Community Water System
Service Area Boundaries
Data Standard

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U.S. Environmental Protection Agency

Office of Water

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Purpose

Service area boundaries describe the geographic area that a community water system (CWS) serves. The U.S. Environmental Protection Agency (EPA), states, and several organizations have collected and/or estimated service areas of community water systems throughout the United States, but there is an increasing need for better, standardized service area data to support drinking water planning, environmental justice analyses, emergency response, and other uses. To increase transparency of information provided to users of published service areas and to ensure that users can determine which of the published geospatial files are of sufficient quality for their intended end use(s), the EPA recommends the following data standards for CWS service areas.

The primary goal of these standards is to encourage publishers of geospatial service area datasets to adopt standardized data fields, standardized terminology and definitions, and dataset metadata, which will enable users to make their own determinations about the quality of service areas for particular end uses. These standards also call for documentation of the methods used to generate individual service areas, which the EPA hopes will support the primary goal and drive improvement of the methods used to define service areas.

To provide feedback or ask a question about this draft standard, please contact the EPA at OW_OGWDW_DWIDD_DWDAB@epa.gov.

Scope

The EPA encourages data stewards to implement these standards for all CWS service area boundary shapes and geospatial datasets. The U.S. Safe Drinking Water Act defines a CWS as a public water system that has at least 15 service connections that serve year-round residents or that regularly serves at least 25 year-round residents. The service areas should include all parcels/customers currently served by the water system.

Some service area datasets include jurisdictional area boundaries – the area that the system currently serves plus locations that it may serve in the future or is legally required to serve but is not currently serving. These data standards focus on boundaries of the area currently served but may be applicable for datasets representing jurisdictional boundaries as well. The data standard calls for clear identification whether a boundary represents current area served or the jurisdictional boundary (see the "Data Elements for Community Water System Service Area Records" section below).

Geospatial Data Standards

The EPA has published Geospatial Policies and Standards that define the procedures for documenting and managing general geospatial data to ensure datasets are standardized to the extent practicable and documented to facilitate integration (such as, creation of a consistent, national data layer) and analyses.

For service area data, this standard recommends the CRS: EPSG:4326-WGS 84 coordinate reference system to ensure ease of mapping with existing service area data layers. The majority of states that provide publicly available service area data use this coordinate reference system.

Data Elements for Community Water System Service Area Records

For individual CWS service areas, the data elements identified in the table below should be included with each spatial record. There are both recommended and optional data elements. Recommended elements are the core fields that are needed at a minimum to allow users to understand if the information they are using is suitable for their intended use. Optional data fields augment the data and provide additional useful information about the service area and should be included where available.

Table 1. Data Elements Describing Individual CWS Service Areas

Data Element	Description	Recommended	Type (length)	Values
PWSID	The identifier for individual drinking water system recognized by and used in the Safe Drinking Water Information System (SDWIS). The first two characters of the PWSID typically consist of a two-letter state or EPA region code, followed by seven numeric digits.	Recommended	Char (9)	Such as, OH3102612
PWS Name	The name of the Public Water System (PWS).	Recommended	Char (100)	Such as, CINCINNATI PUBLIC WATER SYSTEM
Original Data Provider	The name of the entity responsible for creating the boundary or the original provider of the boundary. Typical values include: the water system itself; the specific state agency/department/division that provided the data; federal agency/department; or other organization.	Recommended	Char (100)	Examples: • UT Division of Water Resources • Yakima County • Mountain View Special Service District • City of Grandview • Massachusetts Water Resource Authority • California Water Resources Control Board • EPA Office of Research & Development • Environmental Policy Innovation Center

Data Element	Description	Recommended	Type (length)	Values
Data Provider Type	The type of entity responsible for creating the boundary or the original source of the boundary (such as, water system itself, state agency, federal agency, academic).	Recommended	Char (14)	• Water system • Federal agency • Tribal • State agency • Municipal agency • Private • Mixed (Public-private partnership) • Academic • Other
Method	Technique employed to generate the boundary as a GIS polygon feature, selected from a standardized list of comparable options. **See Table 2 below for definitions of the values that can be entered for this data element.**	Recommended	Char (50)	• GIS data • Heads-up digitization • Manual digitization • Modeled • Other
Method Basis	The original basis, input, or source of the boundary data, selected from a standardized list of comparable options. **See Table 3 below for definitions of the values that can be entered for this data element.**	Recommended	Char (50)	• Service area • Service lines • Verbal description • Written description • Geocoded locations • Water boundary tool • Parcel boundaries • Municipal boundary • County boundary • Census Place • Other

Data Element	Description	Recommended	Type (length)	Values
Method Details	Details of the techniques employed/methods used and the basis/data source used to generate the boundary.	Recommended	Char (1000)	Examples: • GIS data (KML, ArcGIS shapefile, QGIS) provided by utility during permitting • Modeled using machine learning and other techniques • Water system required to verify or update service area in boundary Viewer tool during annual Water User Survey • Digitized from maps submitted with the Annual Water Supply Report for 2003 • Digitized a 500' buffer boundary around system's major pipelines from paper map • Mapped by inspector during annual inspection • Mapped by contractors during site visits for water system project • Used the Municipal Boundaries of Oklahoma (CSA) to delineate system area
Date Created	Date the boundary data was initially created or published.	Recommended	Date (YYYY-MM-DD)	Such as, 2022-05-09
Date Modified	Date the boundary data was last modified.	Recommended	Date (YYYY-MM-DD)	Such as, 2023-11-28
Service Area Type	The type of service area the record represents.	Recommended	Char (20)	• Current service area • Jurisdictional area • Other
Verification Status	Indicates whether or not the boundary has been verified.	Recommended	Char (12)	• Verified • Not Verified • Unknown

Data Element	Description	Recommended	Type (length)	Values
Verification Date	Date the boundary data was verified. Leave blank if not verified.	Recommended	Date (YYYY-MM-DD)	Such as, 2023-11-28
Verification Process	Description of the procedures for reviewing and confirming and/or updating the boundary data. (e.g., independent review by Water Board on rolling basis, verified by water system annually, verified during inspection).	Recommended	Char (100)	Examples: • Independent review by Water Board • Verified by water system during annual reporting • Verified during annual or other inspection
Verification Schedule	Schedule or cycle for reviewing and confirming and/or updating the boundary data.	Recommended	Char (100)	Examples: • Annual cycle (January 1) • Rolling basis • Five-year cycle
Verifier Type	Entity responsible for verifying the accuracy of the boundary or acceptance.	Recommended	Char (14)	• Water system • Federal agency • Tribal • State agency • Municipal agency • Private • Mixed (Public-private partnership) • Academic • Other
Publisher (Owner)	Entity responsible for publishing the boundary. This may be the same as the entity responsible for creating the boundary or the original provider of the boundary, or it may be different. This may include the specific state agency/department/division that provided the data; Federal agency/department; the water system itself; non-profit or other type of organization.	Recommended	Char (100)	Examples: • UT Division of Water Resources • California Water Resources Control Board • EPA Office of Research & Development • Environmental Policy Innovation Center • USGS

Data Element	Description	Recommended	Type (length)	Values
Data Source Link	Link or URL to the data source for this boundary.	Recommended	Char (500)	Such as, https://opendata.gis.utah.gov/datasets/utahDNR::culinarywaterserviceareas/explore
Secondary ID	Secondary identifier (such as, State water system ID, other regulatory program ID), if available.	Optional	Char (20)	Such as, D9010, 22506
Secondary ID Source	The source of the secondary identifier value.	Optional	Char (40)	Examples: • SDWIS • State of XX water system

Data Element	Description	Recommended	Type (length)	Values

Supplemental information related to quality/ confidence of boundary accuracy	Any additional fields available that may be used to determine service area quality or accuracy. These elements will vary depending on the method used to generate the shape, source/owner of the shape, and other factors. Examples:
	  EPA-ORD modeled service areas:
	    • PWS Match method type: method used to assign Census Blocks to a PWSID
	    • PWS Match RF probability: probability that the PWSID assignment is correct
	  Environmental Policy Innovation Center (EPIC) CWS service areas:
	    • Geometry Source Detail: notes provided by the data sources themselves, about how the geometry was sourced
	  USGS public-supply water service areas:
	    • Issue: Defines what the potential issue is with the aggregated water service area
	  Examples from state datasets:
	    • Notes and/or Comments fields
	    • Area in square miles or acres of the service area (can be used for QA/verification)
	    • Data Source fields indicating the original source of the data and Data source Type fields indicating the type of data originally provided (multiple states have their own source and type fields with non-standardized options)
		Recommended if available	Varies	Additional State-Specific Examples:
				California
				• BOUNDARY_FILETYPE: Indicates the type of boundary file used to create the shape (WBT Tool; KMZ, Shapefile)
				• VERIFIED_NAME: Name of person who submitted the boundary to DDW.
				• VERIFIED_TYPE: Indicates the submitter's relationship to the boundary and/or dataset.
				
				Southwest Florida
				• SOURCE: The data source format, type, and purpose of the original water utility retail service information.
				
				North Carolina
				• WAVHM: whether all valves, hydrants, and meters are located for this system.
				• WASM: whether the system is mapped.
				• WAGIS: whether the system map is in GIS format.
				• WAUPDATE: whether the service owner is willing to update data annually.
				
				Washington
				• SERVICEAREATYPE: Type of service area (current, future, Indian, retail, old).

Method and Method Basis Data Elements

The recommended data elements "Method" and "Method Basis" in Table 1 that describes the technique employed and the basis or data input used to generate the specific boundary record are critical to allowing users to understand if the information is suitable for their intended use. Table 2 and Table 3 define each of the values that can be entered for these data elements.

Table 2. Definition of Allowable Values for the Method Data Element

Method	Description
GIS data	The boundary was generated directly as a GIS feature or was imported from an existing GIS boundary file (such as, a Census Place shapefile or GIS parcel dataset).
Heads-up digitization	The boundary was created by heads-up digitizing (that is, digitization by tracing features displayed on a computer monitor) a map or image file or files (such as, PDF, jpeg, png).
Manual digitization	The boundary was created by manual digitization.
Modeled	The boundary was modeled using machine learning or other geospatial modeling techniques.
Other	Another technique not listed was employed to generate the boundary as a GIS polygon feature. For records that list "Other," the "Method Details" data element should provide more specific information on how the boundary was generated to help the user understand if the information is suitable for their intended use.

Table 3. Definition of Allowable Values for the Method Basis Data Element

Method Basis	Description
Service area	The boundary is based on a representation of the service area. This would typically be provided by the water system itself.
Service lines	The boundary is based on the location of the system's service lines. This would typically be provided by the water system itself and could include buffered area around the service lines.
Verbal description	The boundary is based on a verbal description of the service area. The description would typically be provided by the water system but may come from another source (such as, from inspector phone call).
Written description	The boundary is based on a written description of the service area. The description would typically be provided by the water system but may come from another source (such as, from inspector notes or legal description of the service area).

Method Basis	Description
Geocoded locations	The boundary is based on a list of addresses or other location points served by the water system (such as, a list of addresses from a meter reading or billing list).
Water boundary tool	The boundary is based on data from a water service boundary tool designed to collect and verify water service area boundaries, such as, the Texas Water Service Boundary Viewer or California's Water Boundary Tool.
Parcel boundaries	The boundary is based on the parcel boundaries of addresses served by the water system (such as, a list of addresses from a meter reading or billing list).
Municipal boundary	The boundary is based on the municipal, or other city or town, boundary (or boundaries).
County boundary	The boundary is based on the county our other similar administrative jurisdictional boundary (or boundaries).
Census Place	The boundary is based on the Census Place geography boundary (or boundaries) as defined by the U.S. Census Bureau (including both Incorporated Place and Census Designated Place boundaries).
Other	The boundary is based on a source not listed. For records that list "Other," the "Method Details" data element should provide more specific information on the basis of the boundary to help the user understand if the information is suitable for their intended use.

Integration with Safe Drinking Water Information System Data Elements

The Safe Drinking Water Act requires that states collect and report to the EPA descriptive information about each public water system, such as, population served, county served, violation information, and enforcement actions, which the EPA maintains in the Safe Drinking Water Information System (SDWIS). When publishing CWS service areas, it is recommended to include what are considered the authoritative values for data elements from SDWIS for each water system service area. If values in SDWIS are known to be outdated or inaccurate, they should be corrected in SDWIS and associated with service area boundaries instead of having separate values in SDWIS and CWS service area records. Some examples of SDWIS data elements that may be useful to include with CWS service area records:

- Service connection count: the number of service connections to the water system.
- Population served count: the estimated average daily population served by a system.
- City served: the name of the cities that the facility serves.
- County served: the name of the county that the facility serves.
- ZIP Code served: the 5-digit postal ZIP Code that the facility serves.

- PWS type code: indicates the type of public water system: CWS (community water system); TNCWS (Transient non-community water system); NTNCWS (Non-transient non-community water system)
- Primary source code: the primary water source code: GW (Ground water); GWP (Ground water purchased); SW (Surface water); SWP (Surface water purchased); GU (Groundwater under influence of surface water); GUP (Purchased ground water under the influence of surface water source).
- Is wholesaler indicator: indicates whether the system is a wholesaler of water.

These data can be retrieved from SDWIS and linked to records in published datasets via the PWSID. A list of available data elements in SDWIS that can be downloaded from the EPA's Enforcement and Compliance History Online (ECHO) system can be found in the SDWA Data Download Summary and Data Element Dictionary.

Metadata for Service Area Datasets

This section provides standards for documenting a published dataset of service area boundaries for multiple CWSs. Metadata are important for the purpose of understanding whether a given dataset can support the particular use case intended by the data user. In the case of service area boundaries, jurisdictional boundaries may have the fidelity to support simple planning and awareness data visualizations but not have the fidelity needed to perform population analyses. Metadata give the data owner the opportunity to make clear which use cases may be supported with descriptive and clarifying text beyond what can be contained in the data elements alone. Many states publish service area datasets containing service areas for each CWS within their jurisdiction. The Environmental Policy Innovation Center (EPIC), a non-governmental organization, has assembled and released a provisional national map including states' datasets, service areas from individual CWSs, and EPIC's modeled service areas. The U.S. Geological Survey (USGS) has generated and published modeled service areas for a portion of the U.S., and the EPA is producing a dataset with both modeled and selected state published service areas of high quality.

Metadata for a service area dataset incorporates the data elements, definitions, and standards described for individual service area records. The EPA has established specifications for publishing metadata for datasets (EPA Metadata Technical Specification) that define the procedures and elements required for all datasets developed by the EPA. The EPA also provides guidance, suggestions, and best practices on geospatial metadata creation in the EPA Metadata Style Guide and in the Environmental Dataset Gateway to ensure datasets are standardized and to make it simpler for users to evaluate and access each dataset.

Metadata for service area datasets should adhere to EPA's specifications outlined in the resources above. In addition, stand-alone documentation should be prepared and disseminated along with the service area dataset that summarizes:

- Purpose

- Publisher
  - Contact information
- Summary of methodologies used to create service areas
  - Count of service area records by method
- Summary of review and validation procedures
- Overview of quality and limitations
  - Completeness, that is, number of CWSs included in the dataset and number of active CWSs present in the same geography
  - Caveats and limitations for expected end uses
  - Details on any known outliers
- Age of the service area records, that is, a summary of dates last modified for records in the dataset
- Anticipated date of next refresh
- Error notification and correction process
- Citations and URLs where data can be accessed
- Citations and URLs where additional documentation can be found

Ownership Details, Roles, and Responsibilities

This data standard is owned by the EPA and provides a template recommended for creating service area datasets and individual service area shapes so they can be used for various purposes and harmonized with other service area records and existing geospatial and drinking water system data.

Related Resources

- EPA Geospatial Policies and Standards
- EPA Metadata Technical Specification and EPA Metadata Style Guide, available in the Environmental Dataset Gateway
- EPA Community Water System Service Areas map
- EPA Safe Drinking Water Information System (SDWIS) database data elements available in the SDWA Data Download Summary and Data Element Dictionary
- USGS public-supply water service areas within the conterminous U.S. (2017)
- W3C Group Spatial Data on the Web Best Practices
- Florida Department of Environmental Protection GIS Location Data Standard
- Environmental Policy Innovation Center (EPIC) water utility service area boundaries website
- Environmental Policy Innovation Center (EPIC) U.S. Community Water Systems Service Boundaries (v3.0) and corresponding Provisional Water Utility Service area Boundaries Viewer
- EPIC's Service Area Boundaries State Playbook Methodologies
- Geoconnex.us Public Water Systems collection

- [Internet of Water GitHub repository](#)
- [SimpleLab US Water System Service areas (blog)](#)
- [McDonald, Y. J., Anderson, K. M., Caballero, M. D., Ding, K. J., Fisher, D. H., Morkel, C. P., & Hill, E. L. (2022). A systematic review of geospatial representation of United States community water systems. *AWWA Water Science*, vol. 4, issue 1, e1266](#)
- Arkansas [Public Water Systems polygon layer](#)
- Arizona [CWS service areas](#)
- California
    - [State Water Resources Control Board system area boundaries](#)
    - [Water Boundary Tool Project](#)
- Connecticut [Public Water Supply Map](#)
- Florida
    - [South Florida Water Management District current public supply utility service areas](#)
    - [Southwest Florida water Management District public supply service areas](#)
- Kansas [Boundaries for Rural Water Systems](#)
- Missouri [Public Drinking Water Districts](#)
- New Jersey [Purveyor Service areas of New Jersey](#)
- New Mexico [Public Water Supply Areas](#)
- North Carolina
    - [Current Public Water Systems MapServer](#)
    - [Map view of water systems](#)
- Oklahoma [Public Water Supply approximate system service areas](#)
- Pennsylvania
    - [Public Water Systems - Public Water Supplier Service areas](#)
    - [PWS Service areas data summary](#)
- Texas [Water Service Boundary Viewer](#)
- Utah [Culinary water suppliers service area boundaries](#)
- Washington [Drinking Water Service areas](#)
- West Virginia [Water Served Area](#)

Revisions and Review

These standards should be reviewed on an annual basis and as needed when the service area user community identifies changes may be needed.

Version	Date	Name	Description of Change