



# Oregon Water & Monitoring Well Data Standard

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## **1.0 Introduction**

Water well data, and their locations, are collected by a variety of public and private entities in Oregon at all levels—local, state, and federal— with little coordination. The Oregon Water Resources Department (OWRD) is the custodian of well logs filed by well drillers when they drill, deepen, or abandon a well. Location information provided by most well logs is, at best, defined by a Public Land Survey quarter-quarter section description. OWRD locates wells using GPS for inspections or ground water studies. Additionally, staff from other government and private organizations visit wells and determine more precise location information for their purposes. The data is not collected or stored according to a standard nor is it easily available to be shared amongst the various users. This can impede and/or increase the cost of development that requires accurately located ground water data.

Well locations portrayed on USGS quadrangle maps, the primary source for the Digital Line Graph (DLG) data files and, subsequently, the NHD (National Hydrography Dataset), are not reliable, either. The maps are dated and most wells were not shown on a given quad map when they were compiled. For example, only representative wells were portrayed on the map where they were part of a large cluster of closely spaced wells (Thompson. p. 42).

### **1.1 Mission and Goals of Standard**

The purpose of the Oregon Water & Monitoring Well Data Standard (OWMWDS) is to specify a common method for locating and identifying water & monitoring wells in the state. The hope is that users are able to acquire data from disparate sources and use the results in an appropriate manner for the required need.

### **1.2 Relationship to Existing Standards**

The OWMWDS draws from a variety of agency and private entity methods for capturing location and descriptive information about water wells. There is some overlap with the National Hydrography Model which also captures the locations of some wells and not for the same purposes as most entities in the state. However, a possible outcome of this effort would be to populate the NHD points theme in Oregon with more accurately located water well features.

All geospatial datasets developed from the OWMWDS must adhere to the Federal Geographic Data Committee, Content Standard for Digital Geospatial Metadata.

### **1.3 Description of Standard**

The OWMWDS includes the elements necessary to adequately identify and locate water & monitoring wells in Oregon and relate records from different entities about the same wells.

### **1.4 Applicability and Intended Use of Standard**

The OWMWDS is applicable to tabular and feature data sets that represent water & monitoring wells within the state. This standard is intended to support the mapping, integration and sharing of publicly available water well information. Having a common format to facilitate data sharing will enhance the prospects of developing a comprehensive water well data set. This will help diminish redundant data

collection efforts between the various entities collecting data from the same water wells. It could help reduce the need to drill new monitoring wells because an agency doesn't know about the existence of wells in area where work is planned.

This standard does not preclude agencies from developing and maintaining water & monitoring well data differently for internal purposes. However, shared versions of the datasets must meet the requirements set forth in this standard.

## **1.5 Standard Development Procedures**

The need for this type of standard goes back several years as more water & monitoring wells have been drilled in Oregon and more agencies have become involved in tracking information about them. There were several informal discussions around methods for standardizing the elements, but nothing came to fruition until a proposal was submitted by the OWRD to the OGIC Framework Data Development Program in April of 2009. The proposal was reviewed and accepted later that year. In early 2010, staff from the OWRD identified and sent invitations to contacts in several federal, state, and local agencies, and ground water consulting companies asking them to participate in the development of the OWMWDS. The first meeting of the work group was held and representatives from 6 different agencies and consultants participated.

Meetings continued through 2010. Each member presented their agency's method of data collection for water wells. The work group agreed on a common set of attributes for locating and identifying wells. OWRD staff will test viability of the OWMWDS in the winter of 2010/2011 against a subset of the well log data maintained by the OWRD.

## **1.6 Maintenance of Standard**

The OWMWDS will be revised on an as-needed basis. Revisions can be initiated by members of the standards work group or by anyone in the GIS or ground water community with significant revisions, needs or expertise related to the creation, maintenance or integration of water well data.

As the Oregon Framework Hydrography Standard moves towards adoption of the National Hydrography Dataset, there may be necessary updates to the OWMWDS. The OWRD will assume responsibility for maintaining the standard and the water well data for the state as Horizontal Steward. Work will be dependent on available funding and other partners may assist with these responsibilities.

## **2.0 Body of the Standard**

### **2.1 Scope and Content of the Standard**

The scope of the OWMWDS is to provide a standard method of identifying and locating water & monitoring wells in Oregon. It contains a core set of attributes to which other data collected about wells can be related.

## **2.2 Need for the Standard**

Multiple federal, state, and local agencies and other entities currently collect data about water wells. These entities as well as many that do not collect well data all have a shared need to know about ground water resources. The various data collected from wells contribute to a better understanding of the state's ground water, which is being increasingly impacted. With multiple entities collecting data about the same wells there is an urgent need to ensure that they're referring to the same well.

The Oregon Water Resources Department is the steward of well logs filed by well drillers when they drill, deepen, or abandon a well. This process has been in place since 1955. Physical tags, with a well identification number, are also required to be affixed to all wells drilled, deepened, converted or altered (OWRD, 11/08, p. 3). The well tag program was started in 1996 so only a fraction of wells have a tag.

Up through the 1990s, and even at present, wells are located by their Public Land Survey (PLS) quarter-quarter section description on the well log. Since the advent of inexpensive GPS receivers more wells are being located by their latitude and longitude coordinates. Through the process of well inspections by OWRD personnel and ground water studies conducted with other agencies older wells are being located by GPS.

Personnel from well construction companies, consulting firms, non-profits, and other federal, state, and local agencies, also visit wells and record their own location information along with the data that they're collecting for their business. Some of them record the well tag if it exists and the well log number if they look for it in the course of their research. Without a standard there is no consistent means of identifying water & monitoring wells so that data collected by the various entities can be tied together for a particular well.

## **2.3 Participation in Standards Development**

This standard and the process by which it will be updated or enhanced is open to all entities concerned with the development, maintenance, and application of water & monitoring well data to important business functions. As with all Oregon framework standards, public review of and comment on the OWMWDS is encouraged.

The work group that drafted the standard had representatives from all levels of government and a private consulting company.

## **2.4 Integration with Other Standards**

The OWMWDS follows the same format as other Oregon Framework geospatial data standards.

## **2.5 Technical and Operation Context**

### *2.5.1 Data Environment*

The data environment for the OWMWDS is a vector model comprised of points which can be maintained as a formatted text file, such as comma or tab-delimited, a spreadsheet, or database table, as long as it contains two columns—one for the x-coordinate and the other for the y-coordinate.

The exchange medium for water & monitoring well data files is the Environmental Systems Research Institute (Esri) shapefile, which is an open data structure relating points, lines, polygons and feature attribution (including shape geometry). This exchange medium is supported by all known GIS software suites in use in Oregon. Information about the technical specification for the Esri shapefile is found at: <http://www.esri.com/library/whitepapers/pdfs/shapefile.pdf>. In designating the shapefile as the exchange format, this standard has been designed to accommodate its limitations, such as limiting attribute (field) names to ten characters.

Alternatively, users may use the Esri file geodatabase (FGDB), version 10. Esri has recently released an API for programmers to use for creating and maintaining FGDBs without having to obtain ArcObjects through other Esri products (ArcGIS Desktop or Engine). Updates and information about the API can be found at: <http://resources.arcgis.com/content/geodatabases/10.0/file-gdb-api>. It does not have the ten character attribute name or size limits imposed by the shapefile format.

### *2.5.2 Reference Systems*

Since most GPS receivers capture locations as latitude and longitude coordinates in WGS 84 the OWMWDS includes those as required attributes. A shapefile created from these coordinates should be projected into the state coordinate reference system, Oregon Lambert (EPSG #2992; described at <http://gis.oregon.gov/DAS/EISPD/GEO/data/format.shtml>).

### *2.5.3 Integration of Themes*

The OWMWDS is currently a stand alone specification for water well locations in Oregon. However, since this work group is part of the Oregon Hydrography Framework an effort will be made to use well locations captured according to the standard to improve and supplement well locations in the NHD.

### *2.5.4 Encoding*

Encoding translates user formats into standard formats, like the shapefile specified here for exchange. All GIS software used in Oregon has the capability of encoding its format to the shapefile format.

### *2.5.5 Resolution*

The OWMWDS dataset resolution will meet a minimum 1:24,000 scale. Local data capture methods will vary as will the business applications that those data must support. It is the intention of the OWMWDS to allow for the integration of data collected at multiple spatial resolutions.

### *2.5.6 Accuracy*

As with resolution, the intention of the OWMWDS is to support varying levels of positional and attribute accuracy. However, it is essential to the success of the data standard that all aspects of water & monitoring well data be completely documented (either at the feature or dataset level).

### *2.5.7 Edge Matching*

The OWMWDS is intended to facilitate the compilation of a comprehensive dataset for water & monitoring wells in Oregon. Edge matching between jurisdictional submissions will be implemented by the Horizontal Steward according to established business rules. Where multiple data originators submit conflicting data for the same wells, the Horizontal Steward will refer these back to the originators for reconciliation.

### *2.5.8 Feature Identifier*

The feature identifier will be created and maintained by the Horizontal Steward for this element. It will uniquely identify water & monitoring wells.

### *2.5.9 Features and Attributes*

There is one feature type with its associated characteristics.

#### *2.5.9.1 Points*

Point features are geospatial objects that represent water & monitoring well locations in the OWMWDS.

#### *2.5.9.2 Lines*

Line features will not be employed in the OWMWDS.

#### *2.5.9.3 Polygons*

Polygon features will not be employed in the OWMWDS.

#### *2.5.9.4 Associated Characteristics*

Associated characteristics are any of the additional information that is collected and shared in relation to the representation of water & monitoring wells. These are referred to as attributes in spatial datasets. They are kept to a minimum in this standard since they are maintained by other entities for their business needs. See Section 3 for the specification of minimal and optional characteristics.

### *2.5.10 Transactional Updating*

Transactional updating processes will be explored as a functional component of a water & monitoring well database. The database will be hosted at the Oregon Water Resources Department. Through the business rules identified in the OWMWDS and the stewardship plan that will be employed for managing the water & monitoring well locations, it should be possible to manage the regular merging of locally managed water well locations into a statewide data structure.

### *2.5.11 Records Management*

In the event where water well locations change the information will be reflected in the distribution dataset available for download from the Horizontal Steward.

### *2.5.12 Metadata*

The OWMWDS follows the Federal Geographic Data Committee, Content Standard for Digital Geospatial Metadata. Metadata detailing the characteristics and quality of submitted water well locations must be provided. Metadata must provide sufficient information to allow the user to determine if that dataset will meet the intended purpose, as well as telling the user how to access the data.

### 3.0 Data Characteristics

#### 3.1 Minimum Graphic Data Elements

Suggested field names of 10 characters or less are shown in parentheses.

##### 3.1.1 Points

<i>ITEM NAME</i>	<i>TYPE</i>	<i>WIDTH</i>	<i>DESCRIPTION</i>
Shape	Point		Water well location.
wwID (wwID)	Long integer		Unique feature identifier: sequential, unique id generated by the horizontal steward.

##### 3.1.2 Lines

None.

##### 3.1.3 Polygons

None.

#### 3.2 Minimum Attribute or Non-graphic Data Elements

Suggested field names of 10 characters or less are shown in parentheses.

##### 3.2.1 Points

<i>ITEM NAME</i>	<i>TYPE</i>	<i>WIDTH</i>	<i>DESCRIPTION</i>
wwLongitude (wwLong)	Double	13.6	Longitude value of the well location expressed in “degrees-decimal”, with a preceding negative sign (World Geodetic Spheroid 1984).
wwLatitude (wwLat)	Double	13.6	Latitude value of the well location expressed in “degrees-decimal” (World Geodetic Spheroid 1984).
wwHorizontalAcc (wwHorizAc)	Double	6.2	Horizontal accuracy assessment of the preceding latitude and longitude coordinate pair.
wwLabel (wwLabel)	Text	15	Oregon Water Resources Dept. issued well label number. <i>Also known as the “well tag” or “well ID number”.</i> If this id is not available, use one of the elements under “Optional Attributes” (3.4) to identify the well.
wwOtherID (wwOtherID)	Text	50	Collecting entity well identifier other than the OWRD
wwUser ( wwUser)	Text	25	Name of person creating this data record.
wwAgency ( wwAgency)	Text	50	Name of the agency that the person represents.
wwRecordDate (wwRecDate)	Date		Date that this record created.

##### 3.2.2 Lines

None.

##### 3.2.3 Polygons

None.

### 3.3 Optional Graphic Data Elements

3.3.1 *Points*  
None.

3.3.2 *Lines*  
None.

3.3.3 *Polygons*  
None.

### 3.4 Optional Attribute or Non-graphic Data Elements

The *wwLogCounty*, *wwLogNbr*, and/or the *wwStartCardNbr* items are optional unless the well label (a.k.a., the well tag) is unknown. These attributes are presented in order of preference. The remaining attributes on this list are helpful if the well log (*wwLogCounty* & *wwLogNbr*) is unknown since they provide clues about a water well that can be used to tie it to the correct well log. Suggested field names of 10 characters or less are shown in parentheses.

#### 3.4.1 *Points*

<b>ITEM NAME</b>	<b>TYPE</b>	<b>WIDTH</b>	<b>DESCRIPTION</b>
wwLogCounty (wwLogCnty)	Text	4	Four letter county code abbreviation used at the beginning of the Oregon Water Resources Dept. well log id (all upper case). For example, "MARI" in the well log id "MARI99999". The county-code is assigned based on the county the driller entered on the well log. It may not correspond to the actual county that contains the well.
wwLogNbr (wwLogNbr)	Long integer		The second (numerical) part of the OWRD well log number. For example, "99999" in the well log id "MARI99999". This number is assigned by OWRD when the well log is filed at the Department. There may be more than one well log per well. OWRD assigns a well log id to each well log. Use the number of the first well log (first construction), if known.
wwStartCardNbr (wwStartCrd)	Long integer		Oregon Water Resources Dept. "start card" number. A startcard is a notice of intent to drill a well that must be submitted to OWRD by a well constructor. Startcards have only been required since 1989. Therefore, there will be a different startcard for each well log filed after 1989. Use the startcard number of the first well log (first construction).
wwWellName (wwWellName)	Text	50	Name of the well. Local reference or agency applied name.
wwOwner (wwOwner)	Text	254	Original owner's name or company name on the well log.
wwAddress (wwAddress)	Text	100	Street address of the property (including state and zip code) where the well is located. For example, "1Main St., Salem, OR 97301".
wwTaxlot (wwTaxlot)	Text	29	The statewide standard map and tax lot number (ORTaxlot) as defined in the Oregon Cadastral Data Exchange Standard is preferred.

<i>THE FOLLOWING ITEMS ARE TO BE USED FOR IDENTIFICATION PURPOSES ONLY. THEY ARE NOT INTENDED FOR USE IN ANALYSIS. THE WELL LOG SHOULD BE USED AS THE FIRST SOURCE AND, IF THERE IS MORE THAN ONE LOG, THE FIRST LOG IN THE SERIES IS PREFERRED.</i>			
wwTypeofUse (wwTypeUse)	Text	100	Primary use of the well. Record the observed use in the absence of a well log.
wwCompletionDate (wwCompDate)	Date		The original completion date of the well expressed. If only the month and year are known use the last day of the month, e.g. "6/30/2001" for "June 2001". If only the year is known use December 31 <sup>st</sup> , e.g. "12/31/2001" for "2001".
wwCompletedDepth (wwCDepth)	Double	6.2	Completed depth as reported on the (first) well log (in feet).
wwCasingDiam (wwCasing)	Integer		Surface casing diameter of the well, or the maximum casing diameter, to the nearest inch.
wwDepth2Water (wwDWater)	Double	6.2	Reported depth to first water, to the nearest foot.
wwStaticWater (wwSWater)	Double	6.2	Static water level, in feet below the land surface, as reported on the (first) well log.
wwDrillingMethod (wwDrill)	Text	100	Method of drilling.
wwLandSurfaceElevation (wwLSElev)	Double	6.2	Elevation of the well at the ground surface (in feet).
wwElevationRemarks (wwElevRmks)	Text	100	Remarks describing where the preceding elevation value was taken with respect to the well.

3.4.2 *Lines*  
None.

3.4.3 *Polygons*  
None.

## References

Bastasch, Rick. 1998. *Waters of Oregon: A Source Book on Oregon's Water and Water Management*. Corvallis, Oregon: Oregon State University Press.

Thompson, Morris. 1982. *Maps for America*, 2 ed. Washington, D.C.: USGPO.

*A Guide to the Well Identification Program*. [pamphlet]\* Oregon Water Resources Dept., November 2008.

*How to Measure the Water Level in a Well*. [pamphlet]\* Oregon Water Resources Dept., June 2009.

*Water Well Owner's Handbook*. [pamphlet]\* Oregon Water Resources Dept., March 2010.

\* - all OWRD pamphlets are available from the agency's web site at:

<http://www.wrd.state.or.us/OWRD/PUBS/index.shtml>