Appendix E

Well Installation, Maintenance, and Decommissioning

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E Well Installation, Maintenance, and Decommissioning

This chapter describes well installation, maintenance, and decommissioning activities on the Hanford Site in 2014. Numerous water wells were drilled or hand dug by early settlers for drinking water supplies, beginning in the early half of the 20th Century. Several thousand wells have been drilled since the early 1940s to support the Site's nuclear weapons production program. Since the 1990s, many additional wells have been drilled to support the Site's environmental cleanup mission.

All well types are tracked on the Hanford Site through the Well Information and Document Lookup (WIDL) database, which is available to users of the Hanford Local Area Network. Much of this information (borehole geophysical logging reports and data sheets) is also available to the public through the DOE Environmental Dashboard Application. Other data can be accessed via borehole summary reports that are generated for each drilling campaign.

Recognized well types onsite include aquifer tubes, borings, groundwater wells, hosted piezometers, independent piezometers, piezometer hosts, soil tubes, lysimeters, and vadose wells (Table E-1). All wells (cased and uncased), borings, aquifer tubes, soil tubes, piezometers, and other subsurface excavations are required to receive a unique Hanford well identification (ID) number. A total of 12,180 unique well ID numbers had been assigned on the Hanford Site by the end of 2014. The Washington State Department of Ecology (Ecology) also assigns a well ID number to each of these well types.

Figure E-1 presents the categorization of unique well ID numbers taken from WIDL and their approximate geographic designations. During 2014, 4,087 of these unique well ID numbers were documented to be in use, representing 2,990 wells, 122 piezometers within host wells, 79 lysimeters within host lysimeters, 509 aquifer tubes, and 387 soil tubes. Thus, of the 12,180 unique well IDs, 5,963 wells are candidates for decommissioning or have been decommissioned.

E1 Monitoring Well and Aquifer Tube Installation

DOE works with the appropriate regulatory agencies to define the need for new wells at the Hanford Site. Each year, DOE proposes new wells to meet the requirements of RCRA detection and assessment groundwater monitoring requirements; characterization, remediation, and monitoring for CERCLA; and long-term monitoring of regional groundwater plumes in accordance with DOE orders based on AEA requirements. These efforts may include new or ongoing RCRA assessment of groundwater contamination, replacement of monitoring wells that go dry because of the declining regional water table, replacement of wells that need to be decommissioned, improvement of spatial coverage for different monitoring networks and plume monitoring, and characterization of subsurface contamination.

New RCRA, CERCLA, and AEA monitoring well proposals are reviewed, prioritized, and approved annually in accordance with the Tri-Party Agreement (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*) Milestone M-024. All new wells are constructed as either resource protection wells or water supply wells in accordance with WAC 173-160. Well requirements are integrated, prioritized, and documented through the budget development process, discussions between DOE and the regulatory agencies, and specific monitoring and characterization requirements.

During 2014, 30 wells were installed (Table E-2) and 6 aquifer tubes were installed (Table E-3) at the Hanford Site. The locations of the new wells are shown in Figure E-2. The 30 wells installed were completed (accepted) in 2014. In some cases, drilling began in 2013. Four of the wells installed were temporary wells (199-D5-155, 199-D5-156, 199-D5-157, and 199-D5-158), and were also decommissioned in 2014.

Water well reports for all newly constructed wells, as required by WAC 173-160, were submitted to Ecology. Detailed well information such as geologic and geophysical descriptions, characterization activities (that is, sediment and groundwater sampling, aquifer testing), and construction records for the new wells are stored in WIDL and consolidated in borehole summary reports. Much of this information is also accessible and available through the DOE Environmental Dashboard Application.

E2 Borings

During 2014, one boring was drilled for the 300-FF-5 Operable Unit (Figure E-2) to a depth of 12.1 m (39.7 ft). The borehole was drilled for post-ROD investigation purposes. Borings differ from wells in that no permanent casing or screen is installed and the borehole is decommissioned immediately after characterization is complete.

E3 Maintenance

During 2014, well maintenance was conducted 672 times on the different well types. Surface modifications included repair or replacement of locking well caps, surface casing repairs, diagnosis and repair of electrical wiring, labeling, electrical bonding, and modifications to surface pump and riser pipe discharge components and fittings. Subsurface tasks typically included repair and replacement of sampling pumps, downhole camera surveys, pump and equipment retrieval, and replacement of discharge tubing. Well rehabilitation activities included surging, swabbing, screen brushing, chemical treatment, and over-pumping to improve well performance.

Documentation for well maintenance activities is entered into the Well Maintenance Application database and accessible through WIDL. This information is also accessible externally through the DOE Environmental Dashboard Application.

E4 Decommissioning

This section describes the Hanford Site well decommissioned process. Four temporary wells in 100-D Area (199-D5-155, 199-D5-156, 199-D5-157, and 199-D5-158) were decommissioned in 2014. The wells were located in the 100-D-100 waste site excavation and were decommissioned so the excavation could be filled. In 2015

As part of DOE asset management, wells, boreholes, or other subsurface installations are identified for decommissioning when they are no longer useful for achieving the Hanford Site environmental cleanup mission. Well decommissioning is driven by DOE/RL-2005-70, *Hanford Site Well Decommissioning Plan*. Decommissioning is defined therein as the properly completed and documented sealing of water or resource protection wells in compliance with state groundwater protection laws (WAC 173-160). The plan lays out the basis, decision logic, and implementation process for prioritizing and decommissioning Hanford Site wells.

All candidate wells for decommissioning must be reviewed and approved by Hanford Site contractors, DOE, Ecology, EPA, and other potential well users such as the Pacific Northwest National Laboratory prior to decommissioning. The initial phase of decommissioning includes a thorough records review and physical inspection of each well to confirm the well's location and configuration (well attributes). Normally, a well becomes a candidate for decommissioning under one of the following conditions:

The well is no longer used for water level or contaminant monitoring, contaminant extraction, in situ remedial treatment of contaminated groundwater, permitted injection of treated effluent from a remedial action, water supply, research, or technology demonstration.

- The well has no specified future purpose.
- The well is unusable, abandoned, or permanently discontinued.
- The well is in such disrepair that its continued use is impractical.
- The well is an environmental, safety, or public health hazard (e.g.,, it does not meet WAC 173-160 requirements for well completion; however, there are special provisions for continued use of a non-WAC 173-160-compliant well).
- The well interferes with environmental remediation, excavation, and/or construction activities.

Decommissioning is performed in accordance with WAC 173-160-460 ("What Is the Decommissioning Process for Resource Protection Wells?"), applicable well decommissioning variances, and conditions defined in the Hanford Facility RCRA Permit (WA78900008967).

Decommissioning typically involves backfilling a well with impermeable material in both the annular space and the casing to prevent vertical movement of water and/or contaminants into the vadose zone and groundwater. For wells that are constructed according to WAC 173-160 requirements (compliant), decommissioning is performed by filling the well screen and the casing with an impermeable material (e.g., bentonite or cement grout). For older, noncompliant wells, the casing is either removed and the borehole is filled with seal material, or the casing is perforated and pressure grouted to create an external annular seal and then internally grouted to the surface. As far as possible, all casing is removed from the ground. A brass survey marker identifying the former well is typically set in cement grout at the ground surface over the decommissioned location. Decommissioning activities result in the permanent removal of a well, borehole, or piezometer from service and from the Hanford Site active well inventory.

A completed water well report form is required to be transmitted by the contractor or in-house driller to Ecology when a well is decommissioned. The report provides the details on the well's final construction and the steps taken to decommission the well.

Administratively decommissioned wells may be wells that can no longer be located and are determined to no longer exist; more generally, they are wells that were physically decommissioned but still require documentation describing this in the well database.

Each year a very limited number of previously unknown wells are usually discovered during the conduct of field activities. Once discovered, these wells are assigned a unique well ID number, assigned an appropriate well status, and added to WIDL. There were no well discoveries in 2014.

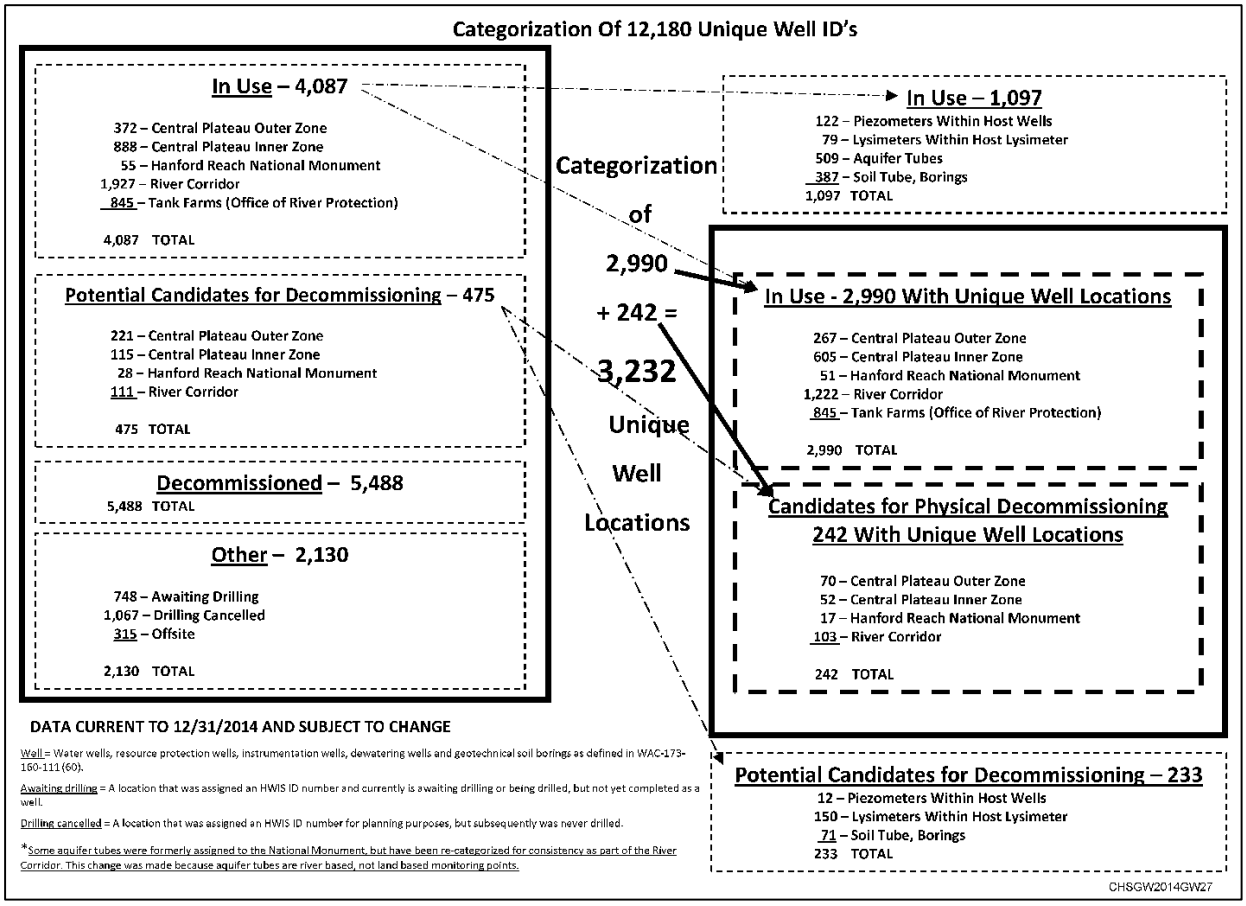

Figure E-1. Categorization of Unique Well Identification Numbers

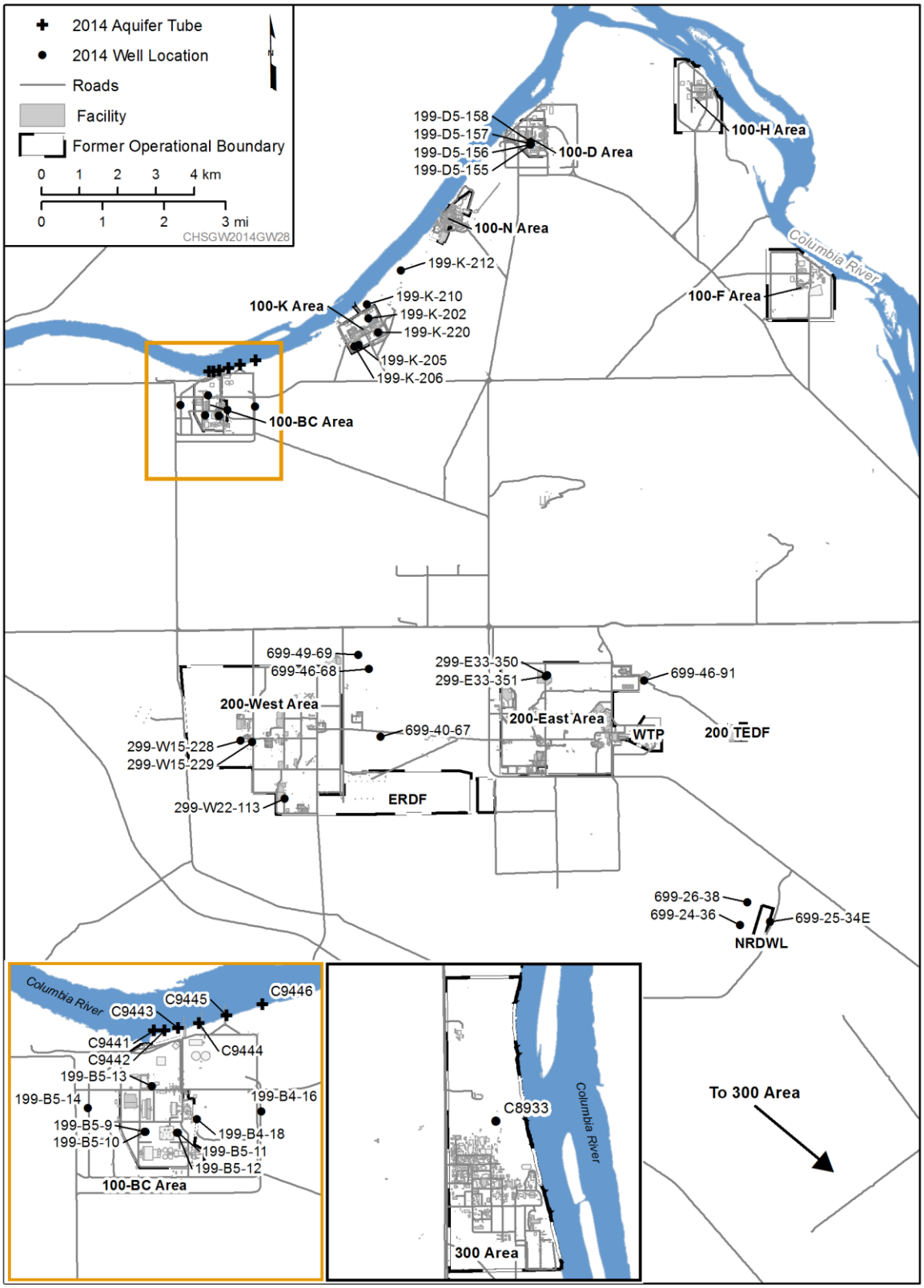

Figure E-2. Hanford Site Wells and Aquifer Tubes Installed in 2014

Table E-1. Hanford Site Well Types

Well Category	Description
Aquifer tube	A groundwater monitoring site installed along the river shoreline. Generally consists of a small diameter tube (less than one inch) and screen installed using push technology near the water table.
Boring	A borehole or direct push that was decommissioned immediately after drilling. Decommissioning generally would have been performed before the drill rig was removed from the site.
Groundwater well	A well constructed with the open interval extending below the water table. This is the general case and should not be used if the site could be otherwise classified as an aquifer tube, piezometer, or piezometer host.
Hosted piezometer	Groundwater monitoring well constructed inside of a host well. In most cases, hosted piezometers are one and one-half inch in diameter with the open interval extending below the water table.
Independent piezometer	Small diameter, independent, groundwater monitoring well not constructed inside of a host well. In most cases, the independent piezometers are one and one-half inch in diameter.
Lysimeter	Generally an in situ open bottom cylindrical core where the top is coincident with the ground surface, and with walls that prevent horizontal movement of moisture. A lysimeter is used to measure moisture or contaminant changes through time over a specific depth interval.
Piezometer host	A well with one or more piezometers constructed inside it.
Soil tube	Vadose zone monitoring site. A small diameter tube (less than two inches in diameter) and possibly a screen are left in place after the drilling is completed for sampling.
Vadose well	A vadose zone monitoring site where casing (greater than two inches in diameter) is left in place after drilling activities are completed. May have a screen, open bottom, or may be closed.

Table E-2. Wells Installed in 2014

Groundwater Interest Area	Well Name	Well ID	Well Purpose	Construction Depth (ft bgs)	Drilled Depth (ft bgs)	Acceptance Date
100-HR-D	199-D5-155	C8953	Temporary monitoring; multiple sampling ports	31.7	34.7	6/2/2014
100-HR-D	199-D5-156	C8954	Temporary monitoring; multiple sampling ports	31.9	35.9	6/2/2014
100-HR-D	199-D5-157	C8955	Temporary monitoring; multiple sampling ports	31.2	34.2	6/2/2014
100-HR-D	199-D5-158	C8956	Temporary monitoring; multiple sampling ports	28.7	32.8	6/2/2014
100-HR-D total = 4						
100-BC	199-B4-18	C8778	Monitoring	197.3	202.0	1/27/2014
100-BC	199-B5-13	C8783	Monitoring	172.9	223.4	1/27/2014
100-BC	199-B5-14	C8784	Monitoring	81.3	231.1	1/27/2014
100-BC	199-B5-9	C8779	Monitoring	189.3	205	1/27/2014
100-BC	199-B4-16	C8776	Monitoring	112.0	204.8	2/19/2014
100-BC	199-B5-10	C8780	Monitoring	98.0	100.7	2/19/2014
100-BC	199-B5-11	C8781	Monitoring	205.1	251.9	2/19/2014
100-BC	199-B5-12	C8782	Monitoring	104.0	104.4	2/19/2014
100-BC total = 8						
100-KR	199-K-202	C8289	Monitoring	157.1	160.1	4/7/2014
100-KR	199-K-205	C8292	100-KR-4 extraction (KW)	185.1	188.0	4/7/2014
100-KR	100-K-206	C8293	100-KR-4 injection (KW)	183.3	183.3	4/7/2014
100-KR	199-K-220	C8795	100-KR-4 extraction (KX)	169.2	171.3	7/16/2014
100-KR-	199-K-212	C8299	100-KR-4 extraction (KX)	81.9	85.8	7/16/2014
100-KR	199-K-210	C8297	100-KR-4 extraction (KX)	121.1	122.1	7/16/2014
100-KR total = 6						
200-UP	699-40-67	C8070	200 West Pump and Treat expansion – injection	534.9	535.1	9/2/2014
200-UP	299-W22-113	C8943	Monitoring	267.0	271.3	12/2/2014
200-UP total = 2						

Table E-2. Wells Installed in 2014

Groundwater Interest Area	Well Name	Well ID	Well Purpose	Construction Depth (ft bgs)	Drilled Depth (ft bgs)	Acceptance Date
200-PO	699-25-34E	C8200	Monitoring (SWL)	167.1	168.7	3/20/2014
200-PO	699-26-38	C8774	Monitoring (NRDWL)	169.1	169.9	3/20/2014
200-PO	699-24-36	C8772	Monitoring (SWL)	175.3	177.3	3/20/2014
200-PO total = 3						
200-BP	699-46-91	C8916	Monitoring	207.6	208.0	5/6/2014
200-BP	299-E33-350	C8914	Monitoring (perched water)	233.9	234.9	3/27/2014
200-BP	299-E33-351	C8915	Monitoring (perched water)	233.2	234.0	3/27/2014
200-BP total = 3						
200-ZP	699-46-68	C8067	200 West Pump and Treat expansion – injection	314.8	437	6/2/2014
200-ZP	299-W15-229	C8944	200 West Pump and Treat expansion – injection	455.0	479.5	9/24/2014
200-ZP	299-W15-228	C8716	200 West Pump and Treat expansion – injection	445.5	520.2	11/13/2014
200-ZP	699-49-69	C8786	200 West Pump and Treat expansion – injection	415	417.2	9/24/2014
200-ZP total = 4						
Grand total = 30						

bgs = below ground surface
ID = identification

Table E-3. Aquifer Tubes Installed in 2014

Groundwater Interest Area	Well Name	Well ID	Well Purpose	Construction Depth (ft bgs)	Drilled Depth (ft bgs)	Acceptance Date
100-BC	C9441	C9441	Remedial investigation	1	1	10/27/2014
100-BC	C9442	C9442	Remedial investigation	1	1	10/27/2014
100-BC	C9443	C9443	Remedial investigation	1	1	10/27/2014
100-BC	C9444	C9444	Remedial investigation	1	1	10/27/2014
100-BC	C9445	C9445	Remedial investigation	1	1	10/27/2014
100-BC	C9446	C9446	Remedial investigation	1	1	10/27/2014
100-BC total = 6						
Grand total = 6						

bgs = below ground surface
ID = identification

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