# APPENDIX A: SPECIFICATIONS FOR DIGITAL DATA

## Navy IGI&S Standards & Specifications for Vector GIS Deliverables

Navy Installation Geospatial Information & Services (IGI&S)

**Contents**

## Document History

| Version# | Action | Author | Date | Section(s) |
|---|---|---|---|---|
| 1.0 | Created | Navy IGI&S Program | 2/16/2023 | |
| 2.0 | Updated MXD references to reference ArcGISPro Projects and removal of references to version 10.8.1. | Navy IGI&S Program | 4/18/2023 | Section 2<br>Section 8.4<br>Section 12 |
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## Main Points of Contact

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Regional / FEC GeoReadiness Center (GRC) Managers

## Purpose

The following language details specifications and requirements for handling and delivery of all spatially referenced *vector* data, supporting data types and information products intended for integration with Navy Installation Geospatial Information & Services (IGI&S) assets. Vector formats include but are not limited to:

- GIS file formats
    - Shapefiles (typically comprised of: .shp,shx,shn,sbx,dbf,xml)
    - File Geodatabase (.gdb)
    - SDE Geodatabase (Oracle/SQL Server)
- CAD formats intended for use with spatially referenced information (i.e. dwg, dxf, dgn)
- Tabular data representing spatial information including ASCII formats and .CSV files.
- GPS file formats that have been processed and prepared for GIS export.

This document should be referenced by and appended to Statements of Work.

## Background

Navy IGI&S vector data assets are stored and maintained in an ESRI Spatial Data Engine (SDE) enterprise Geodatabase environment. The data and GIS applications used to manage it are accessed remotely allowing Navy IGI&S data and applications to be shared universally via data and application servers across the corporate enterprise rather than residing on a desktop or LAN shared drive.

The Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) is the Department of Defense (DoD) family of spatial standards and models that supports common implementation and maximizes interoperability for installation, environment, and civil work missions. The Navy IGI&S program employs an approved registered adaption of the DoD SDSFIE; registered as the Navy Data Model (NDM). The NDM schema defines the set of features, attribution, and metadata for enterprise geospatial data collected by or on behalf of the Navy.

The Navy IGI&S Data Collection Guidance (DCG) defines the standard for geospatial data collection and extraction methodology under the Navy IGI&S Program. The Navy IGI&S DCG is a complement to the NDM. The NDM defines what data to collect, and the DCG defines how to collect it.

## Specifications

All in-bound data deliverables must conform to the following Navy IGI&S technical specifications and corporate business rules prior to acceptance:

- Vector Data Delivery Methods
- Database format and software version
- Vector Data Standard
- Spatial Reference
- Feature Class geometry
- Horizontal and Vertical Spatial Accuracy
- Geometric Topology Rules
- Feature Attributes
- Data Authority and Duplication Protocols
- Metadata standards
- Symbology

## 1. Vector Data Delivery Methods

Unless otherwise specified in the Statement of Work, the Contractor shall deliver geospatial data and information products to the GRC Manager and the Project Manager via secure FTP using DoD SAFE (https://safe.apps.mil).

## 2. Database Format & Software Version

The Navy IGI&S Enterprise GIS data is currently stored in the Esri Geodatabase format for ArcGIS/ArcSDE. GIS data sets must be delivered in the Esri File Geodatabase (*.gdb) file format. GIS Map documents utilizing the delivered GIS data sets to present information must be must be prepared in Esri ArcGISPro Project unless otherwise specified in the Statement of Work or by the Government.

## 3. GIS Data Standards

### 3.1 Data Modelling Standards

The current version of the NDM is 4.x. Note that the "*.x" represents the steps between versions, i.e. 4.3, 4.4, etc. Version steps are upgraded on an annual basis, so it is crucial to coordinate with the Navy IGI&S GeoReadiness Center (GRC) to ensure that deliverables are aligned to the correct version of NDM.

A copy of the physical data model (PDM) and documentation for the NDM 4.x can be obtained via the GRC Manager. Unless otherwise specified in the Statement of Work, all delivered data sets must comply with the most current version of NDM 4.x. If the subject data is not represented by a feature type in in NDM 4.x, the Contractor, Project Manager and the GRC Manager will coordinate to determine if a deviation to the standard is warranted. If a deviation is authorized, the Contractor shall submit a schema model for the deviation to the GRC Manager for approval.

### 3.2 Data Collection Standards

Navy IGI&S employs a quality assurance process that provides guidance for feature extraction and data collection and classification in accordance with the NDM. The process is documented in the *Navy IGI&S Data Collection Guidance (DCG)*. Unless otherwise specified in the Statement of Work or by the GRC Manager, adherence to Navy IGI&S DCG guidance is mandatory for NDM-compliant deliverables. Deviation from the DCG for any reason will be considered on a case-by-case basis and should be coordinated with the GRC Manager via the Project Manager.

### 3.3 Government Furnished Materials

Based on scope requirements, Navy IGI&S DCG and NDM documentation can be obtained as required from the GRC Manager.

## 4. Spatial Reference Specifications

Unless otherwise specified, all GIS feature classes, data sets and database files delivered **shall be delivered** using the spatial reference parameters specified for the location/installation as indicated by the GRC Manager. The Contractor shall work with the GRC Manager to determine the appropriate spatial reference specifications prior to any geospatial work.

## 5. Feature Class Geometry

5.1. Unless otherwise specified in the Statement of Work, the Contractor shall ensure that all vector feature classes contained within a Geodatabase are by default created with three dimensional "Z" geometry enabled.

5.2. Unless otherwise specified in the Statement of Work, Geodatabases with the M geometry enabled will not be accepted.

**6. Horizontal and Vertical Spatial Accuracy**

6.1. Unless otherwise specified in the Statement of Work, all features stored in delivered vector data sets must have a *horizontal* accuracy error tolerance of < 1 Meter or as specified in the Navy IGI&S DCG.

6.2. Vertical accuracy tolerances depend on the feature type and project requirements. This specification will be determined by the Project Manager or Technical Representative and specified in the Statement of Work. These requirements will determine the type of survey methodology used.

6.3. For vector data captured using GPS devices, data must be captured as outlined in the Navy IGI&S DCG (ref. section *8.1 GPS Data Collection) u*sing one of the following methodologies:

- Differential GPS (DGPS)
- Real-Time Kinematic (RTK)

6.4. Equipment Specifications: GPS equipment used must be rated to support Horizontal data capture to 2DRMS (95-98% Probability) standards and Vertical data capture to RMS (63-68% Probability).

**7. Geometric Topology Rules**

The Contractor shall be responsible for ensuring that all features comply with standard GIS topology rules and best practices as outlined in the Navy IGI&S DCG (ref. section *11.2.1 Data Reviewer Batch Job).*

*There are exceptions to this rule. Should such features physically overlap, the Contractor shall document the variants and report them to the PM or Technical Representative and GRC Manager prior to final delivery.

**8. Feature Attributes**

8.1. If applicable, the Contractor shall populate feature attributes for a given feature class with minimum required attributes specified by the responsible Stakeholder for the data set and per the Navy IGI&S DCG (ref. section 9*.1 Attribute Table)*.

8.2. For project or mission-specific attribute values (aka business data), the Contractor shall adhere to one of the two recommended database schema designs outlined in Figures 3a or 3b, below depending on the project requirements, complexity of the data and end-use. The Contractor shall coordinate with the GRC Manager to determine the best design strategy based on input from the end user and project requirements.

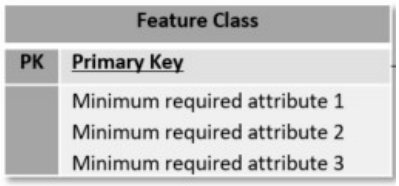



**Figure 3a. Feature class containing required attributes in the native table.**


**Figure 3b. Feature class with associated external business table, linked by a common Primary Key (PK) and Foreign Key (FK).**

Data Authority and Data Duplication Warning

8.3. Unless otherwise specified in the Statement of Work, the Contractor shall not duplicate or modify feature classes associated with the Navy IGI&S Common Installation Picture (CIP) or any other authoritative Government furnished NDM GIS data set. Modification in this context is defined by: editing geometry or attributes; altering the feature class schema by adding, deleting or renaming attribute fields or changing the spatial reference. If errors or issues related to the currency, completeness or accuracy of data are noted during the course of project execution, notify the GRC Manager for corrective action.

8.4. All map documents delivered that reference authoritative data sets as overlays must directly reference the spatial data stored in the NDM Enterprise Geodatabase (SDE) located in the M&A Environment. Please contact the GRC Manager to verify the correct database connection information prior to delivery.

8.5. Authorized Deviations: If circumstances prevent the Contractor from establishing database connections to the enterprise data sources necessary to add layers to their map documents, a deviation can be requested from the GRC Manager on a case-by-case basis. In this event, the GRC Manager will provide the Contractor with a file Geodatabase containing required authoritative data sets needed to complete the deliverable. This Geodatabase shall not be altered or modified in any way.

**9. GIS Product Control Document**

9.1. The Contractor shall produce and deliver a GIS Product Control Document upon final delivery of the GIS product(s) or project completion. The GIS Product Control Document is comprised of the following.

- Section I. Data Dictionary

  In the event that deliverable includes a non-NDM compliant data set, a standard GIS data dictionary must be delivered. Data Dictionary format to be determined by Navy GIS Program Director, GRC Manager, and Project Manager.

- Section II. Logical Data Model

  Complex data sets containing relationships, external tables or network topology must be documented in the form of a logical data model or entity relationship models.

**10. Metadata Standards**

All metadata must comply with FGDC metadata standards to the data set level.

11.1 Feature-level metadata. NDM compliant feature classes contain six (6) attribute fields that track metadata to the feature-level. It is the Contractor's responsibility to ensure completeness of metadata to the feature level. The fields are listed with their definitions below:

CREATOR – Creator of data*
DATECREATED – Date Created*
COLLECTIONSOURCE – Collection Source
LOCACCY – Location Accuracy
EDITOR – Editor of data*
DATEEDITED – Date Edited*

* Fields marked with an asterisk indicated that they are auto-generated in the enterprise geodatabase environment.

**11. Cartographic Symbology**

11.1. The Contractor shall coordinate with the GRC Manager to determine if symbology standards exist for a particular data set.

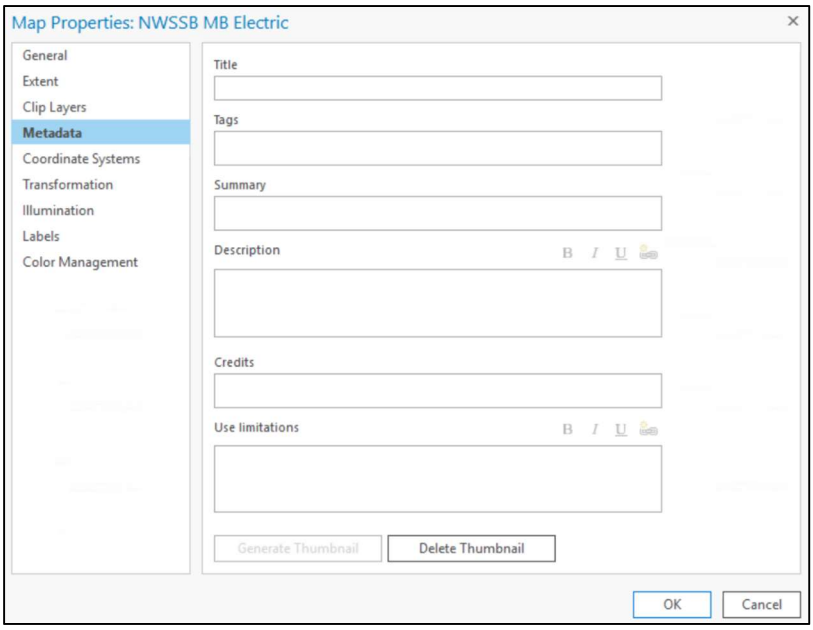
11.2. The NDM does not support annotation layers and any information collected and created needs to be stored in the NDM attribution structure.

11.3. Cartographic symbology standards vary from one functional area to another. Unless otherwise outlined in the Statement of Work, responsible Stakeholder(s) and Government Project Manager(s) have discretion to define the language in this section to meet the specifications of the project deliverables.

## 12. Map Documents

12.1. As stated in Section 2 of this document, cartographic representations will be delivered in the Esri ArcGISPro Projects for the following minimum information must be defined in the *Metadata Map Properties* dialog of the Pro Project:

12.1.1. Title
12.1.2. Tags
12.1.3. Summary
12.1.4. Description
12.1.5. Credits
12.1.6. Use Limitations

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