Water Planning Information Exchange

Business Requirements Document (BRD)

Department of Water Resources

Sacramento, CA

Version 1.1

8/25/13

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Introduction			
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Preface:	This document contains an introduction to the project and will preface all following document deliverables such as the As Is Model, To Be Model, Business Requirements, Use Cases and Story Boards, and Solution Requirements. It must be approved by the Business Sponsor and Business Manager after the review of the Subject Matter Experts. This document is prepared by the Business Analyst.
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Date	**Version**	**Update Log**
6/4/13	0.01	Draft version of the BRD for informal review by Program Manager and Project Manager

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Date	**Version**	**Update Log**
8/5/13	0.02	BRD updated based on comments from the Program and Project Manager and modifications based on feedback from Tim Garza.
8/20/13	1.0	Updated with changes from the subject matter experts and Program Manager.
8/25/13	1.1	Updated with changes from Eric Senter.

Part 1: Purpose

This business requirements document template conforms to industry best practices in business analysis and is the primary tool for structuring requirements-gathering activities. Interim feedback loops and approvals for business requirements document sections are achieved in an iterative manner, as requirements become clear over successive meetings with project stakeholders, both primary and secondary users. This facilitates the final review and approval of the overall document, which by then will contain “no surprises.”

Section 1.1: Different Types of Requirements

Functional requirements can only be derived following elicitation and documentation of business and user requirements. The distinctions between these different requirements levels are important.

1. Regulatory Requirements—encompass all the restrictions, licenses, and laws applicable to a product or business. They may be internal (driven by the company itself) or external (driven by a government or other regulatory body), and are usually nonnegotiable.
2. Business Requirements—place the business at the center of focus and tie the project to documented strategic, tactical, and operational goals. If developing products or services as part of the overall direction of the company, product or service features need to be covered at a high level in this section, then in detail under User Requirements.
3. User Requirements—place the user at the center of focus and describe—with flowcharts, use case diagrams, use case scenarios, and other process models—the TO-BE user experience with the new system. In some cases, especially where business processes are being modified, it may also be necessary to document the AS-IS state of user experience with the current system.
4. Functional Requirements—place the proposed system at the center of focus and provide a prioritized list of capabilities the system must demonstrate in order to satisfy business and user requirements (Defined in the Software Requirement Specification (SRS).
5. Nonfunctional Requirements—refer to system characteristics that must be fulfilled related to things like the user interface, access security, availability, robustness, system failure, integration, migration, and documentation. As such, they do not deal with the actual functionality of the system, but nevertheless represent key project success factors. (Defined in the Software Requirement Specification (SRS).)

Section 1.2: Prioritizing Requirements

The following interpretations regarding the prioritization of requirements have been used:

- Requirements that determine project success (must have)—will be included in this release. These items represent core functionality and must be present. Absence of any “must have” functionality represents project failure.
- Requirements that add value (should have)—will be included in this release provided that all “must have” requirements have been met and sufficient project resources and time remain.
- Requirements that add convenience (nice to have)—will be included in this release provided that all “must have” and “should have” requirements have been met and sufficient project resources and time remain.

Section 1.3: Intended Audience

Both readers and approvers of the business requirements document are identified here. Organizational titles and functional project roles for each individual are included. An organization chart is very helpful in complex reader/approver environments.

In priority order, the main reviewers of this document are—

1. Client —review and approve
    a. Greg Smith – Program Manager
2. Project Manager —review, approve, and integrate into construction project phase
    a. Diane Huey
3. Systems Analyst—review and translate into system specifications (SRS)
    a. Brian Niski
    b. Danny Luong
    c. Jay Song
4. Users/Subject Matter Experts — review, approve, and provide feedback to client
    a. Greg Smith
    b. Eric Senter
    c. Mary Scruggs
    d. Bruce Agee
    e. Michael Gardner

Section 1.4: Analysis Approach

The following provides a brief description of the approach used to develop each deliverable.

Section 1.4.1: As Is Environment Approach

M Corp's approach to documenting the Water PIE As Is Environment was to:

- Understand the Department's vision for Water PIE
- Understand the prior water information exchange efforts, such as BDAT and IWRIS
- Understand the initial data sources, their data sets (spokes), their process flow and systems

The M Corp team's method for analyzing the current environment was to interview the DWR Program Manager regarding the larger vision for Water PIE. Next, the team interviewed subject matter experts regarding the Water PIE prototype and the three initial data exchange systems. This effort identified the purpose of the system, the users of the data, data types the system supports, and the data flow and business processes supporting the data.

Section 1.4.2: To Be Environment Approach

M Corp's approach to documenting the Water PIE To Be Environment was to:

- Understand the As Is Environment

- Understand the data to be exchanged
- Understand any restrictions on data exchange
- Understand at what point in the work flow process the data is available for exchange

The M Corp team's method for investigating the To Be environment was to interview subject matter experts regarding the Water PIE prototype and three exchange systems.

Section 1.4.3: Draft Business Requirements

M Corp's approach to documenting the Water PIE Draft Business Requirements was to:

- Understand the To Be Environment
- Understand the business needs of the subject matter experts

The M Corp team's method for gathering Regulatory, Business, User and Functional Requirements was to interview subject matter experts in brain storming sessions by data source. The team documented the requirements and reviewed them with the subject matter experts. Next, the team gathered a cross functional group of subject matter experts to identify requirements from the perspective of the Water PIE hub. The project team distributed the entire set of draft business requirements for rating by the data source subject matter experts. This weighting allowed the team to evaluate the importance of requirements and identify where conflicts may exist.

The team brought conflicts to the Steering Committee for evaluation and direction and updated the Draft Business Requirements based on Steering Committee decisions

Section 1.4:4 Use Case Approach

M Corp's approach to documenting the Water PIE use cases and storyboards was to:

- Understand the business need for Water PIE phase I
- Understand the business need for Water PIE in later phases

The M Corp team's method for developing the use cases was to draft use cases and storyboards based on the business needs identified during the initial business requirements analysis. The team held cross-functional working sessions with subject matter experts to refine the use cases and storyboards. Finally, M Corp updated the use cases, storyboards and requirements based on feedback received during the working sessions and provided by the program manager. This document is the result of these efforts.

Part 2: Business Project Scope

The Water Planning Information Exchange (Water PIE) project is a multi-phase project involving the analysis, design, development and implementation of a web-based data sharing application. This document presents an introduction to all of the deliverables for phase I of the project, which focuses on initial analysis and requirements for the system. The introduction provides a brief description of the:

- Organization
- Water PIE system vision
- Water PIE project and phases
- Phase I scope

Section 2.1: Organization Background

The mission of the Department of Water Resources (DWR) is to manage the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments. DWR develops business strategies and automated tools to align with this mission and provide information to the public as well as local and regional agencies, which they can use to increase the reliability and sustainability of water supplies.

The California Water Plan and the Integrated Regional Water Management Program are mandated programs that are integral to DWR. Both of these programs have a need to share and access water management planning information with other DWR programs, other State agencies, and local, regional, state, federal, and tribal organizations.

DWR is responsible for preparing the California Water Plan Update (Water Code section 10000). The California Water Plan is updated every five years to address water challenges facing California, such as satisfying the needs of the State's growing population, quantifying water demands and supplies, and identifying management strategies to diversify the regional portfolio assets. There is a departmental need to improve data management in support of the California Water Plan and for integrated water management in California.

The California Water Plan Advisory Committee recognized the importance of, and the difficulties organizations have, with data. In the 2005 Update, the California Water Plan made fourteen recommendations. Recommendation 11 - Improve Water Data Management and Scientific Understanding, states:

> "DWR and other State agencies must improve data, analytical tools, and information management and exchange needed to prepare, evaluate, and implement regional integrated resource plans and programs in cooperation with other federal, tribal, local, and research entities."
>
> California Water Plan, Update 2005. Volume 1. Chapter 5. Page 5-17.

In Update 2009, the California Water Plan recommended developing Water PIE. (California Water Plan, Update 2009. Volume 1. Chapter 6. Page 6-15.)

Water PIE is an essential step towards helping to integrate water management in California. Water PIE establishes the technological framework by which water management planning data can be accessed and shared.

The long-term goals include allowing organizations around the state to share their data to better integrate water supply, water quality, flood management, watershed management and environmental stewardship. This data access and sharing will support integrated water resource planning at all levels of government, including that done by the California Water Plan.

Section 2.2: Water PIE Vision

Water PIE uses the terms “hub” and “spoke” for two purposes:

- To define the features and responsibilities of Water PIE.
- To limit the architectural choices for Water PIE.

The features of Water PIE include a hub and many spokes. The hub is a central location for people to find, view and retrieve information. A spoke is data collected and managed by an organization and voluntarily shared through Water Planning Information Exchange.

For each feature, Water PIE defines responsibilities for the hub and spoke. DWR has administrative responsibilities for Water PIE that will have to be included in the hub. Spoke stewards have responsibilities for registering data with Water PIE, and maintaining this connection. Without the terms “hub” and “spoke” in the business requirements, references to features and responsibilities would become cumbersome and unwieldy.

The terms “hub” and “spoke” limit the possible architectural choices, but do not define them. Information sharing must be supported by an adaptable and compatible environment to ensure a harmonious blend of the information, the technology, the people, and the institutions. What may be a good technical solution many not be approved by institutions because of regulations or policies. Information sought by users may not be able to be shared for a variety of reasons, such as confidentiality or the information is only draft and not finalized.

The steering committee and subject matter experts require that spoke stewards be able to control the data that they collect and manage. The final architectural solution must guarantee this requirement. This document uses “hub” and “spoke” to reinforce this requirement.

Spoke stewards are passionate about their data. If spoke stewards cannot control their own data, then they will not voluntarily participate. If organizations choose not to participate, this will limit the ability of the project to satisfy requirements of the California Water Plan and the Integrated Regional Water Management Program.

In order to control the data, spoke stewards want to know and understand all of the analytical transformations before the system provides the information to a user. If analytical transformations are added to the ones defined in this business requirements document, then spoke stewards must be given timely notice and the option to withdraw.

There are cases where spoke stewards may want something beyond a spoke. Water Planning Information Exchange will potentially connect many large and small organizations. Small organizations do not have the information technology staff that larger organizations do, and may be willing to give up some of control of their data in order to share the data. We can expect smaller organizations to want “some place” to put their data because they do not have the resources necessary to build the linkages between a spoke and the hub. In these cases, a strict definition of “spoke” may not be appropriate.

Water PIE is envisioned to be a web-based, federated system to provide tabular and spatial data access for local, regional, State, Federal and tribal organizations to publish and share water management planning information. Water PIE can be thought of conceptually as a hub-and-spoke model. Each spoke is a data set from an autonomous data source as displayed in Figure 1.

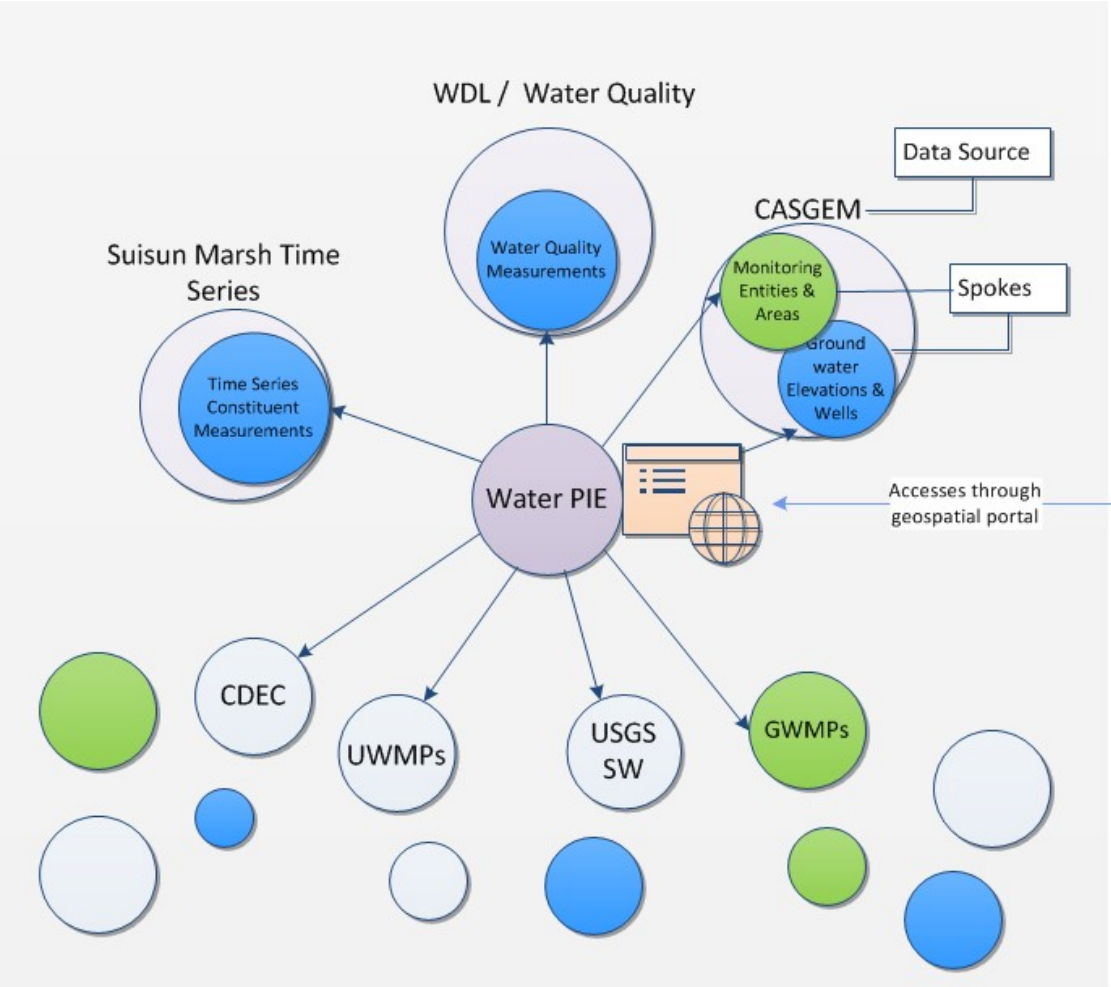

Figure . Hub, Data Source and Spoke Concept

Water PIE will access data sets (spokes) from data sources or systems owned and maintained by various organizations across the State. Participation in Water PIE is voluntary. The amount and type of information an organization shares will be determined by the organization. Data made available through the hub may be a subset of the data available in the data source itself. Water PIE is not intended to supplant the purpose, functionality or processes associated with a data source or spoke.

The hub is an interface through which people access data sets. Water PIE will eventually link many, heterogeneous data sets together to support integrated water resources planning. Data sharing will be voluntary. Each organization will be responsible for the information it shares and will manage access to the data through Water PIE.

The hub will be a portal to water resources information. Water PIE will use a web-based, geographic user interface for the portal. For organizations that do not wish to store their data at DWR, the hub will only store the data necessary to define the spoke, such as metadata.

One of Water PIE's goals is to allow users to easily find what information different organizations collect and where the information is collected. The information from different organizations can be leveraged to address questions that a single organization alone could not answer.

The potential for sharing information with the Water Planning Information Exchange is enormous. In California, there are 481 incorporated cities, 58 counties, about 500 urban water utilities that prepare urban water management plans and about 125 agricultural water utilities. Each of these groups could share information that would improve the California Water Plan and regional water management solutions. In addition, State and federal agencies collect and publish water resources information. This information could be shared through Water Planning Information Exchange, to compliment what is available on individual program web pages. Finally, there is information from non-profit organizations and educational institutions. Water Planning Information Exchange would provide a method for these organizations to share information that they would not otherwise have. All of these organizations could be spokes on the Water Planning Information Exchange wheel.

Section 2.3: Water PIE Project

The Water PIE project is organized into phases as identified in the table below:

Project Phase	***Key Components***
Phase 1 *(this project)*	*Analysis*
	Requirements
	Documentation
Phase 2 (future)	*Design*
	Prototype
	Development
	Test
	Implement Framework
	Initial Data Sources
Phase 3 (future)	*Technical Framework Refinement*
	Interface Enhancements

	Additional Data Sources
Phase 4 (future)	*Maintenance and Operations*

Although Water PIE is envisioned to access many heterogeneous data sources in support of the strategic water resources planning by the California Department of Water Resources, the initial implementation of Water PIE (phase 1 & 2) includes a few select data sources:

- California Statewide Groundwater Elevation Monitoring (CASGEM)[1]
- Water Data Library (WDL)/Water Quality
- Suisun Marsh Time Series System

The data sets from these data sources will be the first spokes of Water PIE. Phase 3 of the Water PIE project will refine the framework and implement additional data sources. Phase 4 will be operation and maintenance of the system.

1 NOTE: This and other documents related to the proposed Water PIE system use "CASGEM" as an all-inclusive term to describe information gathered by the California Statewide Groundwater Elevation Monitoring Program and the backend database of groundwater levels that DWR manages. The database is also referred to as the Water Data Library Groundwater Module, or WDL/Groundwater. Near the end of M Corp's engagement, DWR decided to promote the use of the term "Water Data Library/Groundwater" to describe the database backend, which contains data elements that are not specific to the CASGEM Program, and "CASGEM" to include data elements that are more specifically related to aspects the California Statewide Groundwater Elevation Monitoring Program. In the interest of expediency, the terminology in these documents has not been changed; however, future phases of the Water PIE project should be cognizant of this terminology change.

Part 3: As Is and To Be Overview

This section provides a brief overview of the As Is environment of the Phase I data sources (CASGEM, WDL/Water Quality, and Suisun Marsh Time Series) and an overview of the hub prototype (IWRIS).

Section 3.1: As Is Overview

The three initial data sources (CASGEM, WDL/Water Quality, and Suisun Marsh Time Series) are not integrated, support separate programs, and contain disparate data as displayed in figure 1 below.

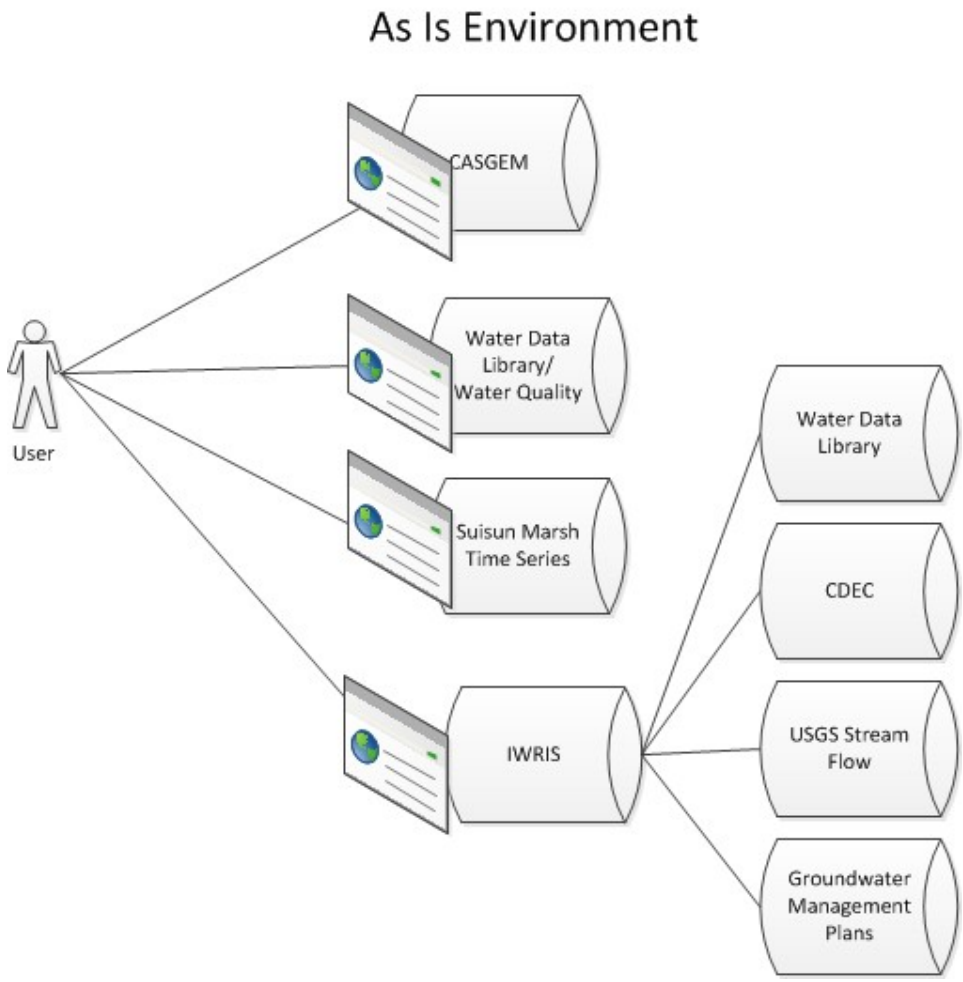

Figure 1. As Is Overview

Each data source has its own GIS/map based method of disseminating data. Users access data through various program websites and applications.

IWRIS is DWR's first attempt at providing a data exchange and can be viewed as a prototype for Water PIE. IWRIS is no longer supported and is not as extensible as Water PIE is envisioned, but is examined in this document to understand the functionality it currently provides as well as lessons learned.

Appendix E describes Phase I data source and the prototype hub (IWRIS) from the perspective of purpose, functionality, data types and process flow, users, technical background, and issues and opportunities.

Section 3.2: To Be Environment

Section 3.2.1: Functionality Overview

The hub will be a map based interface where users can view and access data from many different programs related to California's water management efforts. The hub must support business needs from the data user, the spoke, and support hub administration. Figure 2 is a Business Interaction Model for Water PIE, which depicts the providers and data sources, system interactions and data users of Water PIE information.

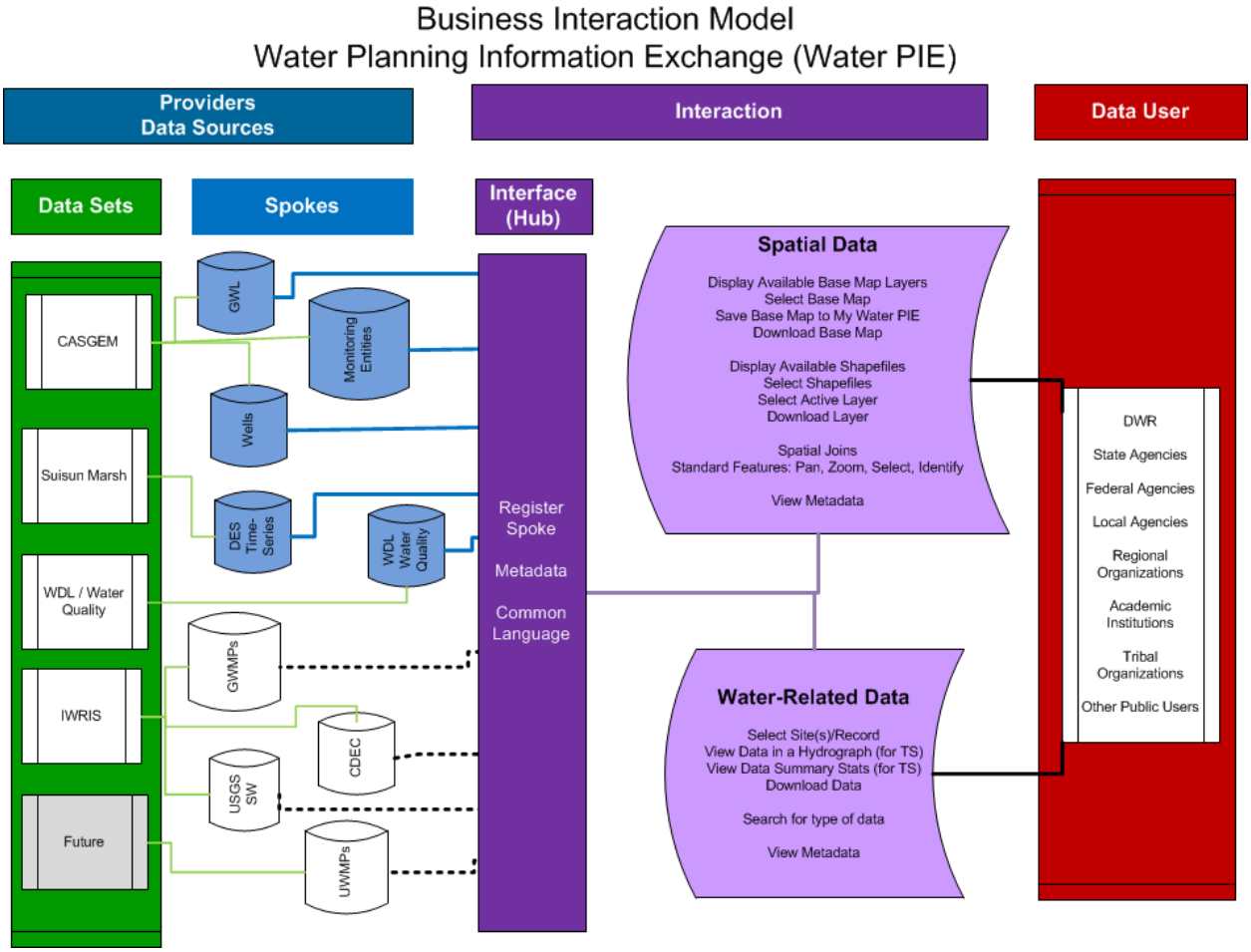

Figure . **Water PIE Business Interaction Model**

Section 3.2.2: Data Types

The Water PIE hub must manage a variety of data including metadata for spokes, shapefiles, and information related to map display. The following data will be managed via the Water PIE hub:

Type	Description
Water-Related Data	This is all the water-related data shared through Water PIE. This includes time-series, documents, data from data bases and other information.
Shapefiles	This is the spatial data with which the water-related data will be associated. This will include shapefiles and basemaps.
Metadata	**This is metadata for the spoke. This includes metadata for the spoke, metadata for the water-related data, and meta-data for the shapefiles – if they are maintained by the spoke.** **Metadata is critical for users to understand the methods used to create data and differences between datasets.**
Style information for map visualization	**DWR will maintain style information for map visualization such as standards for symbology and legend headers.**

Section 3.2.2.1 GIS Data

The hub will support geospatial data such as shapefiles. Shapefiles may contain points, lines, or polygons. Some of this data will be maintained in DWR's enterprise GIS system, and some of this data will be maintained by spokes.

Section 3.2.2: Phase I Data Sources & Spokes

Data within the spoke will be represented geospatially by a point, line, or polygon (a spatial element). The steward is responsible for maintaining the data and related information about the spatial elements. Each spoke will have one or more active spoke stewards from the organization that owns the data source.

The remainder of this section describes the three Phase I data sources, the spokes they contain, and their interaction with Water PIE.

Section 3.2.2.1 CASGEM

Section 3.2.2.1.1: Spokes

The CASGEM data source contains two spokes:

Spoke	Type	Geospatial Reference
Groundwater Level Measurement and Well Data	• Time Series data for the well • Data regarding the well	Latitude and Longitude of the well
Monitoring Entity	• Organization Information	Groundwater Monitoring Area Shapefile

Spoke	Type	Geospatial Reference
	• Documents	

Section 3.2.2.1.2: Data Types and Process Flow

Section 3.2.2.1.2.1: Groundwater Level Measurements and Well Spoke

CASGEM will share groundwater level measurements and well data with Water PIE.

Type	Data	Data Restrictions	When is it available for Exchange
Groundwater Level Measurement	Site ID, site name, date and time, measurement, and quality code.	None	Immediately upon submission to the database

CASGEM contains two primary types of wells:

Type	Data	Data Restrictions	When is it available for Exchange
CASGEM	Site ID, site name, location, owner, total depth, and screened interval	All data is public	Immediately upon submission to the database
Water Data Library	Site ID, site name, location and well owner	Total well depth and screened interval are confidential	Immediately upon submission to the database

Figure 3 illustrates how CASGEM will share groundwater level measurements in CASGEM with Water PIE. Water related and spatial data will be exchanged between the Oracle database and Water PIE.

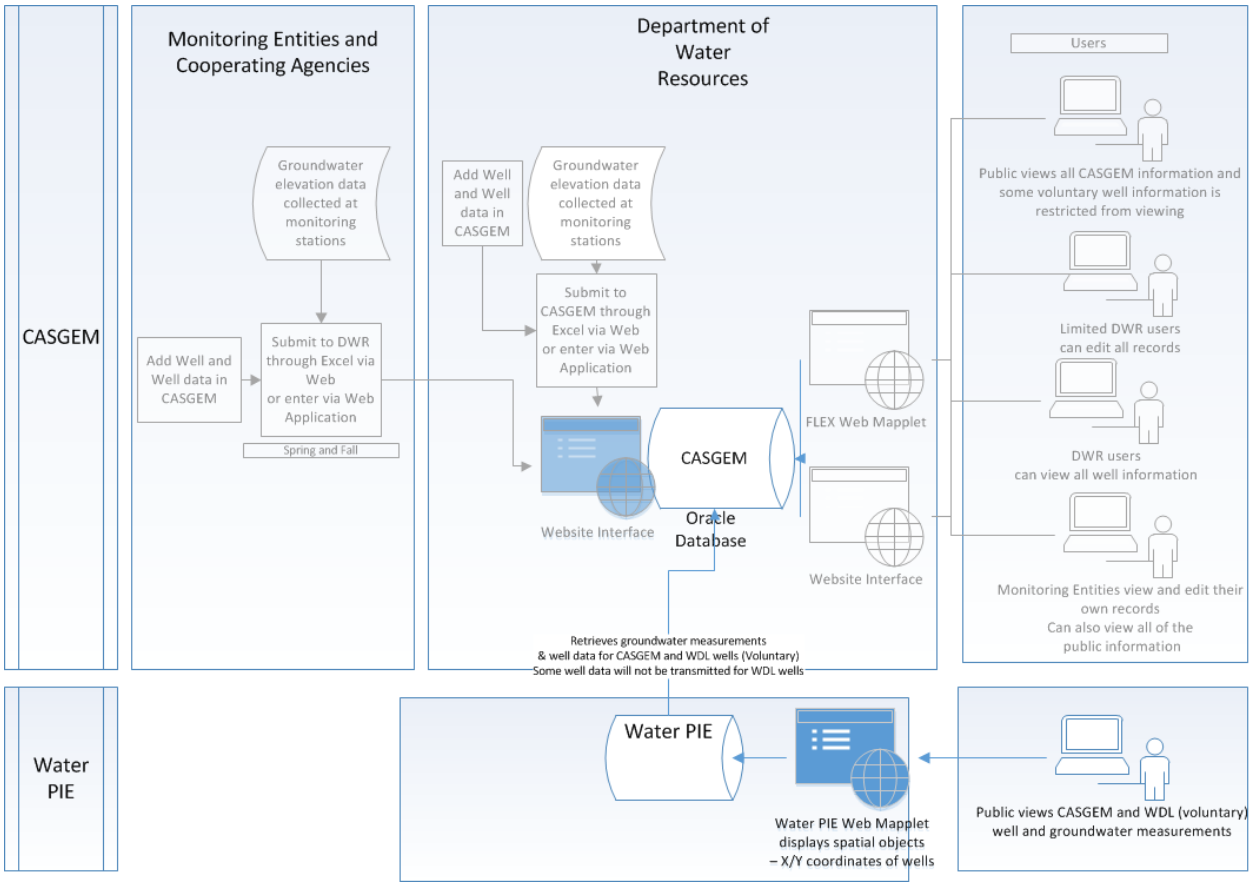

Figure . **To Be Groundwater Level Measurements exchange with Water PIE**

Section 3.2.2.1.2.2: Monitoring Entity Spoke

CASGEM will share monitoring entity information with Water PIE. CASGEM stores the following types of information regarding monitoring entities:

Spoke	**Data**	**Data Restrictions**	**When is it available for Exchange**
Monitoring entity	Monitoring entity name, contact information, and monitoring area.	All data is public with the exception of notes maintained by DWR regarding the monitoring entity	Immediately upon submission to the database
Monitoring Plan and other required documentation required for CASGEM designation	Documents	All documents are available to the public	Available to Water PIE once the Groundwater Monitoring Entity is designated by DWR
Monitoring Areas	Shapefiles	All shapefiles are available to the public	Available to Water PIE once the Groundwater Monitoring Area is designated for the Monitoring Entity by DWR

Figure 4 illustrates how monitoring entity information in CASGEM will be shared with Water PIE. Monitoring entity data will be exchanged between the Oracle database and Water PIE. Spatial data, monitoring entity area, will be consumed from the ESRI ArcGIS Geodatabase.

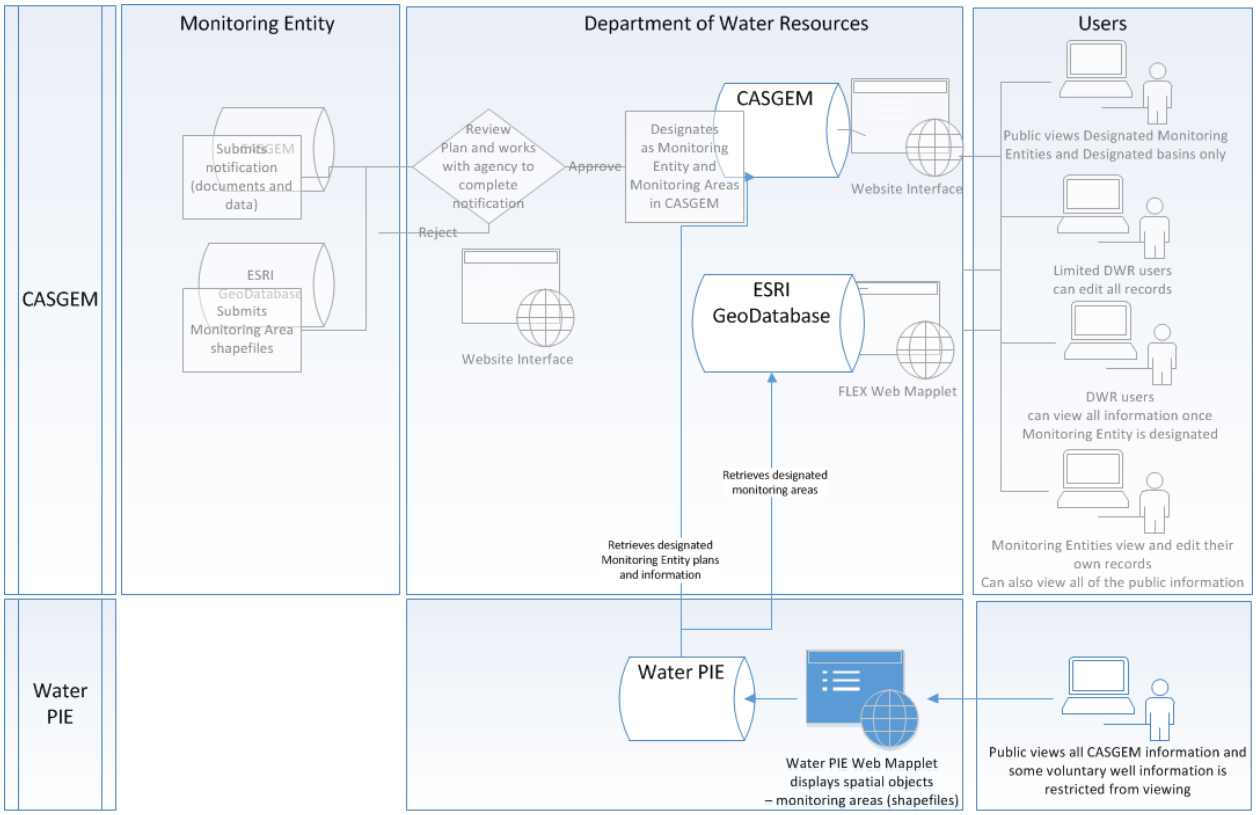

Figure **. To Be Monitoring Entity Exchange with Water PIE**

Section 3.2.2.2: Water Data Library - Water Quality

Section 3.2.1.2.1: Spokes

The WDL/Water Quality data source contains one spoke:

Spoke	**Type**	**Geospatial Reference**
Water Quality Measurements and site data	Water quality time-series	Latitude and Longitude

Section 2.2.2: Data Types and Process Flow

WDL/Water Quality will share water quality measurements entity with Water PIE. QA/QC records, while part of WDL/Water Quality will not be shared with Water PIE.

Type	**Data**	**Data Restrictions**	**When is it available for Exchange**
WDL- Quality Measurements	Site ID, site name, date and time, analyte group, analyte name, measurements value, comparability index, sample id, analytical method Possible QA code.	Tile drain site locations will be obscured. All other data is public.	Available to Water PIE when the record status is set to 'public' by the record owner.
Site		All data is public	Water PIE will exchange data with the staging server. All data in the server is available immediately.

Figure 5 illustrates how water quality data from WDL will be shared with Water PIE. Water related data will be exchanged between the Oracle database and Water PIE. The EPA WQX XML may be used in the exchange. Spatial data will also be exchanged through web services.

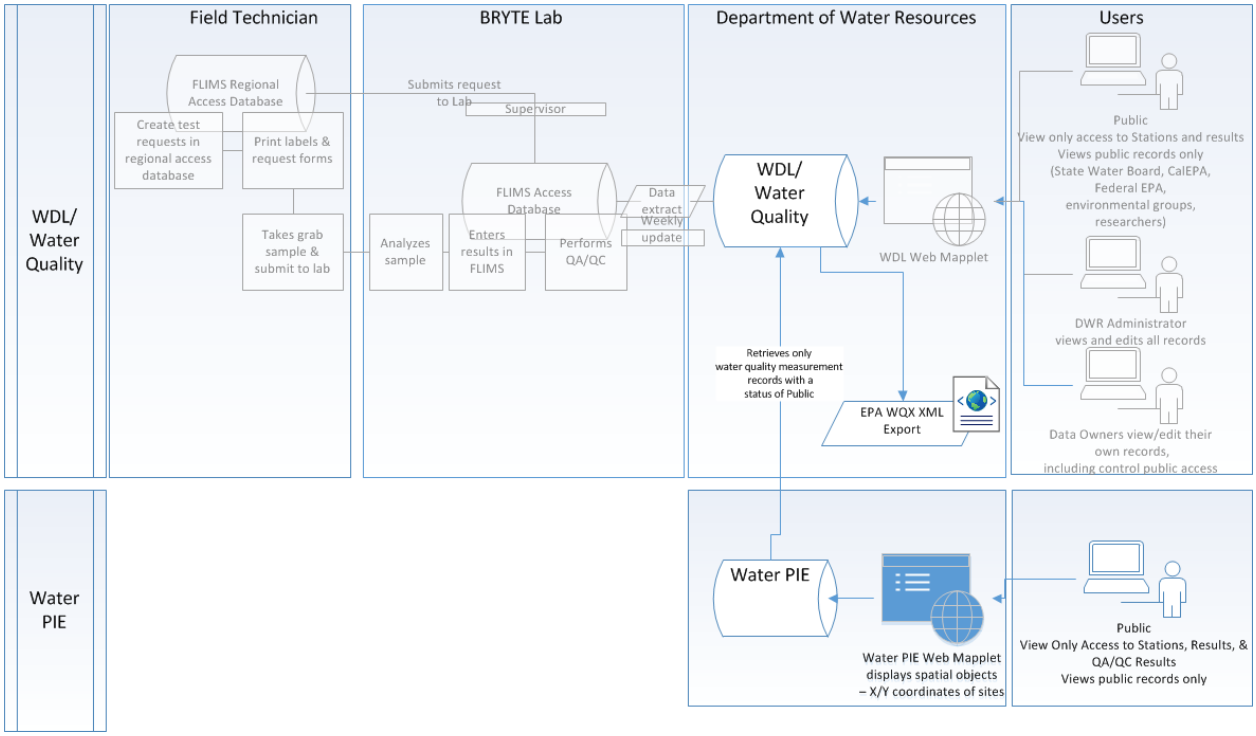

Figure **. To Be Water Quality exchange with Water PIE**

In 2011, DWR applied for and received a grant from EPA to export water quality information through United States Environmental Protection Agency (EPA) Water Quality Exchange (WQX) standards. DWR is currently in the process of contracting to implement this. The contract should be complete by the end of 2013 calendar year.

Water PIE will not require the exchange of water quality data in the format of the United States Environmental Protection Agency (EPA) Water Quality Exchange (WQX) standard, but will support the exchange of data using the EPA WQX standard as an option through Water PIE's the common language. Figure . depicts, Water PIE accessing WDL/Water Quality data through the WDL Water Quality system independent of the EPA WQX export.

Section 3.2.2.3: Suisun Marsh

Section 2.3.1: Spokes

The Suisun Marsh Time Series System data source contains one spoke:

Spoke	Type	Geospatial Reference
Suisun Marsh	Time Series	Latitude and Longitude

Section 2.3.2: Data Types and Process Flow

Water PIE will provide access to the following general categories of data from the Suisun Marsh Time Series system:

Type	**Data**	**Data Restrictions**	**When is it available for Exchange**
Time Series Data	Water quality measurements Stage measurements	All data is public	Water PIE will exchange data with the staging server. All data in the server is available immediately.
Station data		All data is public	Water PIE will exchange data with the staging server. All data in the server is available immediately.

The Suisun Marsh system also contains field visit results, but this data will not be exchanged with Water PIE or made available in the staging server.

Water PIE will only exchange data with the Suisun Marsh Time Series staging database that is populated with records that have passed quality control and are available for public viewing as depicted in Figure . To Be Suisun Marsh Time Series Data exchange with Water PIE

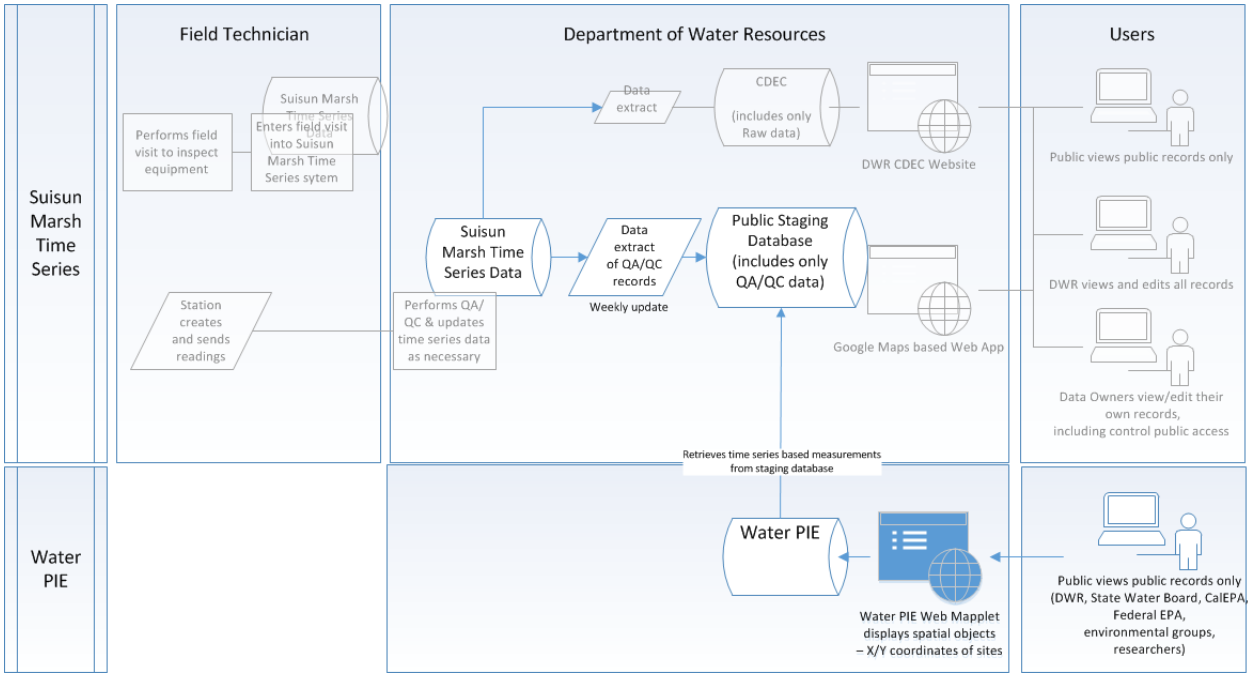

Figure **. To Be Suisun Marsh Time Series Data exchange with Water PIE**

For more details regarding the Suisun Marsh Time Series process, refer to Appendix E: As Is Environment.

Section 3.2.2.4: Integrated Water Resources Information System

IWRIS is a prototype for Water PIE and is not a data source for Water PIE. As a prototype, IWRIS supports several potential spokes identified as Phase I for Water PIE. The table below outlines the Phase I Water PIE spokes and potential future spokes.

Spoke	Data Type	Comment
DWR Water Data Library – Groundwater module	Time-series for groundwater	Included as Water PIE data source and described in Section 2.2 WDL/Water Quality and Section 2.1 CASGEM
Groundwater Management Plans	Management plans	These are important, and may be shared through Water PIE in a later phase. There is currently no designated data steward to support the groundwater management plans data. In addition, a Groundwater Management Plan shapefile is still in development.
CDEC	Time-series for surface water, water quality and climate	CDEC will be a future data source for Water PIE
United States Geological Survey (USGS) Streamflow	Time series for surface water	USGS Streamflow will be a future data source for Water PIE
Data from local agencies	Varies	Data from local agencies may be future data sources. This data is not currently maintained in IWRIS.

Part 4: Business Use Case Overview

The team organized the functional requirement description section by functional area:

- User Management
- Managing a Spoke
- Searching for Data
- Water PIE Administration
- My Water PIE

Each functional area has a process flow that outlines the business process, a Unified Modeling Language (UML) diagram that outlines the use cases, use case definitions that define the actor's interactions with the system, and storyboards that depict the functionality described in the use cases. The business process diagrams reference the use case that addresses the functionality indicated in the process step. Each use case references the storyboard diagrams that illustrate the functionality in the use case.

Roles

During the development of the functional requirements, the subject matter experts defined four primary roles. The table below discusses each role.

Role	Who	Description
User	General Public (Anyone)	• Can search for data using the map features • Can download data • Can download shapefiles • Can generate hydrographs of time series data • Can run public configurations, see section 2.5 for more information on public configurations
Registered User	General User who creates a User ID and Password	All of the access of the User and: • Can save, use, and share searches and views through a My Water PIE account
Spoke Steward	Spoke Owner(s)	All of the access of the Registered User and: • Can administer one or more spokes • Can make other registered users spoke stewards for the spokes within their purview
DWR Water PIE Administrator	DWR Water PIE Owner	All of the access of the spoke steward and: • Can administer Water PIE features, including the common language dictionaries and elements, managing DWR hosted shapefiles, and managing unit conversions • Can approve a spoke's registration

		• Can make a registered user a spoke steward or DWR Water PIE administrator

Use Case Descriptions

User Management

This section provides process flows, use cases, and storyboards for user registration and user management in Water PIE. User registration includes functions such as how an actor will access the system, register with Water PIE, and the creation of roles for spoke stewards.

This section includes the following subjects: access Water PIE without authentication, perform user registration, perform forgot username/password, perform login, configure user profile, associate/disassociate role, inactivate user, perform logout.

UML

The Water PIE User Administrator UML Diagram below depicts the use cases included in the User Administration Process described in section 2.1.3.

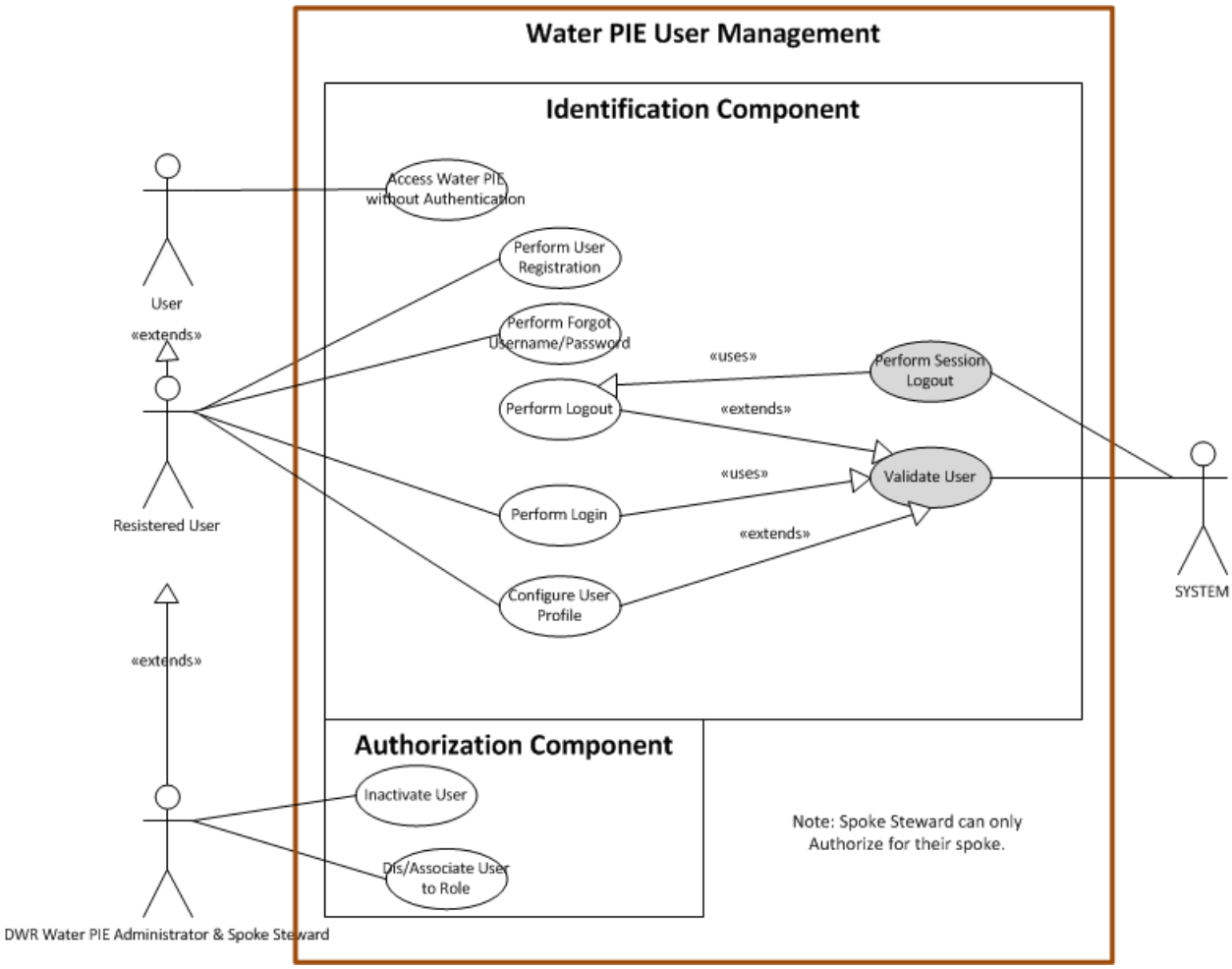

Figure 7. User Administrator Unified Modeling Language Diagram

Managing a Spoke

This section will introduce process flow diagrams, use cases, and storyboards for the management of a Water PIE spoke. The spoke management is the process by which new data sources join Water PIE, set up spokes, and begin to share data with the public. The spoke management consists of initial spoke registration, loading and mapping of data elements to a common language, and adding spatial elements. Spoke management will involve time and personnel resources from both DWR and spoke organizations. If the system designer develops the process properly, the process will minimize DWR resource requirements.

This section includes the following subjects: configure spoke, view registration status, perform spoke test connection, approve/deny spoke, inactivate or decommission spoke, and copy spoke registration.

UML

The Managing a Spoke Unified Modeling Language Diagram below depicts the use cases included in the User Administration Process described in section 2.2.3.

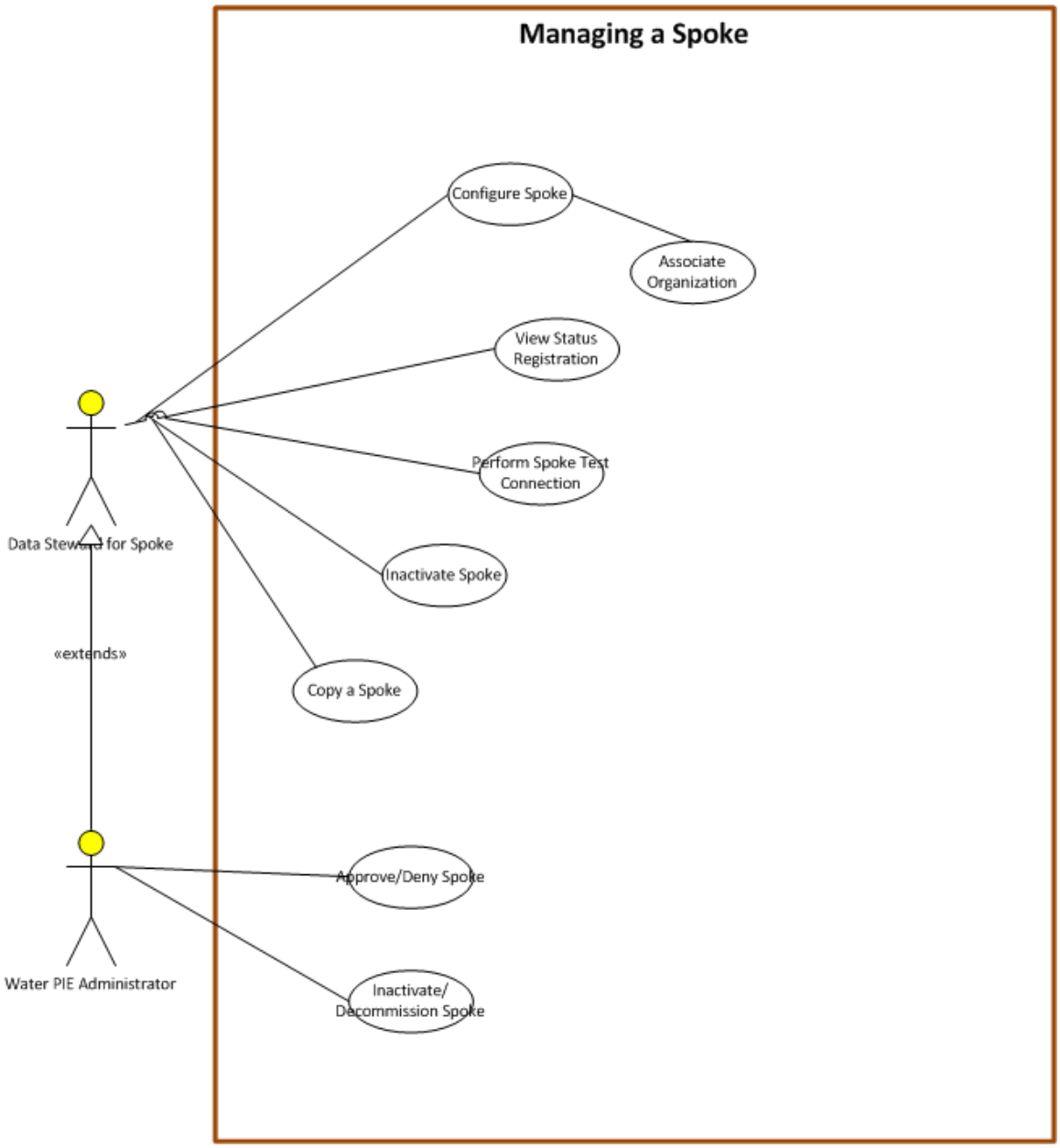

Figure 8. Managing a Spoke Unified Modeling Language Diagram

Searching for Data

This section provides processes, uses cases, and storyboards describing the process of searching for and accessing data through Water PIE. The Searching section includes creating a search, navigating within a map, advanced searching capabilities, filtering the result before running the query and once the system retrieves and displays the result, printing and saving reports, chart functionality, and administering preferences.

This section includes the following subjects: perform search, perform spatial display, perform tabular search, filter and display results, administer search preference, save report, print report, display hydrograph, and perform help.

The Searching for Data Unified Modeling Language Diagram below depicts the use cases included in the User Administration Process described in section 2.3.3.

UML

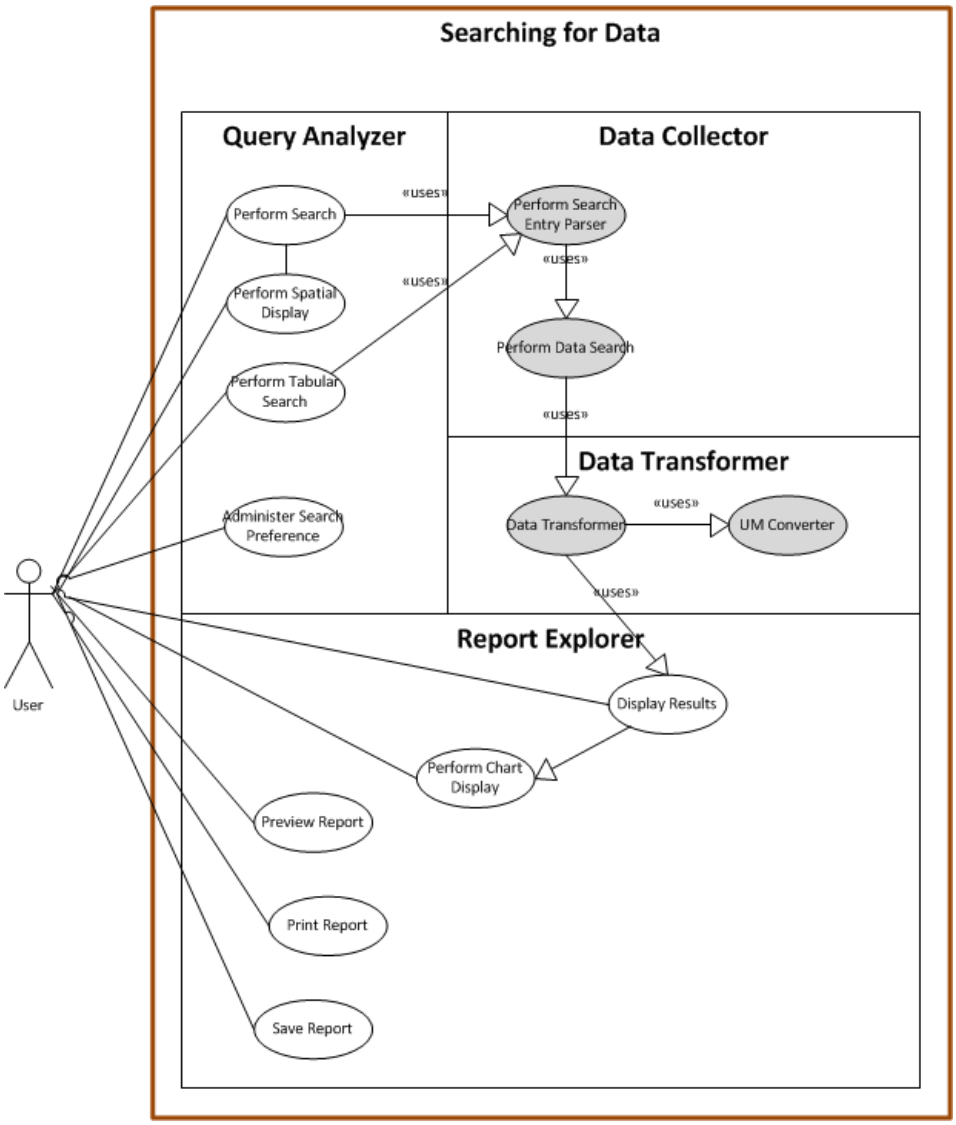

Figure 9. Querying Unified Modeling Language Diagram

Water PIE Administration

This section discusses the administrative activities that a DWR Water PIE administrator will perform. These activities include configuration of lists (controlled language), such as organizations, configuration of the common language, managing shapefiles hosted by Water PIE, configuring unit conversions, and configuring symbology.

This section includes the following subjects: configure organization and data source list, configure common language, configure dictionaries, configure elements, map elements to dictionary, map elements between dictionaries, configure standard unit definition list, configure unit conversions, configure shapefiles, and configure symbology.

The Water PIE Administration Unified Modeling Language Diagram below depicts the use cases included in the User Administration Process described in section 2.4.3.

UML

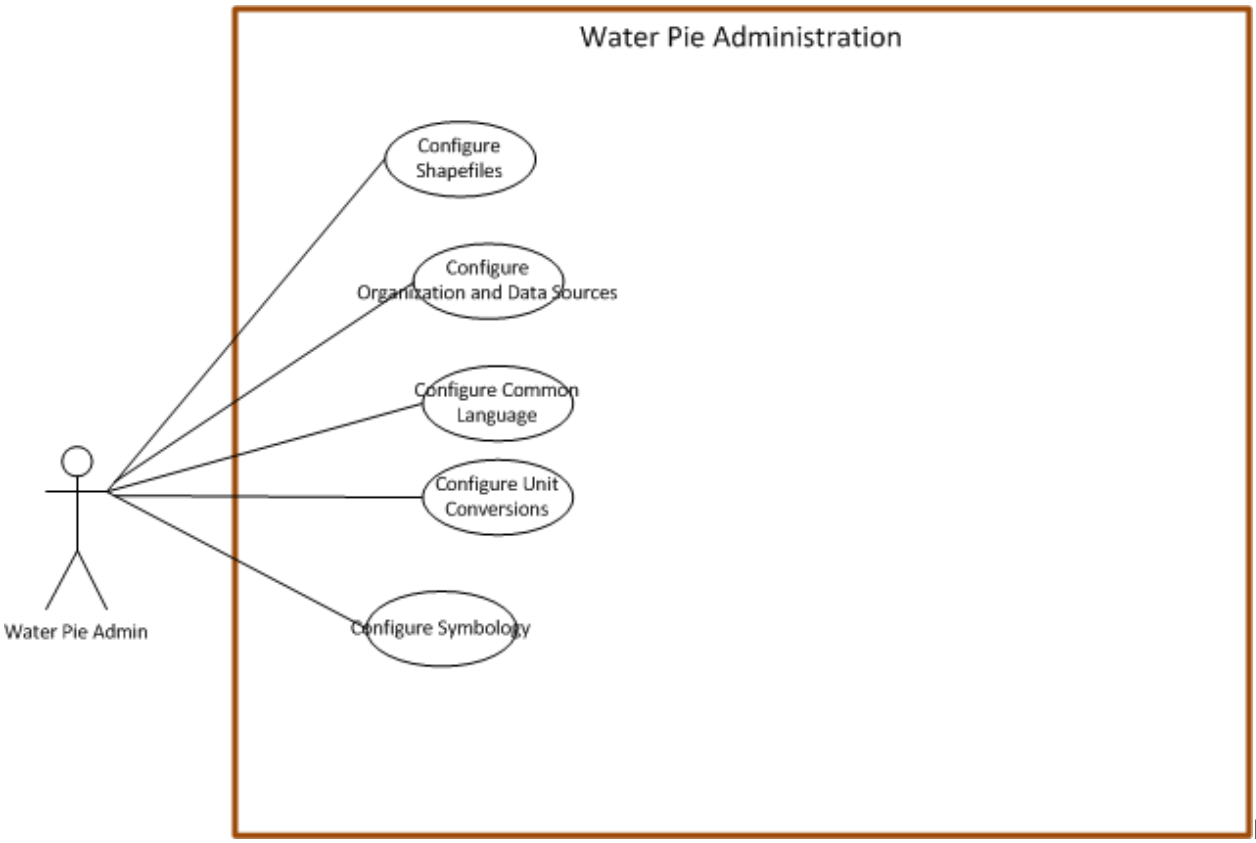

Figure 10. Water PIE Administration Unified Modeling Language Diagram

My Water PIE

A registered user can save custom configurations in the registered user's My Water PIE account for repeated use. These include map configurations, spatial and tabular queries, and hydrographs. For example, a registered user could configure a map and select a set of wells the first time, then return to the configuration without searching for and selecting the set of wells again.

In addition, a registered user can manage the organization of the saved configurations. This includes grouping, renaming, copying, and deleting configurations in the registered user's My Water PIE account.

This section includes the following subjects: perform save configuration, perform open saved configuration, manage My Water PIE configurations, share My Water PIE configurations, and promote My Water PIE configuration to public.

UML

The Manage My Water PIE Custom Configurations Unified Modeling Language Diagram below depicts the use cases included in the User Administration Process described in section 2.5.3.

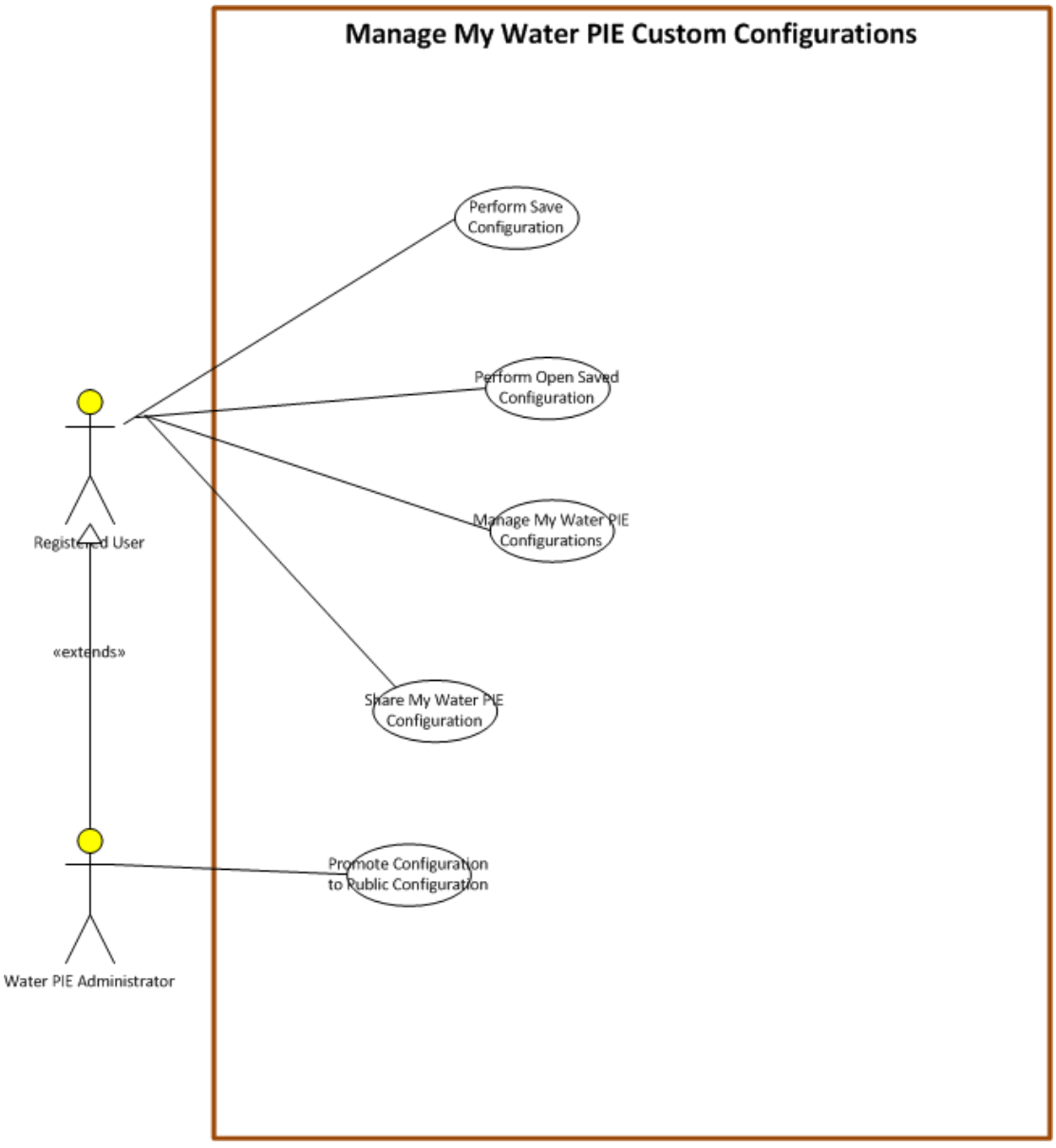

Figure 11. Manage My Water PIE Configurations Unified Modeling Language Diagram

Part 5: Summary of Regulatory, business and User Requirements

The regulatory, business and user requirements are listed in the following sections.

Section 5.1: User Management

Unique ID	Requirement	Level of Importance	Category
UM.01	Users must be able to access Water PIE without requiring user authentication.	Mandatory	Regulatory/ Business
UM.02	The system should remember the user configuration (layers and data sources selected and view customization) the user last viewed.	Nice to Have	Functional
UM.03	Users must be able to create and edit a My Water PIE account without DWR involvement.	Mandatory	Business
UM.04	Users must be able to reset expired or forgotten passwords/user IDs without DWR involvement.	Mandatory	Functional
UM.05	The system must prompt user to set new password after a period of inactivity designated by DWR.	Mandatory	Functional
UM.06	If a user has a My Water PIE account, the system should remember the configuration (layers and data sources selected and view customization the registered user last viewed.)	Desirable	Functional
UM.07	Users must be able to modify their user profile, including user ID, email, or password.	Mandatory	Functional
UM.08	When registering, a spoke steward must be able to manage spoke registration with minimal help from DWR.	Mandatory	Business
UM.09	A spoke steward for an organization must be able to add, modify, and remove administrative users for their data source.	Mandatory	Functional
UM.10	DWR Water PIE administrator must be able to configure spoke stewards and DWR Water PIE administrators.	Mandatory	Functional
UM.11	DWR Water PIE administrators and spoke stewards must be able to inactivate an account within their prevue. DWR Water PIE administrators can inactivate any account. Spoke stewards can inactivate an account within their organization.	Mandatory	User

Section 5.2: Managing Spoke

Unique ID	Requirement	Level of Importance	Category
MS.00	A spoke steward must be able to control his data.	Mandatory	Business
MS.01	A spoke must be able to associate data with a spatial element for display, query, and reporting purposes through Water PIE.	Mandatory	Business
MS.02	A spoke must be able to identify where the data originates when the data does not originate from the data source.	Mandatory	Functional
MS.03	The system must allow the information associated with a spatial element to be files/publications (Microsoft Word, Microsoft Excel, Graphics, PDF), and information from databases. The databases SQL Server, Hydstra, My SQL, PostgresSQL, Oracle, MS Access. Files/publications will display in their native format.	Mandatory	Functional
MS.04	The system must allow the information associated with a spatial element to be time-series data, station/site data, or file/document.	Mandatory	Functional
MS.05	The system must allow a data source to contain more than one spoke.	Mandatory	Functional
MS.06	The system must be able to consume shapefiles from other geodatabases, either inside the Department (as with CASGEM and CDEC) or outside of the Department.	Mandatory	Business
MS.07	The system must be able to retrieve and display a shapefile from an external data source through a web service.	Desirable	Functional
MS.08	The system must be able to associate a document or data from an external data source with a shapefile maintained at the Department.	Mandatory	Functional
MS.09	When an organization registers a spoke, the system must require the organization to identify metadata regarding the data they are sharing.	Mandatory	User
MS.10	The system must support the following spoke identification of the following metadata regarding the spoke and the data it is sharing:		Functional

Unique ID	Requirement	Level of Importance	Category
MS.10.01	o The steward of the data and their contact information, including name, organization, telephone number, and email address.	Mandatory	Functional
MS.10.02	o The spatial reference, including the shapefile associated with the data, an explanation of records in the shapefile, and identification of owner of the shapefile (DWR or spoke).	Mandatory	Functional
MS.10.03	o The temporal scale of the data, the temporal extent of the data and the temporal frequency of the data.	Mandatory	Functional
MS.10.04	o The data being shared is translated to the common language.	Mandatory	Functional
MS.10.05	o An ability to add an optional comment about an element mapping.	Mandatory	Functional
MS.10.06	o An abstract of the data.	Mandatory	Functional
MS.10.07	o The date the data source was developed.	Mandatory	Functional
MS.10.08	o The update frequency of the data.	Desirable	Functional
MS.10.09	o The name of the data source	Mandatory	Functional
MS.10.10	o The organization responsible for the data source	Mandatory	Functional
MS.10.11	o The methodologies for collection and processing.	Mandatory	Functional
MS.10.12	o A description of use constraints or liabilities.	Mandatory	Functional
MS.10.13	Spoke stewards must be able to identify their data elements offline and upload the listing for mapping to the common language.	Mandatory	Functional
MS.11	When an organization registers a spoke, the system must require the organization to identify metadata regarding the shapefile they are sharing.	Mandatory	User
MS.12	The system must support the following spoke metadata:		Functional
MS.12.01	o The steward of the shapefile and their contact information, including name, organization, telephone number, and email address if different from the data steward	Mandatory	Functional

Unique ID	Requirement	Level of Importance	Category
MS.12.02	o An abstract of the shapefile	Mandatory	Functional
MS.12.03	o The date the shapefile was developed.	Mandatory	Functional
MS.12.04	o The update frequency.	Mandatory	Functional
MS.12.05	o The name of the shapefile.	Mandatory	Functional
MS.12.06	o The organization responsible for the shapefile.	Mandatory	Functional
MS.12.07	o The methodologies for collection and processing the shapefile.	Mandatory	Functional
MS.12.08	o A description of use constraints or liabilities.	Mandatory	Functional
MS.12.09	o The spatial reference including projection, datum, and what the shapefile represents (such as well, site, county, etc.)	Mandatory	Functional
MS.12.10	o A description of spatial accuracy.	Mandatory	Functional
MS.13	When an organization registers a spoke, the system must allow the user to attach one or more documents to their metadata record.	Mandatory	Functional
MS.14	A spoke steward for a spoke must be able to edit the registration information for the spoke.	Mandatory	Functional
MS.15	A spoke steward for a spoke must be able to change the information it is sharing with Water PIE without re-registering.	Mandatory	Functional
MS.16	The system must manage the workflow associated with the registration of a spoke through automatic notifications to DWR Water PIE administrators and spoke stewards when a spoke is ready review and approval.	Desirable	Functional
MS.17	Spoke stewards must be able to view registration status and history of spoke modifications.	Mandatory	Functional
MS.18	Spoke Stewards and DWR Water PIE Administrators must be able to test a spoke’s connection to Water PIE and performance before the system activates the spoke.	Desirable	User
MS.19	A data steward for an organization must be able to remove the data source, or spoke from Water PIE at any time.	Mandatory	User

Unique ID	Requirement	Level of Importance	Category
MS.20	A spoke steward must be able to make changes to the spokes registration, including data mapping and/or web services with minimal interruption to service.	Mandatory	Functional

Section 5.3: Perform Search

Unique ID	Requirement	Level of Importance	Category
PS.01	The system must provide a method for local, regional, State, Federal and tribal organizations to publish and share water management planning information in a tabular and spatial data format.	Mandatory	Business
PS.02	The system must provide a web-based GIS interface for sharing of data in a spatial format.	Mandatory	Business
PS.03	Water PIE must support the sharing of heterogeneous data from autonomous data sources.	Mandatory	Business
PS.04	Users must be able to query by one or more spatial elements defined in a shapefile.	Desirable	User
PS.05	Users must be able to generate a search by individually selecting one or more spatial elements.	Mandatory	User
PS.06	Users must be able to generate a search by drawing a custom area.	Mandatory	Functional
PS.07	Users must be able search using spatial joins.	Mandatory	Functional
PS.08	Users must be able search using spatial difference.	Mandatory	Functional
PS.09	Users must be able to search within a buffer of a spatial element or user-drawn spatial element.	Mandatory	Functional
PS.10	For records with time series data, users must be able to identify one or more spatial elements (sites) from any data source and display summary data that includes		User
PS.10.01	o Name (label) required for spatial elements	Desirable	Functional
PS.10.02	o Minimum and maximum date ranges of the data available	Desirable	Functional
PS.10.03	o Number of data points available, for example the number of samples for a water quality site or the number of readings for a groundwater site	Desirable	Functional

Unique ID	Requirement	Level of Importance	Category
PS.10.04	o Metadata regarding the update frequency of data	Desirable	Functional
PS.11	Users must be able to query and report data spatially by shapefile or by searching by common language element or group of common language elements.	Desirable	User
PS.12	The system must display the location of the spatial elements in a map view so they are visually discernible.	Desirable	Functional
PS.13	Users must be able to activate a shapefile (layer).	Mandatory	Functional
PS.14	Users must be able to turn data on and off by organization.	Mandatory	User
PS.15	Users must be able to search by data element group or data element, for example, groundwater and water quality.	Desirable	User
PS.16	Users must be able to turn data sources on and off.	Mandatory	User
PS.17	Users must be able to turn spatial element display on and off by spoke.	Mandatory	User
PS.18	Users must be able to control the order of the shapefiles.	Mandatory	Functional
PS.19	Users must be able to adjust the transparency of each shapefile so that stacked shapefiles are discernible.	Desirable	Functional
PS.20	Users must be able to turn the display of shapefiles and basemaps on and off.	Mandatory	Functional
PS.21	Users must be able to select and display an unlimited number of shapefiles.	Mandatory	Functional
PS.22	When a user selects one or more spatial elements, the system must highlight the selected objects so the user can differentiate between selected objects and unselected objects.	Mandatory	Functional
PS.23	The system must display labels or IDs with spatial elements (points, lines or polygons) when in a viewable scale (zoomed in enough).	Mandatory	Functional
PS.24	Users must be able to pan and zoom in and out on all map views.	Mandatory	Functional

Unique ID	Requirement	Level of Importance	Category
PS.25	The system must display a legend, scale, and north arrow for all map based displays.	Mandatory	Functional
PS.26	Users must be able to query and report by a value of a variable, for example, total well depth greater than 10 feet.	Desirable	User
PS.27	Users must be able to generate a tabular query by:	Mandatory	Functional
PS.27.01	o Location	mandatory	Functional
PS.27.02	o Spatial element Name or ID (such as County, Groundwater basin)	Mandatory	Functional
PS.27.03	o Organization	Desirable	Functional
PS.27.04	o Data Source	Mandatory	Functional
PS.27.05	o Spoke	Mandatory	Functional
PS.27.06	o Date element or data element group	Mandatory	Functional
PS.27.07	o Date or data range	Mandatory	Functional
PS.28	The system must generate a summary report with the number of sites measuring a user specified variable and date range.	Desirable	User
PS.29	When a user triggers a query, the system must display the data from the selected spatial elements, any spatial element data related data, and metadata.	Mandatory	User
PS.30	Users must be able to select a single spatial element or multiple spatial elements and download the data from the spokes.	Mandatory	User
PS.31	Users should be able to filter the data elements and records from a query result before the system downloads to the user's computer.	Desirable	User
PS.32	Users must be able to perform a spatial query and have the system produce a tabular report of spatial elements.	Mandatory	User
PS.33	User must be able to sort the query results by any column in the result table.	Nice to Have	Functional

Unique ID	Requirement	Level of Importance	Category
PS.34	The system must support batch reporting (through a back end process) for queries when the query return is too long. DWR will work with the vendor to determine the appropriate duration.	Desirable	Functional
PS.35	The system must calculate and display the estimated time to retrieve results and allow the user to choose to either display the results or batch the results.	Desirable	Functional
PS.36	Users must be able to hide shapefiles or basemaps they do not use (remove them from the list of layers used to select and deselect).	Mandatory	Functional
PS.37	The system must be able to display all shapefiles that are available to an end user.	Mandatory	Functional
PS.38	The system must allow users to set the font size on the map.	Desirable	Functional
PS.39	The system must allow users to set scale of the map.	Desirable	Functional
PS.40	The system should allow users to set symbols and colors that display on the map.	Nice to Have	Functional
PS.41	Users must be able to download a shapefile.	Mandatory	User
PS.42	Users must be able to download reports of all data types and query results in MS Excel, CSV, and XML.	Mandatory	User
PS.43	The system must allow a user to download reports and query results of time series data in HEC DSS.	Mandatory	User
PS.44	Whenever extracting data from a data source, the related metadata must be included in the extract.	Mandatory	Functional
PS.45	Users must be able to save a configured map in picture format as a PDF, PNG or JPEG.	Desirable	User
PS.46	Users must be able to generate a report of user activity, including what was downloaded and who downloaded it by spoke, data element and date range.	Mandatory	User
PS.47	Users must be able to generate a report of custom view configurations and custom report parameters users have saved.	Desirable	User
PS.48	Users must be able to generate a report of shapefile downloads.	Desirable	User

Unique ID	Requirement	Level of Importance	Category
PS.49	DWR Water PIE Administrators and spoke stewards must be able to generate a report of error logs.	Mandatory	User
PS.50	Users must be able to select a graph format for display of administrative reports (at a minimum, pie chart or histogram.)	Desirable	Functional
PS.51	Users must be able generate a hydrograph for time series data.	Mandatory	User
PS.52	The system must support the display of hydrographs of a single variable with up to 5 stations/ spatial data elements displayed in a single hydrograph.	Desirable	Functional
PS.53	The system must support at least one variable per hydrograph.	Mandatory	Functional
PS.54	The system must support the display of up to five data elements for one site displayed in one hydrograph.	Nice to Have	Functional
PS.55	Users must be able to select either depth or elevation when generating a hydrograph for groundwater readings.	Desirable	Functional
PS.56	The system must display a scale, units, axis labels and title for all hydrographs.	Mandatory	Functional
PS.57	Users must be able to define hydrograph scale, axis units, axis labels, axis bounds, and hydrograph title.	Desirable	Functional
PS.58	Users must be able to select a date range when generating a hydrograph.	Mandatory	Functional
PS.59	Users must be able to download a hydrograph in the form of a picture, at a minimum as a PNG or JPEG.	Mandatory	Functional
PS.60	All reports must display the parameters used to create the graph including, at a minimum, date, organization, spoke and variable.	Mandatory	Functional
PS.61	The system must support the display of hydrographs with data from one or more data sources of the similar data type in one graph.	Nice to Have	Functional
PS.62	The system must provide dynamic scaling on the X and Y-axis for hydrographs, i.e. the hydrograph should not always start at zero unless relevant based on the data being graphed.	Mandatory	Functional

Section 5.4: Water PIE Administration

Unique ID	Requirement	Level of Importance	Category
WPA.01	The system must maintain a unique list of organizations and data sources.	Mandatory	Functional
WPA.02	The system must allow DWR to configure a list of common language dictionaries.	Desirable	Functional
WPA.03	The system must allow DWR to configure a list of common language elements and categories of elements.	Mandatory	Functional
WPA.04	The system must allow DWR to map common language elements to one or more common language dictionaries.	Desirable	Functional
WPA.05	The system must allow DWR to configure a list of standard unit definitions.	Mandatory	Functional
WPA.06	The system must allow DWR to configure unit conversion formulas. The system will use these formulas to convert units between spokes with differing units of measure for use in charts and value based queries.	Desirable	Functional
WPA.07	Administrative DWR users must be able to add/delete shapefiles to the system.	Mandatory	Functional
WPA.08	Administrative DWR users must be able to add/delete basemaps to the system.	Mandatory	Functional
WPA.09	The system must be able to consume shapefiles from the DWR enterprise system.	Mandatory	Functional
WPA.10	DWR Water PIE administrator must be able to configure default spatial element symbology.	Desirable	User
WPA.11	The system must apply the DWR approved symbology consistently throughout the system.	Desirable	Functional

Section 5.5: My Water PIE

Unique ID	Requirement	Level of Importance	Category
MWP.01	Registered users must be able to use a saved custom user configuration (layers and data sources selected and view customization) for display, query, and reporting purposes.	Desirable	User

Unique ID	Requirement	Level of Importance	Category
MWP.02	Registered users must be able to create and save a custom configuration with a specified date range, one or more variables, and one or more spatial elements, from one or more spokes.	Desirable	Functional
MWP.03	Registered users must be able to copy a custom user configuration, edit the query, and create a new custom user configuration.	Desirable	Functional
MWP.04	Registered users must be able to group configurations within their custom configurations list.	Desirable	Functional
MWP.05	Registered users must be able to email a configuration to another user.	Desirable	Functional
MWP.06	The system must allow the DWR Water PIE administrator to promote a configuration to Public.	Nice to Have	Functional

Part 6: Assumption, Dependencies, Constraints, and Risks

Section 6.1 Assumptions

- CASGEM, Water Quality, and Suisun Marsh are the only data sources to be included in Phase I of the project.
- The initial scope of phase I of Water PIE assumed water resource data would not be stored in a Water PIE mechanism. A storage component was added as a solution option in the SRD at the end of Phase 1, which changes the scope of the project going forward. Some requirements may require modification and some may need to be added due to the addition of the storage capability. For example, the project team should consider when and if data should be deleted from storage when a spoke leaves Water PIE.
- IWRIS is a prototype for Water PIE.
- CASGEM is the only data source addressed by IWRIS included in the scope of phase I.
- The following data sources addressed by IWRIS are not included as part of the scope of phase I: CDEC, USGS Streamflow, WDL/Groundwater module, and Groundwater Management Plans.
- Migration of data from WDL to CASGEM is not part of the scope of this project.
- Groundwater well data will only be accessed by Water PIE from CASGEM not WDL.
- Ongoing funding is assumed available to maintain Water PIE.
- DWR resources will be available to manage Water PIE.
- DWR DTS has technical capabilities to manage Water PIE.

Section 6.2 Dependencies

- WDL/Groundwater module data will be migrated to CASGEM prior to phase II of Water PIE.
- Spokes must have resources to complete spoke connections, unless they choose to store their data at DWR.
- Spokes must have technological capacity for data sharing, unless they choose to store their data at DWR.

Section 6.3 Constraints

- Water PIE must meet all technical requirements for a web map application set by DWR DTS such as minimum standards for user management, performance, and security.

Section 6.4 Known Risks

- DWR has not identified a funding source for phase II of Water PIE.
- DWR staff retirements may impact implementation of the WDL Water Quality and Suisun Marsh spokes.

Part 7: Business/User Requirements Traceability Matrix

Section 7.1: Business Process to Business Use Case Traceability

Business Process Reference Number	Associated Business Use Case Number
2.1.1 – User Administration	
Figure 1 - User	2.1.3.1, 2.1.3.2
Figure 2 – Spoke Administrator	2.1.3.6
Figure 3 – Inactivate User	2.1.3.7
Figure 4 – DWR Administrator	2.1.3.6
2.2.1 – Spoke Registration	
Figure 12 – Create Spoke	2.2.3.1, 2.4.3.1
Figure 13 – Enter Spoke Details	2.2.3.5, 2.4.3.1
Figure 14 – Mapping Spatial Elements	2.2.3.1
Figure 15 – Mapping Data Elements	2.2.3.1, 2.4.3.2, 2.4.3.3, 2.4.3.4
Figure 16 – Approving Spoke	2.2.3.3, 2.2.3.4
Figure 17 – Update Spoke	2.2.3.1, 2.2.3.3, 2.2.3.4
Figure 18 – Copy a Spoke	2.2.3.1, 2.2.3.4, 2.2.3.5
Figure 19 – Inactivate Spoke	2.2.3.4
Figure 20 – Decommission a Spoke	2.2.3.4
2.3.1 – Searching	
Figure 34 – Create Search	2.1.3.1, 2.3.3.2, 2.3.3.6, 2.3.3.7
Figure 35 – Create Tabular Search	2.1.3.1, 2.3.3.3
Figure 36 – Display Results	2.3.3.4, 2.3.3.5, 2.3.3.6
Figure 37 – Create a Hydrograph	2.3.3.9, 2.3.3.6
2.5.1 – My Water PIE	
Figure 72 - Save Configuration	2.1.3.4, 2.5.3.1
Figure 73 – Sharing My Water PIE Configuration	2.5.3.1, 2.5.3.3, 2.5.3.4
Figure 74 – Promote Configuration	2.5.3.3, 2.5.3.2, 2.5.3.4, 2.5.3.5

Section 7.2: Business/User Requirement to Business Use Case Traceability

Business/User Requirement Reference Number	**Business Use Case Number**
UM.01	2.1.3.1 Access Water PIE without Authentication
UM.03	2.1.3.2 - Perform User Registration, 2.1.3.3 - Perform Forgot Username/Password
UM.08	2.1.3.6 - Associate/Disassociate Role 2.2 Managing a Spoke
UM.11	2.1.3.7 - Inactivate User
MS.00	2.2.3.1 Configure Spoke
MS.01	2.2.3.1 Configure Spoke
MS.06	2.2.3.1 Configure Spoke
MS.09	2.2.3.1 Configure Spoke
MS.11	2.2.3.1 Configure Spoke
MS.18	2.2.3.3 - Perform Spoke Test Connection
MS.19	2.2.3.4 Manage Spoke Status (Approve/Deny/Inactivate/Decommission)
PS.01	2.3.3 – Searching
PS.02	2.3.3 – Searching
PS.03	2.3.3 – Searching
PS.04	2.3.3.1- Perform Search
PS.05	2.3.3.1- Perform Search
PS.10	2.3.3.1- Perform Search
PS.11	2.3.3.1- Perform Search
PS.14	2.3.3.1 - Perform Search
PS.15	2.3.3.1 - Perform Search
PS.16	2.3.3.1 - Perform Search
PS.17	2.3.3.1 - Perform Search
PS.26	2.3.3.3 Perform Tabular Search
PS.28	2.3.3.3 - Perform Tabular Search
PS.29	2.3.3.4 – Filter & Display Result
PS.30	2.3.3.1 Perform Search, 2.3.3.4 Filter and Display Results
PS.31	2.3.3.4 – Filter & Display Result
PS.32	2.3.3.4 - Filter and Display Results
PS.41	2.3.3.7 - Save Report
PS.42	2.3.3.7 - Save Report
PS.43	2.3.3.7 - Save Report

Business/User Requirement Reference Number	Business Use Case Number
PS.45	2.3.3.7 - Save Report
PS.46	2.3.3.8 - Print Report
PS.47	2.3.3.8 - Print Report
PS.48	2.3.3.8 - Print Report
PS.49	2.3.3.8 - Print Report
PS.51	2.3.3.9 - Display Hydrograph
WPA. 10	2.4.3.5 - Configure Symbology
MWP.01	2.5.3.1 - Perform Open Saved Configuration

APPENDIX A – ACRONYMS

Acronyms	Description
CSV	Comma Separated Value
BDAT	Bay Delta and Tributaries
CASGEM	California Statewide Groundwater Elevation Monitoring
CDEC	California Data Exchange Center
DAU	Detailed Analysis Units
DES	Department of Environmental Services
DTS	Data Technology Services
DWR	Department of Water Resources
EMP	Environmental Monitoring Program
EPA	United States Environmental Protection Agency
ESAR	Environmental Sampling, Analysis and Results
FLIMS	Field and Laboratory Information Management System
GIS	Geographic Information System
GWMP	Ground Water Management Plan
HEC DSS	Hydrologic Engineering Center Data Storage System
IWRIS	Integrated Water Resources Information System
NAIP	National Agriculture Imagery Program
QA/QC	Quality Analysis/Quality Control
USGS	U. S. Geological Survey
USGS	United States Geological Survey
VISTA	VISualization Tool and Analyzer
Water PIE	Water Planning Information Exchange
WDL	Water Data Library
WQX	Water Quality Exchange
UC	Use Case
Acronyms	Description
CSV	Comma Separated Value
BDAT	Bay Delta and Tributaries
CASGEM	California Statewide Groundwater Elevation Monitoring
CDEC	California Data Exchange Center
DAU	Detailed Analysis Units
DES	Department of Environmental Services
DTS	Data Technology Services
DWR	Department of Water Resources
EMP	Environmental Monitoring Program
EPA	United States Environmental Protection Agency
ESAR	Environmental Sampling, Analysis and Results
FLIMS	Field and Laboratory Information Management System
GIS	Geographic Information System

Acronyms	Description
GWMP	Ground Water Management Plan
HEC DSS	Hydrologic Engineering Center Data Storage System
IWRIS	Integrated Water Resources Information System
NAIP	National Agriculture Imagery Program
QA/QC	Quality Analysis/Quality Control
USGS	U. S. Geological Survey
USGS	United States Geological Survey
VISTA	VISualization Tool and Analyzer
Water PIE	Water Planning Information Exchange
WDL	Water Data Library
WQX	Water Quality Exchange
UC	Use Case

APPENDIX B – GLOSSARY

Terms	Synonym	Definition
Aliquot		A portion of grab sample used for analysis of water quality. A grab sample may have one or more aliquots. An aliquot may have one or more analyte readings.
Analyte	Constituent, Variable	Variables measured for water quality such as electrical conductivity (EC). Includes physical and chemical characteristics.
Basemaps		Base reference imagery, contains no data.
Bulletin 118 Basin		State legislation outlining alluvial groundwater basins in California. Groundwater elevations in these basins are to be monitored.
CASGEM		California Statewide Groundwater Elevation Monitoring NOTE: This and other documents related to the proposed Water PIE system use “CASGEM” as an all-inclusive term to describe information gathered by the California Statewide Groundwater Elevation Monitoring Program and the backend database of groundwater levels that DWR manages. The database is also referred to as the Water Data Library Groundwater Module, or WDL/Groundwater. Near the end of M Corp’s engagement, DWR decided to promote the use of the term “Water Data Library/Groundwater” to describe the database backend, which contains data elements that are not specific to the CASGEM Program, and “CASGEM” to include data elements that are more specifically related to aspects the California Statewide Groundwater Elevation Monitoring Program. In the interest of expediency, the terminology in these documents has not been changed; however, future phases of the Water PIE project should be cognizant of this terminology change.
Data Source	System	Individual program within an organization contributing to WPIE. Can have multiple spokes.
Discipline		A category of data or information such as Water Quality, Groundwater levels, etc.
Documents	Files - to not limit the type	Documents can be any type of file, for example: PDF, Word, Excel, Graph - such as JPEG, etc. Cannot attach an executable, macro enable document, BAT file, database.
DTS		Department of Technical Services at DWR. Maintains Oracle/ASP.net and geodatabases at the enterprise level.
External Data Source	External Source	Data stored outside of DWR.
Federated System		A system that from comprised of data sources or systems owned and maintained by various organizations.

Terms	Synonym	Definition
FLIMS		Field and Laboratory Information Management System. DWR-developed MS Access based tool for managing water quality sampling runs and chain of custody from field to lab. It is the source of key data components of the WDL Water Quality module.
Personal Geodatabase		MS Access based data storage system developed by ESRI. Used to store feature classes such as shapefiles and other spatial data.
GIS		Geographic information system. Digital representation of spatial information used for analysis.
Groundwater Management Plan		Adopted plan by a water agency and cooperators outlining general/comprehensive issues related to groundwater.
Groundwater Management Plan Area		Area covered by groundwater management plan. Can be associated with more than one agency/entity and multiple documents.
Hub		Central core of WPIE, administered by DWR. Spokes will connect to Hub for information display and download.
Hydrograph		Line graph representing time-series water data such as groundwater elevations or EC levels.
Internal Data Source	DWR Source	Data stored within DWR, either at the program or enterprise level.
IWRIS		Integrated Water Resources Information System. Web based mapplet for viewing data from multiple sources. No longer maintained by DWR.
Layer		Layers are the mechanism used to display geographic datasets. Each layer references a dataset and specifies how that dataset is portrayed using symbols and text labels. When you add a layer to a map, you specify its dataset and set its map symbols and labeling properties.
Monitoring Entity		Organization designated to monitor groundwater within a given B118 basin.
Monitoring Plan		Submitted to CASGEM by designated monitoring entities. Outlines monitoring methodology and lists what specific wells will be monitored.
Monitoring Plan Area		Shapefile submitted by monitoring entities during the designation process. Outlines geographic area monitored for groundwater elevations by the entity.
Notifications		The process by which a monitoring entity becomes approved to the CASGEM system. A collection of .pdf documents and .shp files stored with DWR.
Organization		Group reporting data to Water PIE. Can have multiple data sources within an Organization.

Terms	Synonym	Definition
Readings	Measurements	Measurements taken at stations. Can be groundwater elevations, levels of constituents/analytes, etc.
Report		Pre-assembled query that meets common business needs. Determined by spokes.
Shapefile	Feature Class	Data format created by ESRI to store spatial information in individual vector objects. For the purposes of the requirements, these can be a point, line, or area. A point can be an XY coordinate.
Site	Station	Location where some measurement data is being taken. Must have an XY coordinate for geographic display.
Spatial Element	Shapefile Spatial Object	A point, line or polygon that may constitute part of (or be a single record within) a shapefile.
Spatial Query		A type of query that uses spatial location to create a union/intersection/difference between datasets.
Spoke		Data of a similar type that will connect with Water PIE. A data source may have one or more spokes.
Station	Well, Monitoring Site	A location where a device is or has been monitoring some kind of parameter/constituent. Must have an XY coordinate for geographic display.
Spoke Steward	Spoke owner, data owner	Person responsible for the data associated with a spoke.
Tabular Query	SQL Query	User defined search of tabular data.
User Configuration		The way the user sets up and interacts with the mapping/data tool such as layers and sites.
Variable	Analyte, Constituent, Parameter	Reading or measurement taken at a monitoring location. Can be groundwater elevation, EC, DO, etc…
View	Display	What a user sees when looking at the map application.
WDL	Water Data Library	Water Data Library. DWR web based data access portal. Repository for water quality data and groundwater elevation data. Oracle database maintained by DTS. Also include a continuous monitoring data module, with data managed Kisters Hydstra software.
Data Element		Individual water resource data elements supplied by spokes.
Common Language		A hierarchy of variables and/or parameters by which a Water PIE can search and find data in a language of common terms.
Common Language Category		A hierarchy of common language elements. A grouping of common language elements.
Common Language Element		The lowest level of common language hierarchy.

Terms	Synonym	Definition
Dictionary		A group of common language categories that make up a commonly used language such as the EPA WQX Standard or Water ML.

Appendix C – Water PIE Project Library

The following table lists the documents the M Corp Team reviewed during the development of the As Is Environment:

Category	Document Name	File name	Description
Concept	Water PIE Background documentation	**Subject Matter Experts**	
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM entity-relationship diagram		
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM data dictionary		
Shared Documents—CASGEM and Water Data Library (Groundwater)	Water Data Library groundwater data dictionary		
Shared Documents—Water Data Library (Water Quality)	Integration of the Water Data Library Water Quality Module and the Field and Laboratory Information Management System		
Shared Documents—Water Data Library (Water Quality)	WDL Water Quality data dictionary		
Charter	Water PIE Phase 1 Charter		

Appendix D: Subject Matter Experts

This section lists the individuals that participated in the As Is / To Be Environment interviews and participated in the development of the business

Concept	Water PIE Background documentation	**Subject Matter Experts**
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM entity-relationship diagram	
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM data dictionary	
Shared Documents—CASGEM and Water Data Library (Groundwater)	Water Data Library groundwater data dictionary	
Shared Documents—Water Data Library (Water Quality)	Integration of the Water Data Library Water Quality Module and the Field and Laboratory Information Management System	
Shared Documents—Water Data Library (Water Quality)	WDL Water Quality data dictionary	
Charter	Water PIE Phase 1 Charter	

Appendix D: Subject Matter Experts

This section lists the individuals that participated in the As Is / To Be Environment interviews and participated in the development of the business requirements.

Subjects	
CASGEM	Eric Senter

Concept	Water PIE Background documentation
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM entity-relationship diagram
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM data dictionary
Shared Documents—CASGEM and Water Data Library (Groundwater)	Water Data Library groundwater data dictionary
Shared Documents—Water Data Library (Water Quality)	Integration of the Water Data Library Water Quality Module and the Field and Laboratory Information Management System
Shared Documents—Water Data Library (Water Quality)	WDL Water Quality data dictionary
Charter	Water PIE Phase 1 Charter

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Subjects

Subject Matter Experts

Mary Scruggs

Concept	Water PIE Background documentation	**Subject Matter Experts**
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM entity-relationship diagram	
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM data dictionary	
Shared Documents—CASGEM and Water Data Library (Groundwater)	Water Data Library groundwater data dictionary	
Shared Documents—Water Data Library (Water Quality)	Integration of the Water Data Library Water Quality Module and the Field and Laboratory Information Management System	
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Charter	Water PIE Phase 1 Charter	

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This section lists the individuals that participated in the As Is / To Be Environment interviews and participated in the development of the business requirements.

Subjects

	Aleksander Vdovichenko

Concept	Water PIE Background documentation	**Subject Matter Experts**
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM entity-relationship diagram	
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM data dictionary	
Shared Documents—CASGEM and Water Data Library (Groundwater)	Water Data Library groundwater data dictionary	
Shared Documents—Water Data Library (Water Quality)	Integration of the Water Data Library Water Quality Module and the Field and Laboratory Information Management System	
Shared Documents—Water Data Library (Water Quality)	WDL Water Quality data dictionary	
Charter	Water PIE Phase 1 Charter	

Appendix D: Subject Matter Experts

This section lists the individuals that participated in the As Is / To Be Environment interviews and participated in the development of the business requirements.

Subjects	
	Brett Wyckoff

Concept	Water PIE Background documentation	**Subject Matter Experts**
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM entity-relationship diagram	
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM data dictionary	
Shared Documents—CASGEM and Water Data Library (Groundwater)	Water Data Library groundwater data dictionary	
Shared Documents—Water Data Library (Water Quality)	Integration of the Water Data Library Water Quality Module and the Field and Laboratory Information Management System	
Shared Documents—Water Data Library (Water Quality)	WDL Water Quality data dictionary	
Charter	Water PIE Phase 1 Charter	

Appendix D: Subject Matter Experts

This section lists the individuals that participated in the As Is / To Be Environment interviews and participated in the development of the business requirements.

Subjects	
Water Quality	Bruce Agee

Concept	Water PIE Background documentation	**Subject Matter Experts**
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM entity-relationship diagram	
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM data dictionary	
Shared Documents—CASGEM and Water Data Library (Groundwater)	Water Data Library groundwater data dictionary	
Shared Documents—Water Data Library (Water Quality)	Integration of the Water Data Library Water Quality Module and the Field and Laboratory Information Management System	
Shared Documents—Water Data Library (Water Quality)	WDL Water Quality data dictionary	
Charter	Water PIE Phase 1 Charter	

Appendix D: Subject Matter Experts

This section lists the individuals that participated in the As Is / To Be Environment interviews and participated in the development of the business requirements.

Subjects

	Eric Senter

Concept	Water PIE Background documentation	**Subject Matter Experts**
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM entity-relationship diagram	
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM data dictionary	
Shared Documents—CASGEM and Water Data Library (Groundwater)	Water Data Library groundwater data dictionary	
Shared Documents—Water Data Library (Water Quality)	Integration of the Water Data Library Water Quality Module and the Field and Laboratory Information Management System	
Shared Documents—Water Data Library (Water Quality)	WDL Water Quality data dictionary	
Charter	Water PIE Phase 1 Charter	

Appendix D: Subject Matter Experts

This section lists the individuals that participated in the As Is / To Be Environment interviews and participated in the development of the business requirements.

Subjects	
Suisun Marsh	Michael Gardner

Concept	Water PIE Background documentation
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM entity-relationship diagram
Shared Documents—CASGEM and Water Data Library (groundwater)	CASGEM data dictionary
Shared Documents—CASGEM and Water Data Library (Groundwater)	Water Data Library groundwater data dictionary
Shared Documents—Water Data Library (Water Quality)	Integration of the Water Data Library Water Quality Module and the Field and Laboratory Information Management System
Shared Documents—Water Data Library (Water Quality)	WDL Water Quality data dictionary
Charter	Water PIE Phase 1 Charter

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This section lists the individuals that participated in the As Is / To Be Environment interviews and participated in the development of the business requirements.

Subjects	**Subject Matter Experts**
IWRIS	Mary Scruggs

Appendix E: Description of Phase I Data Sources

Section 2.3.1.1: California Statewide Groundwater Elevation Monitoring

Section 2.3.1.2: Purpose

Historically, DWR and cooperating agencies have collected groundwater elevation data at wells throughout the state. DWR currently operates a network of groundwater elevation monitoring wells, mainly north of the Tehachapi Mountains. Until recently, all the data DWR collected was stored and managed in the Groundwater Module of the Water Data Library. Several dozen cooperating federal and local agencies also voluntarily submitted their groundwater elevation measurements to DWR, which were stored and managed in WDL and made available to the public via the World Wide Web. However, there was no mandate that any agency share its data with DWR, nor was there any requirement to measure groundwater elevations.

On November 4, 2009 the State Legislature amended the Water Code with Senate Bill x7-6, which mandates a statewide groundwater elevation monitoring program to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. To achieve that goal, Senate Bill x7-6 requires collaboration between local Monitoring Entities and DWR to collect groundwater elevation data.

In accordance with this amendment to the Water Code, DWR developed the CASGEM program. The intent of the CASGEM program is to establish a permanent, locally-managed program of regular and systematic monitoring in all of California's alluvial groundwater basins. DWR's role is to coordinate the CASGEM program, to work cooperatively with local entities, and to maintain the collected elevation data in a readily and widely available public database.

Section 2.3.1.3: Functionality Overview

The CASGEM system has three primary components:

- A data system to store monitored groundwater elevations
- A tracking system to maintain records of well monitoring agencies and entities
- An online system for reporting groundwater elevations to the public

Section 2.3.1.3.1: Groundwater elevation Data

DWR has collected data from more than 45,000 wells across the state. There are currently two systems collecting and storing groundwater elevation data:

- WDL
- CASGEM

Of these wells, approximately 7,500 wells are currently designated as CASGEM wells and are being monitored as a part of CASGEM. DWR is in the process of migrating well data into CASGEM. This process is anticipated to be complete prior to Phase II of the Water PIE project.

All data associated with CASGEM designated wells is available to the public for viewing. However, certain fields are not available for public viewing such as the well construction characteristics of non CASGEM wells, called voluntary wells, and the location and construction characteristics of public drinking water wells. A complete collection of groundwater data is available for DWR internal users and is currently accessed through the WDL.

Section 2.3.1.3.2: Well Monitoring Entity Administration

CASGEM also focuses on administrating the state's groundwater Monitoring Entities through its notifications process. The notification process is the method a groundwater management entity applies for and is designated as the official Monitoring Entity by DWR for a defined area. Monitoring Entities and cooperating agencies are responsible for reporting groundwater elevation data within their defined areas to CASGEM twice per year.

A groundwater monitoring agency requests designation as a Monitoring Entity by submitting a notification of application to DWR. The notifications contain:

1. Information about the Monitoring Entities (authority, contact information, etc.)
2. Monitoring Plan for the specified monitoring area
3. Information about individual well attributes
4. GIS information -- well locations and agency monitoring areas, applicable groundwater basins
5. Groundwater management plan (GWMP), if applicable

Newly submitted notifications must go through an approval process within DWR, beginning with the appropriate regional DWR office, and ending with the CASGEM program manager. Notifications can be updated by the monitoring entity through the online system including alterations to shapefiles. Updates and changes are noted in an audit trail available for the Monitoring Entity and internal users to view. Notifications are publicly viewable through CASGEM only after a monitoring entity has been designated through the approval process within DWR.

Section 2.3.1.3.3: Reporting and Usage

Data in CASGEM is available to the public once a user logon is created. Data can be accessed in two ways:

- Web-based mapplet
- Online System

There is a web-based mapplet that allows for visualization of data including CASGEM well locations and Bulletin 118 basins. To create a data portal that customers could easily understand, DWR created an

ArcGIS based Adobe Flex web-based mapplet. The mapplet comes with topographic, road, and satellite imagery basemaps. CASGEM also displays hydrographs for user selected CASGEM or Voluntary wells. A search feature enables users to search for features using selectable criteria, for example, searching within certain geographies or DWR regional offices, specific well attributes, and well number. Users can download water elevation data in Comma Separate Value (CSV) or Microsoft Excel format from selected wells. Figure 2 displays a screen shot from the mapplet.

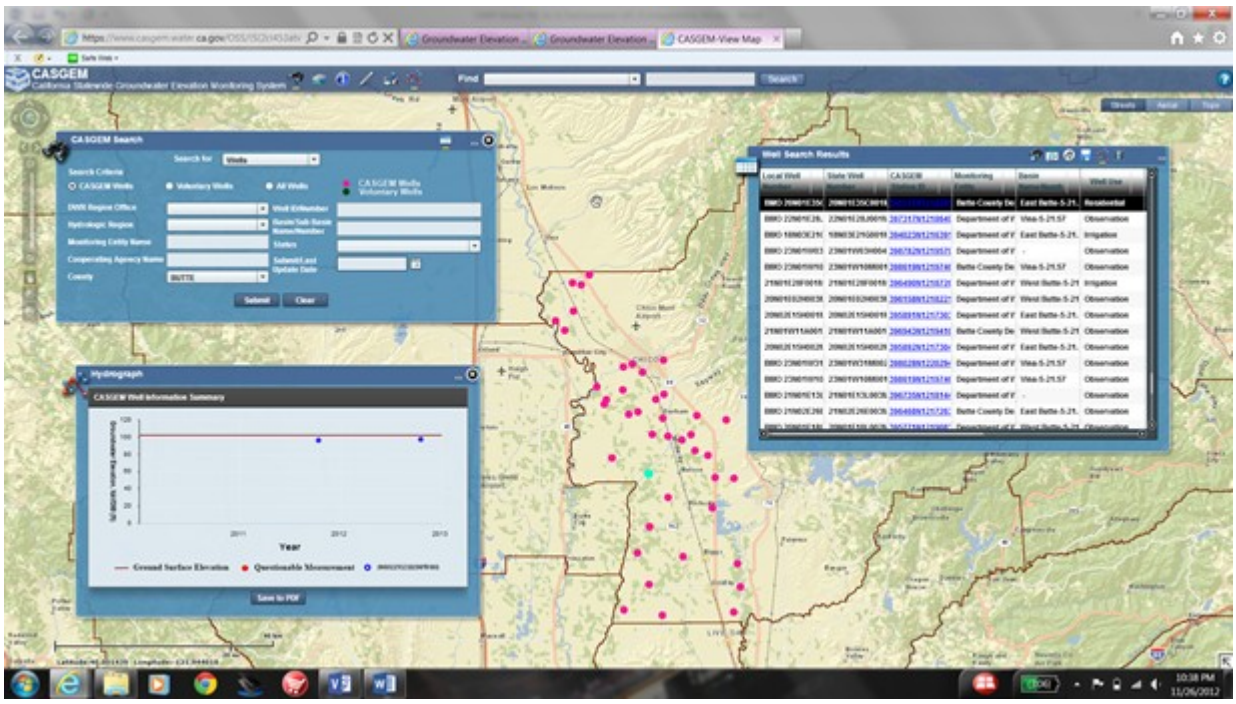


Figure 1. CASGEM Website

This viewer allows users to easily locate data through a variety of query types. The map displays several features such as groundwater monitoring areas, well locations, local jurisdictions, and has several available basemaps. Users can select and save groups for customized reports or visualizations of hydrographs.

CASGEM can be accessed by logging into the online system through the CASGEM website, as seen in Figure 3. Users can search for specific wells, geographic areas (e.g., groundwater basin, Monitoring Entity, etc.) and groundwater management plans. They can then download documents such as Monitoring Plans and GWMPs, download recent and historical groundwater time-series data, and obtain shapefiles of groundwater management areas.

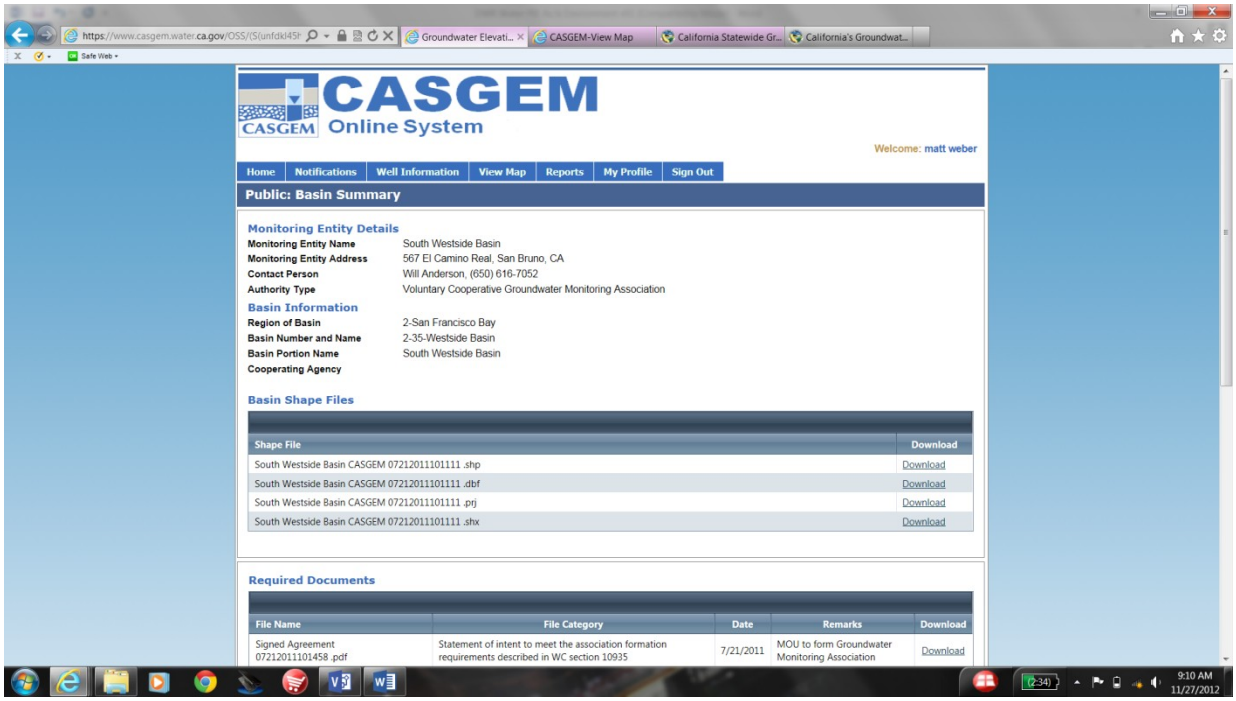


Figure 2. CASGEM Online System

Monitoring entities have the following abilities when logged in to CASGEM:

- Create, edit, and submit notifications to become a Monitoring Entity
- Create and manage user accounts
- Create and manage agency information
- Submit CASGEM monitoring plans and groundwater management plans
- Submit construction and location information associated with CASGEM wells
- Submit groundwater elevation data (including batch uploads)

Both public users and monitoring agencies can access the following features in CASGEM:

- View lists of local agencies, counties and associations who have volunteered to serve as CASGEM Monitoring Entities providing groundwater data statewide
- View CASGEM Monitoring Plans and Groundwater Management Plans (via hyperlink)
- Search and view groundwater elevation data in tabular format
- View hydrographs for single wells
- Search and view groundwater monitoring well information
- View mapped locations of CASGEM wells, DWR wells, monitoring area boundaries, and other geographic information
- Measure distances between wells and sizes of monitoring areas and basins
- Download well information, groundwater data, hydrographs and printable maps
- Download summary reports on wells, groundwater elevations, Monitoring Entities and basin information

- Download “canned reports” based on criteria submitted in query

Section 2.3.1.3.4: GIS Component

CASGEM has the following GIS related components:

- Shapefiles of monitored areas and Bulletin 118 groundwater basins.
- Other selectable administrative boundary layers.
- XY (latitude and longitude) coordinates for well locations.

Shapefiles of monitored areas are available for download. The XY coordinates for each well are contained within a field in the CASGEM well attribute data.

Section 2.3.1.4: Data Types and Process Flow

Section 2.3.1.4.1: Groundwater elevation Data

Groundwater elevation data in CASGEM is reported to DWR twice per year by Monitoring Entities throughout the state as depicted in Figure 4. DWR offers Monitoring Entities two methods to enter data into CASGEM. There is a web-based manual entry form and a downloadable Microsoft Excel spreadsheet to be used for batch upload through the online system. Both options require user identification and password. If data needs to be altered after it has been loaded into the database, Monitoring Entities can log in using user identification and make changes. These privileges are also extended to certain DWR personnel.

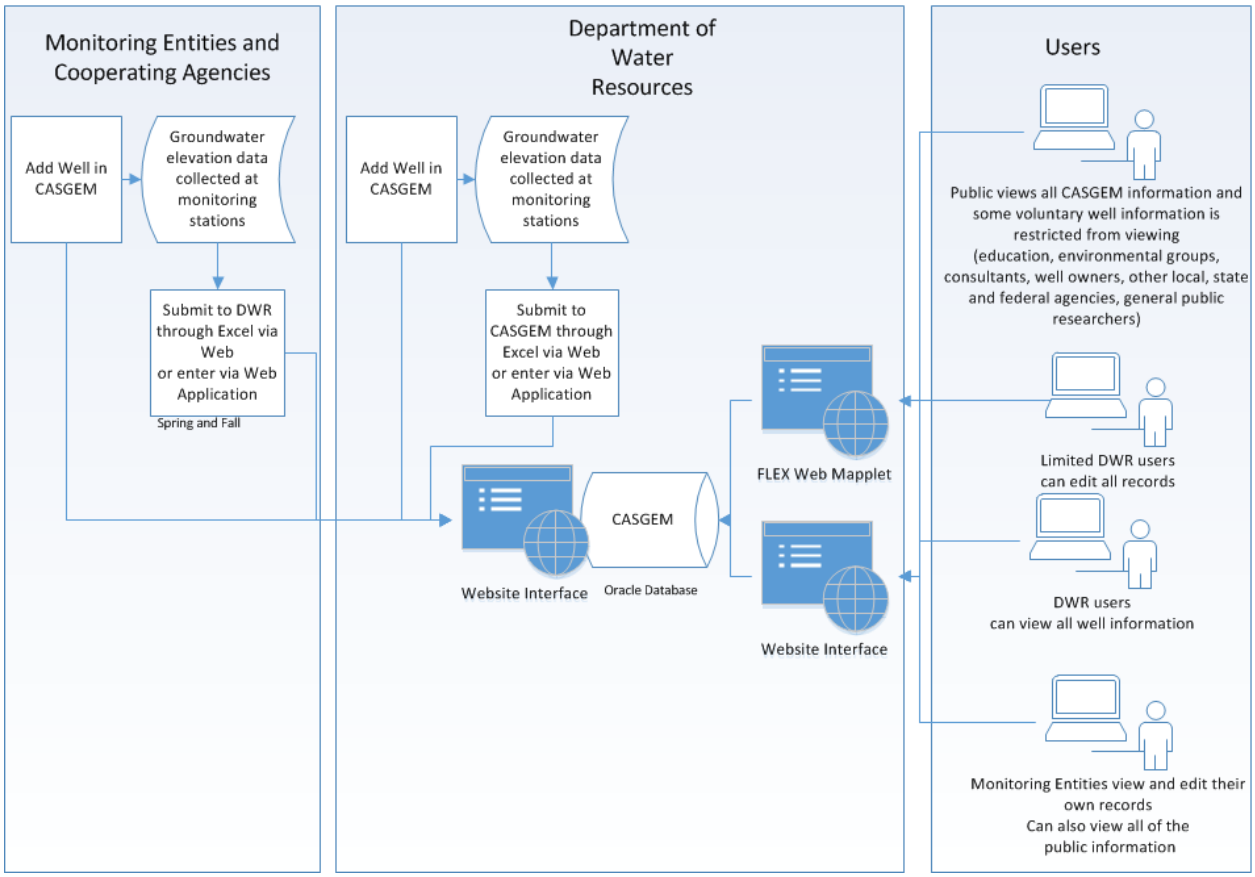


Figure 3. Groundwater elevation Monitoring Data

CASGEM groundwater elevation data is stored in an Oracle database maintained by DTS. Data is made available to the public through a web-based interface requiring all users to sign up for access. Monitoring Entities can access their notification information and data through extended functionality of the interface.

Well/Station data:

- Every well has an X/Y (latitude and longitude) up to four decimals (four decimals are reported, but the locations are not necessarily that accurate as DWR "allow" Monitoring Entities to report to a more generalized degree of accuracy to protect privacy)
- Local Well ID – Assigned by the Monitoring Entity; not unique
- State Well Number – State Lands – only DWR can assign – unique ID based on township and range - lengthy manual process to assign
- Master Site Code – based on Latitude and Longitude plus a sequential unique ID

Groundwater elevations are due by January 1st for measurements from the prior "fall" which covers the period July 1 to December 31, and by July 1st for measurements from the prior "spring" which covers the period January 1 through June 30. Groundwater elevations can be added at any point in time. Regardless of due dates, there is no limitation on the number of readings that can be submitted. In addition, an entity may submit groundwater elevation data and not be a designated monitoring entity.

Multiple Monitoring Entities may report for the same well, for example, a local agency and USGS or DWR. Ownership responsibility for measuring a well could shift between agencies, but has not yet occurred.

Section 2.3.1.4.2: Groundwater Monitoring Entities

In addition to groundwater elevation data, CASGEM also stores Monitoring Plans and GWMP (if applicable) documentation for each monitored groundwater basin or area. When a local agency wants to become a Monitoring Entity under CASGEM, they submit a notification to DWR using the online CASGEM system. This notification includes:

- The agency's authority
- Contact information
- Monitoring well information
- Monitoring Plan
- GWMP (if applicable)
- Other documentation
- Geographic shapefiles that delineate monitoring areas

DWR reviews the submittals and works with the local agency if additional information is needed to meet CASGEM requirements. The submittal is reviewed and approved at three levels within DWR before an

agency is designated as the Monitoring Entity. The Monitoring Plans and GWMPs (if applicable) for groundwater basins (or portions of basins within a designated monitoring area) are stored in an Oracle database maintained by DTS. Shapefiles are stored in an ESRI geodatabase jointly managed by the CASGEM staff and DTS (the geodatabase is a part of the enterprise system maintained by DTS.) Monitoring Plans and GWMPs submitted under CASGEM are available for public viewing through the CASGEM website. This process is depicted in Figure 5 below.

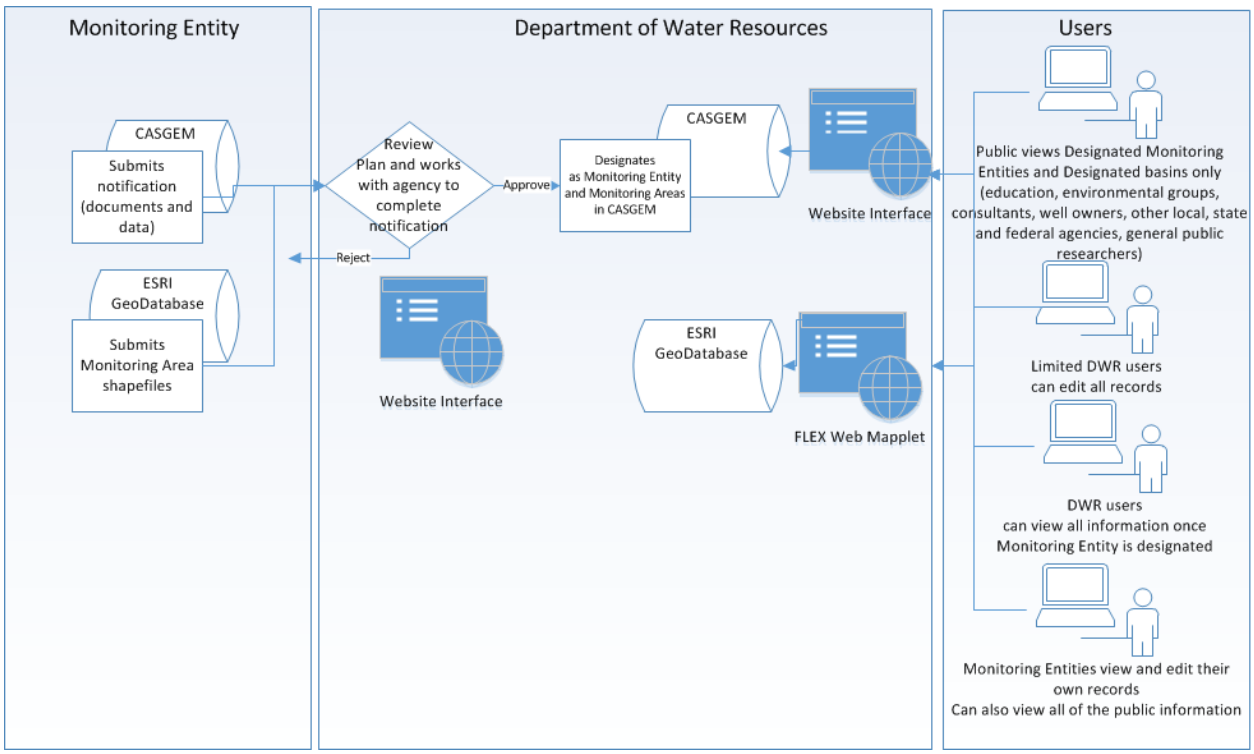


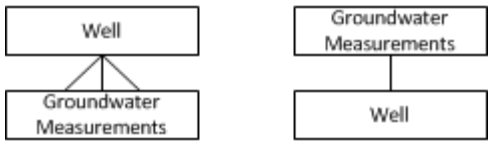
Figure 4. Monitoring Entity Designation

Designated Monitoring Entities have access to certain editing abilities for their agencies records in the CASGEM system, including updating Monitoring Plans and GWMPs, adding additional monitoring wells, and making changes to shapefiles. Updates to Monitoring Plans and to GWMPs are noted in the name of the files.

Section 2.3.1.4.3: General CASGEM Data Relationships and Rules

The following depicts some of the CASGEM data relationships.

- Each well has zero to many groundwater measurements and each groundwater measurement is linked to one well.



- Each well is designated as one well type (CASGEM or voluntary).

- A monitoring entity may linked to one or more documents.

- Monitoring Entity must be designated by DWR before the documents are made available to the public.
- A monitoring entity may be linked to one or more monitoring areas and they can add monitoring areas after they have been designated.

- Each monitoring area must be designated by DWR before the shapefile is made available to the public
- A Groundwater Monitoring Plan may link to multiple monitoring areas and multiple Monitoring Entities.

Section 2.3.1.3.4: Restricted Access Data

CASGEM Wells

All CASGEM well data is available to the public through the CASGEM system.

Voluntary (Non CASGEM) Wells

Some data related to voluntary wells is confidential, specifically well construction type, screened intervals, and depth data on voluntary wells. Confidential data is only viewable by the groundwater monitoring agency and DWR staff.

Public Water Supply Wells (these are also Voluntary Wells)

Groundwater readings are available to the public. Public Water Supply Wells are stored in WDL. Public Water Supply Well data will not be migrated to CASGEM from WDL.

Groundwater Monitoring Plans

GWMPs are not available to the public until the associated notifications are officially designated (approved) by DWR headquarters. Notes pertaining to the notification are not available to the public to view but are available to the Monitoring Entity and DWR.

Section 2.3.1.5: Users

Users of CASGEM data cover a wide spectrum of customers, from internal DWR staff, other state agencies, private environmental firms, consultants, local entities, private well owners, general public, and educational/academic researchers.

Users fall into five primary categories:

- DWR staff whose tasks include working with CASGEM data and can view confidential and non-confidential data
- DWR reviewers who supervise the notification process and can review, comment on and have approval authority for designation
- CASGEM Monitoring Entities can submit and edit their notifications, wells, and groundwater monitoring data
- Non CASGEM Water Monitoring Entities (cooperators) who submit groundwater measurements voluntarily and can add and edit their wells and groundwater monitoring data, including confidential data
- Public users who can view and download non-confidential data

Section 2.3.1.6: Technical Background

CASGEM is stored in Oracle databases maintained by DTS in the Natural Resources Agency Data Center. Data in the CASGEM system is also part of the WDL. The WDL is a map based viewer for finding water quality, groundwater, and continuous water data. Groundwater data in the WDL is submitted by Monitoring Entities and is voluntary. The migration of groundwater elevation data to CASGEM is anticipated to be complete prior to Water PIE development.

Shapefiles are stored in an ESRI geodatabase. The geodatabase is jointly managed by the CASGEM staff and DTS' Enterprise GIS staff. Shapefiles are updated by the Monitoring Entities. In addition, the web portal is supported by an ArcGIS Adobe Flex web-based mapplet.

Section 2.3.2: Water Data Library - Water Quality

Section 2.3.2.1: Purpose

WDL/Water Quality is the second spoke for Water PIE. WDL/Water Quality stores results from water quality sampling conducted throughout the State by DWR. The information in WDL is available through a web-map based data portal. WDL also stores other types of water data including groundwater elevations and continuous data.

Section 2.3.2.2: Functionality Overview

Water quality data is accessed through WDL. Users can select water quality information by searching geographically for monitoring stations. Once a station is selected, users can click on a hyperlink to download data in HTML, Excel, or text for any chosen date range. Figure 5 depicts a screen shot of a WDL station.

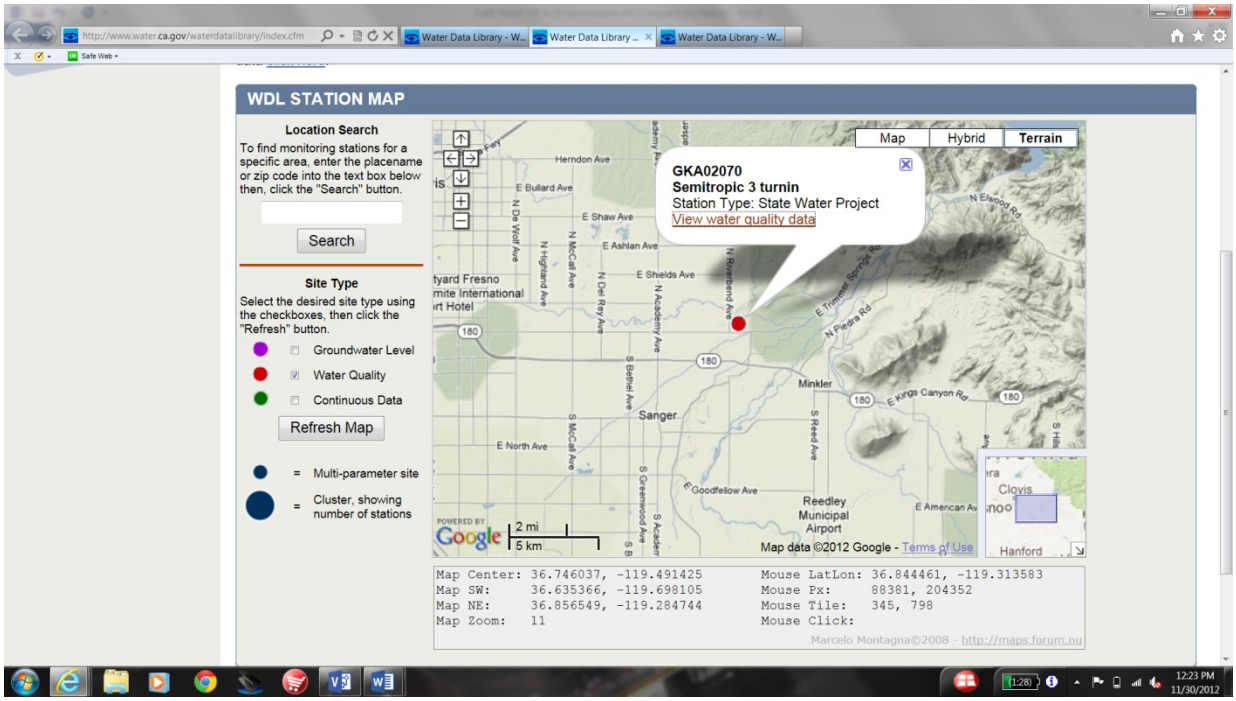


Figure 5. WDL Station Map

Users can also search for and download data through a data reporting system. Users can search for data by:

- County and Water Quality Station Name or Number
- Water Quality Project Name
- Water Quality Station Group

Data searches are limited to 15 stations to ensure system performance is not impacted by the query and results are manageable.

Searches can also be filtered by analytes or analyte groups and collection date, with optional outputs for field data. Data can be downloaded in text, CSV, and Excel format.

Access to certain water quality data within WDL is restricted. Owners of data have extended privileges such as the ability to log on to WDL and:

- Edit field information
- Change viewing privileges
- View confidential data

Section 2.3.2.2.1: GIS Component

- XY coordinates for each water quality monitoring site are provided as a field in the WDL database.

Section 2.3.2.3: Data Types and Process Flow

Water quality data is limited to grab samples. Each sample is a discreet sample taken by a field technician. Samples are taken according to rigorous standards for sampling and handling. Samples are sent to DWR's Bryte Lab in West Sacramento for analysis. Requests for testing are standardized through common language, methodology, and standards set by the lab.

A field technician determines where and when to take samples, and what analyses to perform for each sample. This information is entered into a regional Microsoft Access database. The Microsoft Access database generates labels and chain of custody forms including analytical requests, and container summaries to accompany the physical sample once taken. The system transmits the information to Bryte Lab. There are currently 15 desktop locations of the Microsoft Access database. A new SQL centralized system will be in place soon to replace the Microsoft Access database backend.

Once the samples are taken and appropriately labeled, they are transported to the lab for processing. Samples are analyzed in the lab and the results are recorded in the Field and Laboratory Information Management System (FLIMS).

The lab performs its own QA/QC using blanks, spiked tests, and samples that warrant specialized methodologies. After analysis at Bryte Laboratory, the data is extracted and uploaded to WDL. FLIMS data is updated in WDL every Monday night. The sample analysis and reporting process is depicted in Figure 6 below.

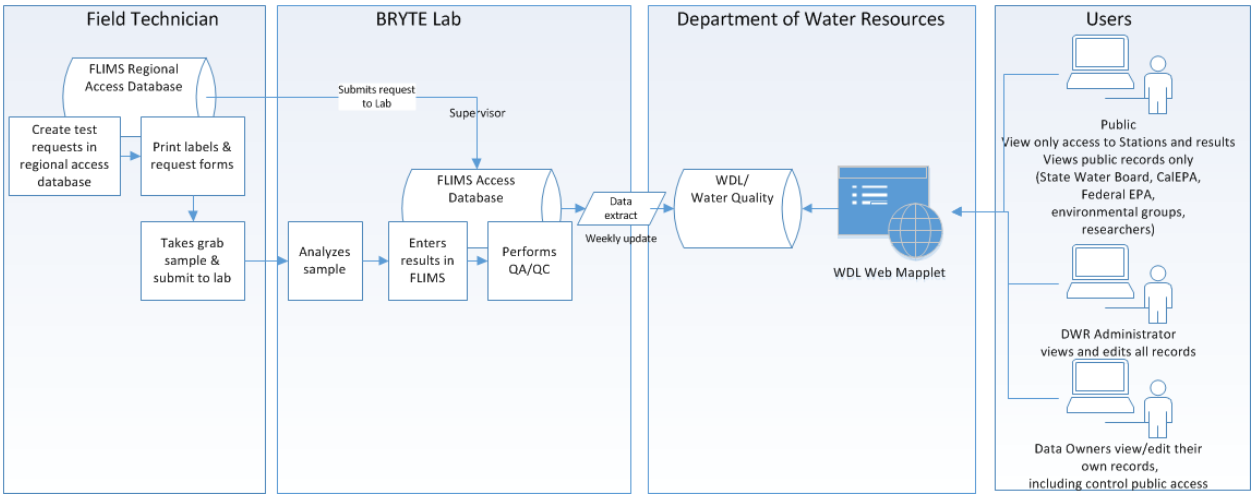


Figure 6. Water Quality Sample Processing

Each month data is purged from Bryte's FLIMS making WDL the primary storage mechanism for water quality results. Regular database backups of FLIMS data are taken and stored in the event a restore is needed.

Data owners can edit water quality data through the WDL. These edits are not transmitted back to FLIMS.

Section 2.3.2.3.1: General WDL/Water Quality Data Relationships and Rules

The following depicts some of the WDL/Water Quality data relationships.

- Each station will have multiple grab samples. Each sample will have multiple Aliquots for testing.

- Each Aliquot may result in multiple analyte test results some are official test results others are QA/QC tests verifying the validity of the test. Each test will reference a method.

- Programs also submit multiple QA/QC samples which are generated to validate testing methods rather than to generate official analyte test results:

Section 2.3.2.3.2: Restricted Access Data

Record access is controlled by the record owner. The record owner sets the security of each record through a status field associated with the aliquot ID. The security status is updated to allow public access when the owner of the record determines it is appropriate. Field data can be edited by the record owner, but lab results can only be changed by the lab record owner.

Tile drain locations are confidential. These records are coded as tile drains and not made available to the public.

QA/QC records are not made available to the public.

Section 2.3.2.4: Users

Users of water quality data include DWR and its regional offices and public users such as the State Water Board, CalEPA, and Federal EPA. Field biologists and academics also frequently use this data. The majority of public users of water quality data will access it through the WDL web-map portal.

Section 2.3.2.5: Technical Background

Section 2.3.2.5.1: WDL

The WDL is an Oracle database maintained by DTS. There are currently 3.5 million historic records in WDL/Water Quality dating back to 1903. Most of this data is not currently available to the public.

WDL/Water Quality contains historic data. This includes the following data:

- 1998 – current – all data statewide
- 1981 – current for Municipal Water Quality Investigations
- 1960 – 1998 historical data that does not include QA/QC data

- 1908 – 1990 other water quality data, some collected by DWR's predecessors

Section 2.3.2.5.2: FLIMS

FLIMS is a Microsoft Access application. It is deployed at regional and field offices, and at Bryte Lab. The data is transferred to Oracle every week, once sample analyses are complete at Bryte Lab. Parts of FLIMS are moving to a centralized SQL server.

Section 2.3.3: Suisun Marsh

Section 2.3.3.1: Purpose

Suisun Marsh is the largest contiguous brackish water marsh remaining on the west coast of North America. It is a critical part of the San Francisco Bay-Delta estuary ecosystem. The Bureau of Reclamation and U.S. Fish and Wildlife Service, in partnership with the California Department of Fish and Game, finalized an environmental document on the Suisun Marsh Habitat Management, Preservation, and Restoration Plan.

The Final Environmental Impact Statement/Environmental Impact Report (Final EIS/EIR) assesses a comprehensive 30-year plan designed to address use of resources within approximately 52,000 acres of wetland and upland habitats in Suisun Marsh near Fairfield, California. The focus of the plan is to achieve an acceptable multi-stakeholder approach to the restoration of tidal wetlands and the enhancement of managed wetlands and their functions.

To support the goal of improving wetland habitat in the Suisun Marsh, a network of water quality monitoring sites reports data to DWR. The Suisun Marsh program is run by DWR's Division of Environmental Services (DES), and by the Interagency Environmental Program.

State Water Resources Board Decision 1641 required the monitoring and reporting of specific stations and listing of all constituents. Compiling these results is a considerable effort consuming DWR resources and costing an estimated $250,000 per year to produce. DWR developed the Suisun Marsh Time Series web application to satisfy a reporting requirement of Decision 1641, which is currently being tested as a prototype and not yet available to the public. Once live, this system will provide public access to the monitoring results.

The Suisun Marsh program was part of a previous attempt to collect and disseminate a wide variety of data collected by numerous monitoring agencies called the Bay Delta and Tributaries (BDAT) system. BDAT was developed by DWR and IEP to manage similar data, but the system is no longer maintained. BDAT is now in DWR archives. Data in BDAT is not within the scope of Water PIE.

Section 2.3.3.2: Functionality Overview

The Suisun Marsh Program developed the prototype of Suisun Marsh time series data using a Google Maps web based display. This website will allow users to view and download data. In addition, users will be able to:

- Display time series data through a Google Charts based graphing tool
- Create and save custom lists of monitoring sites to generate personalized reports
- Manually enter a search by organization name, data type, or location
- Search data types including 13 constituents or parameters such as water temperature, salinity, or

electrical conductivity

- Create graphs or download data for one or many of these parameters at each monitoring location
- View metadata about each station, such as contact person, contact information, etc.

Until the new website is fully operational, the only access Suisun Marsh water quality data is through California Data Exchange Center (CDEC). The time series data in CDEC has not gone through the QA/QC process.

Note for Water PIE:

- Require the user to download the metadata with a date and time stamp when downloading any data from Water PIE
- Possibly limit what can be graphed together, such as one constituent
- Would like an output of data in Army Corp of Engineers Hydrologic Engineering Center Data Storage System (HEC DSS) format

Section 2.3.3.2.1: GIS Component

- Monitoring sites within the Suisun Marsh Program have fields containing XY coordinate locations and Z coordinates.

Section 2.3.3.3: Data Types and Process Flow

The Suisun Marsh data has the following general categories of data:

- Monitoring Data
- Station Data
- Field Visit Results

Section 2.3.3.3.1: Time Series Monitoring Results

Suisun Marsh water quality data is automatically reported to the Suisun Marsh Time-Series database from each individual monitoring station. The raw data is saved and made available for QA/QC by qualified DWR personnel though a subsystem called VISualization Tool and Analyzer (VISTA) which supports interactive viewing and editing of time series data directly to Oracle tables. DWR staff review the data series and manually adjust individual data points and smooth spikes and valleys as necessary. For DWR and other Monitoring Entities, a special role grants access to editing features for data. Qualified users have the ability to alter data points for each 15 minute interval within any of a monitoring station's measured parameters. Each data series record has a field to designate whether it has been checked for QA/QC, unchecked, or flagged as having errors.

The system exports approved QA/QC records into a staging database that will be made available to the public via a Google Maps web based application.

This process is depicted in Figure 8 below.

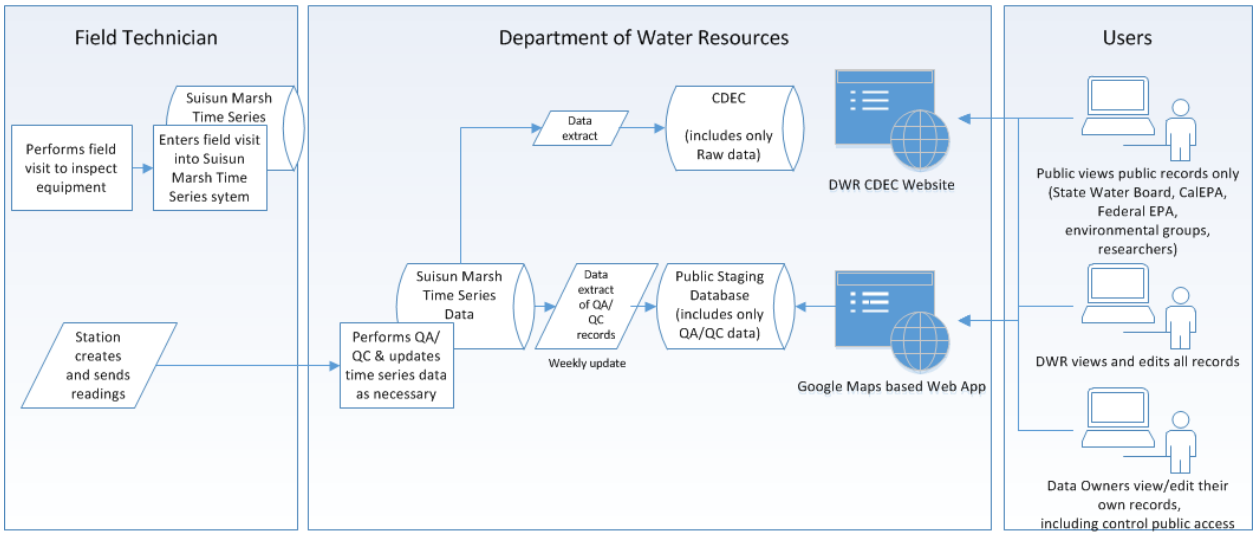


Figure 7. Suisun Marsh Time Series Data

Section 2.3.3.3.2: Field Visit Results

The automated process is augmented with field visits from technicians. They manually record field notes for a variety of standardized checks and procedures. These paper notes are then translated into electronic records. The raw station data, QA/QC data, and field notes are stored in an Oracle database that is accessed using ASP.Net/VB maintained on DTS' virtual servers. The Suisun Marsh Program uses an extract of the QA/QC data for use by the public. This data is refreshed every weekend. All data that is available to the public comes with a metadata file the meets standards set by DWR. This file is mandatory for all data released to the public.

Section 2.3.3.3.3: General Suisun Marsh Time Series Relationships and Rules

The following depicts some of the Suisun Marsh Time Series data relationships.

- Each station has zero to many analyte or staging measurements and each analyte or staging measurement is linked to one station.

Section 2.3.3.3.4: Restricted Data

There is currently no public access to the Suisun Marsh Time Series system. Once the Suisun Marsh Time Series web application is migrated to production, public users will be able to view an extract of the Suisun Marsh Program database which contains records that have passed QA/QC review. Raw time series data is currently available through the CDEC.

Water PIE will exchange data with the public staging database only.

Section 2.3.3.4: Users

Users of Suisun Marsh Program data are varied. One of the most critical users is DWR Operations and Maintenance Division, which uses Delta water quality measurements to balance water-flows out of the Delta system and meet water quality requirements. Other user groups include public agencies of IEP,

academics, and environmental groups. Monitoring of water quality in the Delta is critical for protection of fish species, agricultural producers operating within the region, and during crisis events such as a levee break.

Section 2.3.3.5: Technical Background

Data for the Suisun Marsh Program is stored in an Oracle database and developed in ASP.net. This database is maintained on DTS' virtual servers on the 7th floor of the Natural Resources building.

The Suisun Marsh Time Series database stores up to 20 years of records.

In addition, the Suisun Marsh Time Series database is identical to the Environmental Monitoring Program (EMP) but supports a different area of the delta - the Bay-Delta region. The difference between the two databases is who has permissions to edit which database. EMP data will likely be included in a later phase of Water PIE, although is out of scope for Phase I of Water PIE.

Section 2.3.4: Hub Prototype Integrated Water Resources Information System

The Integrated Water Resources Information System, IWRIS, is a data management tool for water resources data. It is a web based GIS application that allows public access to integrate, query, and visualize multiple sets of data. Some of the data sources available in IWRIS include: DWR Water Data Library – Groundwater elevation data (now CASGEM), CDEC, U. S. Geological Survey (USGS) streamflow, Local Groundwater Assistance Grants (AB303), and data from local agencies. Not all of the local data sources are currently available or active.

IWRIS is a hybrid system. The program uses web services to retrieve data from participating agencies' data sources. Other data sources, such as GWMPs and AB303 Grants, are stored in the system.

The goal of IWRIS was to be a single point of access for state-wide water resources information. It integrates multi-disciplinary data to support Integrated Regional Water Management (IRWM). IWRIS increased efficiency in data download and dissemination of useful information through flexible, expandable, and user customizable functionalities.

Section 2.3.4.1.: Functionality Overview

IWRIS is web based GIS application. The IWRIS homepage contains information such as:

- User manual
- Video guides/examples
- IWRIS GIS Layer List
- Online help

Users must first register with DWR before they can access IWRIS. Once a log-in is created, users can view the application.

Upon entry into the system the user is notified that data sources contained within IWRIS have varying degrees of spatial accuracy, different extents, data dictionaries, and other interoperability issues. These issues are critical for users to understand when trying to interpret data from data sources maintained and populated by different agencies, departments, or areas of study. This message is depicted in the IWRIS screenshot in Figure 9 below.

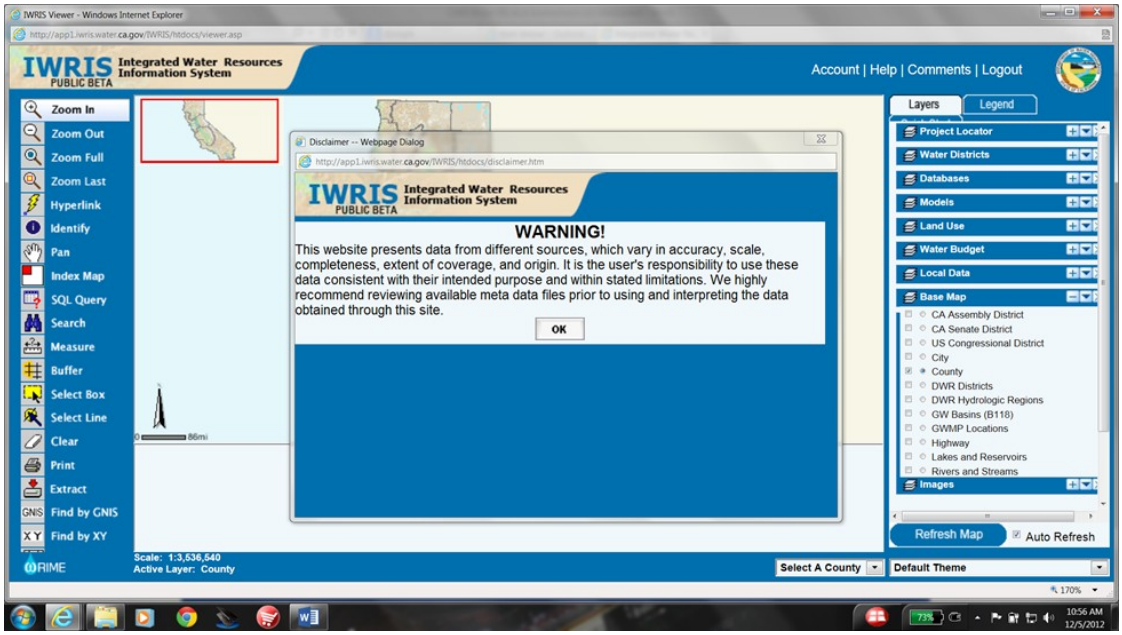


Figure 8. IWRIS Introduction Page

Users can select from available data sources and layers. Layers can be turned on or off, and can be moved to display on top of or below other active layers. Tools are available to help users explore, query, search, and download data. This toolset includes:

- Zoom/Pan
- Open Hyperlink for selected object
- Identify
- SQL Query
- Search
- Search by GNIS Place
- Search by XY
- Measure distance
- Buffer
- Select object with polygon or line
- Print screen

Users can also select GIS layers from which to view and download data. These layers are divided into descriptive categories that contain the individual layers. The categories and layers they contain are:

- Project Locator- AB303 grants for 2001-2005, Proposition 50 grants
- Water Districts- Local, State, Private
- Databases- WDL, CDEC, USGS

- Models- C2USIM, California Models, Individual Models, Sacramento County IGSM
- Land Use- Sacramento County 2000, Fresno County 2000, Yolo County 1997
- Water Budget- Central Valley, Kings Basin, Sacramento County, Stony Creek, Yolo County
- Local Data- Mojave Water agency, Sacramento Groundwater Authority
- Base Map- CA Assembly or Senate districts, US Congressional district, City, County, DWR districts, DWR hydrologic regions, B118 Basins, GWMP Locations, Highways, Lakes, Rivers
- Images- topographic map

One of the more important features of IWRIS is the ability to produce hydrographs for multiple stations. This is particularly helpful for evaluating data before downloading it. Users can download available data in CSV and MS Excel format. Not all data is downloadable.

Users can individually select or group layers for display. Layers can be moved above or below each other for viewing by the user.

Section 2.3.4.2: Data Types and Process Flow

IWRIS connects to outside data sources through web services. IWRIS is currently connected through web services to:

- Water Data Library – Groundwater module
- California Data Exchange Center
- USGS Streamflow data

All other GIS layers such as Bulletin 118 groundwater basins are stored locally in the IWRIS database and maintained by DWR.

Section 2.3.4.3: Users

Security is stratified in IWRIS into three primary tiers - public, DWR, and data owner.

DWR users can access confidential data within DWR's ownership.

When local data was available, local water entities were able to view restricted data from their data sources. This data was not available to the public or DWR.

IWRIS is accessible to any member of the public. After a creating a user login, public users can view any data not identified as confidential or restricted.

Section 2.3.4.4: Technical Background

IWRIS was created as a web-service based data exploration and downloading tool. It was developed by a private contractor for DWR. There is little documentation on the system and DTS has stopped maintaining IWRIS. DWR expects that Water PIE will replace IWRIS in later phases of the project.

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