Chesapeake Bay Program Data Resource Deliverable Guidance

September 17, 2025

Contents

Introduction

The Chesapeake Bay Program Office (CBPO) is a unique regional partnership leading and directing Chesapeake Bay restoration since 1983. CBPO partners include the states of Delaware, Maryland, New York, Pennsylvania, Virginia and West Virginia; the District of Columbia; the Chesapeake Bay Commission, a tristate legislative body; the U. S. Environmental Protection Agency, which represents the federal government; and participating citizen advisory groups.

In 1996, the Chesapeake Executive Council adopted the Chesapeake Bay Program's "Strategy for Increasing Basin-wide Public Access to Chesapeake Bay Information." The approach calls for the development of a shared resource of information that is available through the Internet and based on standards and protocols that facilitate access across agency and jurisdictional boundaries. This document describes the guidelines and requirements for submitting data to the CBPO Data Center in Annapolis, Maryland.

Organizations funded by CBPO, including grantees and contractors, are required to submit deliverables including reports, graphics, spreadsheets, imagery, data files, audio, and digital video products in electronic format. These deliverables must be submitted per the schedule specified in the grant or contract. All data and information funded by CBPO agencies, through direct CBPO funding or indirect (matching) funds, is the property of the program and public information unless there is a grant or contract condition that specifies otherwise. In addition, source data collected and processed in the creation of a deliverable shall also be submitted, if practical. Deviations from these guidelines and requirements must be negotiated with the CBPO Grant/Contract Officer and documented within the grant or contract agreement.

Data resources are foundational to the success of the CBPO, with effective data lifecycle management essential to its mission. CBPO receives and publishes several types of data resources. CBPO data stewards follow consistent procedures for data management across its lifecycle. Submission and delivery of data to the CBPO should adhere to consistent standards and requirements identified for the collection phase of the data lifecycle. The CBPO Data Governance Workgroup has prepared this document to provide clarity and consistency for submission and delivery of data resource deliverables.

Purpose

This document establishes uniform requirements and guidelines to ensure the effective collection, processing, and submission of data to the Chesapeake Bay Program Office (CBPO). All recipients of CBPO funding must adhere to these requirements unless alternative arrangements are explicitly authorized. For questions or clarification, please contact the CBPO Data Managers.

Audience

The intended audience for this document includes organizations such as grantees and contractors funded by CBPO, as well as CBPO data managers, stewards, analysts, and publishers who are responsible for managing CBPO data resources.

Scope

These guidelines apply to all data resources delivered to the CBPO through grants or any form of CBPO funding, whether direct or matching. The scope encompasses authoritative data that may be public or internal, current or legacy, and raw or processed. Non-authoritative data, including resources from external collaborators or internal data lacking documented QA/QC procedures, are excluded from this document's scope.

CBPO Data Resource Environment

Chesapeake Bay Program Data Center

The CBPO maintains a Data Center at its office in Annapolis, Maryland. The purpose of the Data Center is to provide data management and technical support to program participants in accomplishing the goals set forth by the Chesapeake Executive Council. The Data Center coordinates the management of the Chesapeake Center for Collaborative Computing (C4) which provides computing resources to the broader partnership. Recipients of Data Center services are the CBPO committees, goal implementation teams, Bay Program managers, the watershed's scientific community, and the public.

Chesapeake Center for Collaborative Computing

The Center for Collaborative Computing (C4) provides cloud-based infrastructure to CBPO partners for collecting, aggregating, storing, analyzing, and disseminating Chesapeake Bay data and information. C4 also provides on-premises infrastructure supporting the non-federal partners located at the Chesapeake Bay Program in Annapolis, Maryland. C4 receives and manages the authoritative data used by Chesapeake Bay scientists and managers in their science-based decision making. This same authoritative data is disseminated to key Chesapeake Bay stakeholders, including CBPO partners, academia, non-governmental organizations working on Bay restoration, and the public.

Types of Information

Various types of data and information are collected, used or generated by the Chesapeake Bay Program and its participants. Each of the categories of information represented in the diagram below serves specific audience needs.

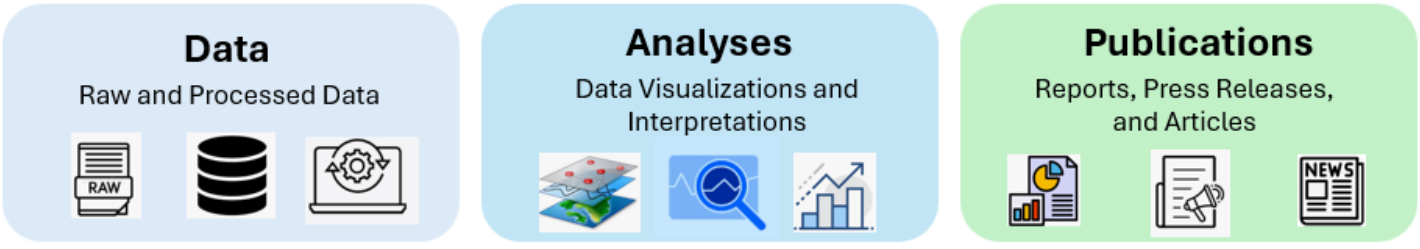

Figure 1. CBPO Data Resource Types

Chesapeake Bay Program's Web Resources

CBPO has operated the Chesapeake Bay Program website (http://www.chesapeakebay.net) since April 1995. This site, along with several of its subdomains, are authoritative sources of Chesapeake Bay Program data and information. Subdomains include the DataHub (https://datahub.chesapeakebay.net/), which is CBPO's primary tool for downloading environmental data, and ChesapeakeData (data.chesapeakebay.net), which is a central point of access for data, decision-support tools, and other data resources.

CBPO Information Management Guidelines and Requirements

The following guidelines and requirements must be followed by all agencies, institutions, and organizations participating in data and information collection, processing, document generation and submittal to the Chesapeake Bay Program under contract, grant or cooperative agreement funding. The Chesapeake Bay Program has adopted these guidelines and requirements to improve coordination, compatibility, standardization, and information access across all the Bay Program partners.

In addition to the **universal** requirements described in this document, **subject-matter specific** requirements for data resources related to monitoring, toxics, wastewater, and best management practices (BMP) data are described in separate documents and should be reviewed by data resource developers working with those types of resources. Comprehensive, subject matter-specific guidelines and requirements are listed in the Related CBPO Documents and Guidelines section of this document.

In addition to these guidelines and requirements, any activities funded with Federal Government funds must also adhere to applicable federal guidelines, policies and executive orders, such as the Federal Information Processing Standards (FIPS) (https:/www.nist.gov/itl/itl-publications/federal-information-processing-standards-fips/) and Executive Order 12906. CBPO requirements and guidelines described in this document include:

- **Data, Information and Document Delivery Requirements:** Describes how data resource content should be delivered to CBPO, including acceptable data formats.
- **Deliverable Serving vs. Submission Requirements:** Describes requirements for electronic data submission and service provision.
- **Geospatial Data Requirements:** Describes requirements for submitting data that contains geospatial coordinates.
- **CBPO Metadata Specification:** Describes requirements for data documentation.
- **Numeric Data Reporting Guideline:** Describes requirements for reporting numeric information, including value precision, true zeros, missing data, and parameters not sampled.
- **Date and Time Guideline:** Describes requirements for reporting date and time information.

Related CBPO Documents and Guidelines

Related CBPO documents and guidelines are listed below. Data providers are encouraged to review the related documents listed to understand subject-matter specific data requirements and data-related processes and procedures used by CBPO partners.

- Chesapeake Bay Program Data Publishing Guidelines
- Chesapeake Bay Program Metadata Specification

- Chesapeake Bay Program Monitoring Data Deliverable Guidance
- Chesapeake Bay Program Data Archiving Guidance
- CBPO Wastewater Facility and BMP Implementation Data Submission Specifications and Requirements

Data, Information, and Document Delivery Requirements

Recipients are required to submit data, information, and document deliverables in electronic format unless exceptions are specified in the grant, cooperative agreement, or contract work plan. Electronic deliverables include, but are not limited to, reports, graphics, spreadsheets, imagery, data files, audio, and digital video products.

All data, information, and documents funded by the Chesapeake Bay Program, whether through direct Chesapeake Bay Program funding or indirect matching funds, are public information and shall be made available to the public unless there is a grant/cooperative agreement award condition that specifies otherwise. In addition, all deliverables must have associated metadata, and the source data used in the creation of a deliverable shall also be submitted when practical. If source data is submitted, it should also be delivered in electronic format. For questions regarding variations from the formats listed below, please contact the CBPO Data Managers.

Electronic deliverables shall be submitted to the Chesapeake Bay Program utilizing the acceptable formats documented in the table below:

Data Resource Component	Acceptable Formats
Text	Microsoft Word (DOCX) Portable Document Format (PDF) ASCII Text (TXT) Markdown (MD)
Spreadsheet /Tabular Data	Microsoft Excel (XLSX) Comma Separated Values (CSV) ASCII delimited text files JSON (JavaScript Object Notation) Parquet
Database	Microsoft Access 2003 or higher Microsoft SQL Server 2016 or higher
Graphics	Portable Network Graphics (PNG) Joint Photographic Experts Group (JPEG) Scalable Network Graphics (SVG)
Geospatial Maps	Project/Map/Layer Package (.ppkx/.mpkx/.lpkx) GeoPackage (.gpkg) Geodatabase (.gdb) Feature Class
Geospatial Vector Data	Shapefile (.shp) GeoParquet GeoJSON Geodatabase (.gdb) as Feature Class GeoPackage (.gpkg) (vector files)
Geospatial Raster Data	GeoTIFF/COG (Cloud-Optimized GeoTIFF) (.tif) Zarr/GeoZarr

Data Resource Component	Acceptable Formats
	Geodatabase (.gdb) (raster files)
Geospatial Coordinate Systems	Geographic Coordinate System (WGS84 or NAD83) USGS Albers Equal-Area Web Mercator
Platforms	Shiny CloudFormation .Net Core Docker Compose AWS CodePipeline
Code Languages	Python C# (.Net Core Stack) R

** Data tables delivered within PDF documents must be delivered in one of the spreadsheet formats.*

Deliverable Serving vs. Submission Requirements

Recipients may submit deliverables directly to the Chesapeake Bay Program or provide access to deliverables via their organization's cloud-based data platforms, APIs, or other hosting mechanisms.

Recipients who intend to deliver grant or cooperative agreement outputs through their organization's data services must provide comprehensive open documentation including API specifications (OpenAPI/Swagger format), authentication protocols, deployment instructions, and user guides. Recipients planning to deliver applications to be hosted by Chesapeake Bay Program must coordinate with the CBPO Data Center to ensure alignment with the Center's operational capacity and technology stack. Applications should be containerized or cloud-native where feasible and use technologies included in the Data, Information, and Document Delivery Requirements. Recipients must provide complete deployment artifacts, configuration files, and documentation sufficient for independent deployment and modification by third parties.

Geospatial Data Requirements

The Chesapeake Bay Program requires consistent and appropriate use of coordinate system to accurately identify the location of entities. This includes both geographic coordinate system (GCS) or datum, and projected coordinate system (PCS). The GCS represents locations as angular units (degrees) such as latitude and longitude, and the PCS is used to represent linear units like meters or feet. The selected coordinate system(s) must be clearly defined and consistently applied across datasets to ensure consistent spatial referencing and interoperability across geospatial workflows.

Thus, all data, containing spatial and/or specific geographic locations, collected or assembled under a CBP grant or cooperative agreement must have appropriate coordinate systems for each entity and across all data products. Projects not creating or reporting spatial data, but confined to one or more given project locations, must include the latitude/longitude of the locations within the study/final report. All electronic geospatial data, whether vector or raster, must have a projection defined and embedded in, or associated with, the data file. Tabular data that

includes latitude and longitude coordinates (given in decimal degrees) shall provide the datum associated with the coordinates (e.g., WGS84 or NAD83).

Data providers should provide data using the following coordinate systems:

- Data provided as points may be provided with a GCS. Tabular data that includes latitude and longitude coordinates (given in decimal degrees) shall provide the datum associated with the coordinates (e.g., WGS84 or NAD83).
- Spatial datasets, including polylines, polygons, raster data, or other complex geometries, shall use the USGS Albers Equal-Area projection.
- Spatial data that is provided for use within a web mapping application or story map shall use the Web Mercator projection.
- Additionally, any numeric data provided as part of a deliverable should explicitly report the units of measurement. This includes spatial units for coordinates, such as meters relative to the specified projected coordinate system (e.g., NAD83 / UTM zone 17N), as well as units for all numeric measurements in attribute tables—such as elevation in feet, temperature in degrees Celsius, and concentrations in milligrams per liter (mg/L).
- If data products have vertical datum, that must be documented as well.

It is required that metadata be provided for all data, and it must include a measurement of the accuracy of the coordinates submitted and the original source material and methods for obtaining the coordinates. It is the responsibility of data generators/providers to include coordinates accurate to the level that is practical for the intended application, and to document the accuracy of those coordinates. Recipients shall include in their work plan assurance to comply with this requirement.

Below is a list of preferred GCS and PCS in Well-known text 2 (WKT2) format along with EPSG and WKID or ESRI codes as well. When documenting coordinate systems as text, WKT2 format is preferred over EPSG or WKID/ESRI codes for clarity. Usage of other coordinate systems such as Universal Transverse Mercator (UTM) are allowed, if they are applied consistently and documented.

Name	Type	Format(s)	Source
WGS 1984	Geographic	WKT2, EPSG:4326	link
USGS Albers Equal-Area	Projected	WKT2, ESRI:102039	link
Web Mercator (WGS 84)	Projected	WKT2, EPSG:3857	link

CBPO Metadata Specification

All data resource deliverables must be provided with metadata that adheres to the requirements described in the 2025 CBPO Metadata Specification. The 2025 CBPO Metadata Specification is based on previous CBPO metadata standards but contains some key changes that should be reviewed by data resource providers. Data resource providers must provide, at a minimum, the required elements specified for each data resource level defined in the 2025 CBPO Metadata Specification:

- **Level 1:** Includes StoryMaps, graphics, reports, and other non-tabular data that is presented in visual form. Primarily supports Discovery and Access, Transparency, and Classification Principles. This level is considered the minimal metadata that is required for all information types. All resources published at CBPO will be provided with metadata that meets the minimal requirements of Level 1.

- **Level 2:** Includes data that are not spatially referenced. Includes all level 1 content, in addition to non-spatial data resources. Supports all Level 1 principles, as well as Quality and Value. This level is considered minimal for all tabular data at CBPO that does not include geospatial features or coordinates.
- **Level 3:** Includes geospatial features and tabular data resources with coordinates. Supports all Level 1 and Level 2 principles. This level is considered minimal for all spatially referenced data resources at CBPO.

The corresponding metadata requirements for each data resource level are described in detail within the 2025 CBPO Metadata Specification.

Numeric Data Reporting Guideline

The Chesapeake Bay Program has adopted the guideline that all data generated, collected for, or submitted to the Chesapeake Bay Program shall report numeric data elements at the same level of precision as that of the original measurement. This guideline has a significant impact on data analysis and the decisions made based on these analyses. The information presented in this section regarding numeric data reporting is intended to be universal across all partners and programs. Data collected for specific programs at the CBPO may have additional requirements for numeric reporting.

The exact precision of recorded values must be maintained. Values should not be zero-filled to greater precision than actually recorded. For instance, if the measured value is 0.03, then the reported value should be 0.03 and not 0.030, which would imply precision to the third decimal place.

It is important to note that some software tools used in data processing may represent the data internally with more precision than the original measurement, and/or may round the value. For instance, even though a value of 0.3 was entered, the value may be stored and reported as 0.299999.

Values should be reported as zero ("0") only if the measured or recorded value is truly zero. Zeros represent a valid scientific result and should not be replaced with blanks, NULL, or other codes.

Missing values should be reported as NULL when a measurement was expected but no valid result was obtained. This situation may occur due to equipment malfunction, laboratory processing errors, or other issues where a sample was collected but could not be successfully measured. In these cases, the result must not be reported as zero, NULL, or left blank.

If a parameter was not sampled or was not applicable for a given sampling event, the data should either be excluded entirely from the dataset or coded with an explicit qualifier code, such as "NS" (Not Sampled). These cases must not be recorded as zero or NULL, and blank fields must not be used. This requirement ensures that "not sampled" values are clearly distinguished from both true zero results and missing values. Data providers must use the qualifier codes defined in the subject-matter specific data submission requirements.

Date and Time Guideline

The Chesapeake Bay Program has adopted the standard that all data generated, collected for, or submitted to the CBPO shall adhere to the ISO 8601 standard for date and datetime representation. The US federal government adheres to the ISO 8601 standard for date and datetime representation. Data providers submitting data to CBPO should use ISO 8601 for both date and datetime content.

Formats:

- **Date only:** YYYY-MM-DD (e.g., 2025-07-29)
- **Datetime:** YYYY-MM-DDThh:mm:ss±hh:mm (e.g., 2025-09-03T20:30:00) or YYYY-MM-DDThh:mm:ssZ (the T separates date and time; Z indicates UTC; offset can specify the difference from UTC; e.g., 2025-09-03T16:30:00-04:00).

For data providers who cannot adhere to ISO 8601 due to system or submission requirements for their content, the standard and format being used for date and datetime representation must be documented. Additionally, at a minimum, the date must be represented using a 4-digit year.

The information presented in this section regarding date and datetime reporting is intended to be universal across all partners and programs. Data collected for specific programs at the CBPO may have additional requirements for date and datetime reporting. Data providers should check with data managers to ensure that they understand the date and datetime requirements for their data resources.

Summary

The information provided in this document is intended to support contractors and grantees in developing data resources for delivery to CPBO such that content is created using consistent requirements, formats, and documentation. These universal guidelines may be complemented by subject matter specific requirements for water quality, toxics, wastewater, and best management practices (BMP) data. Data resource developers working with those types of data should review guidelines provided in the Related CBPO Documents and Guidelines section of this document. For more information about the guidelines and requirements outlined in this document, please contact the CBPO Data Managers.