ECF-200PO1-19-0007
Revision 0

DATA SCREENING PROCEDURE FOR THE WMA A-AX RCRA FIRST DETERMINATION REPORT

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

CH2MHILL
Plateau Remediation Company

P.O. Box 1600
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

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APPROVED
By Lynn M. Ayers at 12:57 pm, Jun 04, 2019

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ENVIRONMENTAL CALCULATION COVER PAGE

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ENVIRONMENTAL CALCULATION COVER PAGE (Continued)

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Terms

BTV	background threshold value
ECF	environmental calculation file
Ecology	Washington State Department of Ecology
EDA	Environmental Dashboard Application
HEIS	Hanford Environmental Information System
MDL	method detection limit
PQL	practical quantitation limit
RCRA	*Resource Conservation and Recovery Act of 1976*
SVOC	semi-volatile organic compound
TIC	tentatively identified compound
VOC	volatile organic compound
WMA	waste management area

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1 Purpose

The purpose of this environmental calculation file (ECF) is to explain the steps involved in the screening of groundwater monitoring data for further evaluation of dangerous waste impacts to groundwater from the Waste Management Area A-AX (WMA A-AX). This screening resulted in the selection of seven constituents that will be used for further evaluation of whether WMA A-AX is the original source impacting groundwater (ECF-200PO1-19-0008, *Statistical Evaluation of Assessment Sampling Results for WMA-A-AX*).

2 Background

WMA A-AX (Figures 1 and 2) was placed in groundwater quality assessment monitoring (40 CFR 265.93[d], "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," "Preparation, Evaluation, and Response") in 2005 because the indicator parameter specific conductance showed an exceedance relative to the statistical comparison value between upgradient and downgradient wells (PNNL-15315, *RCRA Assessment Plan for Single-Shell Tank Waste Management Area A-AX at the Hanford Site*) (40 CFR 265.93[b]). Quadruplicate measurements of specific conductance collected in June 2005 from downgradient well 299-E25-93 averaged 536 μS/cm, which exceeded the critical mean value of 522 μS/cm (PNNL-15315). An assessment groundwater monitoring plan (PNNL-15315) was subsequently drafted, based on requirements for interim status facilities, as defined by the *Resource Conservation and Recovery Act of 1976* (RCRA). Regulations for the WMA A-AX assessment monitoring plan are defined by the Washington State Department of Ecology (Ecology) in the Washington Administrative Code, and the Code of Federal Regulations (WAC 173-303-400, "Dangerous Waste Regulations," "Interim Status Facility Standards"; 40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities," Subpart F, "Ground-Water Monitoring"). The current assessment monitoring plan, DOE/RL-2015-49, *Interim Status Groundwater Quality Assessment Plan for the Single-Shell Tank Waste Management Area A-AX*, was written in 2016 to revise PNNL-15315 because of PNNL-15315's age, and to ensure inclusion of the most current Hanford Site groundwater monitoring information for the WMA (e.g., changes to the well network sampling frequency, groundwater quality assessment constituents and methodology for evaluation of sample results). Under DOE/RL-2015-49, the WMA A-AX monitoring well network was sampled on a quarterly basis between March of 2016 and June of 2018. The groundwater sampling constituent list and frequency requirements are outlined in DOE/RL-2015-49. Nine quarterly assessment groundwater sampling events were completed for WMA A-AX first determination. A larger dataset was obtained to support a robust statistical evaluation as part of the first determination. The objective of the first determination is to determine if any dangerous waste constituents from the facility have entered the groundwater.

3 Methodology

This section describes the screening process for dangerous waste constituents detected in the WMA A-AX monitoring well network that require further evaluation of their possible impact to groundwater (Figure 3). Dangerous waste constituents defined in Table 3-1 of DOE/RL-2015-49 were acquired for the period from March 1 of 2016 to June 30 of 2018 by querying the Hanford Environmental Information System (HEIS) database for all of the wells in the WMA A-AX network. Initial screening eliminated data with associated laboratory or review qualifiers indicating non-detection or quality control issues (Table 1).

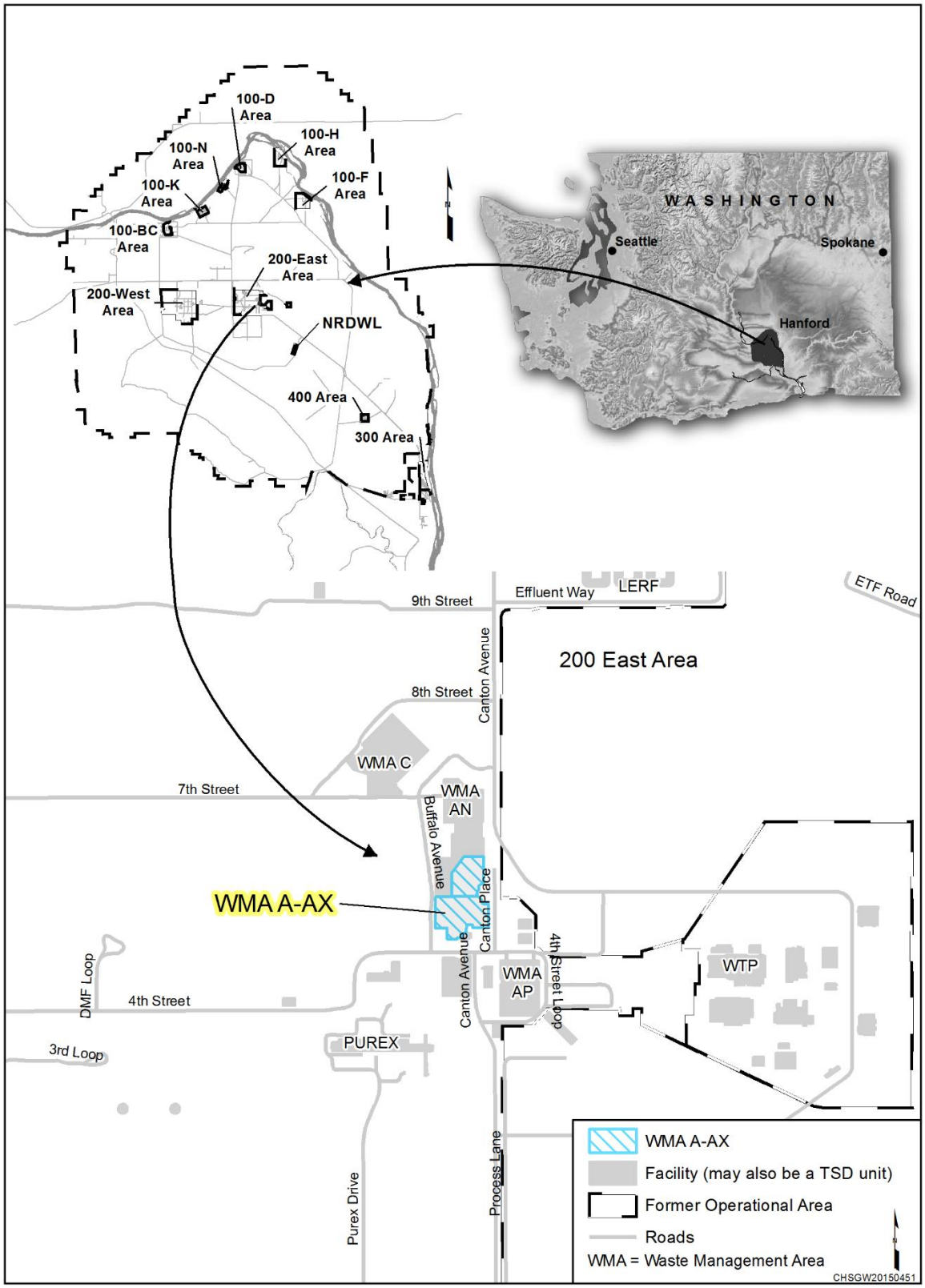

Figure 1. WMA A-AX Location Map

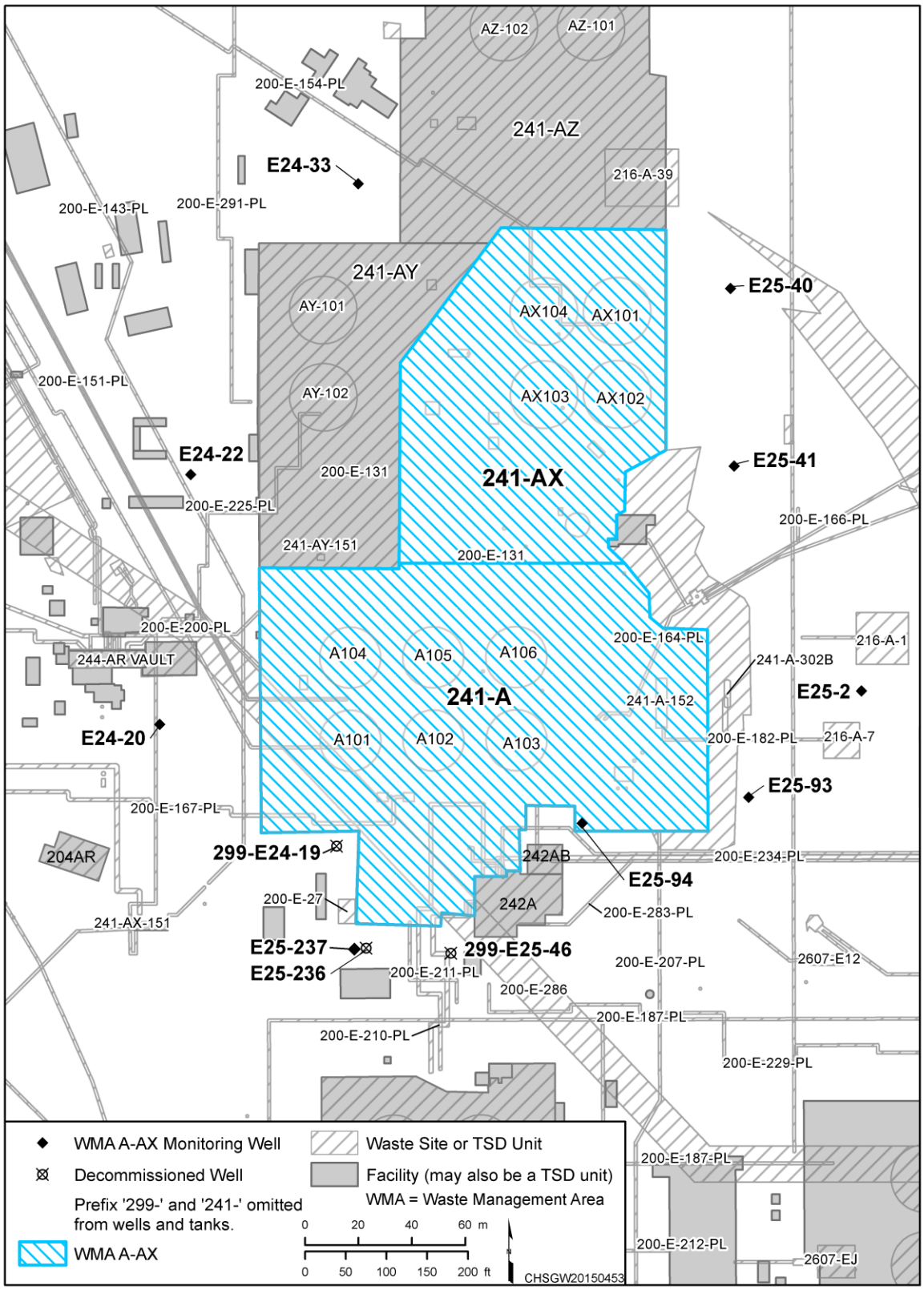

Figure 2. WMA A-AX Monitoring Well Network Location Map

Table 1. Hanford Environmental Information System Data Qualifiers

Qualifier		Translation
Laboratory Qualifier	A	INORGANICS and WETCHEM - Valid for tentatively identified compounds (TIC) only: The TIC is a suspected alcohol-condensation product.
	B	INORGANICS and WETCHEM - The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MIDL (as appropriate). ORGANICS - The analyte was detected in both the sample and the associated QC blank, and the blank concentration was > than the PQL but <= 5% of the sample concentration.
	C	INORGANICS/WETCHEM: The analyte was detected in both the sample and the associated QC blank, and the blank concentration was > than the PQL but <= 10% of the sample concentration. ORGANICS (PESTICIDE only) - The identification of a pesticide confirmed by gas chromatograph/mass spectrometer (GC/MS).
	D	All - Analyte was reported at a secondary dilution factor, typically DF>1 (i.e., the primary preparation required dilution to either bring the analyte within the calibration range or to minimize interference). Required for organics/wetchem if the sample was diluted.
	E	INORGANICS - Reported value is estimated because of interference. See comment on cover page, hardcopy case narrative, or specific inorganic hardcopy datasheet. ORGANICS - Concentration exceeds the calibration range of the GC/MS.
	J	ORGANICS - Estimated value; (1) constituent detected at a level less than the RDL or PQL and greater than or equal to the MDL, (2) estimated concentration for tentatively identified compounds (TICs).
	N	ALL (except GC/MS based analysis) - Spike and/or spike duplicate sample recovery is outside control limits. ORGANICS (GC/MS only) - Presumptive evidence of compound based on mass spectral library search.
	O	ALL - The associated laboratory control sample recovery is outside control limits
	P	ORGANICS (PCB only) - Aroclor target analyte with greater than 25% difference between column analyses.
	Q	ORGANICS (Dioxins & PCB-congeners only) - Estimated maximum concentration. Used if one of the qualitative identification criteria is not met (e.g., Cl isotopic ratios outside theoretical range.)
	S	INORGANICS - Reported value determined by Method of Standard Additions (MSA).
	T	Organics (GC/MS only) - Spike and/or spike duplicate sample recovery is outside control limits.
	U	ALL - Analyzed for but not detected above limiting criteria. Limiting criteria may be any of the following: value reported < 0; value reported < counting error, value reported < total analytical error; value reported <= contract MDL/IDL/MDA/PQL.
	W	INORGANICS - Post-digestion spike recovery for GFAA out of control limit. Sample absorbency <50% of spike absorbency.

Table 1. Hanford Environmental Information System Data Qualifiers

Qualifier		Translation
	X	ALL - The result-specific translation of this qualifier code is provided in the hardcopy data report and/or case narrative and/or case narrative. Additional result-specific translation information may also be found in the RESULT_COMMENT field for this record.
	Y	Same as X if more than one flag is required.
	Z	ALL - The result-specific translation of this qualifier code is provided in the hardcopy data report and/or case narrative.
	Y	Same as X and Y if more than two flags are required.
Review Qualifier	A	Chain of custody issues associated with sample.
	F	Result is undergoing further review.
	G	Record has been reviewed and determined to be correct, or the record has been corrected with laboratory confirmation or other supporting information.
	H	Laboratory holding time was exceeded before the sample was analyzed.
	P	Potential problem. Collection/analysis circumstances makes value questionable.
	Q	Associated quality control sample is out of limits.
	R	Do not use. Further review indicates the result is not valid.
	Y	Result suspect. Review - insufficient evidence to show result valid or invalid.
	Z	Miscellaneous circumstances exist. Additional information may be found in the RESULT_COMMENT field for this record and/or in the SAMP_COMMENT field of the parent sample record.

Laboratory Qualifier Source: CP-15383, *Common Requirements of the Format for Electronic Analytical Data (FEAD)*.

Review Qualifier Source: HNF-38155, *HEIS Sample, Result, and Sampling Site Data Dictionary*.

DF = dilution factor
GC/MS = gas chromatograph/mass spectrometer
GFAA = Graphite Furnace Atomic Absorption
HEIS = Hanford Environmental Information System
IDL = instrument detection limit
MDA = minimum detectable activity
MDL = method detection limit
MIDL = method instrument detection limit
MSA = Method of Standard Additions
PCB = polychlorinated biphenyl
PQL = practical quantitation limit
QC = quality control
RDL = required detection limit
TIC = tentatively identified compounds

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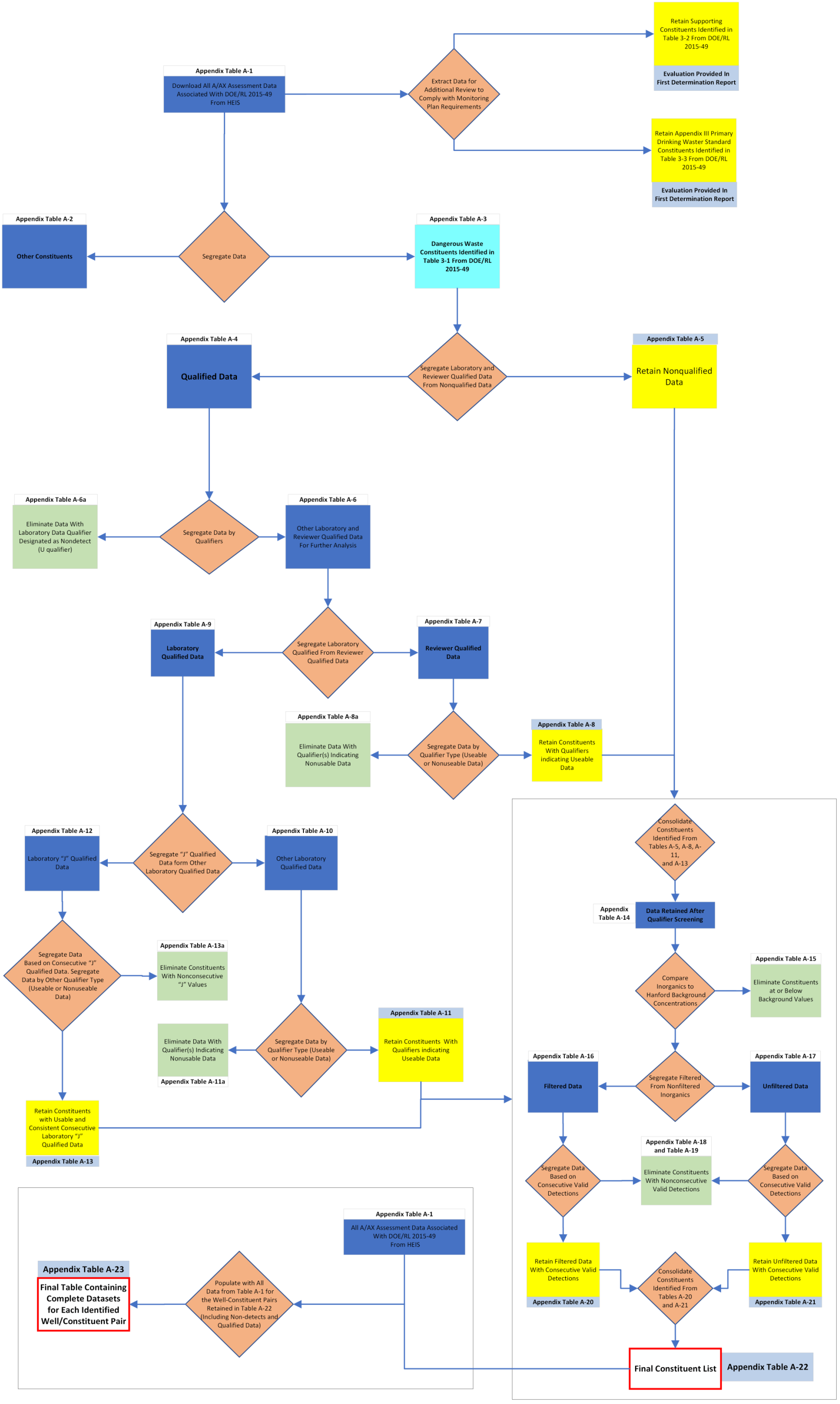

Figure 3. Data Sorting Process Flow Chart

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All remaining inorganic data after the laboratory and review qualifier screening were compared to the sitewide background threshold values (BTV) at the 95th percentile (DOE/RL-96-61, 1997, *Hanford Site Background: Part 3, Groundwater Background*).

All remaining organic data after the laboratory and review qualifier screening were screened for consecutive "J" qualifiers. These data are retained because they indicate the presence of low-level organic compound contamination that may be of interest to the site owner/operator. Specifically the "J" qualifier indicates that an analytical value is higher than the method detection limit (MDL) but lower than the practical quantitation limit. The laboratory practical quantitation limits (PQLs) are either established at the value of the lowest calibration standard obtained by a laboratory for the applicable analytical method or they are based on the MDL multiplied by a factor (usually 3 to 5 times) as determined by a laboratory. MDLs are determined in accordance with the most current version of 40 CFR 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants," "Definition and Procedure for the Determination of the Method Detection Limit." The MDL and PQL values published by the laboratories are based on ideal samples and sample volumes and do not take into account issues (i.e., dilutions or reduced sample sizes) resulting from difficult matrices.

3.1 Laboratory and Review Qualifier Screening

1. Access HEIS using the Environmental Dashboard Application (EDA) and download all groundwater monitoring data for wells 299-E24-20, 299-E24-22, 299-E24-33, 299-E25-2, 299-E25-237, 299-E25-40, 299-E25-41, 299-E25-93 and 299-E25-94 from samples collected between March 1, 2016 and June 30, 2018 for the entire WMA A-AX monitoring network (Figure 3).

    a. Export the data into a Microsoft® Excel® spreadsheet. Load exported data into a Microsoft® Access® database.

    b. Extract all results categorized as supporting constituents in Table 3-2 of DOE/RL-2015-49 and export to an Excel spreadsheet (Appendix A, "AAX_spprtng_consttnts.xlsx"). These data are discussed in DOE/RL-2019-21, *Groundwater Assessment First Determination Report for Waste Management Area A-AX*.

    c. Extract all results sampled for 40 CFR 265 "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Appendix III, "EPA Interim Primary Drinking Water Standards" that are listed in Table 3-3 of DOE/RL-2015-49 and export to an Excel spreadsheet (Appendix A). Appendix III parameter sampling for four quarters is required for wells newly added to the network. For WMA A-AX, only well 299-E25-237 was sampled for Appendix III. These data are discussed in DOE/RL-2019-21.

2. Screen the data not excluded for designated dangerous waste status by comparing constituents with those listed in Table 3-1 of DOE/RL-2015-49. Exclude all data for constituents not listed as dangerous waste in Table 3-1. Retain all constituents listed as dangerous waste for further evaluation.

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® Microsoft Access is a registered trademark of Microsoft Corporation in the United States and other countries.

3. Screen and exclude all data with laboratory qualifiers “A,” “E,” “N,” “O,” “P,” “Q,” “T,” “U,” and “W.” Also, screen and exclude organic constituent data associated with “B” qualifiers and inorganic constituent data with “C” qualifiers.

   a. Retain all organic constituents associated with “J” qualifiers and save in a separate file.

4. Screen and determine adequacy of data associated with laboratory qualifiers “X,” “Y,” and “Z.” For example, if the laboratory hardcopy indicates sample quality control issues (e.g. hold-time exceedance or sample contamination) then exclude the data point.

5. Screen and exclude all data points associated with review qualifiers “F,” “H,” “P,” “Q,” “R,” or “Y.”

3.2 Background Threshold Value

Screen all remaining inorganic data retained in step 5 in Section 3.1 against sitewide BTVs at the 95th percentile (Table 2, DOE/RL-96-61). Retain those values that exceed the BTVs (Figure 3).

3.3 Consecutive Valid Detections Screening

1. Screen all previously retained data for consecutive, valid detections. Retain all well constituent datasets with two or more consecutive valid dangerous waste detections. These data will be forwarded for further evaluation (Figure 3).

2. Screen all organic constituent data for consistent consecutive “J” qualifiers.

3. Retrieve all of the data for constituent/well pairs retained in Section 3.3, step 1 from the initial dataset (Table A-1 in Figure 3) obtained in Section 3.1, step 1. It is necessary to include all assessment data for the retained constituent/well pairs for further statistical evaluation (ECF-200PO1-19-008).

4. Export final dataset (along with intermediate datasets derived in 3.1 through 3.3) from Access database to individual Excel spreadsheets (Appendix A).

Table 2. Hanford Site-wide 95th Percentile Background Values for WMA A-AX Dangerous Waste Constituents

Analyte	Filtered	Units	95 CI
Antimony	Y	µg/L	69.8
Arsenic	Y	µg/L	11.8
Barium	Y	µg/L	149
Beryllium	Y	µg/L	3.38
Cadmium	Y	µg/L	1.29
Chromium	Y	µg/L	3.17
Cobalt	Y	µg/L	1.29
Copper	Y	µg/L	1.04
Cyanide	N	µg/L	9.52

Table 2. Hanford Site-wide 95th Percentile Background Values for WMA A-AX Dangerous Waste Constituents

Analyte	Filtered	Units	95 CI
Lead	Y	µg/L	1.3
Mercury	Y	µg/L	0.006
Nickel	Y	µg/L	1.98
Selenium	Y	µg/L	20.7
Silver	Y	µg/L	5.98
Sulfide	Y	µg/L	2.35
Thallium	Y	µg/L	1.87
Tin	Y	µg/L	23.6
Vanadium	Y	µg/L	19.3
Zinc	Y	µg/L	48.9

Source: DOE/RL-96-61, *Hanford Site Background: Part 3, Groundwater Background*, Rev. 0.

NRDWL = nonradioactive dangerous waste landfill

4 Assumptions and Inputs

Non-detected sample data results (data with a "U" qualifier) are assumed to not be present and were not further evaluated (Figure 3). Sample data results that could have been affected by sample or lab contamination (semi-volatile organic compound (SVOC), and volatile organic compound (VOC) sample data flagged by the laboratory with a "B" qualifier or inorganic constituent data flagged by the laboratory with a "C" qualifier) were not evaluated (Figure 3). Data were considered valid for organic constituents if datasets containing both detections and non-detects contained consecutive detections. Consecutive "J" qualifiers suggests that the organic constituent is detectable in groundwater at very low concentrations.

DOE/RL-2015-49 specifies that tentatively identified compounds (TIC) results also be evaluated. A single instance of a TIC occurred for the June 2018 sampling event in well 299-E25-94 in which isopropyl alcohol was tentatively identified. Being that this substance is common in hand sanitizers and household cleaners and because of its isolated occurrence of detection, isopropyl alcohol is not considered a groundwater contaminant attributable to WMA A-AX.

5 Software Applications

Microsoft Excel and Microsoft Access software are approved and appropriate applications for this effort and were used to perform sorting operations.

6 Calculation

Data were accessed through HEIS using the EDA and processed by Excel and Access using conditional statements in according to the assumptions, inputs, and methodology presented in Chapter 3. Data discussions are summarized in Chapter 7.

7 Results

Results of the screening process described in Section 3 and outlined in the process flow diagram in Figure 3 are presented in tables listed in Appendix A. Of the 29,626 sample results retrieved from HEIS, 23,669 were results representing 243 unique dangerous waste constituents (Table 3-1 in DOE/RL-2015-49). After qualifier, BTV, and consecutive detection screening of the retained dangerous wastes constituent results, the following dangerous waste constituents were considered for further analysis:

- Chromium at wells 299-E24-20, 299-E24-22, 299-E25-2, 299-E25-40, 299-E25-41, and 299-E25-93
- Copper data at wells 299-E24-20, 299-E25-40, 299-E25-41, and 299-E25-93 were retained for further evaluation.
- Nickel at wells 299-E24-20, 299-E25-2, 299-E25-40, and 299-E25-41.
- Sulfide at well 299-E25-2
- Vanadium at wells 299-E24-20, 299-E24-22, 299-E25-2, 299-E25-40, 299-E25-41, 299-E25-93, 299-E25-94, and 299-E25-237

Organic constituents present at low concentrations as indicated by consistent consecutive "J" qualifiers were retained for further evaluation even though those constituents are not considered dangerous wastes attributable to WMA A-AX. Further evaluation of organics present at low-level concentrations was deemed necessary for estimating possible future increases in concentrations and determine if these constituents would be suitable for monitoring as site-specific constituents. WMA A-AX organics carried forward for further evaluation included:

- Chloroform at wells 299-E24-20, 299-E24-22 and 299-E25-237.
- Octachlorodibenzo-p-dioxin in well 299-E25-41 had two consecutive J-flagged values in 2018 but was not carried forward for further evaluation because of very low concentrations (on the order of magnitude of 10^{-6} µg/L). Similar low-level dioxin concentrations are frequently found in both field samples and quality control blanks. This phenomenon is common among multiple analytical laboratories and suggests that dioxin residues are present throughout the environment and often detected at very low levels by sensitive analytical methods.

The final screened dataset consisting of the constituent/well combinations listed above was evaluated further in ECF-200PO1-19-0008. Based on the results provided in this ECF (ECF-200PO1-19-0007), and ECF-200PO1-19-0008, DOE/RL-2019-21 was prepared. A summary of the entire data evaluation process, results, and conclusions is provided in DOE/RL-2019-21.

8 References

40 CFR 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants," *Code of Federal Regulations*. Available at: https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr136_main_02.tpl.

40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol25/xml/CFR-2010-title40-vol25-part265.xml.

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Subpart F, “Ground-Water Monitoring.”

Appendix III, “EPA Interim Primary Drinking Water Standards.”

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DOE/RL-96-61, 1997, *Hanford Site Background: Part 3, Groundwater Background*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: https://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D197226378.

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ECF-200PO1-19-0008, pending, *Statistical Evaluation of Assessment Sampling Results For WMA-A-AX*, Rev. 0, Department of Energy, Richland Operations Office, Richland, Washington.

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WAC 173-303, “Dangerous Waste Regulations,” *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303.

303-400, “Dangerous Waste Regulations.”

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Appendix A

Waste Management Area A-AX Assessment Sampling Data and Data Screening Results

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Results of the steps of the data screening process described in Section 3 are listed in the spreadsheets in the table below. The spreadsheet "table_explanation_AAX.xlsx" explains each of the spreadsheets Figure 3 of this document outlines the process followed for which spreadsheet was derived.

Microsoft Excel® Spreadsheet
table_explanation_AAX.xlsx
Table A-1.xlsx
Table A-2.xlsx
Table A-3.xlsx
Table A-4.xlsx
Table A-5.xlsx
Table A-6.xlsx
Table A-7.xlsx
Table A-8.xlsx
Table A-9.xlsx
Table A-10.xlsx
Table A-11.xlsx
Table A-11a.xlsx
Table A-12.xlsx
Table A-13.xlsx
Table A-13a.xlsx
Table A-14.xlsx
Table A-15.xlsx
Table A-16.xlsx
Table A-17.xlsx
Table A-18.xlsx
Table A-19.xlsx
Table A-20.xlsx
Table A-21.xlsx
Table A-22.xlsx
Table A-23.xlsx
AAX_spprtng_cnsttnts.xlsx
AAX_appndx_3_cnsttnts.xlsx

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