** ***Advanced*** Well-defined management, fully implemented | **Level 5** ***Optimal*** Full management, audited, measured, controlled |
|---|---|---|---|---|---|
| ***Preservability*** *(The state of being preservable)* | Any storage location<br>Data only | Non-designated repository<br>Redundancy<br>Limited archiving metadata | Designated archive<br>Redundancy<br>Community-standard archiving metadata<br>Conforming to limited archiving standards | Level 3 +<br>Conforming to community archiving standards | Level 4 +<br>Archiving process performance controlled, measured, and audited<br>Future archiving standard changes planned |
| ***Accessibility*** *(The state of being searchable and accessible publicly)* | Not publically available person-to-person | Publically available direct file download (e.g., via anonymous FTP server)<br>Collection or dataset level searchable online | Level 2 +<br>Non-standard data service<br>Limited data server performance<br>Granule/file level searchable<br>Limited search metrics | Level 3 +<br>Community-standard data service<br>Enhanced data server performance<br>Conforming to community search metrics<br>Dissemination report metrics defined and implemented internally | Level 4 +<br>Dissemination reports available online<br>Future technology and standard changes planned |

| | | | | | |
|---|---|---|---|---|---|
| ***Usability***<br><br>*(The state of being easy to use)* | Extensive product-specific knowledge required<br><br>No documentation online | Non-standard data format<br><br>Limited documentation (e.g., user's guide online) | Community standard-based interoperable format & metadata<br><br>Documentation (e.g. source code, product algorithm document, processing or/and data flow diagram) online | Level 3 +<br>Basic capability (e.g., subsetting, aggregating) & data characterization overall/global,<br><br>e.g., climatology, error estimates) available online | Level 4 +<br>Enhanced online capability (e.g., visualization, multiple data formats)<br><br>Community metrics of data characterization (regional/cell) online<br><br>External ranking |
| ***Production Sustainability***<br><br>*(The state of data production being sustainable and extendable)* | Ad Hoc or Not applicable<br><br>To obligation or deliverable requirement | Short-term<br><br>Individual PI's commitment (grant obligations) | Medium-term<br><br>Institutional commitment (contractual deliverables with specs and schedule defined) | Long-term Institutional commitment<br><br>Product improvement process in place | Level 4 +<br>National or international commitment<br><br>Changes for echnology planned |
| ***Data Quality Assurance***<br><br>*(The state of data quality being assured)* | Data quality assurance (DQA) procedure unknown or none | Ad Hoc and random<br><br>QA procedure not defined and documented | DQA procedure defined and documented and partially implemented | DQA procedure well documented, fully implemented and available online with master reference data<br>Limited data quality assurance metadata | Level 4 +<br><br>DQA procedure monitored and reported<br>Conforming to community quality metadata & standards<br><br>External review |

| | | | | | |
|---|---|---|---|---|---|
| ***Data Quality Control/ Monitoring***<br><br>*The state of data quality being controlled and monitored* | None or Sampling unknown or spotty<br><br>Analysis unknown or random in time | Sampling and analysis are regular in time and space<br><br>Limited product-specific metrics defined & implemented | Level 2 +<br><br>Sampling and analysis are frequent and systematic but not automatic<br><br>Community metrics defined and partially implemented<br><br>Procedure documented and available online | Level 3 +<br><br>Anomaly detection procedure well-documented and fully implemented using community metrics, automatic, tracked and reported<br><br>Limited quality monitoring metadata | Level 4 +<br>Cross-validation of temporal & spatial characteristics<br><br>Physical consistency check<br><br>Conforming to community quality metadata & standards |
| ***Data Quality Assessment***<br><br>*(The state of data quality being assessed)* | Algorithm/ method/model<br><br>Theoretical basis assessed (methods and results online) | Level 1 +<br><br>Research product assessed (methods and results online) | Level 2 +<br><br>Operational product assessed (methods and results online) | Level 3 +<br><br>Quality metadata assessed<br><br>Limited quality assessment metadata | Level 4 +<br><br>Assessment performed on a recurring basis<br><br>Conforming to community quality metadata & standards<br><br>External ranking |
| ***Transparency/ Traceability***<br><br>*(The state of being transparent, trackable, and traceable)* | Limited product information available<br><br>Person-to-person | Product information available in literature | Algorithm Theoretical Basis Document (ATBD) & source code online<br><br>Dataset configuration managed (CM)<br><br>Unique Object Identifier (OID) assigned (dataset, documentation, source code)<br><br>Data citation tracked (e.g., utilizing Digital Object Identifier | Level 3 +<br><br>Operational Algorithm Description (OAD) online, OID assigned, and under CM | Level 4 +<br><br>System information online<br><br>Complete data provenance online |

| | | | | | |
|---|---|---|---|---|---|
| ***Data Integrity***<br><br>*(The state of data integrity being verifiable)* | Unknown or no data ingest integrity check | Data ingest integrity verifiable (e.g, checksum technology) | (DOI) system)<br>Level 2 +<br><br>Data archive integrity verifiable | Level 3 +<br><br>Data access integrity verifiable<br><br>Conforming to community data integrity technology standard | Level 4 +<br><br>Data authenticity verifiable (e.g., data signature technology)<br><br>Performance of data integrity check monitored and reported |