

```
XMLSchema" xml version="1.0" encoding="UTF-8"
exchangenetwork" <xsd:schema
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:nei="http://www.epa.gov/exchangenetwork"
targetNamespace="http://www.epa.gov/exchangenetwork"
elementFormDefault="qualified" attributeFormDefault="unqualified"
version="3.0">
<xsd:include schemaLocation="EN_NEI_Common_v3_0.xsd" />
<!--
Start of Schema Header
-->
<xsd:annotation base="http://www.w3.org/2001/XMLSchema"
documentation="Point" />
<xsd:documentation base="http://www.w3.org/2001/XMLSchema"
documentation="Available: http://www.epa.gov/exchangenetwork" />
<xsd:documentation base="http://www.w3.org/2001/XMLSchema"
documentation="input format" />
<xsd:documentation base="http://www.w3.org/2001/XMLSchema"
documentation="user" />
<xsd:documentation base="http://www.w3.org/2001/XMLSchema"
documentation="Agency" />
Default="qualified" attributeFormDefault="unqualified"
schemaLocation="EN_NEI_Common_v3_0.xsd" />
</xsd:schema>
</?xml>
<!--
Schema Name: NEI XML 3.0
Current Version
http://www.epa.gov/exchangenetwork
Description: The NEI XML 3.0 Point
Application: Varies by
Developed By: Environmental Information
-->
</?xml>
<!--
Schema Name: NEI XML 3.0
Current Version
http://www.epa.gov/exchangenetwork
Description: The NEI XML 3.0 Point
Application: Varies by
-->
</?xml>
```

Water Data Exchange (WaDE)

Flow Configuration Document

Version: 0.2

Revision Date: October 31, 2012



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Component Alignment

Flow Component Versions Currently Supported

Component	Version(s) Supported	Explanation (optional)
FCD	0.2	Draft Release
Schema	0.2	Draft Release
DET	0.2	Draft Release
WaDE	0.2	Beta Development

1 Introduction

1.1 Flow Identification

Flow Name:

Water Data Exchange (WaDE)

Flow Owner:

Sara Larsen, Water Data Program Manager, Western States Water Council

Flow Owner Contact Information:

Sara Larsen
Western States Water Council

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1.2 Background

The Water Data Exchange (WaDE) is a project being led by the Western States Water Council (WSWC), and in coordination with the Western Governors' Association (WGA), the U.S. Department of Energy National Labs, and the Western States Federal Agency Support Team (WestFAST). The purpose of the project is to better enable the exchange of water availability, water planning, and water use data between the states, with the federal agencies, and with the public. The project will also focus on working with federal agencies to make federal data more available to state water planners to assist in the development of their water plans.

These data are not only critical to water supply planners, but also to water quality managers. The amount of water available at a given time and how that water is allocated is critical information to someone developing a Total Maximum Daily Load (TMDL), someone evaluating a discharge permit, or someone reviewing or developing water quality standards (to name a few). These data have historically have not been available in any type of consistent format, making it difficult to do any broad-scale evaluation of water availability. In the arid west, water availability is becoming increasingly important as population is growing and water is being seen as a critical component to continued economic growth.

Numerous entities (including federal agencies, universities, and industry) are trying to better understand water availability, and how that availability may influence future investment. The WSWC has identified the need for these entities to be using state data for their studies. By making state data available to the public in a common format and via common services, the WaDE project hopes to achieve this goal. Conversely, many federal agencies are the stewards for data sets that are critical to state water managers. Some examples of these data include, but are not limited to, snow depth data (SNOTEL), stream gaging data, precipitation data, and reservoir height data. All of these data are similar in that they measure a given parameter, or set of parameters at a specific location, at a defined interval, over a period of time (for the purposes of this document, these data will be referred to as 'sensor' data. Currently there are several diverse methods and formats that the federal agencies use to publish these data. Efforts have been initiated to try to consolidate these methodologies and formats into a common format. A secondary goal of the WaDE project is to promote the idea of the federal agencies adopting a common approach for sharing this information.

WaDE will provide a state-to-state, state-to-fed, fed-to-state data exchange. The data exchanged will better support water planners in developing and implementing their water plans. The design of the system is such that data should flow seamlessly in a computer-to-computer fashion. Participants in this data exchange should not need to wait for a manual step in order to receive the data that is being requested. Data owners should also be able to control what data are shared and with whom. Participants benefit from being able to access the data from other partners following this same seamless approach. Participants also benefit by having their data published via a central system, thereby avoiding the need to invest in additional public access systems.

1.3 Flow Configuration Document Scope

WaDE is currently under development. The WaDE Flow Configuration Document (FCD) is intended to provide partners with information to participate in the development and testing process. The WSWC has developed a preliminary draft schema and defined services that partners would implement as part of the testing process. As partners implement WaDE as described in this FCD, a log of needed changes will be maintained by the WSWC. This version of the FCD is not intended to be used for production development by partners. Upon completion of the testing period, the WSWC will release Version 1.0 of WaDE, the WaDE schema, and this FCD. At that time, the system will be ready for production flow.

This FCD describes the WaDE schema for water availability, planning, use, and allocation data. It also provides background information on some proposed approaches for the sharing of sensor data. WaDE uses REST and SOAP web services for the exchange of information between states. This FCD describes these services and under what circumstances these services would be used. The predominance of data will be shared using REST services, with some of the SOAP services being used to gather information about participating Nodes (using the Exchange Network GetServices request) and retrieving information about data available at each Node (using Exchange Network Query services).

This FCD covers the exchange of the following types of information:

Water Quantity Summaries by watershed, state basin, or county for:

- Water Availability
- Water Supply
- Water Allocations
- Water Use
- Regulatory Restrictions

Detail Water Quantity data by watershed, state basin, or county for:

- Water Allocations (water rights), diversions, places of use, and return flows

1.4 Data Flow Overview

WaDE defines data services that be used by trading partners to exchange water quantity information with one another. Data is made available by state or tribal partners via REST publishing services. Which services are available on each node are published via a GetServices request and made available via ENDS. Available services are registered within the data exchange. A catalog of those services and a summary of the data available via those services are registered within the exchange.

It is intended that the WaDE REST services will follow the Exchange Network (www.exchangenetwork.net) specifications once those specifications have been finalized. WaDE will support version 2.0 of the Exchange Network's node web service specifications for all transactions that are not REST based. For example, the exchange of catalog information will be implemented via an Exchange Network Query web service.

1.5 Flow Access and Security

All REST service requests are open to the public, and as such do not require any accompanying authentication token. No data made available via WaDE should be sensitive or confidential. Trading partners should consider this as they determine which data sets to make available via WaDE.

For all services that are not REST based, WaDE will require that those requests be accompanied with a valid NAAS security token per the Exchange Network's Node specification. All partners implementing these non-REST services must be authorized to NAAS and receive a valid security token before these services can be invoked. For Node 2.0 implementations, users must authenticate against NAAS 3.0.

1.6 Flow-level Business Rules

Current Business Rules: The Data Exchange Template (DET) contains the list of data elements along with their respective business rules. It is recommended that the user familiarize themselves with the the

DET as a quick reference to help them understand the WaDE XML structure, and to understand the business rules that are being applied.

Fault Follow-up Actions: All Query requests for a partner's catalog information will be validated against the business rules. A summary of errors will be returned to the partner via email or other agreed upon method. A partner's services cannot be registered in WaDE until a catalog request has been successful in retrieving information. Trading partners are responsible for ensuring that REST outputs match the WaDE XML schema and business rules prior to registering their WaDE services.

1.7 Additional Flow Tools and Resources

This FCD is intended to define the supported data services, as well as the approaches and processes that are used to exchange information. This FCD is intended to be used in conjunction with the following support documents:

WaDE Data Exchange Template (DET)

The DET provides a full list of all of the data elements being exchanged via WaDE as well as the relevant business rules. Data partners should familiarize themselves with the DET prior to enabling WaDE services. The DET is available at: <http://westgov.org/wswc/wade/draft/index.htm>.

2 Submission Composition

2.1 Implementation of the Header/Payload for the WaDE Network Exchange

2.1.1 Overview

WaDE has not implement the Exchange Network Submit web service since data are maintained only in the trading partners' systems and not copied to a central system (with the one exception to this being the catalog which is populated via a Query service). As such, WaDE has not made use of the Exchange Network Header or payload operations. Each Query request replaces the entire catalog for that trading partner.

3 Registering with WaDE

WaDE supports Query and REST services. In order to make these services available to other partners, a trading partner must first register these services within ENDS and/or make information about these services available via a GetServices request. WaDE relies on the concept of a catalog being maintained that contains the list of services that each node provides, along with the types of data, the relevant dates of the data, and how much of each type of data are available on each node. These additional elements are unique to WaDE and are an extension of the information already contained within ENDS. The process for making data available via WaDE is as follows:

1. A trading partner enables the GetCatalog service via their Node.
2. The WaDE GetCatalog service is registered within ENDS.

3. The trading partner determines which authorized partners would have access to the GetCatalog services via a query request. At a minimum, the Central Catalog Node should be enabled as an authorized partner.
4. The Central Catalog or another authorized trading partner Authenticate against the Node using the NAAS and receives a security token.
5. Using the token acquired in step 4, the Central Catalog or another authorized trading partner initiates a Query request against the node for the GetCatalog service. The GetCatalog service responds to the requestor with all of the relevant data available on that node along with the REST endpoints for the available services.
6. REST services are registered via the GetCatalog service along with the REST endpoint for the services.
7. REST services can also be registered via ENDS once a standard Exchange Network protocol has been established, however, it is not expected that ENDS will accommodate all of the functionality of the WaDE catalog.

4 Data Access

4.1 Data Access Services using the Exchange Network

The WaDE data flow provides the ability for Exchange Network (EN) partner nodes (i.e., node clients and full nodes) to request and receive WaDE catalog data in XML payloads. This flow is implemented according to EN practices and recommendations via Query web services. WaDE also makes extensive use of REST services to provide access to a trading partner's data via a defined set of services. Whereas Query web services require a NAAS authentication, the WaDE REST services do not.

4.1.1 Registration / Authorization

Users of the Query services must be registered with NAAS and must have NAAS policies to perform these services on the Node on which the request is made. The Administrator for that Node will grant privileges. REST services do not require any registration or authorization.

4.1.2 Query

The GetCatalog service is the only service implemented via Query within WaDE. The purpose of this service is to request a summary of data available from a partner node. Any authorized partner can request catalog information from another partner's node. The purpose of the GetCatalog request is to provide a partner with a high-level summary of what data are available so that they can make informed REST requests against the partner's node.

The general structure of a Query request:

Security Token: valid NAAS security token
Dataflow: WADE
Return Schema: WaDE v0.2 Catalog Schema
ServiceName: GetCatalog
Row Id: 0
Max Rows: -1
Parameters:

Parameter Name	Description	Parameter Type	Required?
LocationType	The type of location for which the catalog should be retrieved (allowed values include: HUC, COUNTY, REPORTUNIT, STATE)	varchar	Yes
LocationText	Text of the location for which the catalog should be retrieved (i.e. a HUC value such as 17030108 or a State abbreviation such as OR). The service will return the catalog only for the area specified.	varchar	Yes
OrganizationIdentifier	Unique identifier for an organization (owner of the data). Provide this parameter if the desired catalog should only relate to one specific organization. Otherwise, all organizations within the specified location will be retrieved.	varchar	No
StateIdentifier	State abbreviation that can be provided to limit the catalog return to information from within just one state. This should be used if the LocationText is a HUC that crosses state boundaries, but you're only interested in returning the catalog from one of the states.	varchar	No

If error occurs the Node will return following errors:

- User is not authenticated
- User is not authorized to perform WaDE Query operation
- Invalid service request
- Invalid service parameter
- Node system error

Notes:

- Mandatory parameters must always be passed
- 2 options in passing Node 2.0 empty optional parameters
 - o no key and no value
 - o key and empty string value

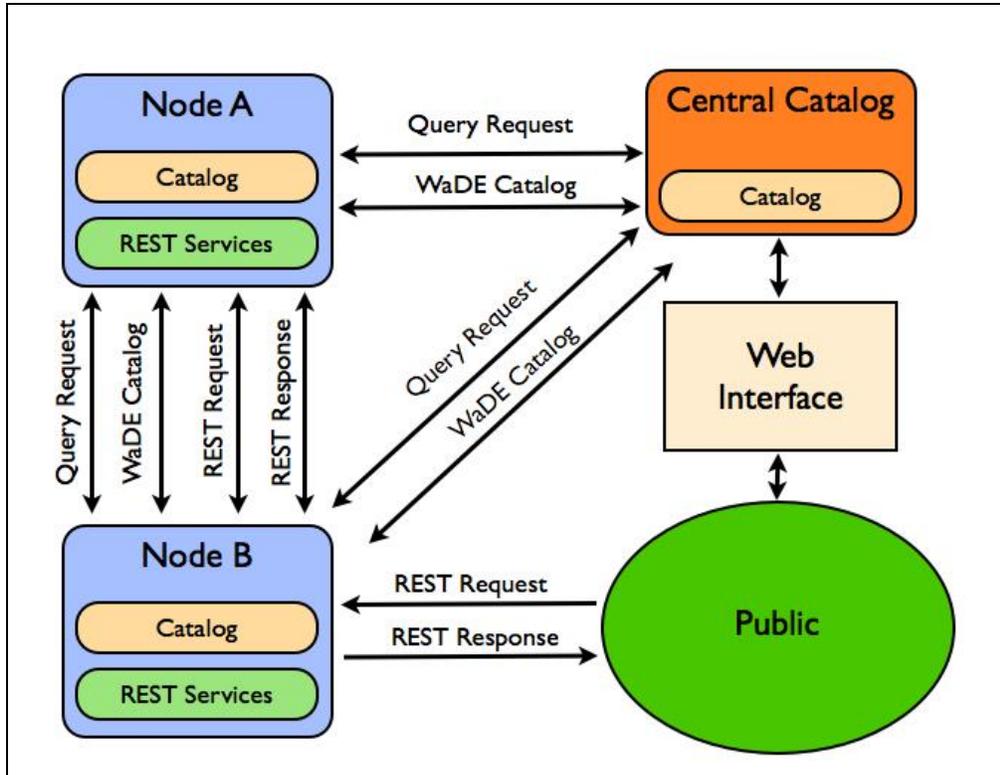


Figure 1. WaDE Data Exchange between nodes

4.2 Data Publishing Services using REST

This FCD defines the WaDE REST publishing services that would need to be implemented by a trading partner in order to participate in the WaDE data exchange. These services provide access to data on a trading partner's node. By doing this, a user will have access to the most current data that are being provided by a trading partner.

4.2.1 Access / Authorization

A username and password is not required to obtain data using the REST interface as only public data is made available.

4.2.2 Services

All REST services have a base URL defined by the trading partner and registered via the WaDE catalog services and within ENDS. WaDE URLs should be structured as follows:

Base_URL/dataflow/servicename/operation?Parameter1=Value1&Parameter2=Value2&Parameter3=Value3

An example URL following this structure would be as follows:

<http://westernstateswater.org/WADE/GetSummaryByLocation/Query?LocationType=HUC&LocationText=17100302&OrganizationIdentifier=ORWRD&DataType=Availability>

All trading partners should implement the services in the same manner, with the only variance being the base URL.

At the time that this FCD was developed, the Exchange Network REST specification was still under development. As the Exchange Network REST specification matures, changes will be incorporated into this structure to accommodate the Exchange Network REST specification.

Since these REST Services are intended to respond in a synchronous manner, trading partners should monitor the performance of the services to ensure that they are responding in an acceptable manner.

4.2.2.1 WaDE REST Services Descriptions

Service Name: GetSummaryByLocation

Operation: Query

Return Schema: WaDE v0.2 Schema

Description: Returns summary data for a specified location, organization, and time period. Summaries can include allocation summaries, use summaries, supply summaries, regulatory restriction summaries, and availability summaries.

Parameters:

Parameter Name	Description	Parameter Type	Required?
LocationType	The type of location for which the catalog should be retrieved (allowed values include: HUC, COUNTY, REPORTUNIT, STATE)	varchar	Yes
LocationText	Text of the location for which the catalog should be retrieved (i.e. a HUC value such as 17030108 or a State abbreviation such as OR). The service will return the catalog only for the area specified.	varchar	Yes
OrganizationIdentifier	Unique identifier for an organization (owner of the data). Allowed values are found in the Catalog.	varchar	Yes
ReportIdentifier	Unique identifier for the report (which specifies the time frame for the data to be returned). Allowed values are found in the Catalog.	varchar	Yes
DataType	Type of summary data to be returned. Leaving this value blank returns all summary data for the above specified parameters.	varchar	No

Service Name: GetDetailByLocation

Operation: Query

Return Schema: WaDE v0.2 Schema

Description: Returns detail data for a specified location, organization, and time period. Detailed data is organized by water allocations (water rights), and contain information on diversions, uses, and return flows.

Parameters:

Parameter Name	Description	Parameter Type	Required?
LocationType	The type of location for which the catalog should be retrieved (allowed values include: HUC, COUNTY, REPORTUNIT, STATE)	varchar	Yes
LocationText	Text of the location for which the catalog should be retrieved (i.e. a HUC value such as 17030108 or a State abbreviation such as OR). The service will return the catalog only for the area specified.	varchar	Yes
OrganizationIdentifier	Unique identifier for an organization (owner of the data). Allowed values are found in the Catalog.	varchar	Yes
ReportIdentifier	Unique identifier for the report (which specifies the time frame for the data to be returned). Allowed values are found in the Catalog.	varchar	Yes
DataType	Type of summary data to be returned. Leaving this value blank returns all detail data for the above specified parameters.	varchar	No

4.2.2.2 Future REST Services for Consideration

The WaDE Integrated Project Team is also considering the implementation of some additional services that may be included in the initial release of WaDE. These services are for discussion only, and are not currently implemented as part of the WaDE v0.2 release.

Service Name: DrawDiversions

Operation: Query

Return Schema: WaDE v0.2 Schema

Description: Returns a subset of the WaDE schema sufficient to draw the diversion points that would be within a user specified boundary (i.e. lat/long box or other polygon). This service would be used to support mapping applications that need to draw the diversion locations to allow the user to interact with individual diversions.

Parameters:

Parameter Name	Description	Parameter Type	Required?
LatLongString	A series of latitude and longitude coordinates, separated by a ',' that defines the vertices of a polygon. The service will return all diversion contained within the polygon. Requests that return too many diversions (>10,000) will return an error that would require the user to narrow the search criteria. Lat/long coordinates to define the polygon would be as follows: "latitude longitude, latitude longitude,"	varchar	Yes
OrganizationIdentifier	Unique identifier for an organization (owner of the data). Allowed values are found in the Catalog.	varchar	Yes
ReportIdentifier	Unique identifier for the report (which specifies the time frame for the data to be returned). Allowed values are found in the Catalog.	varchar	Yes
BeneficialUseType	Text describing the uses for which the water can be diverted. If provided, then only the diversions which are allowed to divert for that use will be returned. Otherwise all diversions will be returned.	varchar	No

Water Mark-up Language

A portion of the WaDE project will also focus on improving the exchange of in-situ hydrologic data (i.e. streamgaging, snow depth, reservoir height, precipitation, etc.) The Open Geospatial Community (OGC) is reviewing Water Markup Language v2 as an international standard for sharing these types of data. As this evolves, WaDE will adopt and implement the schema and services as part of the WaDE data flow. For more information on WaterML 2.0 see:

<http://www.opengeospatial.org/projects/groups/waterml2.0swg>

Geo Services

Many trading partners define their own reporting units (areas by which they summarize their water information). WaDE will need to display these reporting units on a map. Additionally, places of use (locations where water is used) is a geographic data set that would be valuable to share via WaDE. The most effective way to share these types of data are to use standard geospatial services (i.e. a Web Feature Service). The IPT will need to determine the best approach for sharing these data, and how to tie them to the data being made available in the WaDE schema.

4.2.3 Error Handling

In case of an error, REST services will respond with an HTTP Error Code and XML containing application error code and message.

Sample HTTP error with xml response:

```
HTTP/1.1 403 Forbidden
Date: Wed, 31 Oct 2012 16:03:03 GMT
Content-Type: application/xml
Content-Length: 160
```

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<Error>
<Code>E_RestServiceUnavailable</Code>
<Message>REST Service currently unavailable</Message>
</Error>
```

Error Codes:

HTTP Error Code	Error Code	Message
400	E_RestNotSupported	REST currently not supported
403	E_RestUnavailable	REST currently unavailable
403	E_RestServiceUnavailable	REST Service currently unavailable
500	E_TechnicalDifficulties	we are experiencing technical difficulties

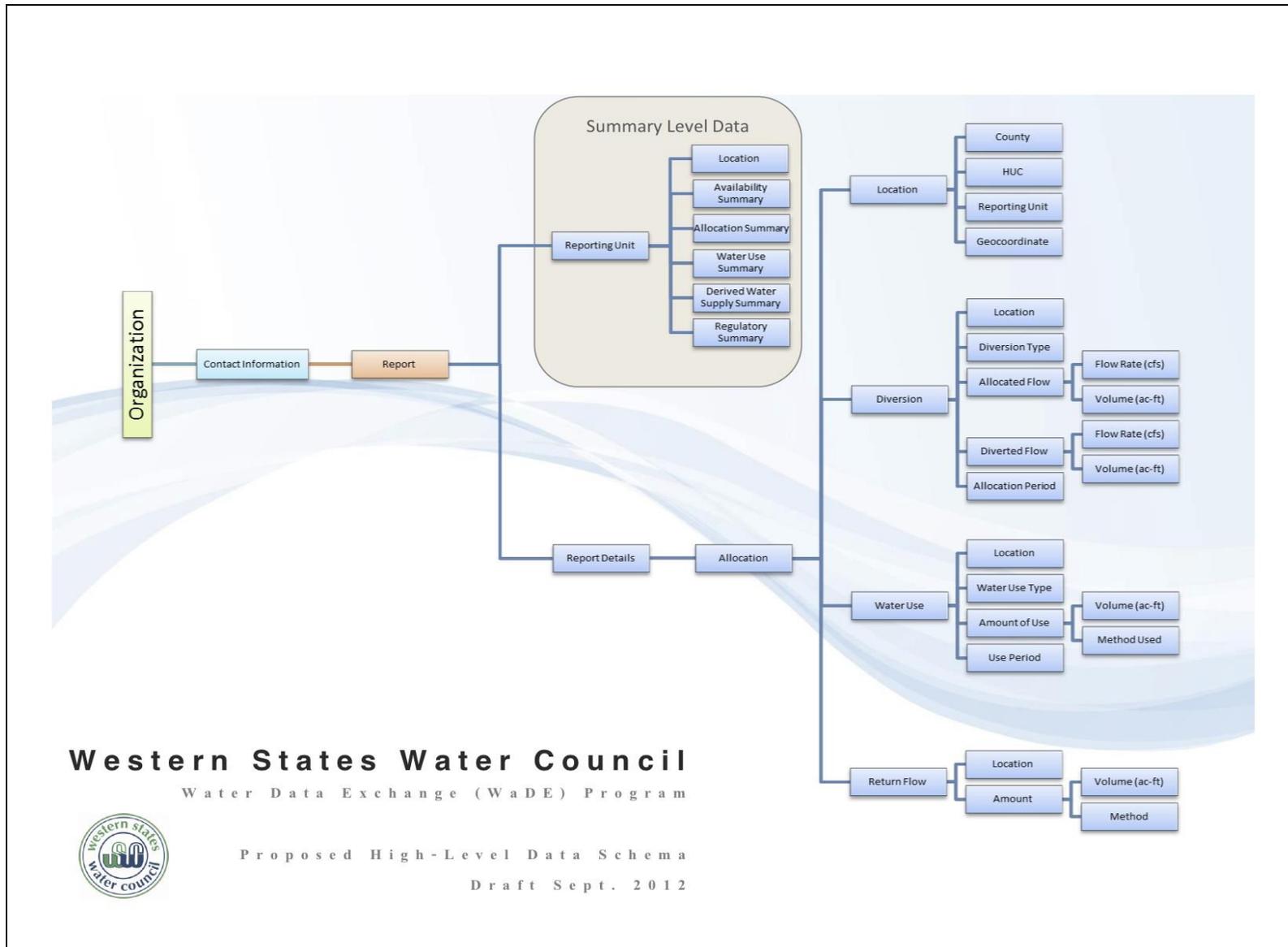


Figure 2. High Level WaDE v0.2 Schema