SGW-59675
Revision 0

Groundwater Meeting Minutes September 2, 2015, with Ecology: Revised RCRA Monitoring Plan Presentations for the 300 Area Process Trenches (APT) and 216-A-29 Ditch

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

P.O. Box 1600
Richland, Washington 99352

Approved for Public Release;
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APPROVED
By Ashley Jenkins at 1:58 pm, Feb 01, 2016

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MEETING MINUTES

Groundwater Meeting Minutes September 2, 2015, with Ecology: Revised RCRA Monitoring Plan Presentations for the 300 Area Process Trenches (APT) and 216-A-29 Ditch

September 2, 2015

Attendees:

Jeff Ayres (ECY)
Lee Brouillard (PRC)
Joe Caggiano (ECY)
Dwayne Crumpler (ECY)
Bill Faught (PRC)
Dib Goswami (ECY)
Doug Hildebrand (RL)
Brian Johnson (ECY)
Rob Mackley (PNNL)
Ken Moser (MSA)
Jessica Ni (PRC)
Virginia Rohay (PRC)
Fred Ruck (PRC)
John Sands (RL)
Heather Sulloway (PRC)

CC: Marty Doornbos (CHPRC)

From: Jessica Ni

Date: January 27, 2016

This meeting was held in the Ecology building, room number 3B, from 2:00 to 4:10 pm Pacific daylight Time on September 2, 2015. A summary of the discussion follows.

Objective:

The objective of this meeting was to review proposed groundwater monitoring plans for the 300 Area Process Trenches (APT) (Appendix A) and the 216-A-29 Ditch (Appendix B).

Discussion:

- John Sands opened the meeting with the 300 Area Process Trenches presentation.
- 300 APT compliance period will extend 3 consecutive years after the CERCLA remedy is complete in accordance with WAC 173-303-645(11). Potential issue with doing sufficient sampling to obtain enough data to do the statistics when the plan only calls for 3 years of monitoring once CERCLA attainment has been reached. Resolution: the monitoring plan will

allow a change to the sampling frequency to collect additional samples during the 3 year period to obtain a sufficient sample numbers for statistics.

- TCE and cis-1,2-DCE have been below concentration limits in 300 APT wells for multiple years, with the exception of cis-1,2-DCE at well 399-1-16B. Ken Moser questioned how many more years we were going to sample for TCE/cis-1,2-DCE before we agreed to be done. Do we actually need to continue to monitor under RCRA (e.g., how many more data points do we need in order to exit?)? All but one CERCLA well has reached attainment for TCE. None of the wells in the 300 Area Process Trenches network are being monitored for TCE in the CERCLA SAP for the 300-FF-5 OU. Resolution: Monitoring for TCE will not be part of the new RCRA SAP. Monitoring for cis-1,2-DCE will be included in the new RCRA SAP for all wells in the 300 APT network because the concentration at well 399-1-16B exceeds the concentration limit and monitoring for cis-1,2-DCE cannot be discontinued for some wells and not others.
    - For the DCE at 399-1-16B, the CERCLA corrective action (monitored natural attenuation) will be periodically evaluated and would be reassessed if there didn't appear to be any attenuation.
- The goal of this effort is to integrate the CERCLA and RCRA plans. Until Rev. 9 of the RCRA permit is issued, we will use this new RCRA plan for 300 APT. Rev. 9 will reference the CERCLA SAP as the integrated CERCLA/RCRA SAP for the 300 Area Process Trenches. The RCRA plan being written now will be defunct once Rev. 9 is issued.
- Did we want to process in 8C to expedite the process?
    - 8C is not set up for alternative requirements.
- Joe Caggiano would like to know what was in the North Process Pond, which was RTD. How deep was it excavated? Could it be the source of the DCE? We know that remediation stopped short of groundwater.
- Lee Brouillard presented the 216-A-29 Ditch.
- Dib Goswami questioned the placement of the new wells at the 216-A-29 Ditch with respect to groundwater flow. Will the flow direction be stable enough to justify them?
    - The flow direction has been like this for approximately the last 5 years and at this time PRC projects that it will continue in this direction for at least the next three to four years.
        - Dib would like PRC to provide justification for the well placement.
- Dwayne Crumpler discussed that the background calculation for the indicator parameters is to be calculated one time for a given well network. The values obtained from this calculation are to be used until there is a change to the well network and are not to be recalculated annually with new data as is the current practice. To be discussed further at a meeting scheduled for 9/9/2015.
    - Although the owner or operator must establish initial background indicator parameters (IP) concentrations during the first year according to 40 CFR 265.92(c)(1) and

compare later IP results with the initial background arithmetic mean 40CFR 265.93(b), comparison of upgradient wells to the IP is also required in section 40CFR265.93(c)(1) and if a significant increase or decrease (pH) is observed the owner or operator must submit this information to the regional administrator in accordance with 40CFR265.94(a)(2)(ii). It is interesting that the text in 40CFR265.93(c)(1) does not include initial background arithmetic mean. EPA provided technical enforcement guidance for RCRA Ground-Water Monitoring (EPA/530/SW-86/055) for cases where comparison of background data with upgradient data collected on subsequent sampling events exceeds the background data as required by 40CFR265.93(c)(1) (page 137, Section 5.4.1). EPA states, "If the owner/operator successfully establishes during the first determination under assessment that no contaminants entered the groundwater…the owner/operator may request…background conditions…be modified." EPA further provided how the background data set be corrected in accordance with EPA/530/SW-86/055 (page 139), "One recommended method involves the use of more than one year of background data and a set of only the most recent aquifer background data (i.e., moving average)." EPA recommends before approving such a change the background data set demonstrate thoroughly why the background data should be modified. For LLWMA-1, such information is provided in Section 2.5 of the current draft revision of the plan, presented to Ecology in November 2015. Based on the regulations and EPAs technical enforcement guidance, continued update of the critical means by a moving average is considered the appropriate action for ensuring upgradient monitoring wells are representative of current background groundwater quality in the uppermost aquifer at LLWMA-1. This action is consistent with 40CFR265.91(1).

Actions:

1. Heather Sulloway to add the paleo channel network to the SAP, per Doug Hildebrand's recommendation to add it to the water level contour map.

   Post-meeting follow-up. The project team added this as a separate figure, as opposed to additions to the water table map.

2. Heather Sulloway to investigate what was going on in the area of 300 APT well 399-1-16B with the elevated cis-1,2-DCE. There may have been a waterline break in that area in the 2005-2007 timeframe that would impact the DCE concentration. Did we change labs at that point?

   Post-meeting follow-up. Contacted WCH for information (such as a waterline break or other water source in that time period) and also evaluated the data. Unfortunately, there is no explanation for the data variability. Added text in Section 2.6 that variability in *cis*-1,2-DCE concentrations was observed in 2004 to 2007, after which concentrations stabilized. No source for the variability has been identified.

3. Heather Sulloway to evaluate the RSVP for the process pond and respond to Joe's questions in these meeting minutes.

   Post-meeting follow-up. See information below on disposal at the North Process Pond and remediation.

4. PRC/Heather Sulloway to drop ORP as an acronym for oxidation-reduction potential.

   Post-meeting follow-up. Attachment provided with 216-A-29 presentation showing Table 3-3 revision with oxidation reduction potential spelled out. Sampling plan will include change.

5. Lee Brouillard to investigate what is being sampled for and what is being detected at the Tank Farm.

   Post-meeting follow-up. A/AX Tank Farm assessment sampling results summary for 2014 provided as Supplemental Information B-1 to Appendix B of these meeting minutes.

6. Lee Brouillard to investigate the transport dispersivity in the area, with regards to our ability to detect a release.

   Post-meeting follow-up. Additional analysis, results and discussion to be presented in next meeting with Ecology on September 23.

7. Lee Brouillard to justify the well placement with respect to the flow direction.

   Post-meeting follow-up. Additional analysis, results and discussion to be presented in next meeting with Ecology on September 23.

Agreements Made:

- Sampling for uranium will be discontinued at the 300 APT under RCRA but will be maintained under the forthcoming AEA SAP.
- The well network is appropriate as documented in the presentation for the 300 APT.
- TCE can be dropped as a constituent from the 300 APT. Note that all TCE concentration data are below the CERCLA cleanup level and add it to the change table.
- Can drop on a constituent by constituent basis, but not on a well by well basis (e.g., TCE can be dropped because all wells are below the concentration limit, cis-1,2-DCE cannot be dropped because there is still an exceedance in one well).
- Integration of CERCLA and RCRA plans will happen in Rev. 9 of the RCRA permit.
- Sampling frequency for the 216-A-29 Ditch is acceptable.
- WAC non-compliant wells can stay in the 216-A-29 Ditch monitoring network since they are still producing acceptable data.
- Two new wells will be placed for the 216-A-29 Ditch network, locations are acceptable.

Response to Action #3 (above), North Process Pond information:

The origin for *cis*-1,2-DCE is attributed to degradation of TCE and PCE historically disposed to nearby liquid waste sites (DOE/RL-2010-99, Appendix F). Large quantities of degreasing solutions were likely disposed to the nearby North and South Process Ponds during the 1950s and 1960s (PNNL-17666). As reported in PNNL-17666, the infiltration of these discharges through the vadose zone was probably sufficient to cause widespread contamination of the underlying aquifer.

Remediation at the North Process Pond (316-2) extended to maximum depth of 7.5 m (24.6 ft) below ground surface (DOE/RL-2010-99, Section 4.3.3.2). The only non-radiological contaminant of concern at the North Process Pond was polychlorinated biphenyls. Cleanup verification of the North Process Pond is described in BHI-01298, Rev. 0 (1999). The western end of the site (termed the above-cleanup level [ACL] area) was the most contaminated area. The elevation of the excavation floor in the ACL area ranged from approximately 111.0 m to 107.6 m (NAV88) at the deepest portion of the excavation.

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BHI-01298, 1999, *300-FF-1 Operable Unit, North Process Pond/Scraping Disposal Area Verification Package*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0078649H.

DOE/RL-2010-99, 2013, *Remedial Investigation/Feasibility Study for the 300-FF-1, 300-FF-2, and 300-FF-5 Operable Units*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at:
[Part 1 of 4] http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0088359.
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NAVD88, 1988, *North American Vertical Datum of 1988,* National Geodetic Survey, Federal Geodetic Control Committee, Silver Spring, Maryland. Available at: http://www.ngs.noaa.gov/.

PNNL-17666, 2008, *Volatile Organic Compound Investigation Results, 300 Area, Hanford Site, Washington*, Pacific Northwest National Laboratory, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0088378.

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Appendix A

Review of 300 Area Process Trenches Monitoring Plan
By Heather Sulloway

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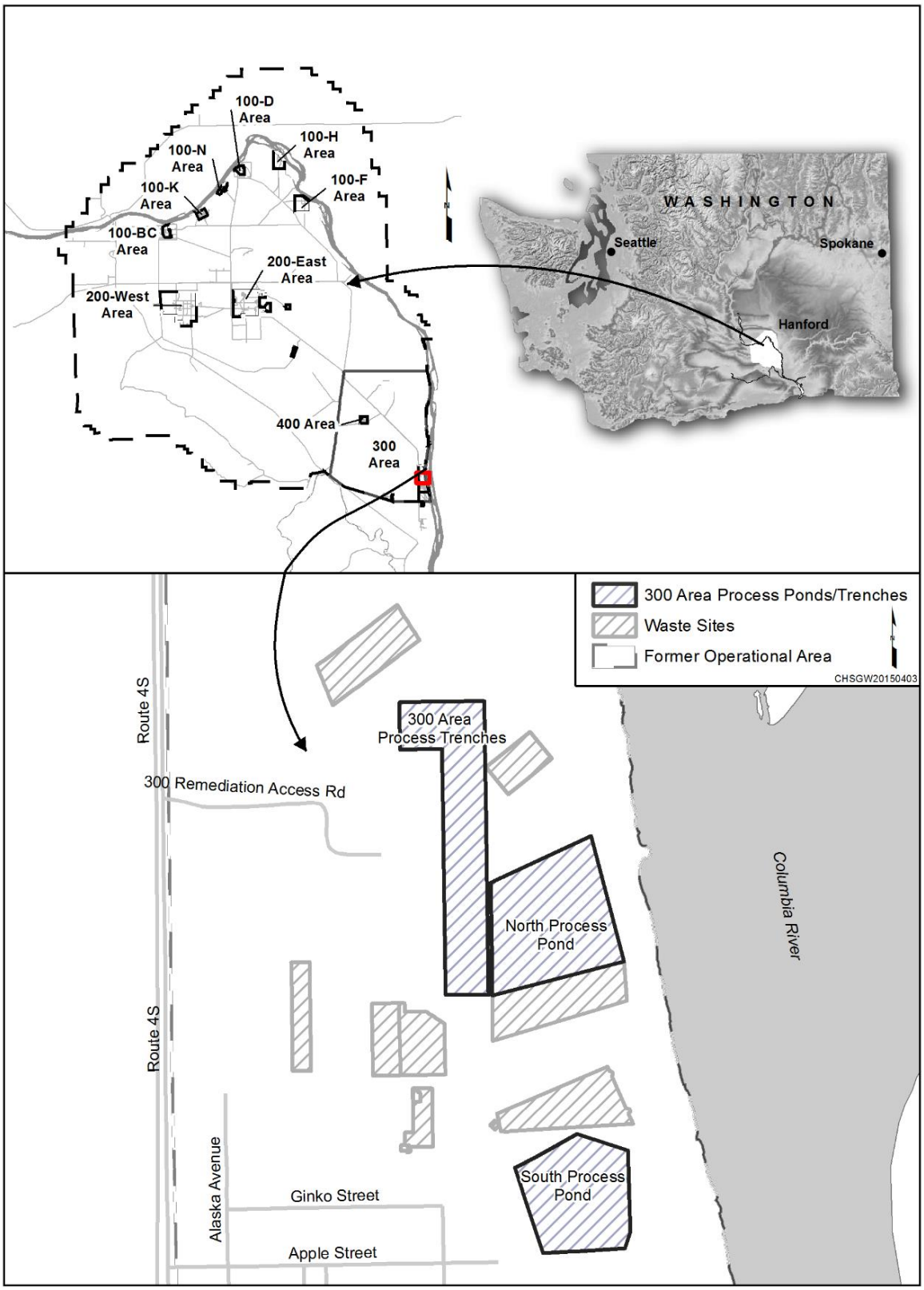

Figure 1-1. Location Map for the 300 Area Process Trenches

Table 1-1. Chronology of 300 Area Process Trenches

Year	Event/Description
1975-1994	Operation of the 300 Area Process Trenches • Served as primary 300 Area liquid disposal facility for process waste • Comprised two, 1,500 ft long trenches • Received waste from 300 Area process sewer - Mostly wastewater with relatively low concentrations of chemicals - Fuel fabrication process waste - range of organic and inorganic lubricants, organic solvents, and other chemcials - Laboratory process waste – cleaners, reagents, solvents, neutralizers – laboratories supported fuel fabrication work and therefore had related waste constituents - Unplanned waste releases – from 300 Area building floor drains and documented releases of tetrachloroethene (140 gal in two events - 1982 and 1984) and ethylene glyocol (362 gal in 2 events - 1993) - Miscellaneous waste
1985	• Enacted administrative controls prohibiting disposal of dangerous waste to 300 Area Process Trenches • RCRA groundwater monitoring commenced
1991	Expedited response action (ERA) at 300 Area Process Trenches • ERA objective - reduce radiation levels in the trenches and reduce potential contaminant migration • Contaminated soil moved to north end of trenches, covered with a barrier, followed by soil
1994	• RCRA permit issued for Hanford Site • Permit identified the 300 Area Process Trenches as a final status unit undergoing closure and subject to WAC 173-303-645 requirements
1995	Compliance monitoring plan issued - Monitoring for trichloroethene (TCE), *cis*-1,2-dichloroethene (*cis*-1,2-DCE), and uranium - First samples exceeded concentration limits for all constituents; therefore corrective action required - Corrective action – CERCLA action (institutional controls)
1996	• Record of Decision for the 300-FF-1 and 300-FF-5 Operable Units issued • Compliance monitoring plan revised (Rev. 0A) - Monitoring for TCE, *cis*-1,2-DCE, and uranium - Thallium, PCBs, chrysene, and benzo(a)pyrene included for a two-year monitoring period due to concern of dangerous waste leaching from the ERA material stockpiled at the northern end of the trenches - Iron and manganese were monitored as part of a follow-up geochemical investigation
1997 – 1998	Remediation of the 300 Area Process Trenches
1998	• Existing compliance monitoring plan accepted as the corrective action monitoring plan required per WAC 173-303-645(11) • Closure of 300 Area Process Trenches approved (clean closure of soil column with continued groundwater monitoring)
2013	Hanford Site 300 Area Record of Decision for 300-FF-2 and 300-FF-5, and Record of Decision Amendment for 300-FF-1 issued • TCE and *cis*-1,2-DCE identified as constituents of concern (300 Area Process Trenches dangerous wastes) • Remedy for TCE and *cis*-1,2-DCE in the 300 Area Industrial Complex - monitored natural attenuation
2015	• Revision to the corrective action monitoring plan proposed: • DOE/RL-2015-29, 2015 Groundwater Monitoring Plan for the 300 Area Process Trenches

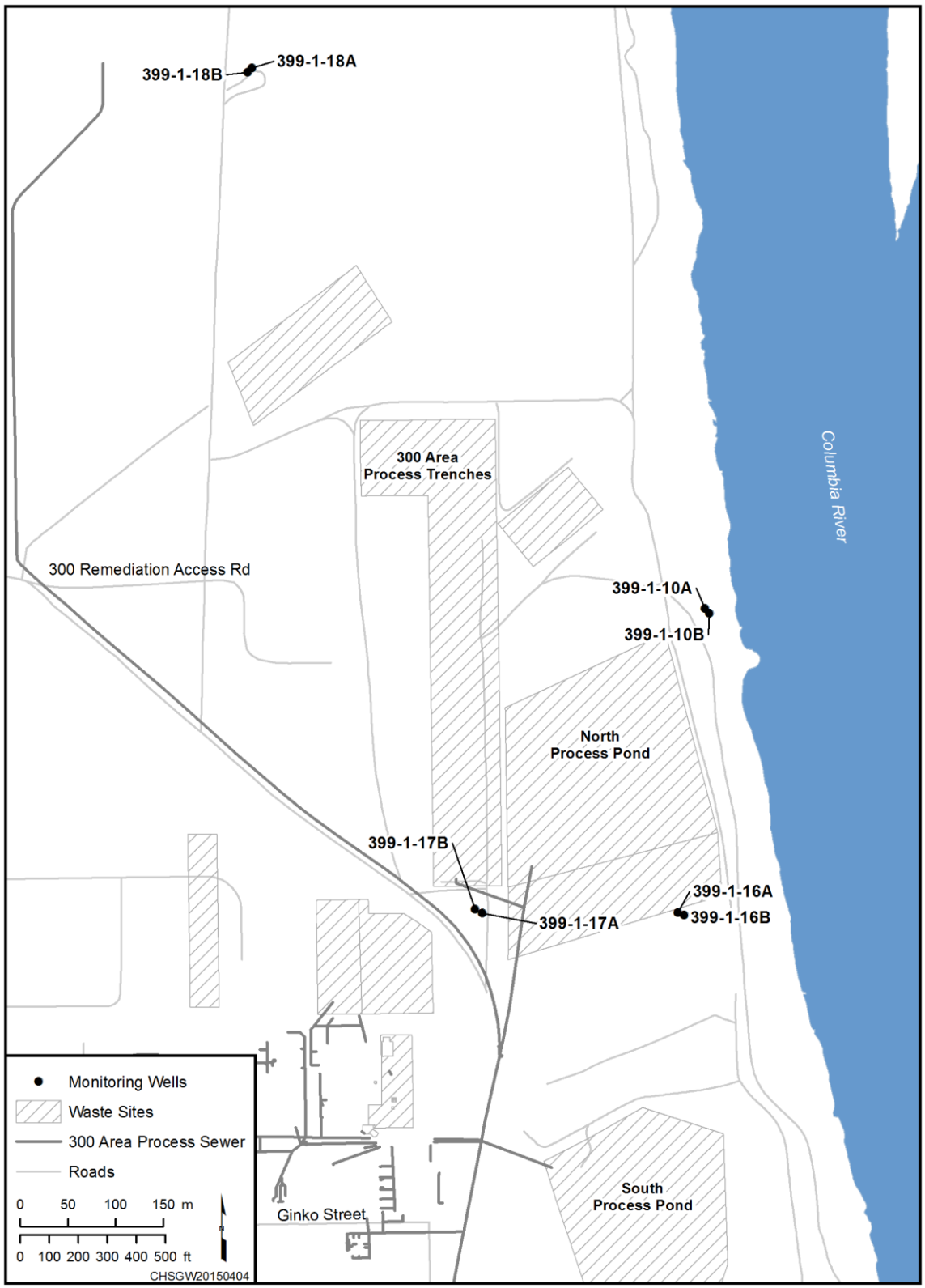

Figure 2-1. Map of the 300 Area Process Trenches

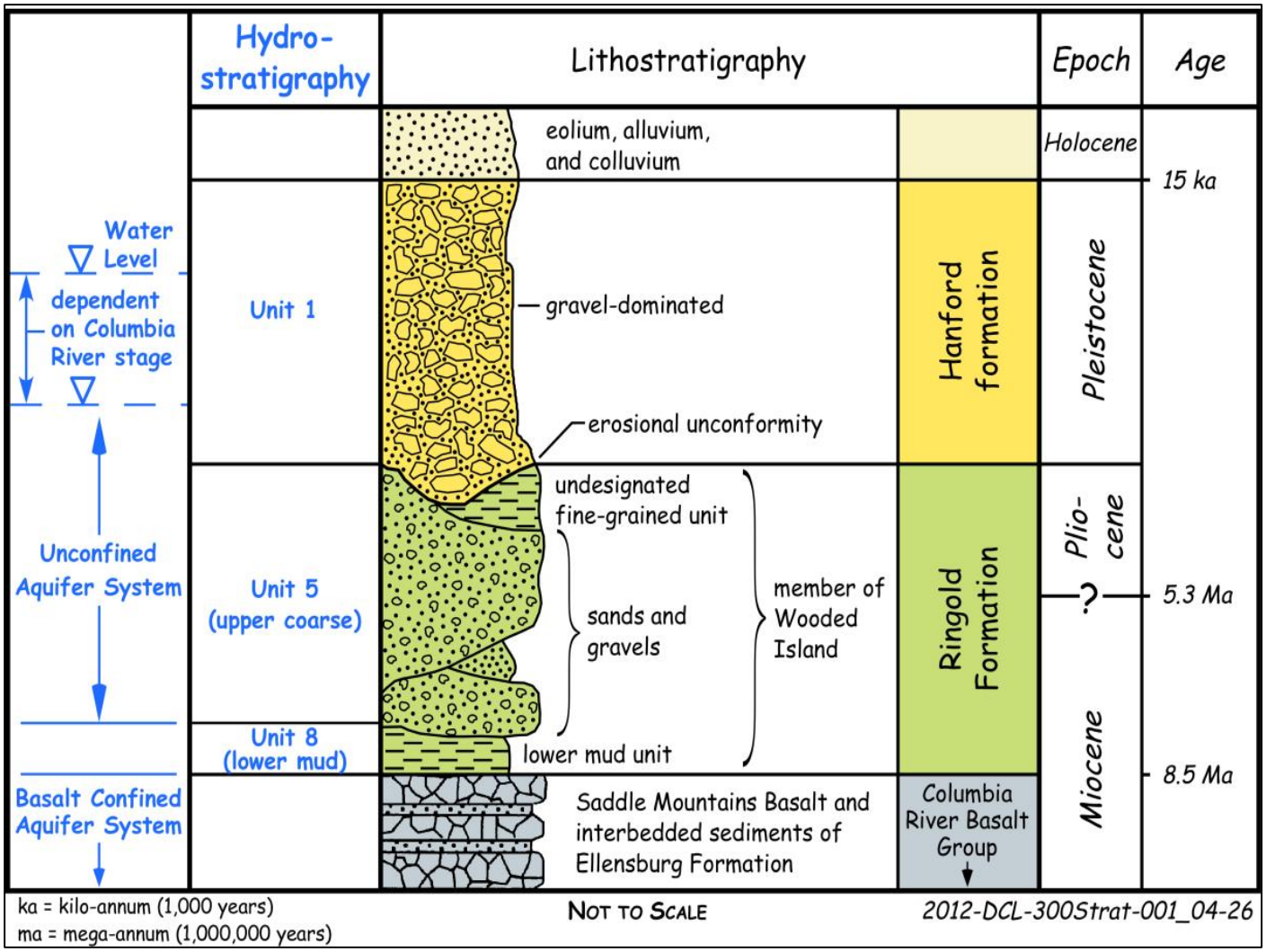

Figure 2-2. Stratigraphy of the 300 Area

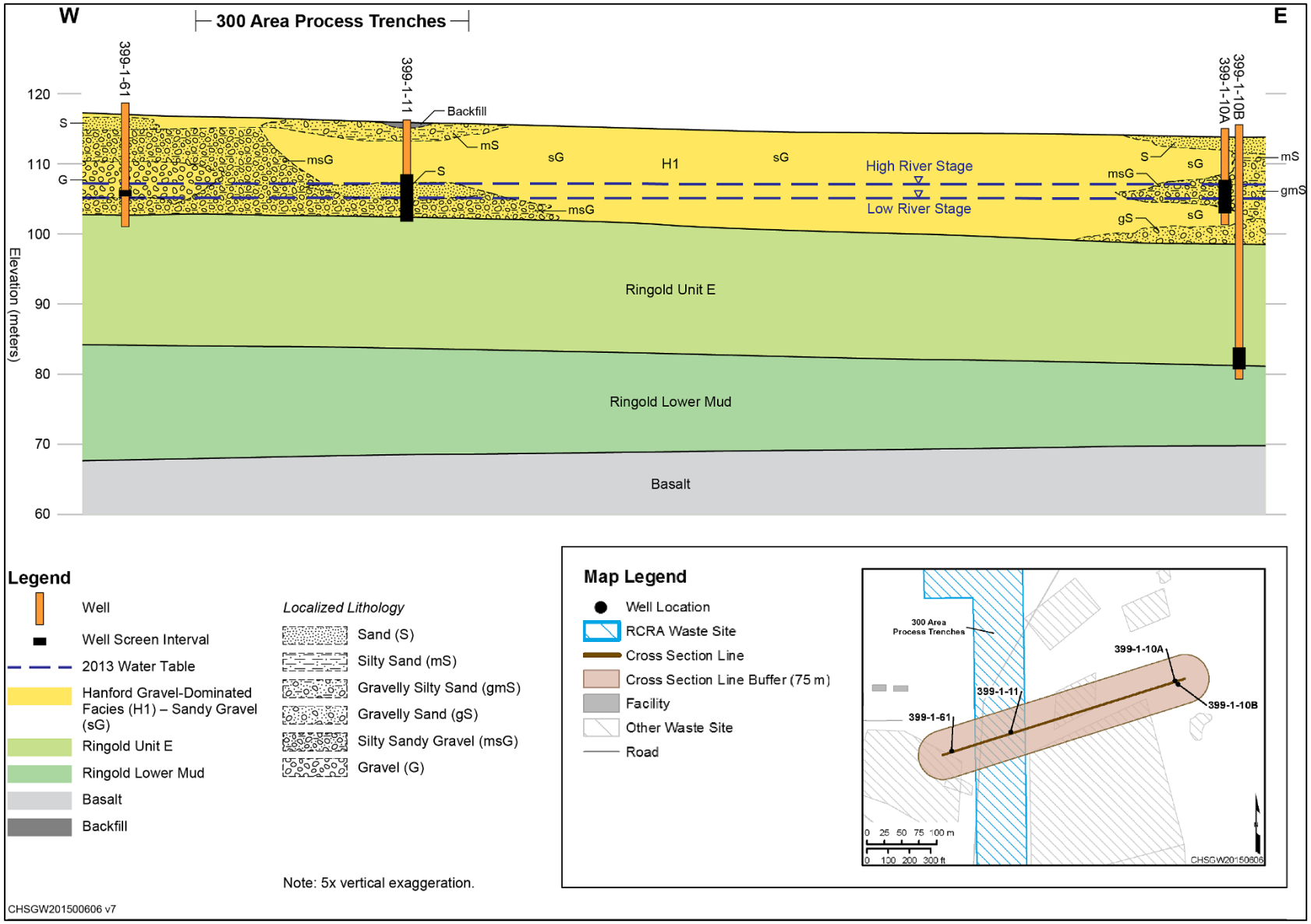

Figure 2-3. West-East Geologic Cross Section Showing the Stratigraphy Underlying the 300 Area Process Trenches

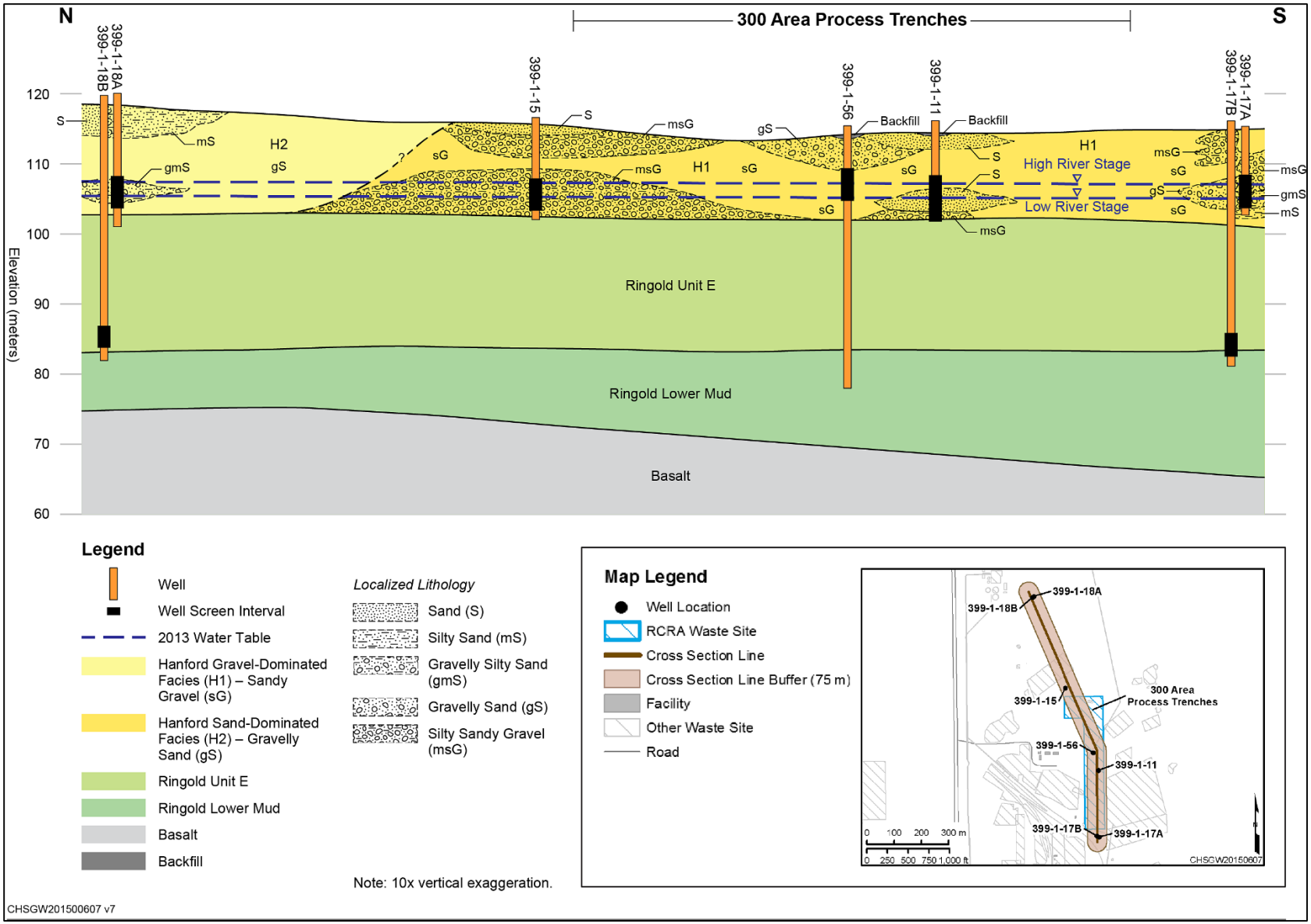

Figure 2-4. North-South Geologic Cross Section Showing the Stratigraphy Underlying the 300 Area Process Trenches

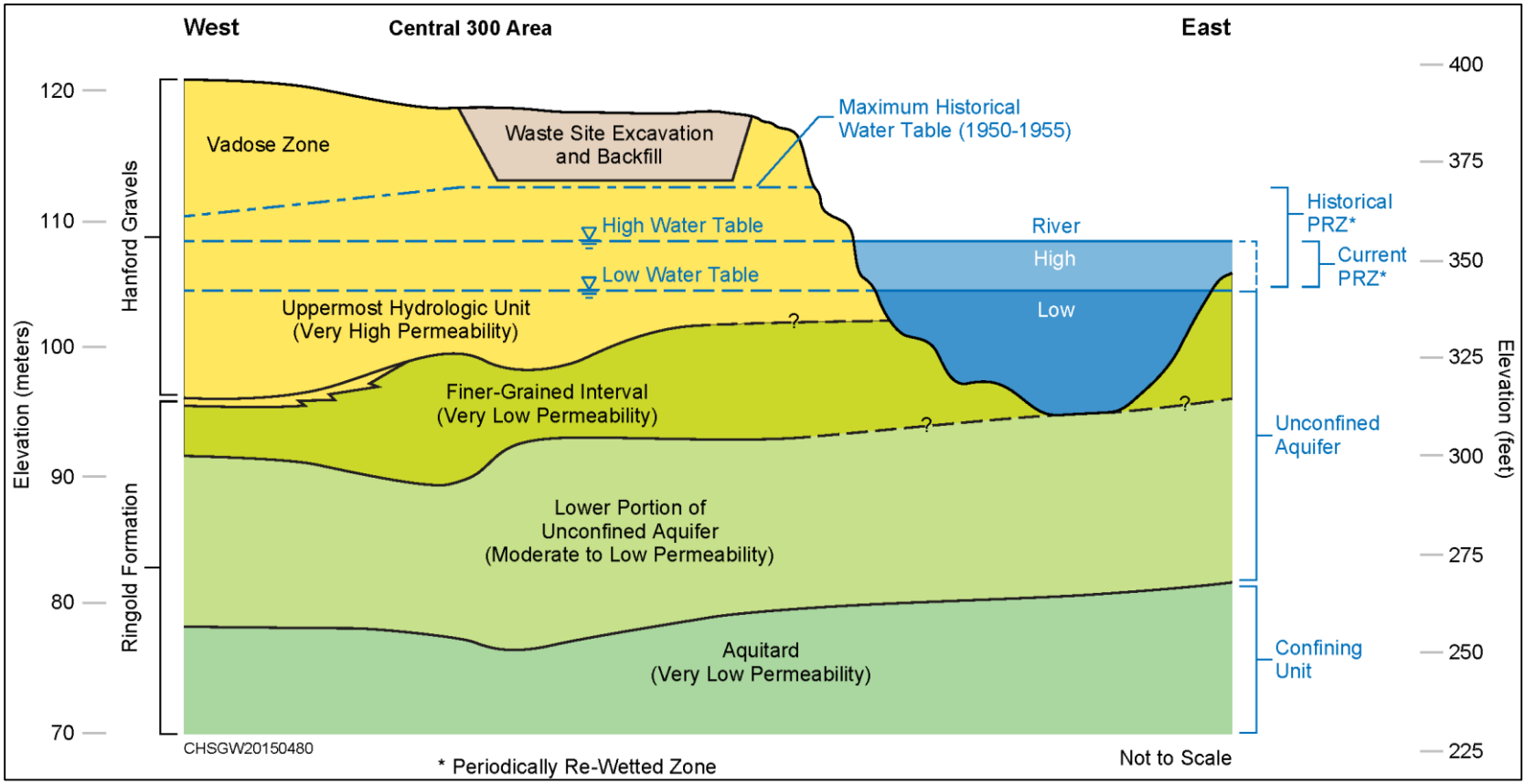

Figure 2-5. Principal Subsurface Features within the 300 Area Industrial Complex

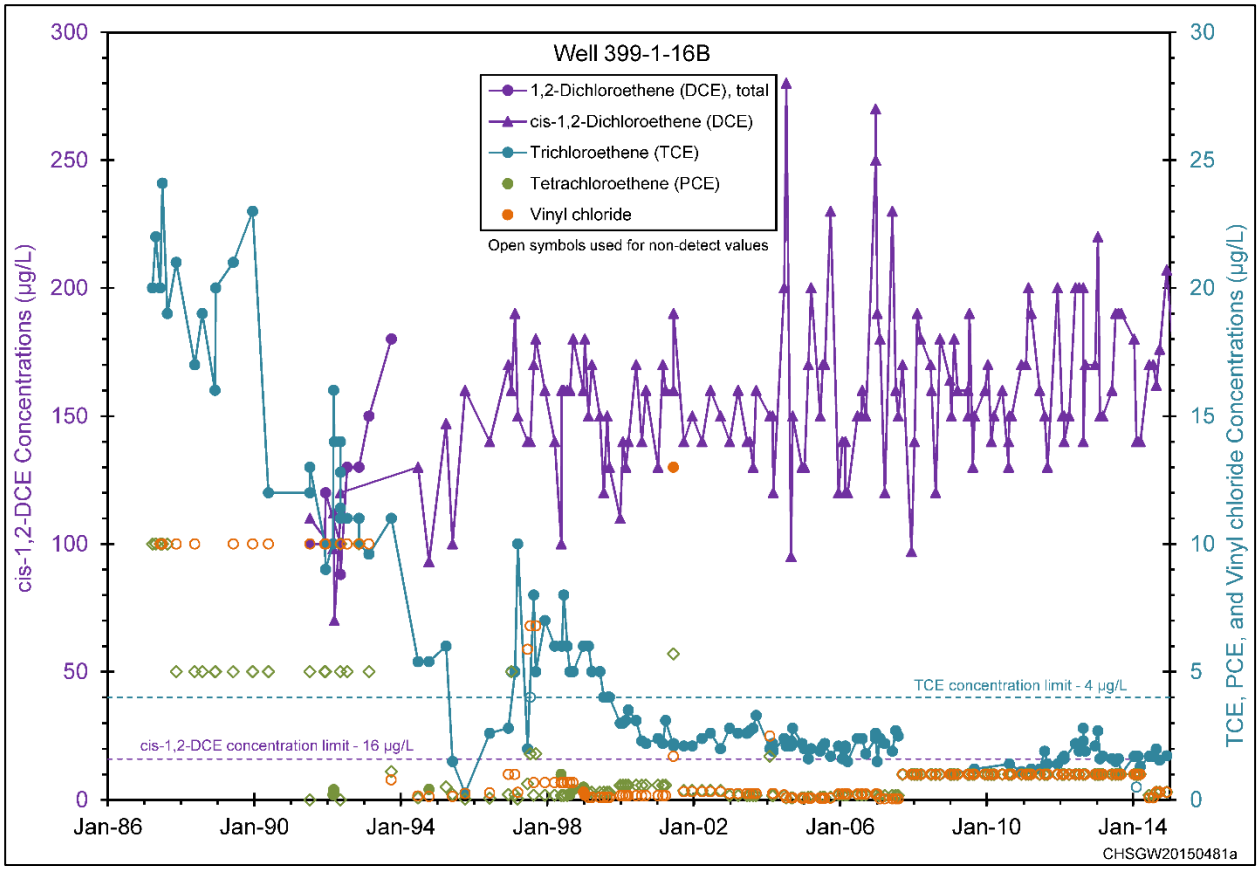

Figure 2-7. Volatile Organic Carbon Trends in Groundwater at Well 399-1-16B

Table 2-4. Previous Monitoring Plans

Document	Date Issued	Monitoring Program
Hazardous Waste Ground-Water Monitoring Plan (Appendix E of Closure/Post-Closure Plan 300 Area Process Trenches, DOE, 1985)	**1985**	**Interim Status Compliance[a]**
Revised Ground-Water Monitoring Compliance Plan for the 300 Area Process Trenches (PNL-6671)	1988	Interim Status Compliance[a]
Groundwater Monitoring Plan for the 300 Area Process Trenches (WHC-SD-EN-AP-185)[b]	1995 (Rev. 0) 1996 (Rev. 0A)	Final Status Compliance[c] Final Status Corrective Action[d]

a. The compliance monitoring program was developed to satisfy the requirements in 40 CFR 265.90, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," "Applicability," and WAC 173-303-400, "Dangerous Waste Regulations," "Interim Status Facility Standards."

b. The compliance monitoring plan (WHC-SD-EN-AP-185, Rev. 0 and Rev. 0A) was accepted by Ecology in 1998 as the corrective action monitoring plan without revision (Ecology, 1998, "Acceptance of Certification of the 300 Area Process Trenches Clean Closure of the Soil Column and Ground Water Corrective Action Requirements"). The requirements identified in WHC-SD-EN-AP-185 (Rev. 0 and Rev. 0A) were incorporated in the RCRA Permit (WA7890008967).

c. The compliance monitoring program satisfied the requirements of WAC 173-303-645(10), "Dangerous Waste Regulations," "Releases from Regulated Units," "Compliance Monitoring Program."

d. The compliance monitoring program under WAC 173-303-645(10) also satisfies the requirements for a corrective action monitoring program under WAC 173-303-645(11), "Corrective Action Program."

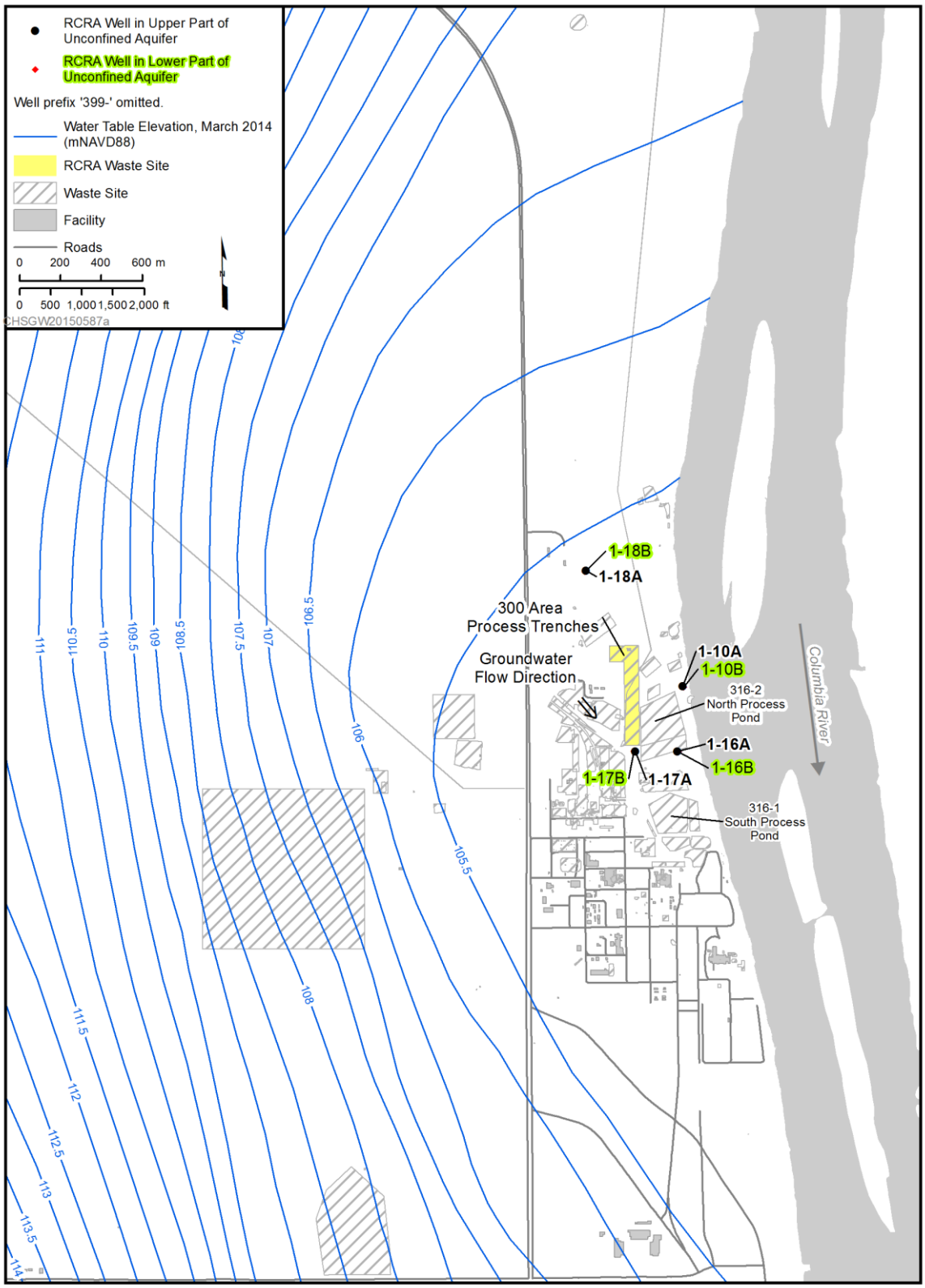

Figure 2-6. Monitoring Network and Groundwater Flow Direction at the 300 Area Process Trenches

Table 3-1. Monitoring Well Network for the 300 Area Process Trenches

Well Name	Purpose	WAC Compliant	Dangerous Waste Constituent and Field Parameters*					
				Dangerous Waste Constituent	Field Parameters			
			Water Level	*cis*-1,2-DCE	pH	Specific Conductance	Temperature	Turbidity
399-1-10A	Downgradient	Y	S	S	S	S	S	S
399-1-10B	Downgradient	Y	S	S	S	S	S	S
399-1-16A	Downgradient	Y	S	S	S	S	S	S
399-1-16B	Downgradient	Y	S	S	S	S	S	S
399-1-17A	Downgradient	Y	S	S	S	S	S	S
399-1-17B	Downgradient	Y	S	S	S	S	S	S
399-1-18A	Upgradient	Y	S	S	S	S	S	S
399-1-18B	Upgradient	Y	S	S	S	S	S	S

* Monitoring as required under WAC 173-303-645(11), "Dangerous Waste Regulations," "Releases from Regulated Units," "Corrective Action Program."

cis-1,2-DCE = *cis*-1,2-dichloroethene

S = to be sampled semiannually

WAC = Washington Administrative Code

Y = well is constructed as a resource protection well (WAC 173-160, "Minimum Standard for Construction and Maintenance of Wells")

Table 3-2. Attributes for Wells in the 300 Area Process Trenches Groundwater Monitoring Network

Well Name	Completion Date	Easting[a] (m)	Northing[a] (m)	Screen Top (m [ft] bgs)	Screen Bottom (m [ft] bgs)	Water Depth (below Top of Casing) (m [ft])	Water Depth corrected for Length of Casing above Ground Surface (m [ft] bgs)	Remaining Water Column in Screened Interval (m [ft])	Water Table Measurement Date
399-1-10A	1986	594346.50	116733.99	7.5 (24.6)	12.0 (39.4)	9.4 (30.8)	8.8 (28.9)	3.2 (10.5)	03/19/2015
399-1-10B	1991	594350.85	116728.79	31.9 (104.7)	34.9 (114.5)	10.0 (32.8)	9.0 (29.5)	3.1 (10.2)	03/19/2015
399-1-16A	1986	594318.11	116414.16	9.9 (32.5)	14.5 (47.6)	11.9 (39.0)	11.5 (37.7)	3.0 (9.8)	03/19/2015
399-1-16B	1987	594324.69	116411.62	32.0 (105.0)	35.1 (115.2)	11.7 (38.4)	11.4 (37.4)	3.1 (10.2)	03/19/2015
399-1-17A	1986	594112.87	116413.79	7.6 (24.9)	12.2 (40.0)	10.6 (34.8)	9.9 (32.5)	2.3 (7.5)	03/19/2015
399-1-17B	1986	594104.82	116417.72	30.5 (100.1)	33.5 (109.9)	10.6 (34.8)	9.9 (32.5)	3.1 (10.2)	03/19/2015
399-1-18A[b]	1986	593870.64	117301.57	11.9 (39.0)	16.5 (54.1)	14.3 (46.9)	13.4 (44.0)	3.1 (10.2)	03/19/2015
399-1-18B[b]	1987	593866.06	117297.23	33.1 (108.6)	36.1 (118.4)	14.0 (45.9)	13.1 (43.0)	3.1 (10.2)	03/19/2015

a. Coordinates are in NAD83, *North American Datum of 1983*.
b. Well is upgradient.
bgs = below ground surface

Table 3-3. Main Differences between this Plan and Previous Plan

Type of Change	Previous Plan[a]	Current Plan	Justification Summary
Constituents	Dangerous waste constituents of concern: • TCE • *cis*-1,2-DCE Other constituent: • Uranium Geochemical evaluation: • Iron • Manganese Two-year monitoring requirement: • Thallium • PCBs • Chrysene • Benzo(a)pyrene • Field parameters: • pH • Conductivity • Turbidity • Temperature	Dangerous Wastes: • *cis*-1,2-DCE Field parameters: • pH • Conductivity • Turbidity • Temperature	Revised plan includes monitoring for dangerous waste constituents only and removes constituents that no longer require monitoring. The following constituents are not included the current monitoring plan: 1. TCE – concentration in RCRA wells have not exceeded the cleanup value established in the 300 Area ROD/ROD Amendment (EPA and DOE, 2013) since 1999 2. Uranium – not a dangerous waste 3. Iron and manganese – elevated concentrations are due to naturally occurring reducing conditions 4. PCBs, chrysene, benzo(a)pyrene – not detected during the monitoring period 5. Thallium – determined to be naturally occurring
Concentration Limit	Based on maximum contaminant levels	Based on cleanup levels in 300 Area ROD/ROD Amendment (EPA and DOE, 2013)	Updated to cleanup levels in the 300 Area ROD/ROD Amendment (EPA and DOE, 2013)
Point of Compliance	Downgradient wells	Same	No change
Sampling Frequency	Semiannual with 4 independent samples per sample event Samples collected December, January, February, and March; and June, July, August and September)	Semiannual (2 samples per year)	Concentrations of *cis*-1,2-DCE have decreased over time and are stable

Table 3-3. Main Differences between this Plan and Previous Plan

Type of Change	Previous Plan[a]	Current Plan	Justification Summary
Well Network	4 well pairs screened at the top and bottom of unconfined aquifer. Downgradient: • 399-1-10A, -10B • 399-1-16A, -16B • 399-1-17A, -17B • Upgradient: • 399-1-18A, -18B	Same	No change
Groundwater Flow Direction	East or southeast during low river stage and south or southwest during high river stage	Same	No change
Type of Groundwater Monitoring Program	Compliance, corrective action[b]	Corrective Action	Not applicable
Compliance Period	As defined in WAC 173-303-645(7): Number of years equal to the active life of the waste management area (including any waste management activity prior to permitting and the closure period). If corrective action is engaged at the end of the compliance period, then the compliance period is extended until it can be demonstrated that the concentration limit has not been exceeded for a period of three consecutive years.	Extends through the CERCLA remedy period for *cis*-1,2-DCE in the 300 Area Industrial Complex. Once cleanup levels under CERCLA are attained, then the compliance period will be extended for a three-year period, unless waived. If the concentration limit has not been exceeded at the end of the three consecutive years, then corrective action monitoring will be discontinued.	Cleanup of the 300 Area is largely complete. The remedy for *cis*-1,2-DCE contamination in the area of the 300 Area Process Trenches has been addressed in the 2013, 300 Area ROD/ROD Amendment (EPA and DOE, 2013).

Table 3-3. Main Differences between this Plan and Previous Plan

Type of Change	Previous Plan[a]	Current Plan	Justification Summary
Statistical Evaluation	Tolerance interval (under the compliance monitoring plan)	95 percent UCL on the mean, targeting 8 to 10 samples. Calculation of the 95 percent UCL is not performed for data sets that are less than the concentration limit. Also, the practical quantitation limit must be less than the concentration limit.	Evaluation methods will be used to determine if the corrective action (CERCLA remedial action) is progressing as expected and demonstrate that the concentration limit has been achieved.

Reference: EPA and DOE, 2013, Hanford Site 300 Area Record of Decision for 300-FF-2 and 300-FF-5, and Record of Decision Amendment for 300-FF-1.

a. WHC-SD-EN-AP-185 (Rev. 0 and Rev. 0A), Groundwater Monitoring Plan for the 300 Area Process Trenches.

b. The previous monitoring plan (WHC-SD-EN-AP-185, Rev. 0 and Rev. 0A) was written as a final status compliance monitoring plan. After the requirements for the 300 Area Process Trenches changed to corrective action monitoring, the plan was determined to be acceptable for corrective action monitoring by Ecology (Ecology, 1998, "Acceptance of Certification of the 300 Area Process Trenches Clean Closure of the Soil Column and Ground Water Corrective Action Requirements").

CERCLA= *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
cis-1,2-DCE = *cis*-1,2-dichloroethene
ROD = record of decision
TCE = trichloroethene
UCL = upper confidence interval

WAC 173-303, 173-303-645, "Dangerous Waste Regulations," "Releases from Regulated Units" *Washington Administrative Code*, Olympia, Washington.

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Dangerous Waste Corrective Action Monitoring Results

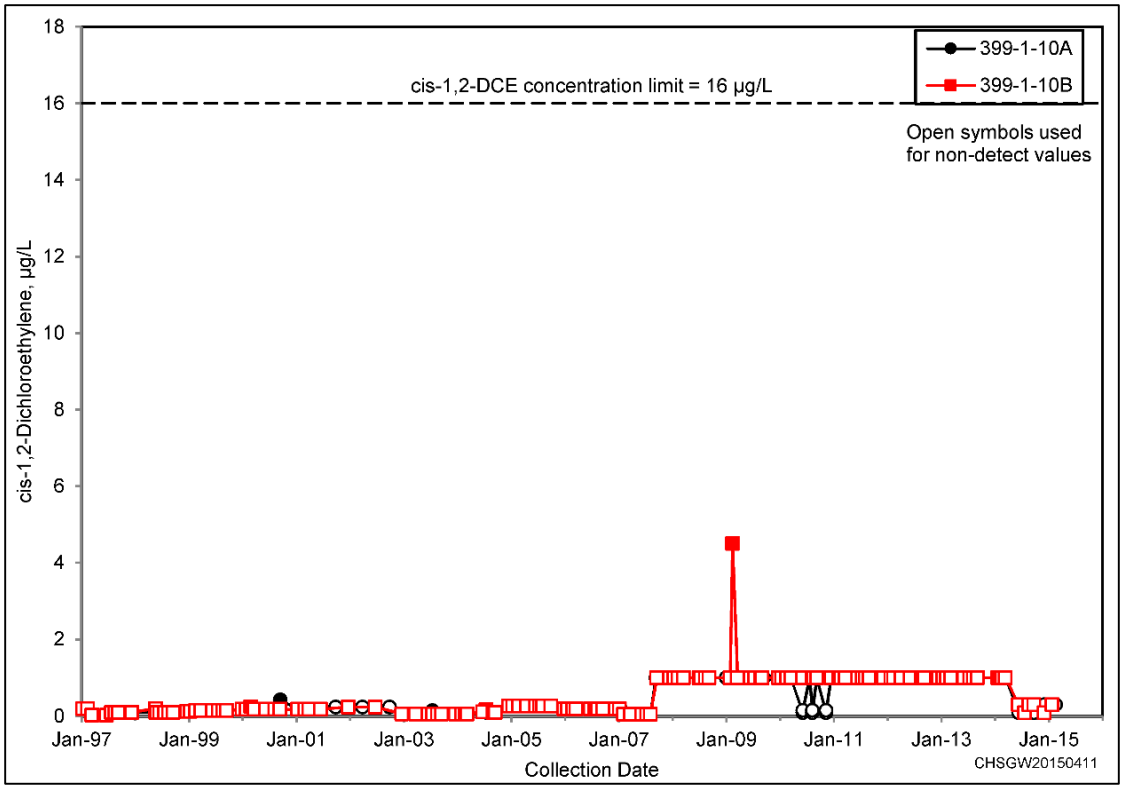

Figure D-1. Corrective Action Monitoring Results of *cis*-1,2-DCE at Wells 399-1-10A and 399-1-10B

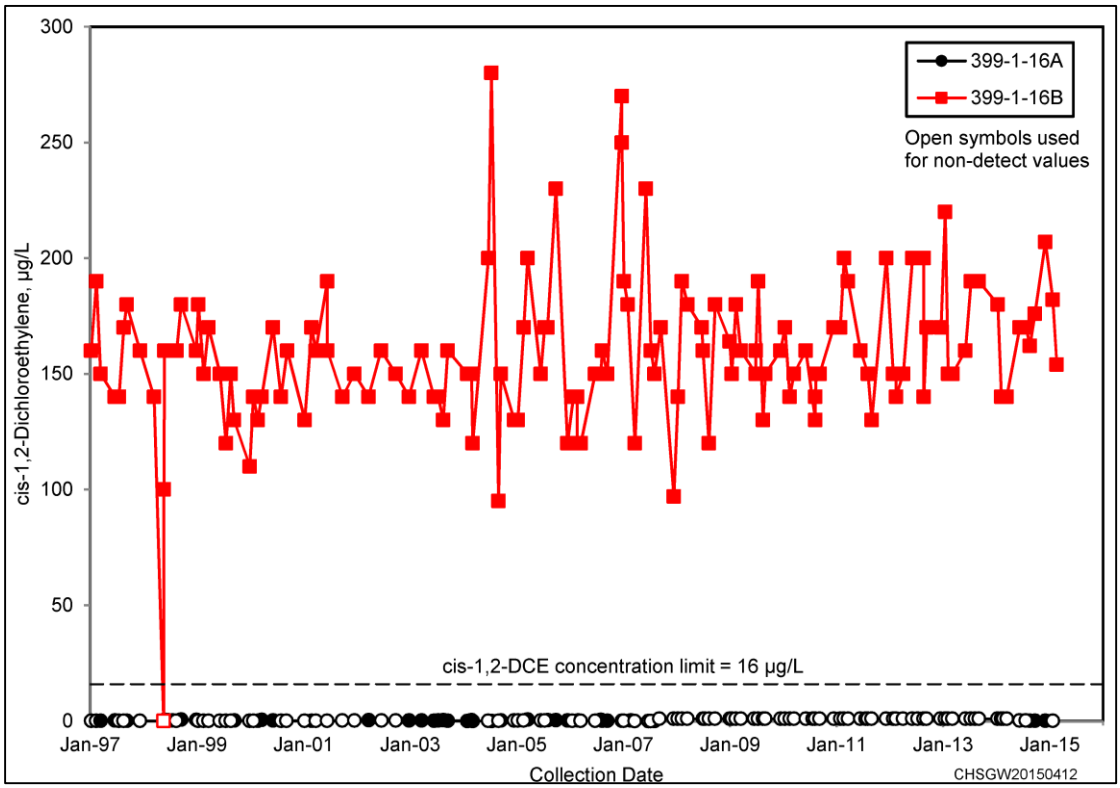

Figure D-2. Corrective Action Monitoring Results of *cis*-1,2-DCE at Wells 399-1-16A and 399-1-16B

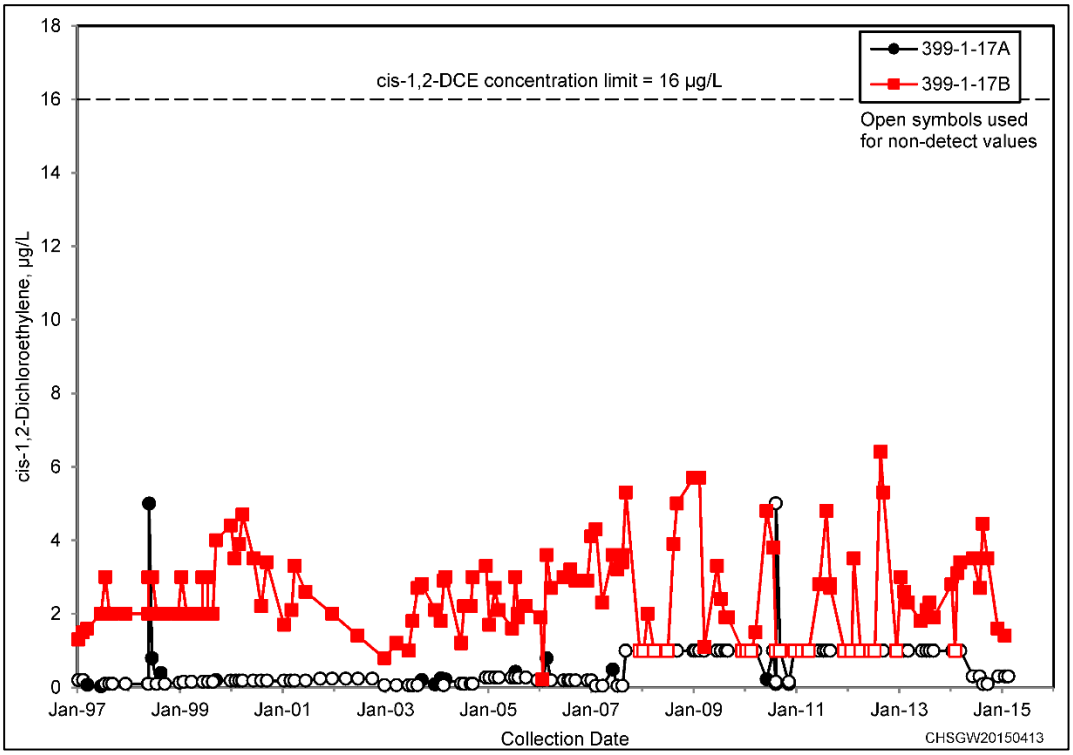

Figure D-3. Corrective Action Monitoring Results of *cis*-1,2-DCE at Wells 399-1-17A and 399-1-17B

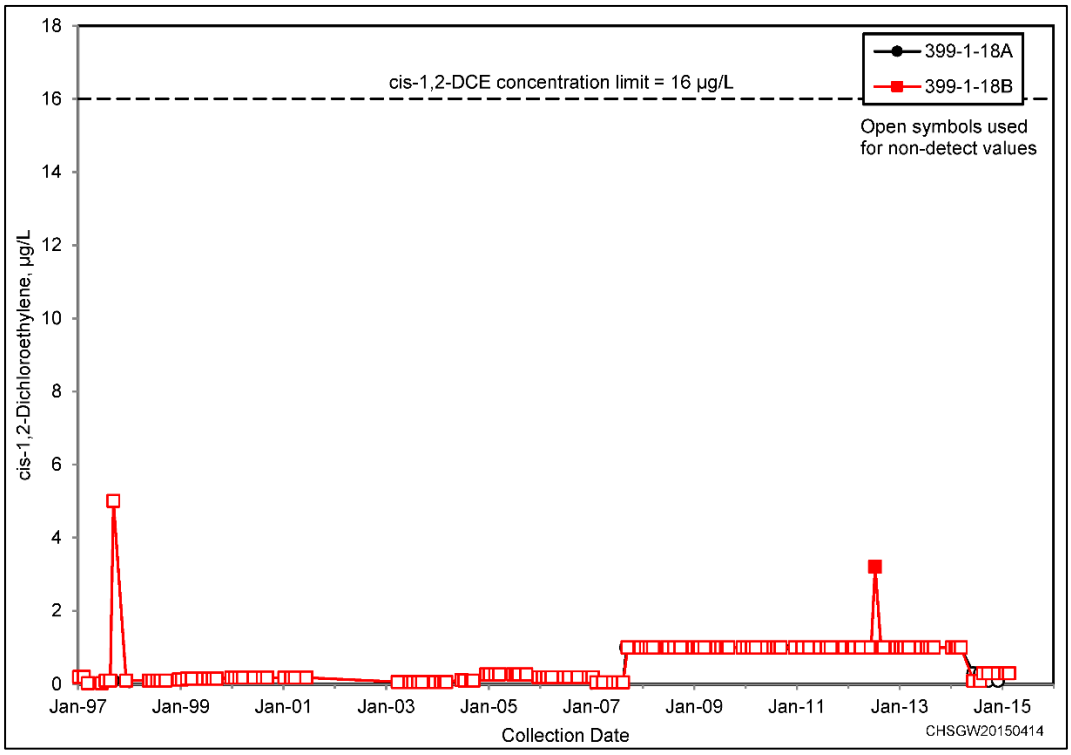

Figure D-4. Corrective Action Monitoring Results of *cis*-1,2-DCE at Wells 399-1-18A and 399-1-18B

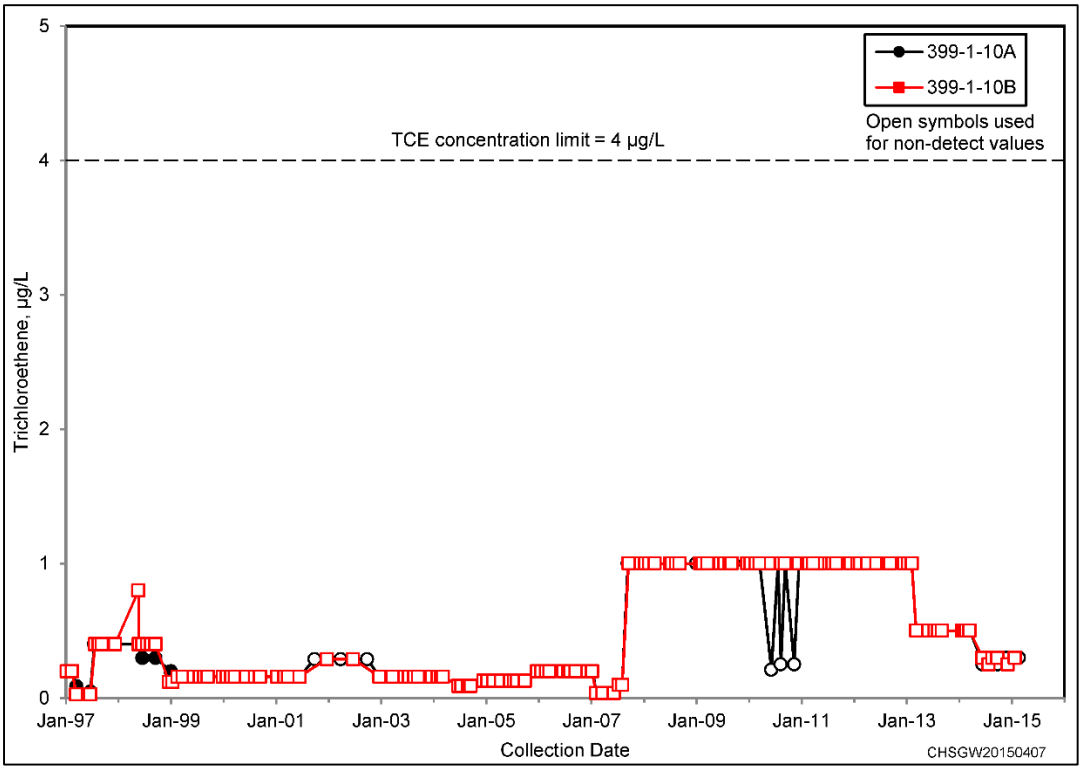

Figure D-5. Corrective Action Monitoring Results of TCE at Wells 399-1-10A and 399-1-10B

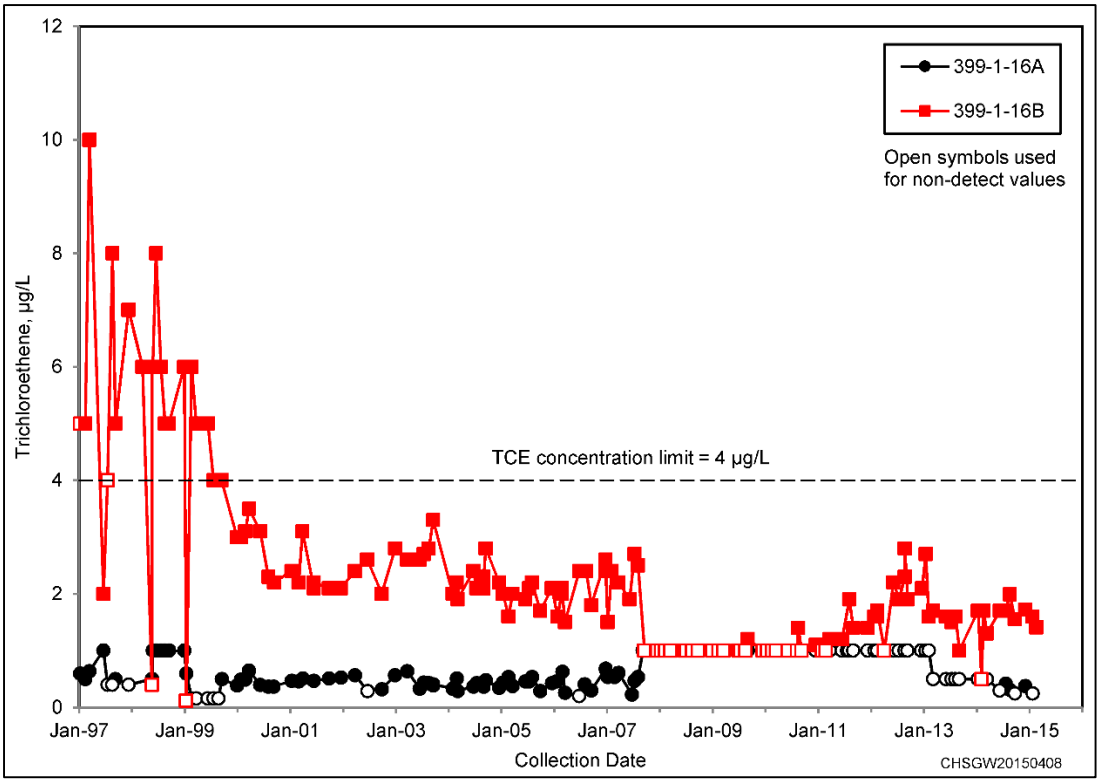

Figure D-6. Corrective Action Monitoring Results of TCE at Wells 399-1-16A and 399-1-16B

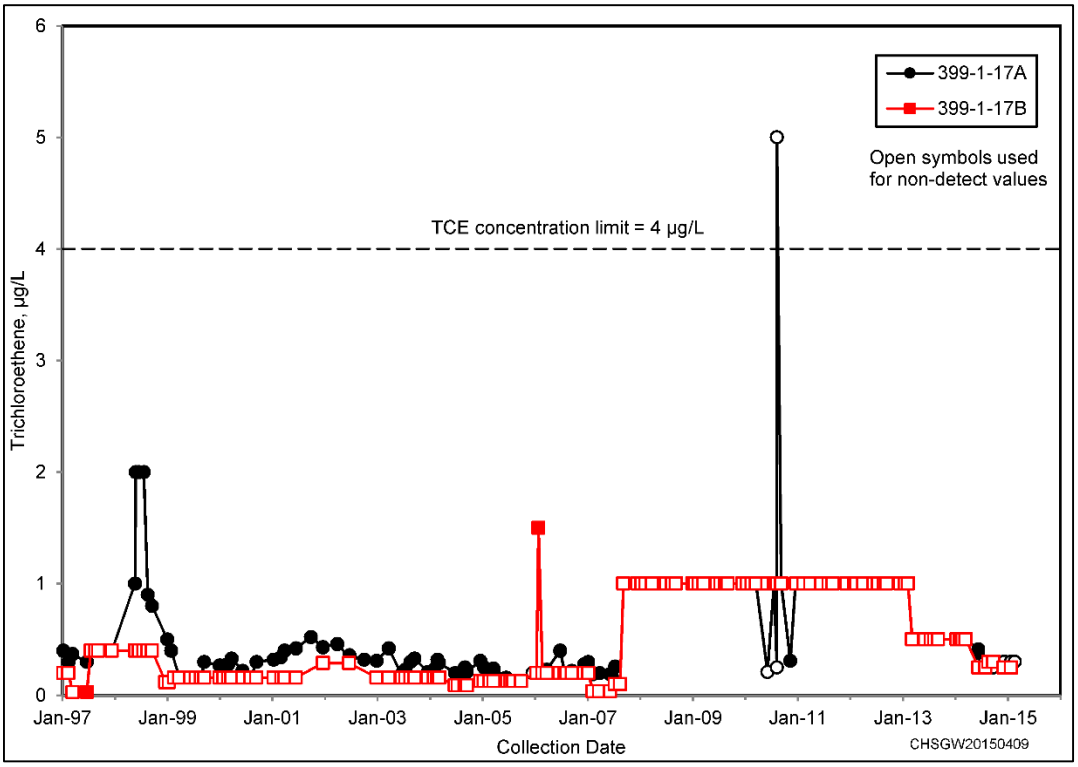

Figure D-7. Corrective Action Monitoring Results of TCE at Wells 399-1-17A and 399-1-17B

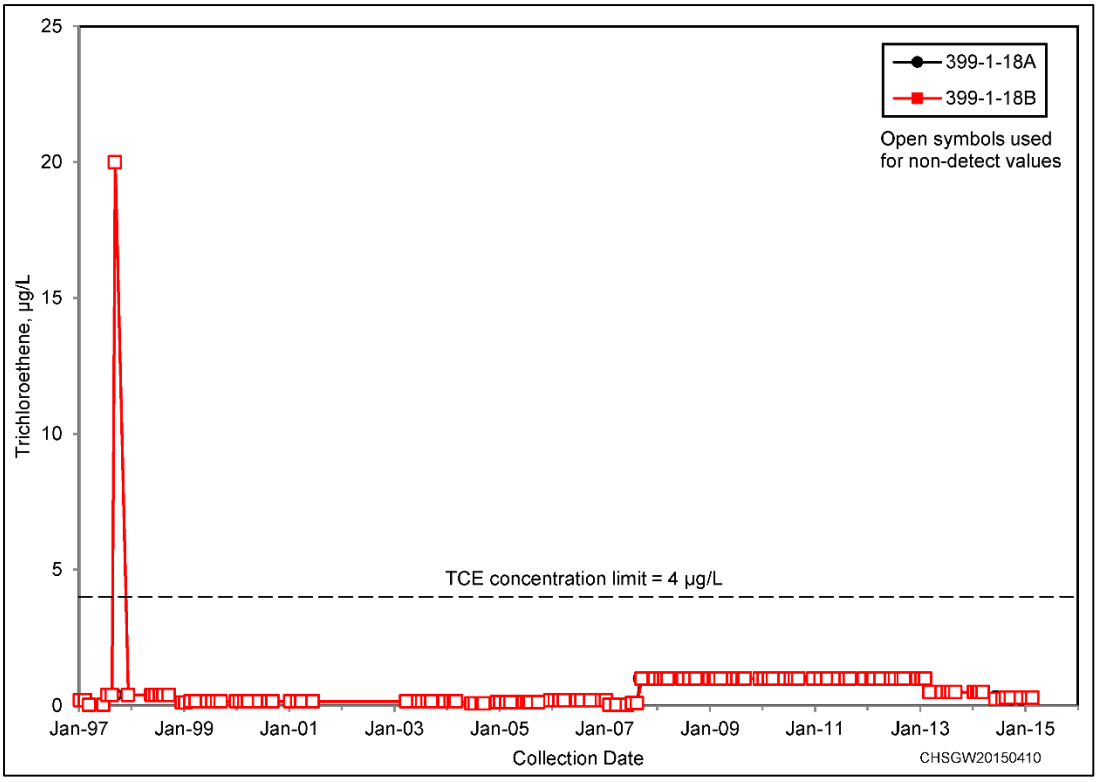

Figure D-8. Corrective Action Monitoring Results of TCE at Wells 399-1-18A and 399-1-18B

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Appendix B

Review of 216-A-29 Monitoring Plan

By Lee Brouillard

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Supplemental Information: Waste Management Area A-AX 2014 Assessment Parameter Analytical Summary B-19

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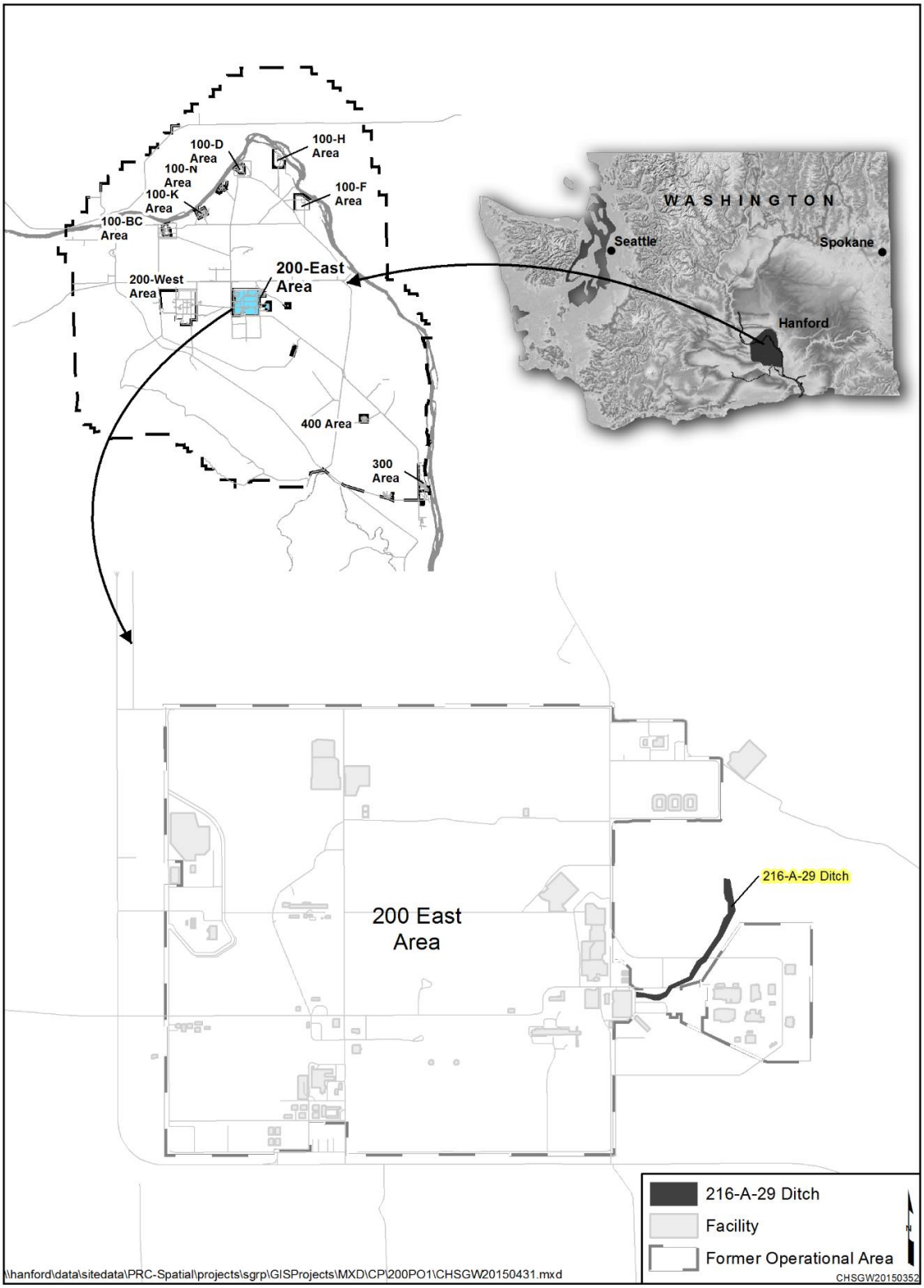

Figure 1-1. Location Map for the 216-A-29 Ditch

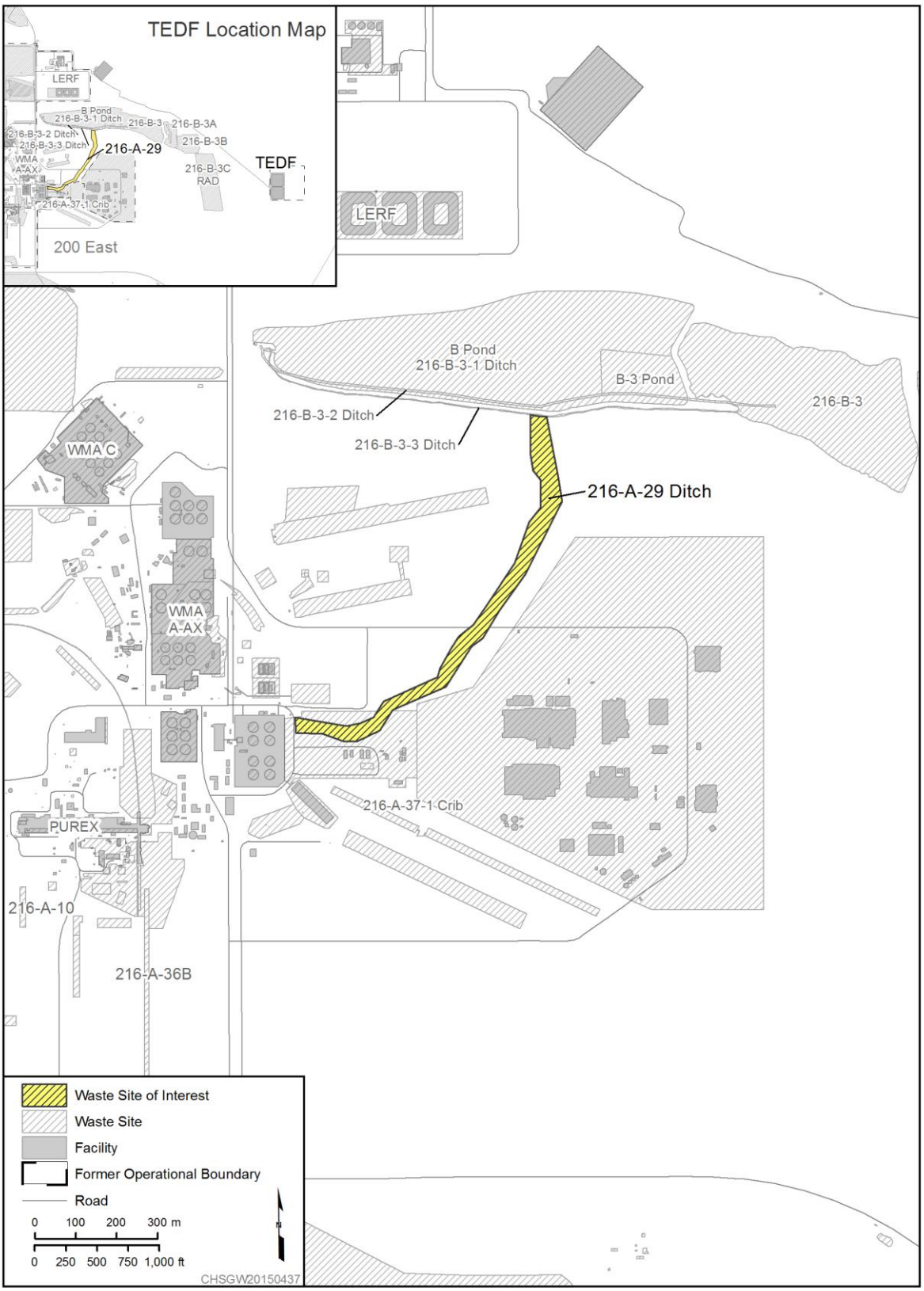

Figure 2-1. Site Map for the 216-A-29 Ditch and Surrounding Facilities

Table 2-1. Known Hazardous Discharges to the 216-A-29 Ditch

Waste Constituent	Date	Description
Demineralizer regenerant	1955 to February 1986	Characteristic (corrosive)
Aqueous makeup tank heels and off-specification batches	1955 to October 1984	Characteristic (corrosive and toxic)
N-Cell prestart testing (oxalic acid, nitric acid, hydrogen peroxide, calcium nitrate)	April 11, 1983 to August 7, 1983	Characteristic (corrosive)
Potassium permanganate, sodium carbonate solution	October 19, 1983	CERCLA reportable release
Hydrazine solution	June 6, 1984 September 13, 1984 to October 2, 1984	CERCLA reportable release
Potassium hydroxide	December 2, 1984	CERCLA reportable release
Nitric acid	August 22, 1984 January 18, 1985 May 27, 1985 June 25, 1985 October 28, 1985	CERCLA reportable release
Sodium hydroxide	February 26, 1984 November 19, 1984 August 6, 1985	CERCLA reportable release
Cadmium nitrate	May 16, 1984 December 18, 1985	CERCLA reportable release
Hydrazine	July 9, 1986	CERCLA reportable release

Note: Table is adapted from DOE, 1987, *40 CFR 265 Interim Status Detection-Level Ground-Water Monitoring Compliance Plan for 216-A-29 Ditch*.

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*

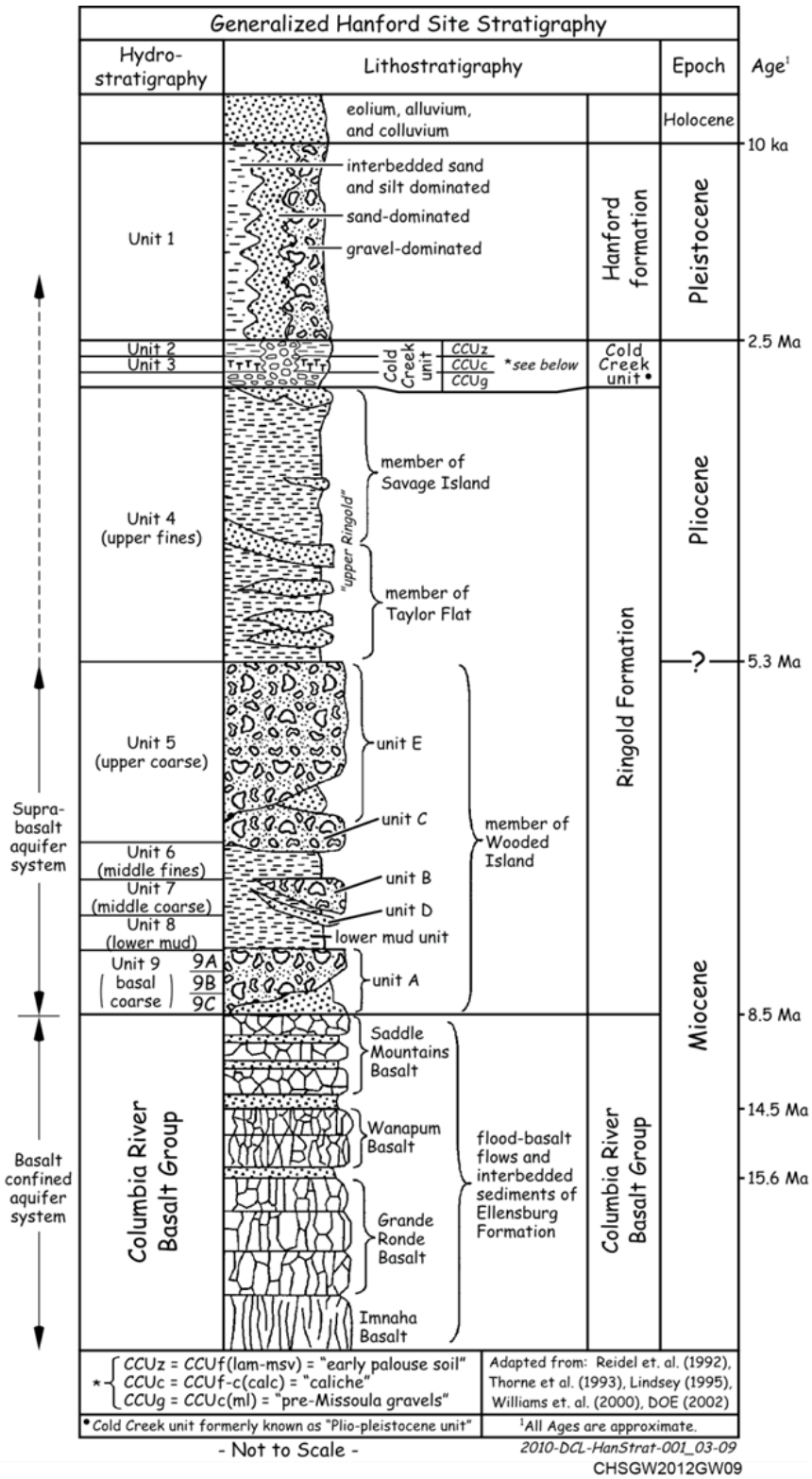

Figure 2-2. General Stratigraphy at the Hanford Site

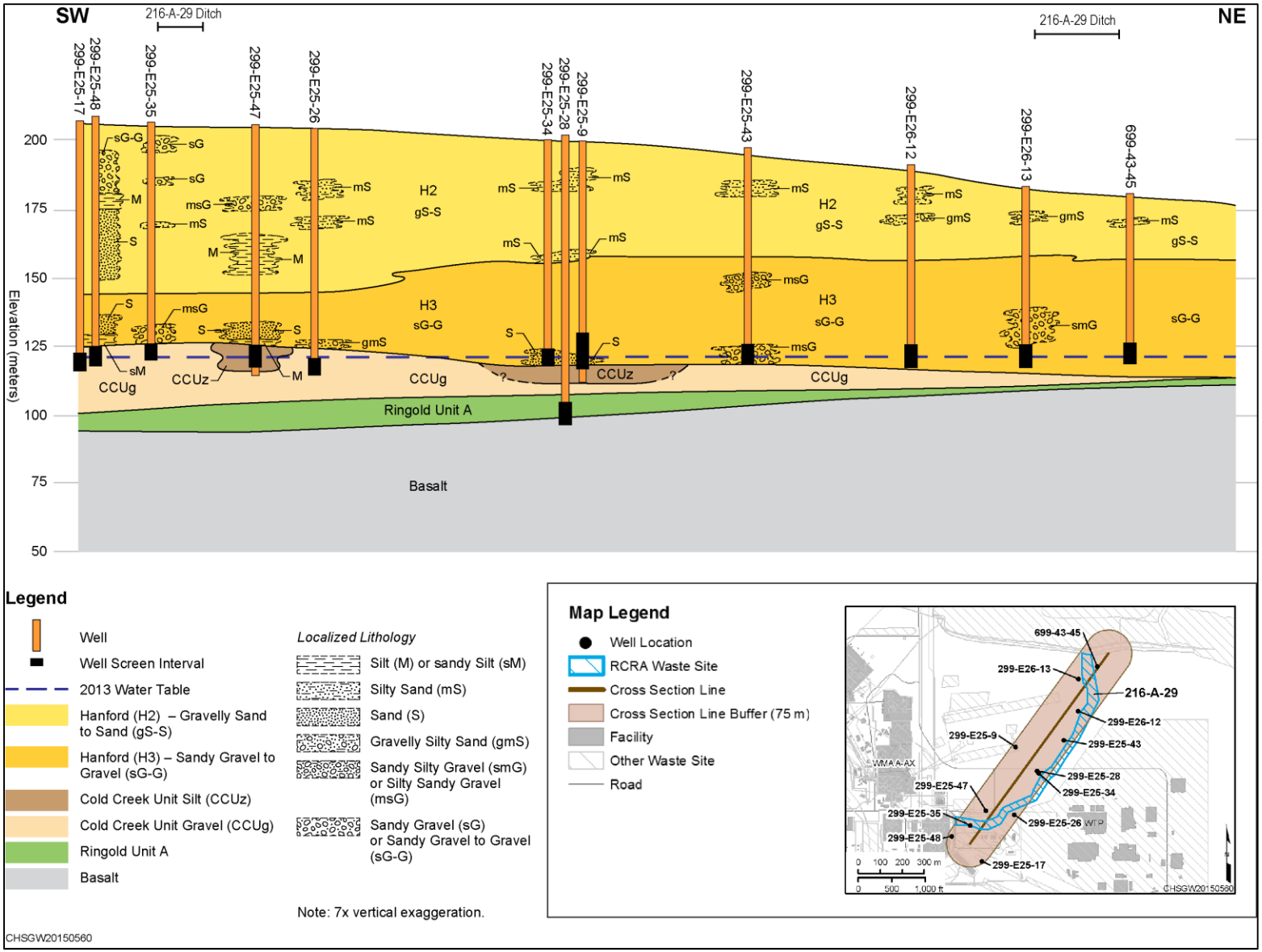

Figure 2-3. Southwest-Northeast Geologic Cross Section Showing the Stratigraphy Underlying the 216-A-29 Ditch.

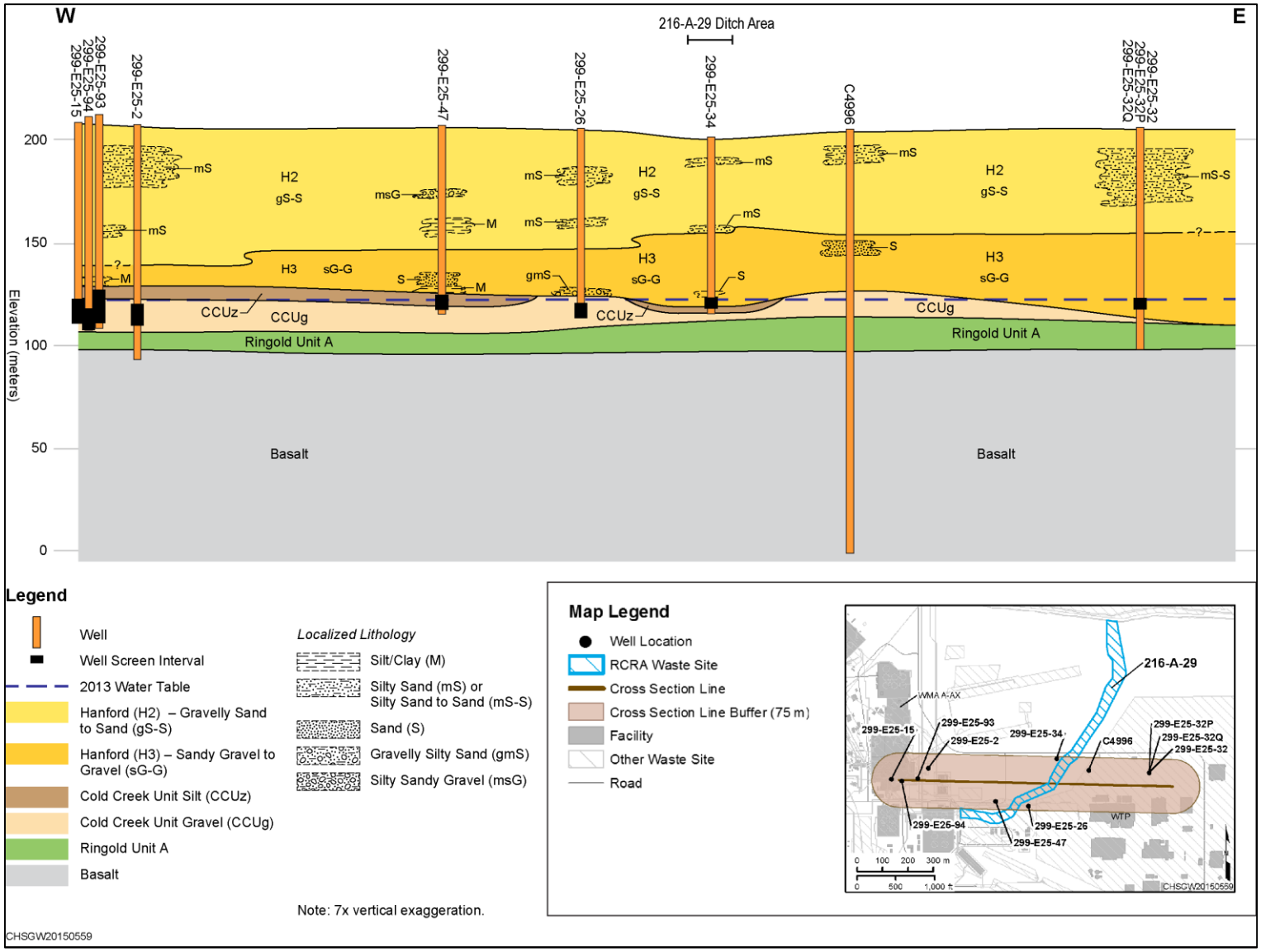

Figure 2-4. West-East Geologic Cross Section Showing the Stratigraphy Underlying the 216-A-29 Ditch.

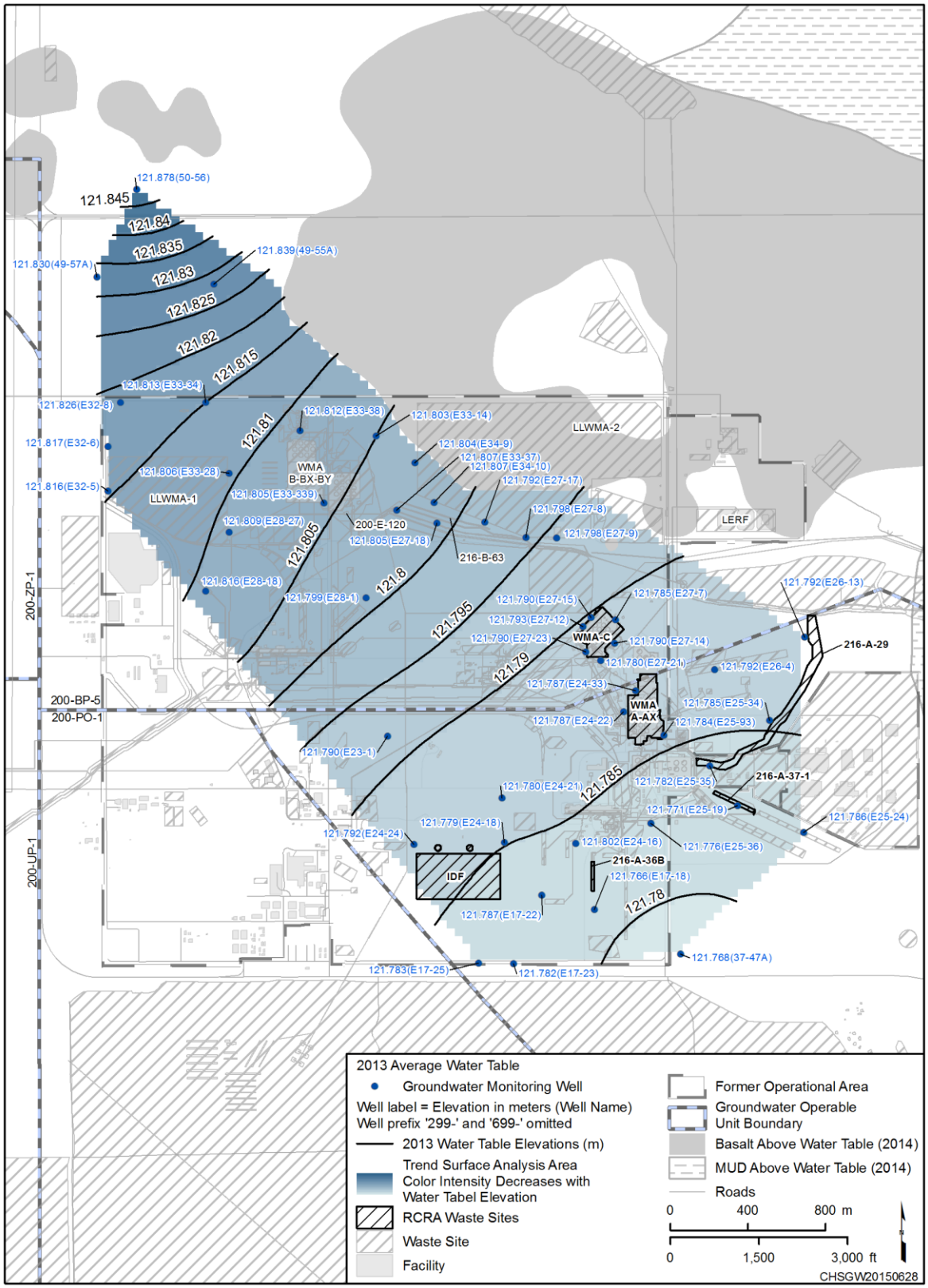

Figure 2-5. Water Table Map for 200 East and the 216-A-29 Ditch Area (SGW-54165).

Table 2-2. Previous Monitoring Plans

Document	Date Issued	Monitoring Program*
40 CFR 265 Interim Status Detection-Level Ground-Water Monitoring Compliance Plan for 216-A-29 Ditch (DOE, 1987)	1987	Indicator Evaluation Program
Effluent Monitoring Plan for 216-A-29 Ditch Monitoring Wells (Luttrell, 1988) [a]	1988	Indicator Evaluation Program
Interim-Status Groundwater Quality Assessment Plan for the 216-A-29 Ditch, WHC-SD-EN-AP-031, Rev. 0	1990	Groundwater Quality Assessment Program
Groundwater Monitoring Plan for the 216-A-29 Ditch, WHC-SD-EN-AP-045, Rev. 0 and Rev. 0A	1991 and 1992	Groundwater Quality Assessment Program
Appendix C of *Results of Groundwater Quality Assessment Program at the 216-A-29 Ditch RCRA Facility*, WHC-SD-EN-EV-032, Rev. 0	1995	Indicator Evaluation Program
Groundwater Monitoring Plan for the 216-A-29 Ditch, PNNL-13047	1999	Indicator Evaluation Program
Interim Status Groundwater Monitoring Plan for the 216-A-29 Ditch, DOE/RL-2008-58, Rev. 0	2010	Indicator Evaluation Program

* The Indicator Evaluation Program satisfies the requirements of 40 CFR 265.92(b)(2), (b)(3), (d)(1), (d)(2) and (e), "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," "Sampling and Analysis." The groundwater quality assessment program's first determination satisfies the requirements of 40 CFR 265.93(d)(4) and (d)(6), "Preparation, Evaluation, and Response."

a. Luttrell, 1988 supplemented DOE, 1987 with direction on drilling activities for new wells.

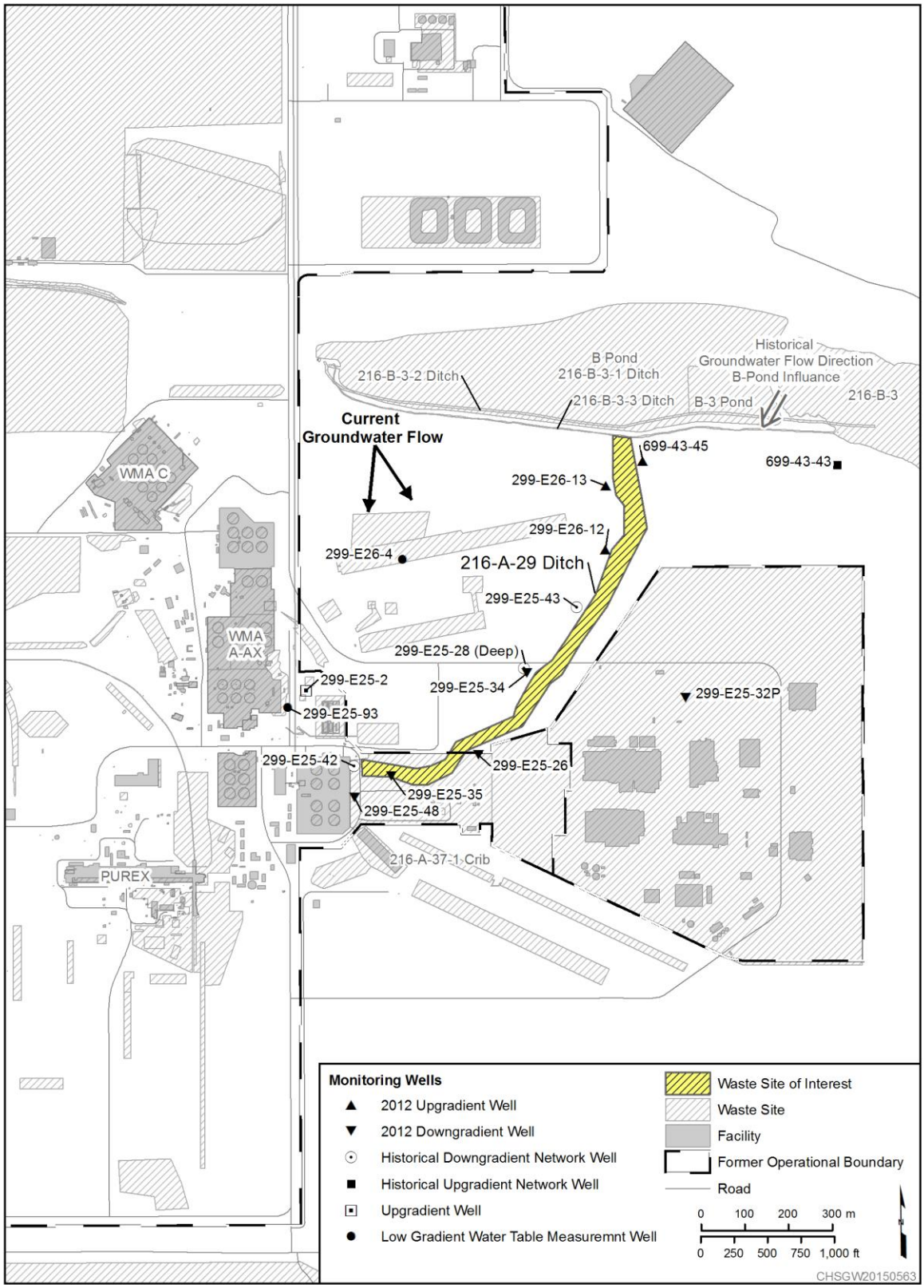

Figure 2-6. Estimated Local Flow Direction and Historical Monitoring Networks near the 216-A-29 Ditch

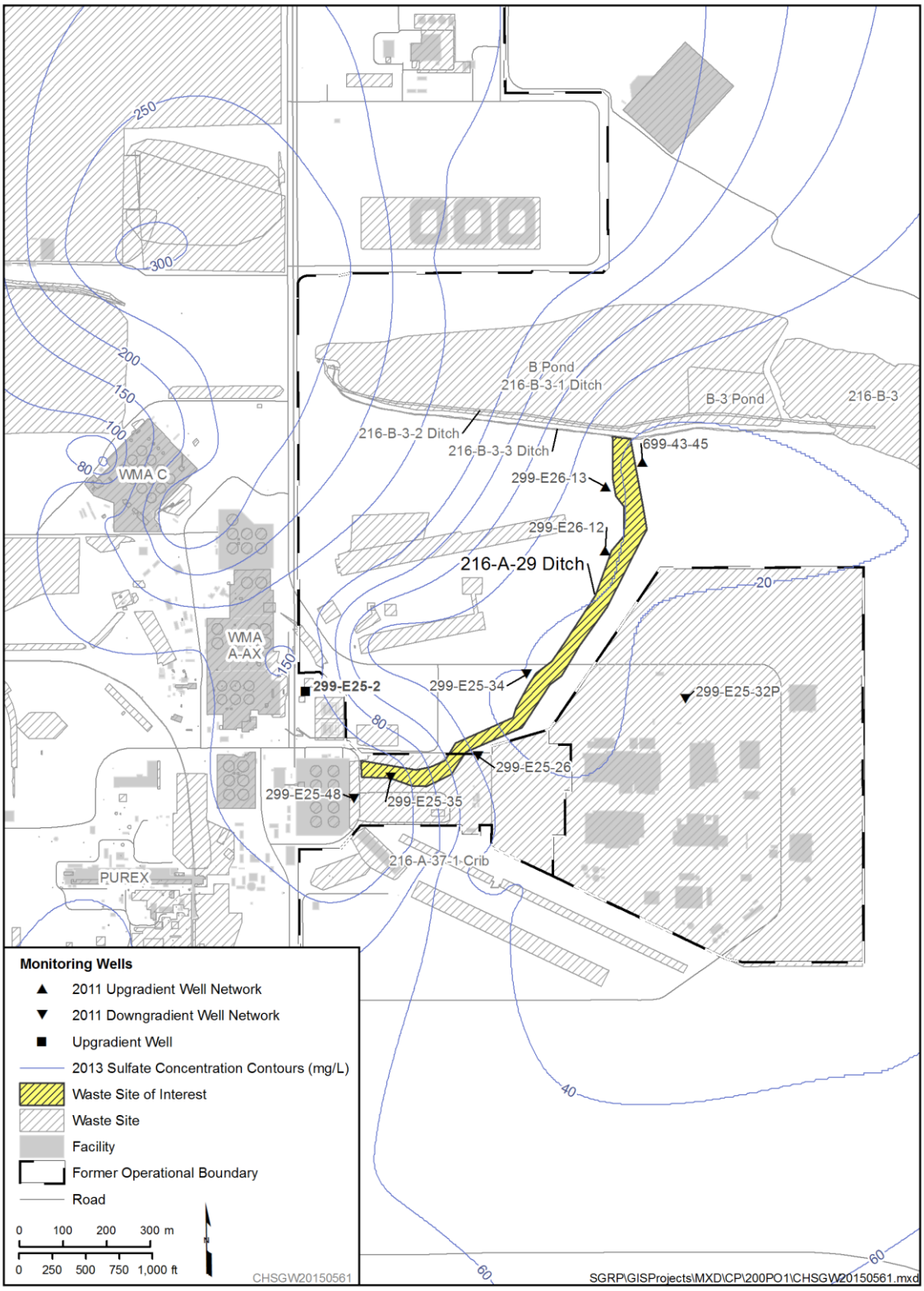

Figure 2-7. Contour Map of 2013 Sulfate Concentrations in the Vicinity of the 216-A-29 Ditch.

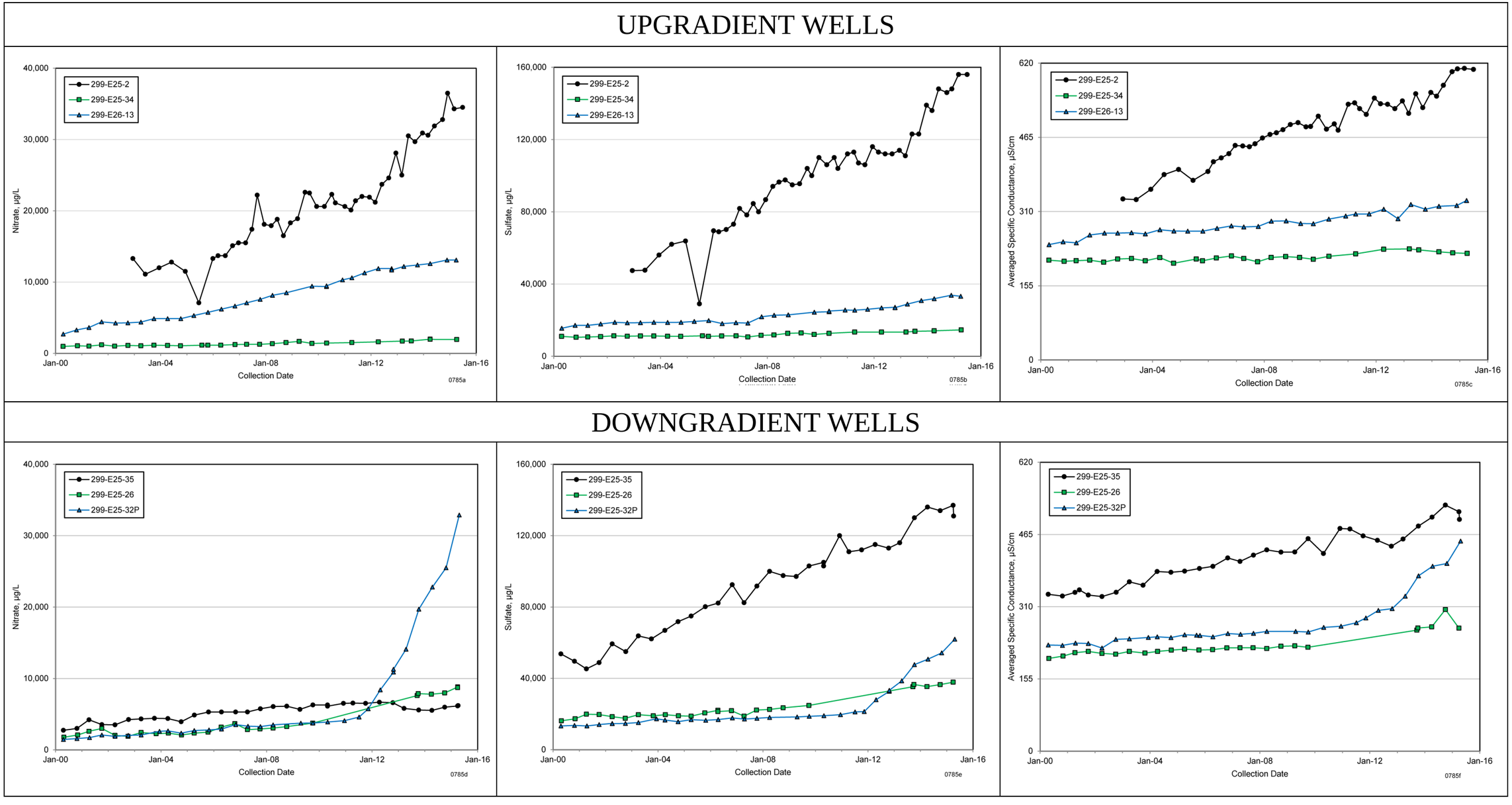

Figure 2-8. Time Series Plot Showing Nitrate, Sulfate and Specific Conductance Concentration Trends in This Plan's Upgradient and Downgradient Wells.

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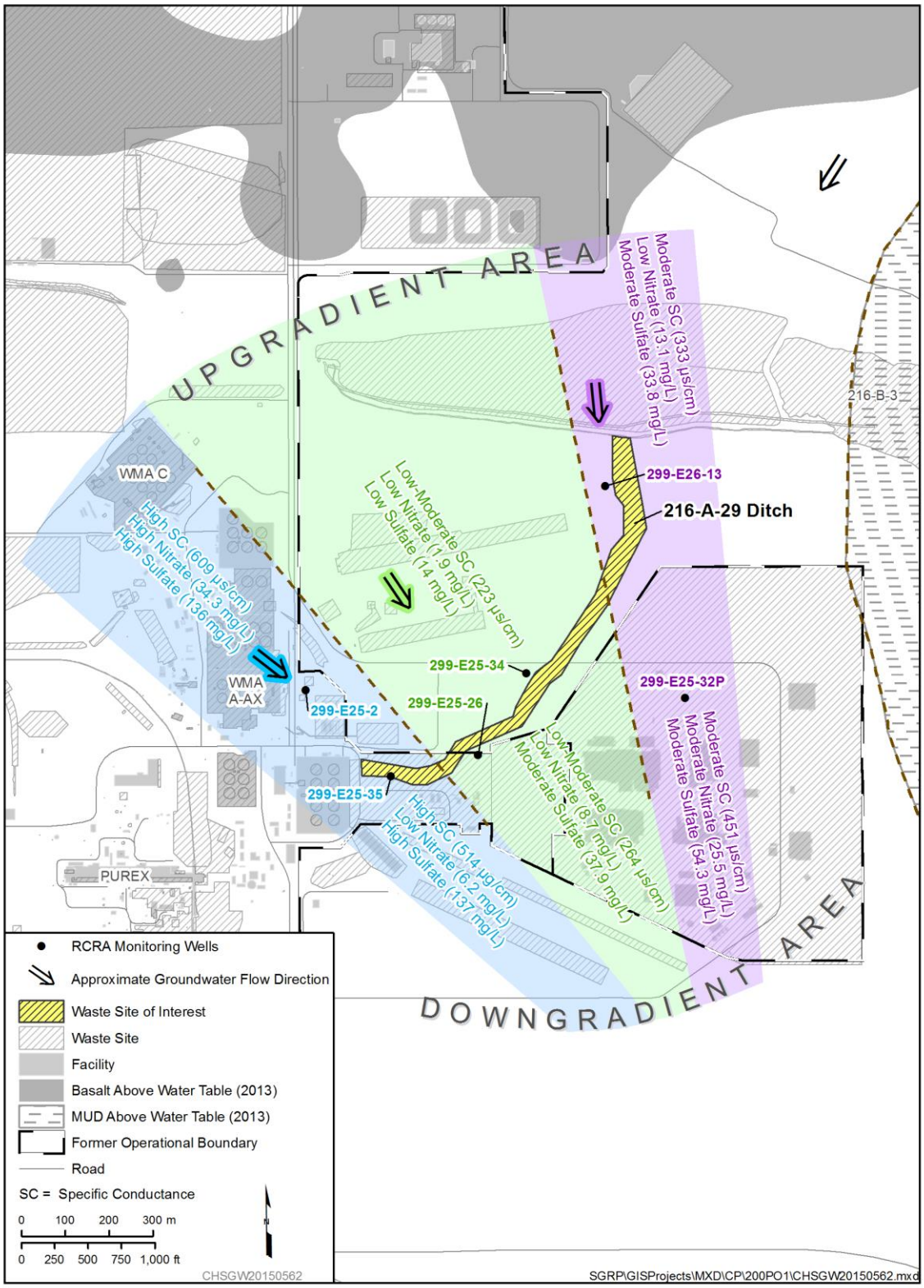

Figure 2-9. Conceptual Site Model for 216-A-29 Ditch

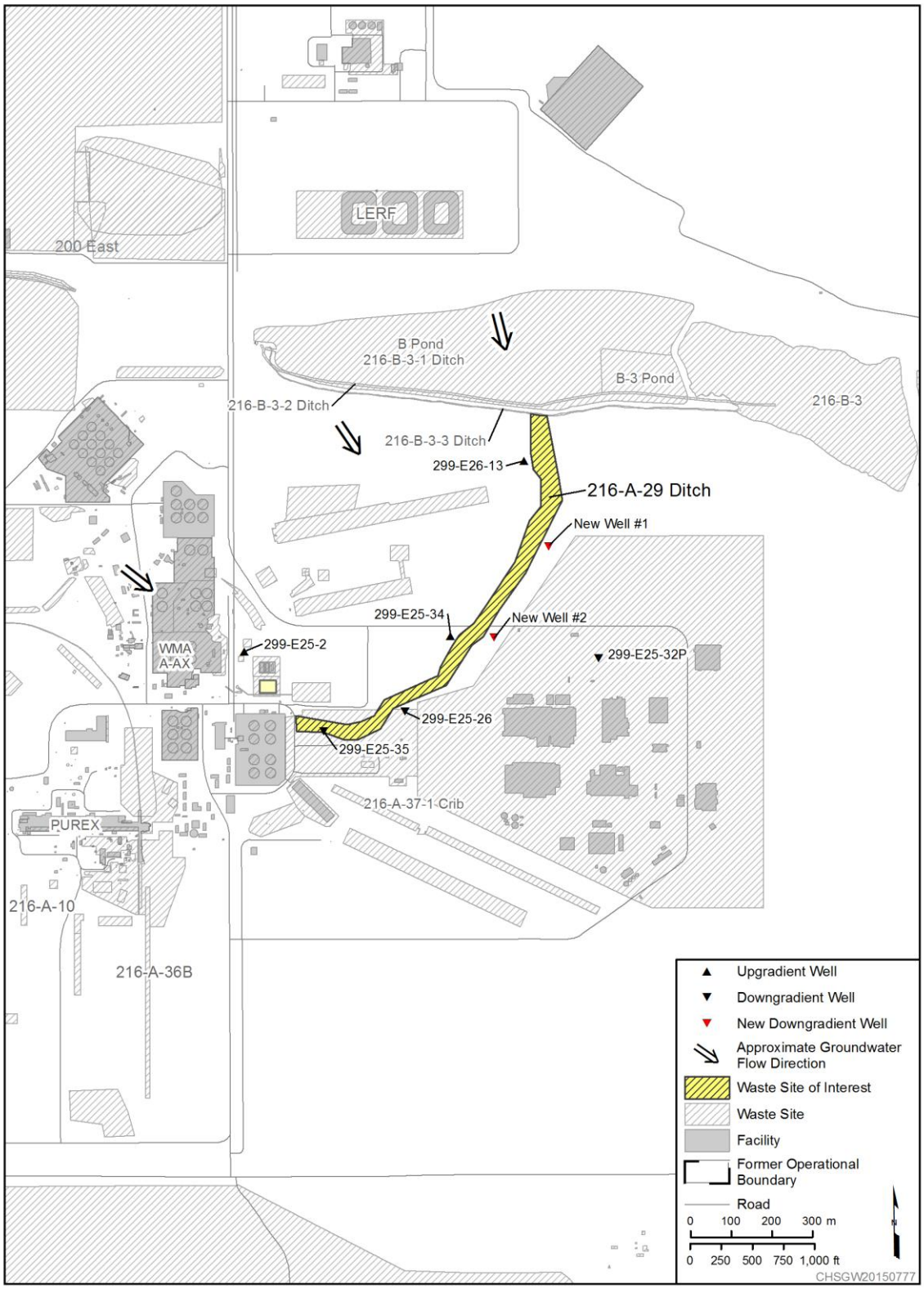

Figure 3-1. 216-A-29 Ditch RCRA Monitoring Network.

Table 3-1. Monitoring Well Network for the 216-A-29 Ditch

Well Name	Purpose	WAC Compliant	RCRA Required Parameters[a]											Site-Specific Constituents			
				Contamination Indicator Parameters				Groundwater Quality Parameters									
			Water Level	pH	Specific Conductance	Total Organic Carbon	Total Organic Halogen	Chloride	Iron (Filtered and Unfiltered)	Manganese (Filtered and Unfiltered)	Phenols	Sodium (Filtered and Unfiltered)	Sulfate	Alkalinity	Metals (Filtered and Unfiltered)[b]	Anions[c]	Field Parameters[d]
299-E25-2	Upgradient	N	S	S4	S4	S4	S4	A	A	A	A	A	A	A	A	A	A
299-E25-26	Downgradient	N	S	S4	S4	S4	S4	A	A	A	A	A	A	A	A	A	A
299-E25-32P	Downgradient	Y	S	S4	S4	S4	S4	A	A	A	A	A	A	A	A	A	A
299-E25-34	Upgradient	Y	S	S4	S4	S4	S4	A	A	A	A	A	A	A	A	A	A
299-E25-35	Downgradient	Y	S	S4	S4	S4	S4	A	A	A	A	A	A	A	A	A	A
299-E26-13	Upgradient	Y	S	S4	S4	S4	S4	A	A	A	A	A	A	A	A	A	A
New Well # 1[e]	Downgradient	Y	Q	Q4	Q4	Q4	Q4	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
New Well # 1[f]	Downgradient	Y	S	S4	S4	S4	S4	A	A	A	A	A	A	A	A	A	A
New Well # 2[e]	Downgradient	Y	Q	Q4	Q4	Q4	Q4	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
New Well # 2[f]	Downgradient	Y	S	S4	S4	S4	S4	A	A	A	A	A	A	A	A	A	A

Notes:

a. Parameters required by 40 CFR 265.92, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," "Sampling and Analysis."

b. Metals (analytes include common soil minerals, calcium, magnesium, and potassium for charge balance computations).

c. Anions (analytes include nitrate for charge balance computations).

d. Field parameters include temperature and turbidity.

e. Constituents and sampling frequency for New Well #1 and New Well #2 only for first year of monitoring.

f. Constituents and sampling frequency for New Well #1 and New Well #2 after first year of monitoring.

A = to be sampled annually
CFR = *Code of Federal Regulations*
N = well is not constructed as a resource protection well (WAC 173-160, "Minimum Standard for Construction and Maintenance of Wells")
Q = quarterly
Q4 = to be sampled quarterly, with quadruplicate samples collected during each event
S = to be sampled semiannually
S4 = to be sampled semiannually, with quadruplicate samples collected during each event
RCRA = *Resource Conservation and Recovery Act of 1976*
WAC = *Washington Administrative Code*
Y = well is, or will be, constructed as a resource protection well (WAC 173-160)

Table 3-2. Attributes for Wells in 216-A-29 Ditch Groundwater Monitoring Network

Well Name	Completion Date	Easting[a] (m)	Northing[a] (m)	Screen Top (m [ft] bgs)	Screen Bottom (m [ft] bgs)	Water Depth (m [ft] bgs)	Remaining Water Column (m [ft])	Water Level Date
299-E25-2[b]	1955	575513.76	136061.87	84.2 (276)	96.3 (316)	84.7 (278)	11.7 (38.4)	3/3/15
299-E25-26	1985	575907.50	135912.86	82.3 (270)	88.4 (290)	83.2 (273)	5.3 (17.4)	4/1/15
299 E25-32P	1988	576382.42	136044.34	79.1 (260)	85.2 (280)	83.1 (273)	2.1 (6.9)	4/23/15
299 E25-34[b]	1988	576019.04	136100.01	76.7 (252)	82.8 (272)	80.8 (265)	2.1 (6.9)	4/29/15
299 E25-35	1988	575708.34	135864.69	79.4 (260)	85.7 (281)	83.9 (275)	1.8 (6.0)	4/29/15
299 E26-13[b]	1991	576199.30	136528.60	58.5 (192)	64.7 (212)	62.7 (206)	2.1 (6.9)	4/29/15
New Well # 1	TBD	576273.29	136338.56	TBD	TBD	TBD	TBD	NA
New Well # 2	TBD	136094.89	576126.06	TBD	TBD	TBD	TBD	NA

a. Coordinates are in NAD83, *North American Datum of 1983*.
b. Upgradient well

bgs = below ground surface
NA = not applicable
TBD = to be determined

Table 3-3. Main Differences between This Plan and Previous Plan

Type of Change	Previous Plan[a]	Current Plan	Justification Summary
Constituents	Indicator parameters, groundwater quality parameters, and water chemistry supporting constituents	Same, except oxidation reduction potential was eliminated as a site-specific field parameter	Oxidation reduction potential is not required by RCRA, and it is not a site-specific monitoring objective. Determination of oxidation reduction potential is not needed for monitoring of the upper unconfined aquifer.
Sampling Frequency	Indicator parameters – semiannual or annual	Indicator parameters – semiannual	Standardized to requirements of RCRA – semiannual in wells used for upgradient-downgradient comparisons.
	Groundwater quality parameters – annual	Groundwater quality – same	No change.
	Water chemistry supporting constituents – semiannual or annual	Water chemistry supporting constituents – annual	Site-specific constituents analyzed annually to correspond with frequency of groundwater quality parameters. Both used for charge-balance calculations.
	Water level measurements – every sampling event	Water level measurements – same	No change.
Well Network	Three upgradient wells[b]: 699-43-45 299-E26-13 299-E26-12 Six downgradient wells: 299-E25-26 299-E25-28 299-E25-32P 299-E25-34 299-E25-35 299-E25-48	Three upgradient wells 299-E25-2 299-E25-34 299-E26-13 Five downgradient wells: 299-E25-26 299-E25-32P 299-E25-35 New Well #1 New Well #2	Changes in groundwater flow direction have affected utilization of wells relative to upgradient or downgradient designations. Formerly downgradient Well 299-E25-34 is now upgradient. Added existing Well 299-E25-2 to monitor upgradient groundwater that comes from the region of Waste Management Area A-AX and its influence on specific conductance levels downgradient of 216-A-29. Wells 299-E26-12, 699-43-45, and 299-E25-48 were removed from the monitoring network. These wells duplicate information provided from other wells or are not appropriately positioned for the groundwater flow path. Two new wells will be installed to improve downgradient monitoring coverage for the central and northern portions of the 216-A-29 Ditch.

Table 3-3. Main Differences between This Plan and Previous Plan

Type of Change	Previous Plan[a]	Current Plan	Justification Summary
Groundwater Flow Direction	South or southwest	South-southeast near the north end of the ditch and southeast near the south end of the ditch	Refined flow direction estimates from low-gradient network for different portions of the 216-A-29 Ditch.
Type of Groundwater Monitoring Program	Indicator Evaluation Program	Same	No change.
Background Arithmetic Mean Recalculated	Calculated annually using two upgradient wells	Calculated annually using three upgradient wells	Three wells are used to capture spatial variability in upgradient conditions along different segments of the ditch. Calculated annually using EPA 530/R-09-007, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance*.
Groundwater Quality Assessment Plan Outline	None[c]	Updated outline provided in Chapter 5 (Table 5-1)	Update outline made available within document (Section 5.0).

a. DOE/RL-2008-58, Rev. 0, *Interim Status Groundwater Monitoring Plan for the 216-A-29 Ditch*.

b. Upgradient well network beginning in 2012 (SGW-55438)

c. Previous groundwater quality assessment plan outline provided in PNNL-13047, *Groundwater Monitoring Plan for the 216-A-29 Ditch* (Section 7.0).

ORP = oxidation-reduction potential

Supplemental Information B-1

A/AX Tank Farm assessment sampling results summary for 2014.

Supplemental Information: Waste Management Area A-AX 2014
Assessment Parameter Analytical Summary

Parameter	Range
Alkalinity	75,400 – 136,000 µg/L
Chromium (filtered)	<1 – 10.6 µg/L
Lead (filtered)	<0.05 – <0.5 µg/L
Nitrate	12,300 – 60,200 µg/L
pH Measurement	7.23 – 8.34
Sodium (filtered)	11,200 – 28,800 µg/L
Specific conductance	445 – 725 µS/cm
Sulfate	92,300 – 210,000 µg/L
Technetium-99	<11.8 – 1,840 pCi/L
Temperature	16.0 – 20.8°C
Total organic carbon	230 – 850 µg/L
Turbidity	0.14 – 53.3 NTU

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