



Department of Energy
Carlsbad Field Office
P. O. Box 3090
Carlsbad, New Mexico 88221
May 24, 2001

ENTERED



Mr. Steve Zappe
Hazardous Waste Permits Program
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
2905 E. Rodeo Park Drive, Bldg. E
Santa Fe, New Mexico 87505

RE: Transmittal of Approved Waste Stream Profile Form for Idaho National
Environmental & Engineering Laboratory, Waste Stream Profile Form Number
INW216.001

Dear Mr. Zappe:

The Department of Energy, Carlsbad Field Office (CBFO) has approved the Idaho National Environmental & Engineering Laboratory (INEEL), Waste Stream Profile Form INW216.001 for Waste Stream First/Second Stage Sludge. Enclosed is a copy of the approved form as required by Section B-4(b)(1) of the WIPP Hazardous Waste Facility Permit No. NM4890139088-TSDF.

If you have any questions on this matter, please contact me at (505) 234-7357 or (505) 361-0265.

Sincerely,

Kerry W. Watson
Assistant Manager
Office of National TRU Program

Enclosure

cc: w/o enclosure
S. Hunt, CBFO
H. Johnson, CBFO
J. Kielling, NMED
C. Walker, TechLaw
J. Cotton, WTS
B. Kehrman, WTS
M. Gerle, WTS
J. May, CTAC



WIPP WASTE STREAM PROFILE FORM

Waste Stream Profile Number: INW216.001
Generator site name: INEL **Technical contact:** Dr. Rodney Arbon
Generator site EPA ID: ID4890008952 **Technical contact phone number:** (208) 526-1867
Date of audit report approval by NMED: May 18, 2001
Title, version number, and date of documents used for WAC certification: See continuation sheet 1 - Heading: WAC Certification
Did your facility generate this waste? ☐ Yes ☒ No **If no, provide the name and EPA ID of the original generator:**
Rocky Flats Environmental Technology Site, CO7890010526

Waste Stream Information¹

WIPP IN-W216, IN-W228,
ID: IN-W220 See continuation sheet 1 **Summary Category Group:** S3000
Waste Matrix Code Group: S3121, S3150 See continuation sheet 1 **Waste Stream Name:** First/Second Stage Sludge
Description from the WTWBIR: See continuation sheet 1 - Heading: Waste Description
Defense TRU Waste: ☒ Yes ☐ No **Check One:** ☒ CH ☐ RH
Number of SWBs 0 **Number of Drums** 6,752 **Number of Canisters** 0
Data report numbers supporting this waste stream characterization: See Characterization Information Summary, Table 6
List applicable EPA Hazardous Waste Codes:² D004, D005, D006, D007, D008, D009, D010, D011, D022, F001, F002, F005, F006, F007, and F009 See continuation sheet 2 - Heading: Hazardous Determination
Applicable TRUCON Content Codes: ID111, ID211

Acceptable Knowledge Information¹

[For the following, enter supporting the documentation used (i.e., references and dates)]

Required Program Information

- Map of site: Acceptable Knowledge Document for INEL Stored Transuranic Waste - Rocky Flats Plant Waste, January 1998, INEL-96/0280, Figure 3.1; Drawing 175603 (BBWXT), Rev. 7, 2/24/00.
- Facility mission description: INEL-96/0280, Section 3.1; PLN-579
- Description of operations that generate waste: INEL-96/0280
- Waste identification/categorization schemes: INEL-96/0280, Section 3.3.2
- Types and quantities of waste generated: INEL-96/0280, Section 3.5, Sections 5-26; Inventory report from Transuranic Reporting, Inventory, and Processing System (TRIPS)
- Correlation of waste streams generated from the same building and process, as appropriate: INEL-96/0280, Section 3.2, Sections 5-26
- Waste certification procedures: PLN-579

Required Waste Stream Information

- Area(s) and building(s) from which the waste stream was generated: INEL-96/0280, Section 23.0, Waste Stream Summary Sheet - First/Second Stage Sludge, EDF-1809
- Waste stream volume and time period of generation: INEL-96/0280, Table 23-1, TRIPS
- Waste generating process description for each building: INEL-96/0280, Section 23.1
- Process flow diagrams: INEL-96/0280, Section 23.0, Figure 23-1
- Material inputs or other information identifying chemical/radionuclide content and physical waste form: INEL-96/0280, Section 23.0; Waste Stream Summary Sheet - First/Second Stage Sludge, EDF-1809, Hazardous Waste Code Determination for the First / Second Stage Sludge (001, 002, 800) INEL/EXT-2001-00015, Backlog Waste Reassessment Baseline Book, Section Waste Form 55 (7/26/99)

- Which Defense Activity generated the waste: (check one)
 - ☒ Weapons activities including defense inertial confinement fusion
 - ☐ Verification and control technology
 - ☐ Defense nuclear waste and material by products management
 - ☐ Defense nuclear waste and materials security and safeguards and security investigations
 - ☐ Naval Reactors development
 - ☐ Defense research and development
 - ☐ Defense nuclear material production

Supplemental Documentation

INEL 96/0280 encompasses several different reference sources. Many of the references used fall into the supplemental documentation category.

WIPP WASTE STREAM PROFILE FORM

- Process design documents: N/A
- Standard operating procedures: N/A
- Safety Analysis Reports: N/A
- Waste packaging logs: N/A
- Test plans/research project reports: N/A
- Site databases: N/A
- Information from site personnel: N/A
- Standard industry documents: N/A
- Previous analytical data: N/A
- Material safety data sheets: N/A
- Sampling and analysis data from comparable/surrogate Waste: N/A
- Laboratory notebooks: N/A

Sampling and Analysis Information¹

For the following, when applicable, enter procedure title(s), number(s) and date(s):

Radiography: RWMC Technical Procedure (TPR)-1572, Operating the Real-Time Radioscopic (RTR) System (Rev. 29, Rev. 30)

Visual Examination: HFEF-01-6890, Waste Characterization, Rev. 4c, 7/17/00

Headspace Gas Analysis

VOC's: ACMM-9930, GC/MS for VOC's in Gas, Rev. 4; ACMM-9910, Analysis of Gas Samples for VOC's by GC/FID, Rev. 3; AC1 P-4 10, Determination of Method Detection Limits for Gas Analysis, Rev. 2; AC1 P-4 45, Gas Transfer Manifold Systems and Sample Compositing, Rev. 2

Flammable: ACMM-9920, Analysis of Gas Samples for Hydrogen and Methane by GC/TCD (Rev. 3)

Other gases (specify): N/A

Homogeneous Solids/Soils/Gravel Sample Analysis

Total metals: ACMM-8909, Microwave Assisted Digestion of Homogeneous Solids and Soil/Gravel, Rev. 3; ACMM-2900, Determination of Trace Elements by ICP Atomic Emission Spectrometry, Rev. 4; ACMM-7802, Determination of Mercury by Cold-Vapor Fluorescence Spectrophotometry, Rev. 8

PCBs: N/A

VOC's: ACMM-9260, Volatile Organic Compounds by GC/MS, Rev. 3; ACMM-9354, Sample Preparation by Purge and Trap and Trap to Trap, Rev. 2

Non-halogenated VOC's: ACMM-9441, Determination of Nonhalogenated Volatile Organics by GC/Flame Ionization Detection, Rev. 4

Semi-VOC's: ACMM-9270, Semi-Volatile Organic Compounds by GC/MS, Rev. 1; ACMM-9500, Sample Preparation for Semi-Volatile Organics, Rev. 2

Other (specify): N/A

Waste Stream Profile Form Certification:

I hereby certify that I have received the information in this Waste Stream Profile Form, and it is complete and accurate to the best of my knowledge. I understand that this information will be made available to regulatory agencies and that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

[Signature]
Signature of Site Project Manager

Rod E. Arban, Alternate Project Manager
Printed Name and Title

5-24-01
Date

NOTE: (1) Use back of sheet or continuation sheets, if required.

(2) If radiography, visual examination, headspace gas analysis, and/or homogeneous solids/soils/gravel sample analysis were used to determine EPA Hazardous Waste Codes, attach signed Characterization Information Summary documenting this determination.

WIPP WASTE STREAM PROFILE FORM

Continuation Sheet 1:

WAC Certification Documents:

- Program Plan for Certification of INEEL Contact-Handled Stored Transuranic Waste, Rev. 1, May 18, 2000, PLN-579
- TRUPACT-II Authorized Methods for Payload Compliance (TRAMPAC) Plan, PLN-577, 3/14/00
- INEEL TRU Waste Characterization, Certification, And Transportation Quality Program Plan, Rev 6., INEEL-PLN-182, 11/08/00
- Quality Assurance Project Plan for the Transuranic Waste Characterization Program, Rev. 7, PLN-190, 11/167/00

Waste Description:

WIPP-ID	Item Description Code (IDC)	Waste Matrix Code (WMC)*	Description
IN-W216	001	S3121	This waste consists of immobilized materials generated from first-stage treatment operations in Building 774. Aqueous liquids coming into the process originated from Building 771 recovery operations. The liquids were made basic with sodium hydroxide to precipitate iron, magnesium, etc, which also carried down the relatively small precipitate of plutonium and americium hydrated oxides. The precipitate was filtered to produce a sludge (IDC 001), which was placed in a drum with Portland cement. Beginning in 1979, sludge waste from second-stage treatment was combined with first-stage sludge. The combined sludges were also assigned IDC 001. IDC 001 was discontinued in 1986 when the immobilization process changed, and has since been assigned IDC 800.
IN-W228	002	S3121	This waste consists of immobilized materials generated from second-stage treatment operations in Building 774. Aqueous liquids to be treated originated from first-stage treatment and from numerous buildings on plant site. The liquids were treated in the same manner as the liquids from the first stage, and the resulting sludge (IDC 002) was placed into a drum with Portland cement.
IN-W220**	800	S3150	The process that produced solidified sludge from Building 774 (IDC 800) was very similar to IDC 001. The difference between the two IDC's was the immobilization process. For IDC 800, the sludge was co-fed into a drum with a diatomite and Portland cement mixture, which formed a solid monolith after curing. IDC 800 was generated from 1986 until March 1991.

*Wastes assigned WMC's S3121 and S3150 were combined into this waste stream because the sludges identified by all three IDC's were generated by the same processes and have the same hazardous waste codes. The IDC's 001 and 002 were discontinued when the immobilization process changed in 1986 and all sludges assigned IDC 800.

**IN-W220 is described in the Transuranic Waste Baseline Inventory Report (TWBIR) as a combination of Rocky Flats generated waste and ANL-E generated waste and is associated with a local ID of ID-OFS-111T. IDC 800 waste was originally shipped to the INEEL using just the TRUCON 111 for the content code. A portion of the drums that are included in IN-W220 were IDC 800 drums. It was not until after publication of the Transuranic Waste Baseline Inventory Report that item description codes (IDC's) were obtained from Rocky Flats for IDC 800 drums and others shipped under TRUCON 111.

WIPP WASTE STREAM PROFILE FORM**Continuation Sheet 2:****Hazardous Determination:****Ignitability:**

The materials in this waste stream do not meet the definition of ignitability (D001) as defined in 40 CFR 261.21. Acceptable knowledge indicates that containers with small amounts of compatible liquid chemical wastes were added to the second-stage sludge generated prior to 1973. According to the Backlog Waste Reassessment Baseline Book, it was common practice to add small quantities of containerized wastes to the process waste stream (as opposed to piped waste water). These residual liquid chemical wastes were compatible with the first and second stage treatment processes. Only drums with liquids below the WIPP waste acceptance criteria (less than or equal to 1 inch of liquid in internal containers and less than or equal to 0.55 gal (2082 ml) total volume in the drum) will be shipped.

Corrosivity:

Under 40 CFR 261.22, a solid waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties:

- It is aqueous with a pH less than or equal to 2, or, greater than or equal to 12.5, as determined by a pH meter using Method 9040 in "Test Methods for Evaluating Solid Waste, Physical and Chemical Methods," EPA Publication SW-846.
- It is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 mm (0.250 inch) per year at a test temperature of 55 degrees Celsius (130 degrees Fahrenheit) as determined by its test method specified in National Association of Corrosion Engineer (NACE) Standard TM-01-69 as standardized in SW-846.

The waste stream does not meet the characteristic of corrosivity (D002) as defined. The waste is not aqueous. As has been determined by radiography and visual examination, none of these drums contain 20% by volume, aqueous waste. Since 20% by volume is required in order to measure pH, the corrosive characteristic does not apply.

The First and Second Stage Sludge waste stream does not meet the definition of liquid in making a determination of corrosivity toward steel because the waste is not a liquid. A knowledge-based determination is allowable when determining whether or not the waste stream is a liquid relative to corrosivity under the Federal Register, 50 FR 18372, dated April 30, 1985. It is stated in the FR that "EPA believes that, for purposes of the characteristic of ignitability and corrosivity, it will generally be obvious whether or not the waste is a liquid."

The generator (RFP) states in the Backlog Waste Reassessment book that, "The characteristic of corrosivity (D002) as defined in 40 CFR 261.22 does not apply because the final waste form is solid." This statement was in regard to the first stage sludge. It also states: "The second stage sludge would carry the same EPA waste codes as the first stage sludge." and "EPA Codes D001 and D002 are not assigned to the IDC 800 subpopulation." As stated previously, the solid state is confirmed using radiography and visual examination.

Reactivity:

The waste stream does not meet the characteristic of reactivity (D003) as defined under RCRA 40 CFR 261.23. The waste materials are stable and will not react violently with water, form potentially explosive mixtures with water, or generate toxic gases, vapors or fumes when mixed with water. The materials do not contain sulfides and are not capable of detonation or explosive reaction. The waste may contain trace quantities of cyanide derived from electroplating wastes, and containers with small amounts of liquid chemical wastes added to the process waste stream (as opposed to piped waste water). Only trace amounts of cyanide are expected in the waste stream feed and would not cause the resulting waste to be reactive. Based on the levels of concentration of cyanide in the feed waste, the alkalinity of the sludges (9 to 11 pH), and the presence of metals (e.g., Fe^{3+} , Cu^{2+} , Al^{3+}), cyanide is not available for release because all free cyanide exists as stable metal complexes. According to the Backlog Waste Reassessment Baseline Book, the small amounts of liquid chemicals present in any internal containers are wastes that are compatible with the sludge. This waste does not present compatibility hazards due to the chemicals identified with each other or with the packaging of the waste.

WIPP WASTE STREAM PROFILE FORM

Continuation Sheet 3:

Second-stage sludge generated before 1973 may contain lithium batteries. However, the batteries are spent/used and therefore not reactive. The following rationale was used to support the decision to not assign EPA hazardous waste codes D003 (reactivity) or D001 (ignitability) to this waste stream due to the potential presence of lithium batteries.

- As stated in the Acceptable Knowledge Document, "Second-stage sludge generated before 1973 may contain lithium batteries. Lithium metal, which is highly reactive with water, was used as an anode in lithium alkaline batteries. As the battery discharges, the lithium metal is converted to lithium oxide, which is not reactive. The materials in this waste group are therefore neither ignitable (D001) nor reactive wastes (D003) due to the potential presence of batteries."
- Considering the cost of lithium batteries in this time frame, there is no reason a user would replace and discard a lithium battery until the voltage dropped. One of the important features of lithium batteries is the constant voltage (i.e., flat discharge curve), which lasts until all of the lithium has been converted into a non-reactive lithium compound. At that time, virtually all of the lithium is no longer present in the reactive metallic state and there is a sharp voltage drop.
- The lithium contained in batteries present in the 1970-1973 generated second stage sludge waste is no longer reactive or ignitable. According to battery manufacturer information, current lithium batteries have shelf lives of approximately 10 to 20 years (early lithium batteries did not have shelf lives of this length). This is the period of time that it takes for a battery to lose its charge (discharge) due to the electrochemical reaction over time. As the result of discharge, the lithium metal is converted to lithium oxide. By design lithium batteries are constructed with an excess of positive electrode material to assure that there is enough positive material to react with all of the metallic lithium present. Spent (discharged) lithium batteries do not contain lithium metal and are not toxic, not ignitable, nor reactive. Any battery in the pre-1973 drums is currently 28 years old or older. Based on shelf life, any batteries present have completely discharged.

The materials in this waste stream do not meet the definition of reactivity and will not be assigned the D003 waste code.

Toxicity:

Acceptable knowledge indicates the potential presence of arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver in this waste stream. Results from sampling and analysis of the sludge (see Table 3 of attached Characterization Information Summary) confirm that cadmium, chromium, lead, and silver are present in the waste stream in quantities that exceed the toxicity limit and that arsenic, barium, mercury, and selenium also are present, but at levels less than the toxicity limit. The waste stream will be assigned all of the EPA codes for the metals including those metals with concentrations that did not exceed regulatory limits, as discussed in INEEL/EXT-2001-00015. EPA hazardous waste numbers for these metals are D004 through D011.

Tetrachloroethylene, trichloroethylene, and carbon tetrachloride were used primarily for cleaning and degreasing in Building 774 as indicated by acceptable knowledge. Small amounts of these solvents may be present in the waste stream. Since these compounds were typically used as solvents and degreasers, the waste is regulated as a listed hazardous waste and not a characteristic waste. Therefore, the toxicity characteristic waste codes associated with these compounds will not be assigned for these constituents.

One toxicity constituent, chloroform, exceeded the headspace gas PRQL (10 ppmv) at the 90%-confidence level (13.3 ppmv). Acceptable knowledge and solid sampling did not indicate the presence of this constituent, but the D022 will be applied to the waste stream as a conservative measure.

WIPP WASTE STREAM PROFILE FORM

Continuation Sheet 4:

Listed Waste:

F Codes:

Tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, chlorobenzene, and 1,1,2-trichloro-1,2,2-trifluoroethane were commonly used for cleaning, degreasing or paint removal and the sludges may contain residual amounts of these spent solvents. Headspace gas sampling (Table 2) supports the evaluation with 90% upper confidence limits for 1,1,1-trichloroethane and trichloroethylene above the PRQL. Sampling and analysis results of solids did not indicate the presence of any organic compounds above regulatory or program-required limits at the 90% upper confidence limit. Carbon tetrachloride, 1,1,1-trichloroethane, methylene chloride and tetrachloroethylene were all detected (above the minimum detection level) in solid samples taken from one or more of the drums. (Table 4) The applicable EPA listed waste codes, F001 and F002, have been assigned to this waste stream.

Acetone, benzene, butanol, ethyl benzene, ethyl ether, methanol, toluene and xylene were used as solvents in laboratory operations. The aqueous waste transferred to Building 774 second-stage treatment may have contained small quantities of these spent solvents. None of these compounds have a 90% confidence level in either the headspace gas samples or the solid samples greater than the PRQL, but all of the compounds except for methanol were detected in one or more of the headspace gas samples for these drums. Methanol and xylene were both detected in one or more solid samples. Originally the generator assigned the F003 code for the non-halogenated, non-toxic F003 constituents. These compounds are F003 listed for their ignitability. These F003 wastes were mixed with other solid wastes and do not exhibit the characteristic of ignitability and do not meet the definition of a F003 waste. The presence of the F005 solvents, benzene and toluene, was confirmed by detects in headspace gas sampling, and assignment of the F005 code is appropriate for this waste stream. EPA code assignments applicable to each analyte are included in Table 2.

Spent stripping, cleaning, and plating solutions from electroplating operations in which cyanides were used were at one time treated in Building 774. The solidified first and second stage sludges from this building were derived from the treatment of the hazardous electroplating wastes and are assigned EPA hazardous waste codes F006, F007, and F009.

U Codes:

The pre-1973 Second-Stage Sludge waste stream does not meet the definition for U codes under 40 CFR 261.33. The definition is:

- (a) Any commercial chemical product, or manufacturing chemical intermediate having the generic name listed in paragraph (f)
- (b) Any off-specification commercial chemical product or manufacturing chemical intermediate, which, if it met specifications, would have the generic name, listed paragraph (f) of this section.
- (c) Any residue remaining in a container or in an inner liner removed from a container that has held any commercial chemical product or manufacturing chemical intermediate having the generic name listed in paragraphs (f) of this section, unless the container is empty as defined in 261.7(b) of this chapter.

Acceptable knowledge indicates the presence of small amounts of contaminated mercury in pint bottles, and containers (bottles) with small amounts of compatible liquid chemical wastes in the Second-Stage Sludge generated prior to 1973. The mercury is described as "contaminated," which denotes that it was used and discarded as waste. According to the Backlog Waste Reassessment Baseline Book, the liquid chemical wastes in internal containers are compatible process wastes, not commercially pure grade chemicals. None of the residual liquids present in internal containers will be greater than 1 inch nor will the total volume of residual liquid in any drum be greater than 1% in compliance with the WIPP WAC.


WIPP WASTE STREAM PROFILE FORM

Continuation Sheet 5:

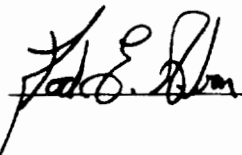
The EPA codes applicable to the liquid chemical wastes referred to in the above paragraph did not include additional codes that were different from those cited for pipeline-transferred wastes. U-listed EPA codes only apply to discarded commercial chemical products, off-specification products, and residues of commercial chemical or off-specification products. By definition, the pre-1973 Second Stage Sludge is not U coded waste due to contaminated mercury or the presence of liquid chemical wastes in bottles and the entire waste stream carries the characteristic code (D009) for mercury.

Characterization Information Summary Report

Lot Number: INW216.001

SQAO Review: 

Date: 05-24-01

SPM Release: 

Date: 5-24-01

SQAO Signature indicates that the information presented in this package is consistent with analytical batch reports.

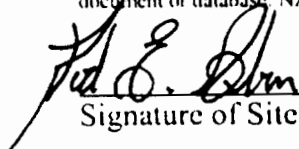
SPM Release concurrence with all information presented in this report

Reconciliation with Data Quality Objectives

I certify by signature (below) that sufficient data have been collected to determine the following Program-required waste parameters:

Check	Reconciliation Parameter
✓	Waste Matrix Code as reported in WWIS.
✓	Waste Material Parameter Weights for individual containers as reported in WWIS.
✓	The waste matrix code identified is consistent with the type of sampling and analysis used to characterize the waste.
✓	The TRU activity reported in WWIS demonstrates that the waste is TRU waste and not low-level radioactive waste.
✓	The potential flammability of TRU waste headspace gases, non
✓	Mean concentrations, upper 90% confidence limit (UCL ₉₀) values for the mean concentration standard deviations, and the number of samples collected for each VOC in the headspace gas of each container were calculated and compared with the program required quantitation limits, as reported in Waste Stream Characterization Summary Table 2, and additional EPA codes were assigned as required.
✓	Mean concentrations, UCL ₉₀ for the mean concentrations, standard deviations, number of samples collected for metals were calculated and compared with the program required quantitation limits and regulatory thresholds, as reported in Waste Stream Characterization Summary Table 3, and EPA codes were assigned as required.
✓	Mean concentrations, UCL ₉₀ for the mean concentrations, standard deviations, number of samples collected for total VOC's were calculated and compared with the program required quantitation limits and regulatory thresholds, as reported in Waste Stream Characterization Summary Table 4, and EPA codes were assigned as required.
✓	Mean concentrations, UCL ₉₀ for the mean concentrations, standard deviations, number of samples collected for total SVOC's were calculated and compared with the program required quantitation limits and regulatory thresholds, as reported in Waste Stream Characterization Summary Table 5, and EPA codes were assigned as required.
✓	Waste stream evaluated to determine if it exhibits toxicity characteristic (TC) under 40 CFR Part 261, Subpart C and TC codes assigned as appropriate.
✓	Sufficient number of samples were taken to meet statistical sampling requirements, as documented on Summary Data Report Table 1.
✓	Only validated data were used in the above calculations, as documented through the site data review and validation forms and process.
✓	Waste containers were selected randomly for sampling, as documented in site procedures.
✓	Sufficient number of waste containers have been visually examined to determine the UCL ₉₀ for the misclassification rate is less than 14%.
✓	All TIC's were appropriately identified and reported in accordance with the requirements of Section B3-1 of the WAP prior to submittal of a waste stream profile form for a waste stream or waste stream lot.
✓	The overall completeness, comparability, and representativeness QAOs were met for each of the analytical and testing procedures as specified in the WAP Sections B3-2 through B3-9 prior to submittal of a waste stream profile form for a waste stream or waste stream lot.
✓	The PRQIs for all analyses were met.

(Check (✓) indicates that data are sufficient to determine the waste parameters and that the waste parameters have been reported in the listed document or database. NA indicates that parameter not applicable to the waste stream)



Signature of Site Project Manager

Rod E. Arbon

Printed Name

5-24-01

Date

Table 1. Solid sampling summary.

Determination of Number of Containers to Sample (S3000, S4000)	
Preliminary Estimates of Mean, Variance, and Coefficient of Variation:	
Attach a table(s) that correlates container identification numbers to data packages, if different from containers used for characterization.	
Description of Source Data	See INEEL/EXT-2001-00015
Samples Randomly Selected from Waste Stream (yes/no)?	Yes and No
Treatment of less-than-detectable measurements:	1/2 detection limit, elevated MDLs not considered in evaluation
Analytes that are listed as spent solvents and therefore are not included in the calculation to determine the number of containers to sample: See INEEL/EXT-2001-00015	
Selected coefficient of variation and associated analyte: See INEEL/EXT-2001-00015	
Total Calculated number of containers to sample: 5	
Attach preliminary estimates: See INEEL/EXT-2001-00015	
Sampling Results	
Samples Randomly Selected from Waste Stream (yes/no)?	Yes
Analytes that are listed as spent solvents and therefore are not included in the UCL ₉₀	
Estimate calculation to determine the toxicity characteristic:	See INEEL/EXT-2001-00015
Largest Coefficient of Variation and associated analyte: See INEEL/EXT-2001-00015	
Comparison of largest coefficient of variation with coefficient of variation selected from Preliminary estimate See INEEL/EXT-2001-00015	
Treatment of less-than-detectable measurements:	1/2 detection limit, elevated MDLs not considered in evaluation
Transformations applied to data and justification: N/A	

Table 2A. Headspace gas summary data.

Analyte	Number of samples	Number of samples above MDL ^a	Mean (ppmv)	Standard deviation (ppmv)	Maximum Concen. (ppmv)	Upper 90% confidence limit (ppmv)	PRQL (ppmv)	EPA Code Assigned
1,1,1-Trichloroethane	41	41	89.9	57.6	230	102 ^b	10	F001/F002
1,1,2,2-Tetrachloroethane	41	0	0.215	0.208	0.700		10	N/A
1,1,2-Trichloro-1,2,2-Trifluoroethane	41	13	1.35	3.31	11.0	2.60	10	F002
1,1-Dichloroethane	41	26	0.675	0.919	3.30	0.913	10	N/A
1,1-Dichloroethylene	41	31	1.67	1.29	5.50	1.97	10	N/A
1,2,4-Trimethylbenzene	41	11	0.287	0.260	0.900	0.395	10	N/A
1,2-Dichloroethane	41	0	0.181	0.212	0.750	^b	10	N/A
1,3,5-Trimethylbenzene	41	11	0.246	0.223	0.800	0.338	10	N/A
Acetone	41	34	2.48	1.18	5.10	2.74	100	N/A ^c
Benzene	41	21	0.346	0.258	1.10	0.421	10	F005
Bromoform	41	0	0.244	0.255	0.950	^b	10	N/A
Butanol	41	11	1.42	1.49	4.50	2.03	100	N/A ^c
Carbon Tetrachloride	41	19	35.4	94.6	300	64.2	10	F001
Chlorobenzene	41	0	0.218	0.206	0.750	^b	10	F002
Chloroform	41	6	5.09	13.6	43.0	13.3	10	D022 ^d
Cis-1,2-Dichloroethylene	41	9	0.404	0.522	1.90	0.647	10	N/A
Cyclohexane	41	0	0.200	0.229	0.850	^b	10	N/A
Ethyl Benzene	41	17	0.407	0.366	1.40	0.526	10	N/A ^c
Ethyl Ether	41	0	0.397	0.466	1.70	^b	10	N/A ^c
Methanol	41	0	4.88	1.23	6.50	^b	100	N/A ^c
Methyl Ethyl Ketone	41	19	0.487	0.280	1.00	0.573	100	N/A
Methyl Isobutyl Ketone	41	9	0.262	0.236	0.850	0.373	100	N/A
Methylene Chloride	41	20	1.17	4.34	28.0	2.46	10	F001/F002
Tetrachloroethylene	41	22	2.94	7.07	23.0	4.93	10	F001/F002
Toluene	41	35	2.75	1.52	8.20	3.09	10	F005
Trichloroethylene	41	36	16.3	13.5	43.0	19.2	10	F001/F002
m&p-Xylene	41	18	0.758	0.737	3.30	0.990	10	N/A ^c
o-Xylene	41	8	0.324	0.280	1.30	0.464	10	N/A ^c

Did the data verify the Acceptable Knowledge? Yes ☐ No ☒^d
If no, describe the basis for assigning the EPA Hazardous Waste Codes.

Statistics Performed by: J.J. Emerson per telecon 7/18/01 Date: 5-24-01
Signature

- When a measurement is reported as below detection, one-half the analysis method detection limit (MDL) is used. Note that the MDL for a given analyte may vary from sample to sample.
- The mean and standard deviation presented are the mean and standard deviation of the method detection limits (after dividing by 2) since all measurements (or all but one) are below detection. Therefore, there are no degrees of freedom associated with the t statistic and the upper 90% confidence limit cannot be calculated.
- The EPA code associated with these constituents (F003) is not applicable because the waste does not exhibit the characteristic for ignitability. The F003 code has been removed from the waste stream as provided in the WAP.
- The toxicity code for chloroform, D022, has been assigned on the basis of the gas headspace results. Acceptable knowledge and solid sampling results do not indicate that chloroform is present in this waste.

Table 2B. Headspace gas summary data - tentatively identified compounds.

Tentatively Identified Compound	Maximum Observed Estimated Concentrations (ppmv)	# Samples Containing TIC	% Detected
None	N/A	N/A	N/A
Did the Data verify the Acceptable Knowledge Yes <u> ✓ </u> No <u> </u> If no, describe the basis for assigning the EPA Hazardous Waste Codes: N/A			

Table 3. Solid Sample Analysis. Metals summary data. – Not applicable to debris

ANALYTE	# Samples	# Samples above MDL	SD (mg/kg)	Mean (mg/kg)	Maximum (mg/kg)	UCL ₉₀ (mg/kg)	RTL (mg/kg)	EPA Code Assigned
Arsenic	7	7	0.907	1.77	3.3	2.27	100	D004
Barium	7	7	25.0	45.7	97	59.3	2000	NA
Cadmium	7	7	76.4	38.2	210	79.8	20	D006
Chromium	7	7	101	171	290	225	100	D007
Lead	7	7	947	632	2500	1147	100	D008
Mercury	7	7	0.772	0.611	2.1	1.24	4	D009
Selenium	7	7	0.160	0.287	0.49	0.461	20	D010
Silver	7	7	72.5	103	200	142	100	D011
Antimony	7	7	45.1	29.3	120	53.8	N/A	N/A
Beryllium	7	7	1055	895	2600	1469	N/A	N/A
Nickel	7	7	90.2	177	310	226	N/A	N/A
Thallium	7	5	1.89	1.87	4.7	3.17	N/A	N/A
Vanadium	7	7	4.37	13.7	21	16.1	N/A	N/A
Zinc	7	7	506	392	1500	668	N/A	N/A
Did the data verify the Acceptable Knowledge? Yes <input checked="" type="checkbox"/> No								
If no, describe the basis for assigning the EPA Hazardous Waste Codes.								

Statistics Performed by: J.J. Einerson per telecon 5/16/01 Date: 5-24-01
Signature

Table 4A. Solid Sample Analysis. Total VOC summary data. - Not applicable to debris

ANALYTE	# Samples	# of Samples above MDL ^a	Mean (mg/kg)	SD (mg/kg)	Maximum (mg/kg)	UCL ₉₀ (mg/kg)	RTL or PRQL (mg/kg) ^c	EPA Code Assigned (D018-40.43)
1,1,1-Trichloroethane	7	3	0.804	1.09	3.00	1.99	10	F001/F002
1,1,2-Trichloro-1,2,2-Trifluoroethane	7	0	0.109	0.008	0.12	^b	10	F002
1,1,2-Trichloroethane	7	0	0.109	0.008	0.12	^b	10	N/A
1,1-Dichloroethylene	7	0	0.109	0.008	0.12	^b	14	N/A
1,2-Dichloroethane	7	0	0.109	0.008	0.12	^b	10	N/A
1,4-Dichlorobenzene	7	0	0.12	0	0.12	^b	150	N/A
Acetone	7	0	0.735	0.156	0.90	^b	100	N/A
Benzene	7	0	0.109	0.008	0.12	^b	10	F005
Butanol	7	0	5.36	1.13	6.50	^b	100	N/A
Carbon disulfide	7	0	0.109	0.008	0.12	^b	10	N/A
Carbon Tetrachloride	7	1	0.779	1.77	4.8	^b	10	F001/F002
Chlorobenzene	7	0	0.109	0.008	0.12	^b	10	F002
Chloroform	7	0	0.109	0.008	0.12	^b	120	N/A
Ethyl benzene	7	0	0.109	0.008	0.12	^b	10	N/A
Ethyl ether	7	0	0.879	0.182	1.05	^b	100	N/A
Isobutanol	7	0	2.46	0.534	3.00	^b	100	N/A
Methanol	7	3	3.54	3.11	7.80	6.93	100	N/A
Methyl ethyl ketone	7	0	1.79	0.381	2.15	^b	100	N/A
Methylene chloride	7	1	0.134	0.065	0.28	^b	10	F001/F002
m-Xylene/p-Xylene	7	1	0.259	0.107	0.50	^b	10	N/A
Ortho-Dichlorobenzene	7	0	0.115	0.00	0.12	^b	10	N/A
o-Xylene	7	0	0.109	0.008	0.12	^b	10	N/A
Pyridine	7	0	1.26	0.271	1.5	^b	100	N/A
Tetrachloroethylene	7	1	0.21	0.260	0.8	^b	10	F001/F002
Toluene	7	1	0.131	0.058	0.26	^b	10	F005
Trichloroethylene	7	1	0.147	0.094	0.36	^b	10	F001/F002
Vinyl chloride	7	0	0.109	0.008	0.12	^b	4	N/A

Did the data verify the Acceptable Knowledge?

Yes ☒No ☐

If no, describe the basis for assigning the EPA Hazardous Waste Codes. N/A

Statistics Performed by:

J.J. Einerson per telecon *[Signature]*

Signature

Date:

5-24-01

- When a measurement is reported as below detection, one-half the analysis method detection limit (MDL) is used. Note that the MDL for a given analyte may vary from sample to sample.
- The mean and standard deviation presented are the mean and standard deviation of the method detection limits (after dividing by 2) since all measurements (or all but one) are below detection. Therefore, there are no degrees of freedom associated with the t statistic and the upper 90% confidence limit cannot be calculated.
- For toxicity characteristic wastes, the TC limit expressed as the Regulatory Threshold Limit (RTL) is used. For listed wastes, the Program Required Quantitation Limit (PRQL) is used.

Table 4B. Solid Sample Analysis. Total VOC summary data tentatively identified compounds. Not applicable for debris

Tentatively Identified Compound	Maximum Observed Estimated Concentrations (ppmv)	# Samples Containing TIC	% Detected
None	N/A	N/A	N/A
Did the Data verify the Acceptable Knowledge Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>			
If no, describe the basis for assigning the EPA Hazardous Waste Codes: N/A			

Table 5A. Solid Sample Analysis. Total SVOC summary data. Not applicable for debris

ANALYTE	# Samples	# of Samples above MDL ^a	Mean (mg/kg)	SD (mg/kg)	Maximum (mg/kg)	UCL ₉₀ (mg/kg)	RTL or PRQL (mg/kg) ^c	EPA Code Assigned (D027-38)
1,4-Dichlorobenzene	7	0	0.12	0	0.12	^b	150	N/A
2,4-Dinitrotoluene	7	0	0.075	0	0.08	^b	2.6	N/A
Cresols	7	0	0.115	0	0.115	^b	40	N/A
Hexachlorobenzene	7	1	0.206	0.253	0.78	^b	2.6	N/A
Hexachloroethane	7	0	0.12	0	0.12	^b	60	N/A
Nitrobenzene	7	0	0.12	0	0.12	^b	40	N/A
Pentachlorophenol	7	0	0.05	0	0.05	^b	2000	N/A
Pyridine	7	0	1.26	0.271	1.5	^b	100	N/A
2,4-Dinitrophenol	7	0	0.010	0	0.010	^b	40	N/A
Aroclor 1016	N/A	N/A	N/A	N/A	N/A	N/A	40	N/A
Aroclor 1221	N/A	N/A	N/A	N/A	N/A	N/A	40	N/A
Aroclor 1232	N/A	N/A	N/A	N/A	N/A	N/A	40	N/A
Aroclor 1242	N/A	N/A	N/A	N/A	N/A	N/A	40	N/A
Aroclor 1248	N/A	N/A	N/A	N/A	N/A	N/A	40	N/A
Aroclor 1254	N/A	N/A	N/A	N/A	N/A	N/A	40	N/A
Aroclor 1260	N/A	N/A	N/A	N/A	N/A	N/A	40	N/A
Ortho-Dichlorobenzene	7	0	0.115	0	0.115	^b	40	N/A

Did the data verify the Acceptable Knowledge? Yes ☒ No ☐

If no, describe the basis for assigning the EPA Hazardous Waste Codes. N/A

Statistics Performed by:

J. J. Emerson per telecon 5/24/01
Signature

Date: 5-24-01

- When a measurement is reported as below detection, one-half the analysis method detection limit (MDL) is used. Note that the MDL for a given analyte may vary from sample to sample.
- The mean and standard deviation presented are the mean and standard deviation of the method detection limits (after dividing by 2) since all measurements (or all but one) are below detection. Therefore, there are no degrees of freedom associated with the t statistic and the upper 90% confidence limit cannot be calculated.
- For toxicity characteristic wastes, the TC limit expressed as the Regulatory Threshold Limit (RTL) is used. For listed wastes, the Program Required Quantitation Limit (PRQL) is used.

Table 5B. Solid Sample Analysis. Total SVOC Summary data - tentatively identified compounds. Not applicable for debris.

Tentatively Identified Compound	Maximum Observed Estimated Concentrations (ppmv)	# Samples Containing TIC	% Detected ^a
Bis(2-ethylhexyl)phthalate	3.5	6	86%
Fluoranthene	9.5	3	43%
Pentachorobenzene	0.36	1	14%
Phenanthrene	1.1	2	18%
Phenol	0.67	1	14%
Phenol,2-Nitro-	0.4	1	14%
Pyrene	0.2	1	14%
Did the data verify the Acceptable Knowledge Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>			
If no, describe the basis for assigning the EPA Hazardous Waste Codes: N/A			

^a TICs listed in Table 5B appear in 40 CFR § 261, Appendix VIII. However, none of these compounds will be added to the target list for this waste stream or will have hazardous waste numbers added. The required number of samples have been cored and characterized (see Section 4.0 in Hazardous Waste Code Determination for First/Second-Stage Sludge Waste Stream (IDCs 001, 002, 800), INEEL/EXT-2001-00015). As a result, there are no additional solids sampling and analyses planned for this waste stream. Only bis(2-ethylhexyl)phthalate and fluoranthene were detected in more than 25% of the samples. The hazardous waste codes associated with these two TICs are either K codes (hazardous wastes from specific sources) or U codes (discarded commercial chemical products). K codes are specific to manufacturing processes that did not occur at the Rocky Flats Plant, therefore these codes are not applicable. The U codes would only apply if the waste were generated from pure product or from the spill of pure product. There is no reason to believe, based on AK, that these results indicate the presence of pure product. AK also confirms that the waste is *not* from the spill of a pure product. Therefore, the U codes associated with these compounds do not apply to this waste stream.

Table 6. Correlation of container identification numbers to data package.

Container Number	Barcode	Headspace Gas Data Package ^(a)	RTR Data Package	RA Data Package	Visual Examination Data Package	Solids Analyses Package ^(b)	PRF Headspace Gas Sampling Data Package
IDRF074112304	013539	ECL01080	RTR010066	SAS010054	N/A	N/A	PRF010059
IDRF074226129	024307	ECL01080	RTR010066	SAS010055	N/A	N/A	PRF010059
IDRF074316060	023669	ECL01080	RTR010066	SAS010054	N/A	N/A	PRF010059
IDRF741200596	030386	ECL01080	RTR010065	SAS010054	N/A	N/A	PRF010059
IDRF741200655	029388	ECL00111	RTR000140	SAS000134	N/A	ACL00004	PRF000090
IDRF741200678	030363	ECL01087	RTR010103	SAS010053	N/A	N/A	PRF010060
IDRF741200792	029600	ECL01087	RTR010060	SAS010051	N/A	N/A	PRF010060
IDRF741200806	028615	ECL01080	RTR010067	SAS010055	N/A	N/A	PRF010059
IDRF741200807	028703	ECL01080	RTR010065	SAS010054	N/A	N/A	PRF010059
IDRF741200848	028659	ECL01087	RTR010103	SAS010053	N/A	N/A	PRF010060
IDRF741200912	027914	ECL01087	RTR010103	SAS010053	N/A	N/A	PRF010060
IDRF741200965	028612	ECL01080	RTR010067	SAS010055	N/A	N/A	PRF010059
IDRF741200994	028581	ECL01080	RTR010065	SAS010053	N/A	N/A	PRF010059
IDRF741201308	012021	ECL00071	RTR000083	SAS000086	N/A	N/A	PRF000054
IDRF741201415	024897	ECL00071	RTR000083	SAS000086	N/A	N/A	PRF000054
IDRF741201441	030038	ECL01080	RTR010065	SAS010053	N/A	N/A	PRF010059
IDRF741201499	030036	ECL01080	RTR010065	SAS010053	N/A	N/A	PRF010059
IDRF741201702	021881	ECL01087	RTR010062	SAS010051	N/A	N/A	PRF010060
IDRF741201707	012634	ECL00071	RTR010082	SAS010066	N/A	N/A	PRF000054
IDRF741201794	012629	ECL01087	RTR010061	SAS010051	N/A	N/A	PRF010060
IDRF741201882	022618	ECL00071	RTR000084	SAS000085	N/A	ACL00003	PRF000054
IDRF741201903	023658	ECL01087	RTR010060	SAS010051	N/A	N/A	PRF010060
IDRF741201978	022396	ECL00071	RTR000084	SAS000086	N/A	N/A	PRF000054
IDRF741202012	022345	ECL01087	RTR010062	SAS010051	N/A	N/A	PRF010060
IDRF741202020	022332	ECL01087	RTR010063	SAS010052	N/A	N/A	PRF010060
IDRF741202055	022353	ECL01080	RTR010066	SAS010054	N/A	N/A	PRF010059
IDRF741202076	011077	ECL01087	RTR010103	SAS010052	N/A	N/A	PRF010060
IDRF741202121 ^c	010474	ECL00071	RTR000085	SAS000085	N/A	ACL00003	PRF000054
IDRF741202216 ^c	022982	ECL00071	RTR000131	SAS000126	N/A	ACL00004	PRF000088
IDRF741202320	010259	ECL00111	RTR000140	SAS000134	N/A	N/A	PRF000090
IDRF741202361	023552	ECL00071	RTR000084	SAS000086	N/A	N/A	PRF000054
IDRF741202371	010420	ECL01087	RTR010063	SAS010052	N/A	N/A	PRF010060
IDRF741202389	031750	ECL01080	RTR010066	SAS010055	N/A	N/A	PRF010059
IDRF741202390 ^c	031573	ECL00106	RTR000131	SAS000126	N/A	ACL00004	PRF000088
IDRF741202447	031871	ECL01080	RTR010065	SAS010053	N/A	N/A	PRF010059
IDRF741203089	016806	ECL01080	RTR010066	SAS010055	N/A	N/A	PRF010059
IDRF741204559	001411	ECL01080	RTR010066	SAS010054	N/A	N/A	PRF010059
IDRF741205229	001355	ECL01080	RTR010066	SAS010055	N/A	N/A	PRF010059
IDRF741205311	002086	ECL00111	RTR000140	SAS000134	N/A	ACL00004	PRF000090
IDRF741205324	003818	ECL00106	RTR000131	SAS000126	N/A	ACL00004	PRF000088
IDRF741205646	004510	ECL01087	RTR010103	SAS010053	N/A	N/A	PRF010060

- An ECL Gas Data Package is composed of three separate reports. For example, ECL01080 contains ECL01080M, ECL01080G, and ECL01080C.
- An ACL Solids Data Package is composed of four separate reports. For example, ACL00004 contains ACL00004M, ACL00004N, ACL00004S, and ACL00004V.
- The radioassay data associated with this drum is outside of the calibration range for the system. Therefore this drum is not certifiable at this point in time.

Table 7. RTR/VE Summary of Prohibited Items and AK Confirmation

Container Number	Barcode	RTR Prohibited Items ^a	Visual Examination Prohibited Items ^a	AK Confirmation ^b
IDRF074112304	013539	None	N/A	Complete
IDRF074226129	024307	None	N/A	Complete
IDRF074316060	023669	None	N/A	Complete
IDRF741200596	030386	None	N/A	Complete
IDRF741200655	029388	None	N/A	Complete
IDRF741200678	030363	None	N/A	Complete
IDRF741200792	029600	None	N/A	Complete
IDRF741200806	028615	None	N/A	Complete
IDRF741200807	028703	None	None	Complete
IDRF741200848	028659	None	N/A	Complete
IDRF741200912	027914	None	N/A	Complete
IDRF741200965	028612	None	N/A	Complete
IDRF741200994	028581	None	None	Complete
IDRF741201308	012021	None	N/A	Complete
IDRF741201415	024897	None	N/A	Complete
IDRF741201441	030038	None	N/A	Complete
IDRF741201499	030036	None	N/A	Complete
IDRF741201702	021881	None	N/A	Complete
IDRF741201707	012634	None	N/A	Complete
IDRF741201794	012629	None	N/A	Complete
IDRF741201882	022618	None	N/A	Complete
IDRF741201903	023658	None	N/A	Complete
IDRF741201978	022396	None	N/A	Complete
IDRF741202012	022345	None	N/A	Complete
IDRF741202020	022332	None	N/A	Complete
IDRF741202055	022353	None	N/A	Complete
IDRF741202076	011077	None	N/A	Complete
IDRF741202121	010474	None	N/A	Complete
IDRF741202216	022982	None	N/A	Complete
IDRF741202320	010259	None	N/A	Complete
IDRF741202361	023552	None	N/A	Complete
IDRF741202371	010420	None	N/A	Complete
IDRF741202389	031750	None	N/A	Complete
IDRF741202390	031573	None	N/A	Complete
IDRF741202447	031871	None	N/A	Complete
IDRF741203089	016806	None	N/A	Complete
IDRF741204559	001411	None	N/A	Complete
IDRF741205229	001355	None	N/A	Complete
IDRF741205311	002086	None	N/A	Complete
IDRF741205324	003818	None	N/A	Complete
IDRF741205646	004510	None	N/A	Complete

- See Table 6 for the associated RTR and Visual examinations. None of the listed drums contains prohibited items as defined by Section B-1c of the Idaho National Engineering & Environmental Laboratory Quality Assurance Project Plan for the Transuranic Waste Characterization Program, PLN-190, Rev 8, 2/6/01.
- Acceptable Knowledge confirmations are conducted using checklist SPO-RTR-VER-1. This checklist can be accessed through the batch listed in Table 6.

Table 8. Sample identification number cross-correlation table.

Container Number	Headspace Gas Sample Number	Solidified Sample Number(s)
IDRF074112304	ID030601E1627	N/A
IDRF074226129	ID030601E1407	N/A
IDRF074316060	ID030601E1475	N/A
IDRF741200596	ID030601E1217	N/A
IDRF741200655	ID121100E1309	ID02938811M1, ID02938811V1, ID02938811V2
IDRF741200678	ID030601E1358	N/A
IDRF741200792	ID030601E1211	N/A
IDRF741200806	ID030601E1101	N/A
IDRF741200807	ID030601E1572	N/A
IDRF741200848	ID030601E1617	N/A
IDRF741200912	ID030601E1624	N/A
IDRF741200965	ID030601E1644	N/A
IDRF741200994	ID030601E1597	N/A
IDRF741201308	ID100300E1449	N/A
IDRF741201415	ID100300E1412	N/A
IDRF741201441	ID030601E1650	N/A
IDRF741201499	ID030601E1210	N/A
IDRF741201702	ID030601E1601	N/A
IDRF741201707	ID100300E1447	N/A
IDRF741201794	ID030601E1819	N/A
IDRF741201882	ID100300E1417	ID02261811M1, ID02261811V1, ID02261811V2
IDRF741201903	ID030601E1227	N/A
IDRF741201978	ID100300E1450	N/A
IDRF741202012	ID030601E1167	N/A
IDRF741202020	ID030601E1829	N/A
IDRF741202055	ID030601E1582	N/A
IDRF741202076	ID030601E1614	N/A
IDRF741202121	ID100300E1419	ID01047411M1, ID01047411V1, ID01047411V2
IDRF741202216	ID113000E1542	ID02298211M1, ID02298211V1, ID02298211V2
IDRF741202320	ID121100E1210	N/A
IDRF741202361	ID100300E1408	N/A
IDRF741202371	ID030601E1259	N/A
IDRF741202389	ID030601E1215	N/A
IDRF741202390	ID113000E1397	ID03157311M1, ID03157311V1, ID03157311V2
IDRF741202447	ID030601E1411	N/A
IDRF741203089	ID030601E1450	N/A
IDRF741204559	ID030601E1625	N/A
IDRF741205229	ID030601E1403	N/A
IDRF741205311	ID121100E1286	ID00208611M1, ID00208611V1, ID00208611V2
IDRF741205324	ID113000E1751	ID00381811M1, ID00381811V1, ID00381811V2
IDRF741205646	ID030601E1351	N/A

Engineering Design File

For

Waste Stream Summary Sheet— First/Second Stage Sludge

Prepared for:
U.S. Department of Energy
Idaho Operations Office
Idaho Falls, Idaho

INEEL
Idaho National Engineering and Science Laboratory
BECHTEL BWXT IDAHO, LLC

Form 412.14
10/05/99
Rev. 02

1. Project File No.: N/A 2. Project/Task: RWMC/SWEPP Programs

3. Subtask: Transuranic Waste Characterization Program Acceptable Knowledge

4. Title: Waste Stream Summary Sheet – First/Second Stage Sludge

5. Summary:

As required by MCP-2988, "Confirmation, Resolution and Re-evaluation of Acceptable Knowledge Information," this Engineering Design File (EDF) formally issues the Waste Stream Summary (WSS) sheet for First Stage Sludge, Item Description Code ([IDC] 001), Second Stage Sludge (IDC 002), and Solidified Sludge-Bldg. 774 (IDC 800). The WSS sheet for First/Second Stage Sludge combines some basic acceptable knowledge information on these sludges with the results of the characterization performed at Idaho National Engineering and Environmental Laboratory (INEEL) to date. Cited references can be obtained from the Acceptable Knowledge Expert (AKE).

6. Distribution (complete package):

M. J. Adams, 4210; R. B. Allen, MS 4201; M. Anderson, MS 3690; R. E. Arbon, MS 4201; L. Blackwood, MS 3779; M. W. Curtis, MS 4201; D. Bryngelson, MS 6000-774; B. W. Chesnovar, MS 4201; J. Clark, MS 4201; P. Contreras, MS 4202; K. Goode, MS 4201; B. K. Ford, MS 4201; L. R. Frost, MS 4201; M. D. Griffin, MS 4201; G. Grissom, MS 4201; S. M. Hailey, MS 3690; Y. Harker, MS 2114; G. R. Hayes, MS 4201; T. H. Johnsen, MS 4201; V. J. Medina, MS 4210; D. E. Menkhaus, MS 4202; T. H. Monk, MS 4201; R. Morris, MS 4201; Northwind (10 copies), MS 3720; D. G. Pound, MS 4201; T. W. Preston, MS 4201; S. J. Sailer, MS 5210; M. T. Sharp, MS 3720; N. E. Stanley, MS 4201; J. L. Wells, MS 1118; Project EDF File Log, EDF Serial No. Log.

Distribution (summary package only):

N/A

7. Review (R) and Approval (A) Signatures:

(Minimum reviews and approvals are listed. Additional reviews/approvals may be added.)

	R/A	Typed Name/Organization	Signature	Date
Performer	R	S. M. Hailey (AKE)/32C0	<i>[Signature]</i> per telecon	5-24-01
Performer	R	B. J. Tolman (AK)/NWE Inc.	<i>[Signature]</i> per telecon	5/24/01
Independent Reviewer	R	L. R. Frost (Independent Verification)/32C0	<i>[Signature]</i> Frost	5/24/01
Requestor	A	S. M. Hailey (AKE)/32C0	<i>[Signature]</i> per telecon	5-24-01
Approver	A	R. E. Arbon (Project Scientist)/32C0	<i>[Signature]</i> Arbon	5/24/01
Quality Assurance	A	T. W. Preston (Quality Assurance Officer)/32C0	<i>[Signature]</i>	05-24-01
Site Project Manager	A	T. H. Monk (Site Project Manager)/32C0	<i>[Signature]</i> for T. Monk	5-24-01

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CONTENTS

<u>ACRONYMS</u>	IV
1. <u>INTRODUCTION</u>	1
2. <u>WASTE STREAM DESCRIPTION</u>	1
3. <u>AREAS OF OPERATION</u>	5
4. <u>GENERATION PROCESSES</u>	5
5. <u>RCRA CHARACTERIZATION</u>	6
6. <u>RADIONUCLIDES</u>	7

ACRONYMS

AK	acceptable knowledge
AKE	Acceptable Knowledge Expert
Am	americium
DU	depleted uranium
EDF	Engineering Design File
EPA	Environmental Protection Agency
EU	enriched uranium
HWN	hazardous waste numbers
ID	Idaho
IDC	Item Description Code
INEEL	Idaho National Engineering and Environmental Laboratory
N/A	not applicable
Pu	plutonium
PVC	poly vinyl chloride
RFP	Rocky Flats Plant
RTR	Real-Time Radioscopy
SWEPP	Stored Waste Examination Pilot Plant
TCO	transportation certification official
TRIPS	Transuranic Reporting, Inventory, and Processing System
TRUPACT	Transuranic Package Container
TWBIR	Transuranic Waste Baseline Inventory Report
U	uranium
WG	weapons grade
WIPP	Waste Isolation Pilot Plant
WMC	Waste Matrix Code
WSS	Waste Stream Summary

INEEL Acceptable Knowledge Waste Stream Summary – First/Second Stage Sludge

1. INTRODUCTION

Note: Unless otherwise indicated information has been obtained from Reference 1.

Waste Stream: First/Second Stage Sludge Rocky Flats Plant (RFP) Item Description Code (IDC) 001, RFP IDC 002, RFP IDC 800

Generation Buildings: Building 774

Waste Stream Volume: 6,752 55-gallon drums²

Generation Dates: August 1971 – September 1988

TRUCON Content Codes³ Idaho (ID) 111A, ID 211A

2. WASTE STREAM DESCRIPTION

First/Second Stage Sludge consists of First Stage Sludge (IDC 001), Second Stage Sludge (IDC 002), and Solidified Sludge-Bldg. 774 (IDC 800). The following IDC specific descriptions present the waste matrix code and waste material parameters for the sludge.

2.1 IDC: 001 – First Stage Sludge

Waste Matrix Code (WMC): S3121⁴
TWBIR: IN-W216

2.1.1 Waste Matrix Code Description

WMC S3121 consists of >50% by volume secondary sludge, or filtercake from wastewater treatment processes or heavy metal sludges resulting from recovery processes.⁵

2.1.2 Waste Description/Inner Packaging

First Stage Sludge consists of immobilized materials generated from first-stage treatment operations in Building 774. Liquids originating in Building 771 recovery operations were made basic with sodium hydroxide to precipitate iron, magnesium, etc. The precipitate was filtered to produce a sludge which was scraped off the filter and placed into a 55-gallon drum. Portland cement was placed on the bottom of the drum and may also have been added to the top of the drum.

2.1.3 Miscellaneous Items

Rocky Flats waste management and inspection protocol allowed containers of wastes to contain up to 10 percent of another IDC other than that assigned to the container. Inspection of sludge containers identified Kimwipes, leaded rubber gloves, rubber gloves, and bottles.

The following table lists items that have been identified in a small percentage of the containers during Idaho National Engineering and Environmental Laboratory (INEEL) examination of First Stage Sludge.

Item ^a	Source	Comment
Free Liquid	AK-99-022 ⁸ AK-00-213 ¹⁴	
Metal Bar	AK-00-159 ¹¹	

- a. All containers are being screened for light ballasts. Any container identified with light ballasts will not be shipped to the Waste Isolation Pilot Plant (WIPP).

2.1.4 Absorbent

- 1970 – 1986: 3 to 5 pounds of Portland cement at bottom of drum
3 to 5 pounds of Portland cement in the bottom of drum bag
~30 pounds of Portland cement in the bottom of the PVC O-ring bag
- 1970 – 1982: 0 to 2 quarts of Oil Dri on top of outer, sealed polyethylene bag¹⁴
- 1982 – 1986: Vermiculite used to fill space between the sealed polyethylene bag and liner
- 1983 – 1986: 3 to 5 pounds of Portland cement on top of sludge inside the O-ring bag

For the most part, Oil Dri was the absorbent used through February 1982 and vermiculite was the predominant absorbent material used after February 1982. However, there are a number of containers that have contained a different than expected absorbent or contained no absorbent.^{9, 13, 14}

2.1.5 Drum Packaging Configurations

- 1970 – 1972: Polyethylene drum bag and poly vinyl chloride (PVC) O-ring bag
Lead sheeting may have been used to line inside of drum
- 1972 – 1988: 90-mil rigid polyethylene liners
Polyethylene drum bag and PVC O-ring bag
Lead tape may have been used to wrap the outside of the rigid liner

Varying combinations of drum bags, poly bags, and O-ring bags may be identified by the Storage Waste Examination Pilot Plant (SWEPP). Any combination of these plastic bags, provided that two layers of containment are not exceeded, does not impact acceptability of the drum. Drums that exceed transuranic package container (TRUPACT)-allowed containment layers are flagged for treatment in the Transuranic Reporting, Inventory, and Processing System (TRIPS) and will be reviewed by the transportation certification official (TCO) on a case-by-case basis. Real-time radioscscopy (RTR) may also identify drum bags without horsetails. These packaging configurations are atypical, but do not impact WMC assignment or hazardous waste number assignment.

Potential Waste Material Parameter	Description
Steel (packaging materials)	55-gallon drum
Plastics (packaging materials)	90 mil drum liner, O-ring bag, drum bag

Potential Waste Material Parameter	Description
Other Inorganic Materials ^a	Portland cement, vermiculite, Oil Dri
Other Metals	Lead Sheets or Lead tape
Inorganic Matrix	First Stage Sludge

a. It will not typically be possible to confirm more than 1-7 kg of other inorganic materials since the majority of the Portland cement will be located at the bottom of the drum. Weights reported by both RTR and visual examination are expected to include most or all of the Portland cement as Inorganic Matrix.

2.2 IDC: 002 – Second Stage Sludge

Waste Matrix Code (WMC): S3121⁴
TWBIR: IN-W228

2.2.1 Waste Matrix Code Description

WMC S3121 consists of >50% by volume secondary sludge, or filtercake from wastewater treatment processes or heavy metal sludges resulting from recovery processes.⁵

2.2.2 Waste Description/Inner Packaging

Second Stage Sludge consists of immobilized materials generated from second-stage treatment operations in Building 774. Liquids originating in several buildings throughout the plant were treated in a variety of ways. The treated liquid was precipitated and the precipitate was filtered to produce a sludge which was scraped off the filter and placed into a 55-gallon drum. Portland cement and the sludge are layered throughout the drum.

2.2.3 Miscellaneous Items

Rocky Flats waste management and inspection protocol allowed containers of wastes to contain up to 10 percent of another IDC other than that assigned to the container. Inspection of sludge containers identified Kimwipes, leaded rubber gloves, rubber gloves, and bottles. Acceptable knowledge (AK) sources indicate that up until 1973 items such as electric motors, bottles of residual liquid chemical wastes, mercury batteries, lithium batteries, and small amounts of contaminated mercury in pint bottles may also be contained in Second Stage sludge.^{16, 17, 18}

2.2.4 Absorbent

- 1970 – 1985: 3 to 5 pounds of Portland cement at bottom of drum
3 to 5 pounds of Portland cement an the bottom of drum bag
~30 pounds of Portland cement layered throughout the drum
- 1970 – 1982: 1 to 2 quarts of Oil Dri on top of outer, sealed polyethylene bag
- 1982 – 1985: Vermiculite used to fill space between the sealed polyethylene bag and liner
- 1983 – 1985: 3 to 5 pounds of Portland cement on top of sludge inside the plastic bag.

For the most part, Oil Dri was the absorbent used through February 1982 and vermiculite was the predominant absorbent material used after February 1982. However, there may be containers that contain a different than expected absorbent or contain no absorbent.

2.2.5 Drum Packaging Configurations

- 1970 – 1972: Polyethylene drum bag and plastic bag
- 1972 – 1988: 90-mil rigid polyethylene liners (All drums)
Polyethylene drum bag and plastic bag or polyethylene round bottom drum liner

Varying combinations of drum bags and poly bags may be identified by SWEPP. Any combination of these plastic bags, provided that two layers of containment are not exceeded, does not impact acceptability of the drum. Drums that exceed TRUPACT-allowed containment layers are flagged for treatment in TRIPS and will be reviewed by the TCO on a case-by-case basis. RTR may also identify drum bags without horsetails. These packaging configurations are atypical, but do not impact WMC assignment or hazardous waste number assignment.

Potential Waste Material Parameter	Description
Steel (packaging materials)	55-gallon drum
Plastics (packaging materials)	90 mil drum liner, polyethylene drum bag, plastic bag
Other Inorganic Materials ^a	Portland cement, vermiculite, Oil Dri
Inorganic Matrix	Second Stage Sludge

a. It will not typically be possible to confirm more than 1-7 kg of other inorganic materials since the majority of the Portland cement will be layered throughout the drum. Weights reported by both RTR and visual examination are expected to include most or all of the Portland cement as Inorganic Matrix.

2.3 IDC: 800 – Solidified Sludge–Bldg. 774

Waste Matrix Code (WMC): S3150⁴
TWBIR: IN-W220

2.3.1 Waste Matrix Code Description

WMC S3150 consists of >50% by volume solidified forms. An example is sludge waste that is immobilized with cement and cured into a solidified form.⁵

2.3.2 Waste Description/Inner Packaging

Solidified Sludge–Bldg 774 consists of solidified materials generated from first stage and second stage treatment operations. The difference between IDC 800 and IDC 001 is the immobilization process. The precipitate was filtered to produce a sludge which was scraped off the filter and co-fed into a drum with diatomite and Portland cement which was cured to form a solid monolith.

2.3.3 Miscellaneous Items

Rocky Flats waste management and inspection protocol allowed containers of wastes to contain up to 10 percent of another IDC other than that assigned to the container. Inspection of sludge containers identified Kimwipes, leaded rubber gloves, rubber gloves, and bottles.

The following table lists items that have been identified in a small percentage of the containers during INEEL examination of solidified sludge.

Item ^a	Source	Comment
Inorganic Liquid	AK-00-138 ¹⁰	
Metal Bolt	AK-99-013 ⁷	
a. All containers are being screened for light ballasts. Any container identified with light ballasts will not be shipped to WIPP.		

2.3.4 Absorbent

1986 – 1988: Vermiculite used to fill space between the sealed polyethylene bag and liner.

2.3.5 Drum Packaging Configurations

1985 – 1988: 90-mil rigid polyethylene liners
Polyethylene drum bag and PVC O-ring bag
Polyethylene drum bag¹²

Varying combinations of drum bags, poly bags, and o-ring bags may be identified by SWEPP. Any combination of these plastic bags, provided that two layers of containment are not exceeded, does not impact acceptability of the drum. Drums that exceed TRUPACT-allowed containment layers are flagged for treatment in TRIPS and will be reviewed by the TCO on a case-by-case basis. RTR may also identify drum bags without horsetails. These packaging configurations are atypical, but do not impact WMC assignment or hazardous waste number assignment.

Potential Waste Material Parameter	Description
Steel (packaging materials)	55-gallon drum
Plastics (packaging materials)	90 mil drum liner, polyethylene drum bag, O-ring bag
Other Inorganic Materials ^a	Vermiculite
Inorganic Matrix	Solidified Sludge-Bldg 774
a. It will not typically be possible to confirm more than 1-7 kg of other inorganic materials since the majority of the Portland cement will be layered throughout the drum. Weights reported by both RTR and visual examination are expected to include most or all of the Portland cement as Inorganic Matrix.	

3. AREAS OF OPERATION

This waste was generated in Building 774.

4. GENERATION PROCESSES

Aqueous wastes from numerous buildings at Rocky Flats were treated in Building 774. In general, there were three initial treatment processes in Building 774 for aqueous wastes which are included in this waste stream. These were: 1) acids with large quantities of cations in solution, 2) acids or bases with small quantities of cations or solids, and 3) basic or neutral solutions that were relatively free of solids. Treatment operations included neutralization, precipitation, flocculation, and clarification. High nitrate

liquid from the clarifier tank was used as feed for second stage treatment. Treatment of the slurry resulting from these processes became first stage sludge.

Second stage treatment handled liquids that were treated by first stage treatment, decanted liquids from a slurry holding tank, and low-level or nonradioactive aqueous process wastes from numerous buildings on plant site. Detailed information on the buildings that transferred liquid waste into the second stage sludge is available in Reference 1. The second stage process included two separate radioactive decontamination systems: 1) a batch-precipitation system used to remove radioactive materials from wastes in which both the radioactive and chemical contaminants exceeded the standards, and 2) a continuous-precipitation system used to remove radioactive materials from wastes meeting the standards for chemical, but not radioactive, contaminants. Both processes used ferric hydroxide carrier-precipitation method of decontamination.

Figure 23-1 of Reference 1 contains a flow diagram of the treatment processes and detailed information on the materials which may be contained in the sludge.

5. RCRA CHARACTERIZATION

The following table presents the Environmental Protection Agency (EPA) Hazardous Waste Numbers (HWNs) currently associated with the First/Second Stage Sludge. These EPA HWNs are subject to change as characterization is conducted.

IDC	Title	EPA Hazardous Waste Numbers ^{1, 21}
001	First Stage Sludge	D004-D011, D022, F001, F002, F005, F006, F007, F009
002	Second Stage Sludge	D004-D011, D022, F001, F002, F005, F006, F007, F009
800	Solidified Sludge-Bldg. 774	D004-D011, D022, F001, F002, F005, F006, F007, F009

Bottles of liquid chemical wastes and contaminated mercury have been observed in second stage sludge. Acceptable knowledge indicates these chemical wastes and contaminated mercury are not U-listed wastes.¹⁷ According to the *Backlog Waste Reassessment Baseline Book, Section WF55*, U-listed EPA codes for discarded commercial chemical products will not be assigned to Building 774 first/second stage sludge. Excess chemicals are stored on the plant site. There is no documentation supporting U-listed waste codes for specific chemicals that were disposed of in the process waste stream.

It was common practice to add small quantities of containerized, compatible wastes to the process waste stream (as opposed to piped waste water). The following text from the Backlog Book reinforces the above statements:

"In addition to the pipeline-transferred waste, wastes in containers that were compatible with the first- and second-stage treatment processes were treated in Building 771. Some of the wastes in containers exhibited hazardous characteristics. However, the EPA codes applicable to these wastes did not include additional codes that were different from those cited for pipeline-transferred wastes. A list of the wastes in containers, along with their associated waste codes, is provided in the report completed under Task 7, Event 13. The Building 774 Setup Log (1973 to 1990) was used to compile the list."

According to AK, the discharge practices changed in 1973, but the generating sources and treatment process did not. The liquid chemical wastes and contaminated mercury potentially added to

second stage sludge before 1973 were from the same source and process. Therefore, the liquid chemical wastes and mercury were not product, and U-listed codes would not apply.

Lithium batteries have also been observed in second stage sludge. Lithium contained in batteries in second stage sludge generated 1970-1973 are no longer reactive or ignitable. According to battery manufacturer information, lithium batteries have shelf lives of approximately 20 years.¹⁹ This is the period of time that it takes for a battery to lose its charge (discharge) due to the electrochemical reaction over time.²⁰ By design lithium batteries are constructed with an excess of positive electrode material to assure that there is enough positive material to react with all of the metallic lithium present. Spent (discharged) lithium batteries do not contain lithium metal and are not toxic, not ignitable, nor reactive. Any battery in the pre-1973 drums is currently 28 years old or older, and undoubtedly has completely discharged.

6. RADIONUCLIDES

The following table provides the prefixes assigned to First/Second Stage Sludge waste containers, generation buildings, and potential radionuclides contained in the waste. Generation dates refer to the waste stored at the INEEL, not the actual process dates.

Gen. Bldg.	Container Prefix	Prefix Description	Generation Dates	Potential Radionuclides
774	0741	Liquid Waste Treatment	1/72 – 6/79	WG Pu, EU, Am-241, DU, U-233
774	0742	Liquid Waste Treatment	8/72 – 12/83	WG Pu, EU, Am-241, DU, U-233
774	0743	Liquid Waste Treatment	1/84 – 4/86	WG Pu, EU, Am-241, DU
774	0743	Liquid Waste Treatment	5/82	WG Pu, EU, Am-241, DU, U-233
774	0744	Liquid Waste Treatment	6/80 – 3/88	WG Pu, EU, Am-241, DU, U-233
774	7412	Liquid Waste Treatment	1/83 – 9/88	WG Pu, EU, Am-241, DU ^a
774	7412	Liquid Waste Treatment	10/79 – 12/82	WG Pu, EU, Am-241, DU, U-233
776	0019	Size Reduction	1/85 – 7/85	WG Pu, EU, Am-241, DU, U-233
776	0025	Drum Repack	11/80 – 10/87	WG Pu, EU, Am-241, DU, U-233

a. There have been isolated incidents of U-234, U-235, and U-238 being detected in drums that were packaged in areas where these isotopes are not expected to be present.¹⁵

**Hazardous Waste Code Determination for
First/Second-Stage Sludge Waste Stream
(IDCs 001, 002, 800)**

R. E. Arbon

Published May 2001

**Idaho National Engineering and Environmental Laboratory
Bechtel BWXT Idaho, LLC
Idaho Falls, Idaho 83415**

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ABSTRACT

This document, Hazardous Waste Code Determination for the First/Second-Stage Sludge Waste Stream (SWS), summarizes the efforts performed at the Idaho National Engineering and Environmental Laboratory (INEL) to make a hazardous waste code determination on Item Description Codes (IDC's) 001, 002, and 800 drums. This characterization effort included a thorough review of acceptable knowledge (AK), physical characterization, waste form sampling, chemical analyses, and headspace gas data. This effort included an assessment of pre-Waste Analysis Plan (WAP) solidified sampling and analysis data (referred to as preliminary data). Seventy-five First/Second-Stage Sludge Drums, provided in Table 1-1, have been subjected to core sampling and analysis using the requirements defined in the Quality Assurance Program Plan (QAPP). Based on WAP defined statistical reduction, of preliminary data, a sample size of five was calculated. That is, five additional drums should be core sampled and analyzed. A total of seven drums were sampled, analyzed, and validated in compliance with the WAP criteria. The pre-WAP data (taken under the QAPP) correlated very well with the WAP compliant drum data. As a result, no additional sampling is required. Based upon the information summarized in this document, an accurate hazardous waste determination has been made for the First/Second-Stage SWS.

SUMMARY

This document, Hazardous Waste Code Determination for the First/Second-Stage SWS, summarizes the efforts performed at the INEEL to make a hazardous waste determination on IDC's 001, 002, and 800 drums. This characterization effort included a thorough review of AK, physical characterization, waste form sampling, chemical analyses, and headspace gas sampling data. Based upon the information and data summarized in this document an accurate hazardous waste determination has been made for the First/Second-Stage SWS.

CONTENTS

ABSTRACT	iii
SUMMARY	v
ACROYNMS	xii
1. INTRODUCTION	1-1
1.1 Scope	1-1
1.2 Background	1-1
1.3 Existing Data (pre-Waste Analysis Plan) Usage	1-4
1.4 Waste Analysis Plan Compliant Sampling and Analysis Data.....	1-4
2. WASTE DESCRIPTION AND ACCEPTABLE KNOWLEDGE	2-1
2.1 History	2-1
2.2 Waste Stream Identification	2-1
2.2.1 Waste Description	2-1
2.2.2 Waste Generation Process	2-2
3. ACCEPTABLE KNOWLEDGE HAZARDOUS WASTE CODE DETERMINATION	3-1
3.1 Characteristic Determination.....	3-1
3.1.1 Corrosivity	3-1
3.1.2 Toxicity	3-1
3.1.3 Ignitibility.....	3-2
3.1.4 Reactivity	3-2
3.2 Listed Determination.....	3-3
3.3 Additional Waste Analysis Plan/Waste Acceptance Criteria Characterization Data	3-5
3.3.1 Radionuclides.....	3-5
3.3.2 Radiography/Visual Examination	3-5
4. CONFIRMATION OF HAZARDOUS WASTE CODE ASSIGNMENTS BASED ON HEADSPACE GAS SAMPLING AND HOMOGENOUS SOLIDS ANALYSIS.....	4-1
4.1 Headspace Gas Sampling and Analysis Results.....	4-1
4.2 Preliminary Data.....	4-3
4.2.1 Preliminary Metals Data Assessment Summary	4-3
4.2.2 Preliminary Semivolatile Organic Compound Assessment Summary.....	4-3
4.2.3 Preliminary Purgeable Volatile Organic Compound Assessment Summary	4-4
4.2.4 Preliminary Nonhalogenated Volatile Organic Compound Data Assessment ...	4-4
4.2.5 Preliminary Data Tentatively Identified Compound Assessment	4-4
4.2.6 Preliminary Data Results and Sample Size Determination	4-5
4.2.7 Non-Toxic Characteristic Analytes.....	4-7

4.3	Waste Analysis Plan Compliant Drum Analysis/Confirmation of Hazardous Waste Codes Assigned.....	4-8
4.3.1	Metals Data Assessment	4-8
4.3.2	Semivolatile Organic Compound Data Assessment.....	4-8
4.3.3	Purgeable Volatile Organic Assessment	4-8
4.3.4	Nonhalogenated Volatile Organic Compound Assessment	4-8
4.3.5	Waste Analysis Plan Compliant Non-Characteristic Analytes	4-8
4.3.6	Tentatively Identified Compound Assessment	4-11
5.	NONCONFORMANCES	5-1
6.	IMPLICATIONS AND FUTURE ACTIONS	6-1
7.	CONCLUSIONS	7-1
8.	REFERENCES	8-1
9.	APPENDICES	9-1

FIGURES

2-1.	Aqueous treatment process.....	2-3
M-1.	Average percent recovery and relative percent difference matrix spikes and matrix spike duplicates metals analyses.....	A-3
M-2.	Average percent recovery laboratory control samples metals analyses.	A-3
SV-1.	Average percent recovery matrix spike/matrix spike duplicates semivolatile organic compounds analyses (n=20).	A-6
SV-2.	Average relative percent difference matrix spike/matrix spike duplicates semivolatile organic compounds analyses (n=20).	A-7
SV-3.	Average percent recovery laboratory control samples semivolatile organic compound analyses.	A-7
SV-4.	Average percent recovery of semivolatile organic compound analyses surrogate Nitrobenzene-d5 (NBZ).	A-9
SV-5.	Average percent recovery of semivolatile organic compound analyses surrogate 2-Fluorobiphenyl (FBP).	A-9
SV-6.	Average percent recovery of semivolatile organic compounds analyses surrogate 2-Fluorophenol (2FP).....	A-10
SV-7.	Average percent recovery of semivolatile organic compound analyses surrogate 2,4,6-Tribromophenol (TBP).	A-10
V-1.	Average percent recovery matrix spike/matrix spike duplicates volatile organic compound analyses (n=24 batches).....	A-12
V-2.	Relative percent difference matrix spike/matrix spike duplicates volatile organic compounds analyses (n=24 batches).	A-13

V-3.	Average percent recovery laboratory control samples volatile organic compounds analyses (n=24 batches).	A-13
V-4.	Average percent recovery of surrogate Dibromofluoromethane (BFM) volatile organic compounds analyses.	A-15
V-5.	Average percent recovery of surrogate Toluene-d8 (<i>TOL</i>) volatile organic compounds analyses.	A-15
V-6.	Average percent recovery of surrogate 4-Bromofluorobenzene (BFB) volatile organic compounds analyses.	A-16
V-7.	Average percent recovery of surrogate 1,2-Dichloroethane (DCA) volatile organic compounds analyses.	A-16
N-1.	Average percent recovery and relative percent difference matrix spike/matrix spike duplicates nonhalogenated volatile organic compounds analyses (n=20 batches).	A-18
N-2.	Average percent recovery laboratory control sample nonhalogenated volatile organic compounds analyses (n=21 batches).	A-19

TABLES

1-1.	First/second-stage drums sampled prior to the waste analysis plan.	1-2
1-2.	Waste analysis plan compliant drums.	1-4
3-1.	Characteristic (toxicity) hazardous waste codes assigned to first/second-stage sludge based on acceptable knowledge.	3-2
3-2.	Listed hazardous waste codes assigned to first/second-stage sludge based on acceptable knowledge.	3-4
4-1.	Headspace gas summary data.	4-1
4-2.	First/second-stage sludge tentatively identified compounds and summary statistics.	4-4
4-3.	First/second-stage sludge waste analysis plan compliant sample size determination.	4-6
4-4.	First/second-stage sludge summary statistics for analytes without regulatory thresholds.	4-7
4-5.	Waste analysis plan compliant data analysis for first/second-stage sludge.	4-9
4-6.	First/second-stage sludge summary statistics for analytes without regulatory thresholds.	4-10
4-7.	Total semivolatile organic compound summary data - tentatively identified compounds.	4-11
M-1.	Analytical Chemistry Laboratory metals quality control average percent recovery of metals matrix spikes and matrix spike duplicates.	A-2
M-2.	Analytical Chemistry Laboratory metals quality control average percent recovery of laboratory control samples.	A-2
SV-1.	Analytical Chemistry Laboratory semivolatile organic compounds quality control average percent recovery of volatile organic compounds matrix spike/matrix spike duplicates.	A-6

SV-2.	Analytical Chemistry Laboratory semivolatile organic compounds quality control average percent recovery of semivolatile organic compounds laboratory control samples.	A-6
V-1.	Analytical Chemistry Laboratory volatile organic compounds quality control average percent recovery of volatile organic compounds matrix spike/matrix spike duplicates.....	A-11
V-2.	Analytical Chemistry Laboratory volatile organic compounds quality control average percent recovery of volatile organic compounds laboratory control samples.	A-12
N-1.	Analytical Chemistry Laboratory nonhalogenated volatile organic compounds quality control average percent recovery of metals matrix spikes/matrix spike duplicates.	A-17
N-2.	Analytical Chemistry Laboratory nonhalogenated volatile organic compounds quality control average percent recovery of nonhalogenated volatile organic compound laboratory control samples.	A-18
B-1.	Analytical Chemistry Laboratory metals quality control matrix spikes and laboratory control samples summary by element.	B-1
C-1.	Analytical Chemistry Laboratory semivolatile organic compounds quality control matrix spike and laboratory control samples summary by compound.	C-1
C-2.	Analytical Chemistry Laboratory semivolatile organic compounds quality control average percent recovery of surrogate compounds by batch.....	C-4
D-1.	Analytical Chemistry Laboratory volatile organic compound quality control matrix spike and matrix spike duplicate summary by compound.	D-1
D-2.	Analytical Chemistry Laboratory volatile organic compound quality control laboratory control samples summary by compound.....	D-4
D-3.	Analytical Chemistry Laboratory volatile organic compound quality control average percent recovery of surrogate compounds by batch.	D-10
E-1.	Analytical Chemistry Laboratory nonhalogenated volatile organic compounds quality control matrix spike and laboratory control sample summary by compound.	E-1

ACRONYMS

Ag	Silver
AK	acceptable knowledge
ANL-W	Argonne National Laboratory - West
As	Arsenic
Ba	Barium
Be	Beryllium
CAR	Corrective Action Report
CBFO	Carlsbad Field Office
CCV	Continuing Calibration Verification
Cd	Cadmium
Cr	Chromium
DOE	Department of Energy
DOT	Department of Transportation
EDF	Engineering Design File
EPA	Environmental Protection Agency
Hg	Mercury
HT	holding time
ID	identification
IDC	Item Description Code
INEEL	Idaho National Engineering and Environmental Laboratory
LCS	laboratory control sample
MDL	Method Detection Limit
MPC	Matrix Parameter Category
MS	matrix spike
MSD	matrix spike duplicate
NH	non-halogenated
Ni	Nickel
NOD	Notice of Deficiency
Pb	Lead

PLN	Plan
PRQL	program-required quantitation limit
PVC	polyvinyl chloride
QAPP	Quality Assurance Program Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFP	Rocky Flats Plant
RPD	relative percent differences
RTL	regulatory threshold limit
RTR	real-time radiography
RWMC	Radioactive Waste Management Complex
Se	Selenium
Sb	Antimony
SVOC	Semi-Volatile Organic Compound
SWS	Sludge Waste Stream
TC	Toxicity Characteristic
TCLP	Toxicity Characteristic Leaching Procedure
Te	Thallium
TIC	tentatively identified compound
TRU	transuranic
TWCP	Transuranic Waste Characterization Program
V	Vanadium
VE	Visual Examination
VOC	Volatile Organic Compound
WAC	Waste Acceptance Criteria
WAP	Waste Analysis Plan
WIPP	Waste Isolation Pilot Plant
Zn	Zinc

Hazardous Waste Code Determination for First/Second-Stage Sludge Waste Stream (IDCs 001, 002, 800)

1. INTRODUCTION

Transuranic (TRU) and mixed TRU waste destined for disposal at the Waste Isolation Pilot Plant (WIPP) must be characterized in accordance with the WIPP Part B Permit [U.S. Environmental Protection Agency (EPA) No. NM4890 139088]. Characterization requirements are derived from 40 CFR Parts 260, through 265, 268, and 270 and are documented within the permit in the Waste Analysis Plan (WAP). The WAP, issued October 27, 1999, specifies a characterization strategy based on acceptable knowledge (AK). AK information is used to identify waste streams and make EPA hazardous waste code assignments. Per WAP requirements, hazardous waste codes are then confirmed through headspace gas and homogenous solids sampling and analysis.

The Idaho National Engineering and Environmental Laboratory (INEEL) TRU Waste Characterization Program (TWCP) has evaluated solidified sampling data relative to AK confirmation of hazardous waste code assignments for the First/Second-Stage SWS. The results of this evaluation are documented in this report. This report contains seven sections: Section 1, provides an overview describing the study scope, background information, and WAP compliance; Section 2, waste stream specific AK information is summarized; Section 3, provides hazardous waste code assignments based on AK; Section 4, provides confirmation of AK based on sampling and analysis; Section 5, provides non-conforming conditions, associated corrective actions, and mitigative factors; Section 6, discusses implications and future actions for subsequent waste streams; and Section 7, provides the conclusions.

1.1 Scope

The hazardous waste code determination provided herein applies to the First/Second-Stage SWS [Item Description Codes (IDCs) 001, 002, 800]. This waste stream consists of a population of 6,752 drums generated by liquid waste treatment operations in Building 774, at the Rocky Flats Plant (RFP), located outside Denver, Colorado. These wastes were generated from 1972 through 1988 and currently reside at the INEEL Radioactive Waste Management Complex (RWMC).

1.2 Background

Prior to the WAP issuance date, the INEEL performed TRU waste sampling and analysis for homogenous solids under the Carlsbad Field Office (CBFO) TRU Waste Characterization Quality Assurance Program Plan (QAPP) requirements. In this document a "data set" is referred to as "preliminary data". Seventy-five First/Second-Stage Sludge Drums, given in Table 1-1, have been subjected to core sampling and analysis using the requirements defined in the QAPP. The drum selection process is discussed in detail in Engineering Design File (EDF)-909, Transuranic Waste Sampling Plan for the INEEL, Revision 2. The INEEL methodology consisted of Phase I and II sampling campaigns. Phase I was exploratory sampling used to determine appropriate sampling sizes for Phase II. Phase II sampling was undertaken to validate Phase I results and to verify AK relative to toxicity characteristics. A brief summary of pre-WAP INEEL sampling is provided below.

Phase I samples were subject to a temporal selection spanning the years that the waste stream was generated. The diversity of sample selection ensured that the sample would be representative of the waste stream, as no known or expected relationship existed between the sample selection process and the contaminant concentrations. However, Phase I samples were not randomly chosen. A statistical reduction of Phase I results determined the number of randomly selected drums to be cored. These drums were designated as Phase II.

The procedure to select the required Phase II drums involved creating a list of all the containers in the waste stream, assigning serial numbers to each container on the list, using a random number generator to select the desired number of samples from the list of serial numbers, and then selecting containers to sample based on the serial number selection. A total of nine Phase II drums were selected, sampled, and analyzed (see Table 1-1).

In addition, seventeen drums were randomly selected (Phase II) as a result of a Notice of Deficiency (NOD) by the State of Idaho. At the time the sample selection was performed, the INEEL was under a NOD by the State of Idaho for not adequately characterizing TRU waste in each IDC by year of generation. As a result, samples were chosen to address the NOD by sampling the deficient years of generation for the given IDC's. The impacted IDC's (001, 007, and 800) are part of the sludge waste streams and are included in the scope of this study. Seventeen drums were selected as a result of this effort (see Table 1-1).

Table 1-1. First/Second-Stage drums sampled prior to the waste analysis plan.

	Drum Identification (ID)	IDC	Phase #/Description	Year Cored
1	RF074112313	001	1 / Exploratory Sampling	1996
2	RF074112445	001	1 / Exploratory Sampling	1996
3	RF074112540	001	1 / Exploratory Sampling	1996
4	RF074112570	001	1 / Exploratory Sampling	1996
5	RF074221401	002	1 / Exploratory Sampling	1996
6	RF741205927	800	1 / Exploratory Sampling	1996
7	RF002500410	001	1 / Exploratory Sampling	1996
8	RF074112301	001	1 / Exploratory Sampling	1996
9	RF074112370	001	1 / Exploratory Sampling	1996
10	RF074112864	001	1 / Exploratory Sampling	1996
11	RF074112870	001	1 / Exploratory Sampling	1996
12	RF741202658	001	1 / Exploratory Sampling	1996
13	RF074112549	001	1 / Exploratory Sampling	1996
14	RF741200327	001	1 / Exploratory Sampling	1996
15	RF741203069	001	1 / Exploratory Sampling	1996
16	RF074221390	002	1 / Exploratory Sampling	1996
17	RF074221647	002	1 / Exploratory Sampling	1996
18	RF074112299	001	1 / Exploratory Sampling	1996
19	RF074112362	001	1 / Exploratory Sampling	1996
20	RF074221436	002	1 / Exploratory Sampling	1996
21	RF741205657	001	1 / Exploratory Sampling	1996
22	RF074226148	002	1 / Exploratory Sampling	1996
23	RF741205809	001	1 / Exploratory Sampling	1996
24	RF741202039	001	1 / Exploratory Sampling	1996
25	RF741206329	001	1 / Exploratory Sampling	1996
26	RF741205140	001	2 / Year Directed NOD Selected Drums	1996
27	RF741204312	001	2 / Year Directed NOD Selected Drums	1996

Table 1-1. (continued).

	Drum Identification (ID)	IDC	Phase #/Description	Year Cored
28	RF741205155	001	2 / Year Directed NOD Selected Drums	1996
29	RF741200665	001	2 / Year Directed NOD Selected Drums	1996
30	RF741202714	001	2 / Year Directed NOD Selected Drums	1996
31	RF741200628	001	2 / Year Directed NOD Selected Drums	1996
32	RF741203499	001	1 / Exploratory Sampling	1997
33	RF741204240	001	1 / Exploratory Sampling	1997
34	RF741201623	001	1 / Exploratory Sampling	1997
35	RF741201643	001	1 / Exploratory Sampling	1997
36	RF741201893	001	1 / Exploratory Sampling	1997
37	RF741205838	800	1 / Exploratory Sampling	1997
38	RF741207281	800	1 / Exploratory Sampling	1997
39	RF741207309	800	1 / Exploratory Sampling	1997
40	RF741205339	001	1 / Exploratory Sampling	1997
41	RF741205546	001	1 / Exploratory Sampling	1997
42	RF741205876	001	1 / Exploratory Sampling	1997
43	RF741221435	002	1 / Exploratory Sampling	1997
44	RF741206889	800	1 / Exploratory Sampling	1997
45	RF741206104	800	1 / Exploratory Sampling	1997
46	RF741207047	800	1 / Exploratory Sampling	1997
47	RF741202134	001	1 / Exploratory Sampling	1997
48	RF741205902	800	1 / Exploratory Sampling	1997
49	RF741206243	800	1 / Exploratory Sampling	1997
50	RF001904233	002	1 / Exploratory Sampling	1997
51	RF741204411	001	1 / Exploratory Sampling	1997
52	RF741206182	800	1 / Exploratory Sampling	1997
53	RF741207001	001	1 / Exploratory Sampling	1997
54	RF741202128	001	1 / Exploratory Sampling	1997
55	RF074221645	002	1 / Exploratory Sampling	1997
56	RF741200837	001	2 / Year Directed NOD Selected Drums	1997
57	RF741201101	001	2 / Year Directed NOD Selected Drums	1997
58	RF741201215	001	2 / Year Directed NOD Selected Drums	1997
59	RF741201223	001	2 / Year Directed NOD Selected Drums	1997
60	RF741200343	001	2 / Year Directed NOD Selected Drums	1997
61	RF741206046	800	2 / Year Directed NOD Selected Drums	1997
62	RF741206080	800	2 / Year Directed NOD Selected Drums	1997
63	RF741206623	800	2 / Year Directed NOD Selected Drums	1997
64	RF741204961	001	2 / Year Directed NOD Selected Drums	1997
65	RF741206622	800	2 / Year Directed NOD Selected Drums	1997
66	RF741204082	001	2 / Year Directed NOD Selected Drums	1997
67	RF741206858	800	2 / Randomly Selected	1998
68	RF741206260	800	2 / Randomly Selected	1998
69	RF741206466	800	2 / Randomly Selected	1998
70	RF741207151	800	2 / Randomly Selected	1998
71	RF741207208	800	2 / Randomly Selected	1998
72	RF741204963	001	2 / Randomly Selected	1998
73	RF741207203	800	2 / Randomly Selected	1998
74	RF741204054	001	2 / Randomly Selected	1998
75	RF741200640	001	2 / Randomly Selected	1998

1.3 Existing Data (pre-Waste Analysis Plan) Usage

The INEEL intends to use the pre-WAP data, both Phase I and II (including NOD) drums, to provide the statistics needed to calculate the number of WAP compliant drums to be sampled. Use of existing data in this manner is consistent with the WAP Attachment B2 which states:

Preliminary estimates of the mean concentration and variance of each RCRA regulated contaminant in the waste will be used to determine the number of waste containers to select for sampling and analysis. The preliminary estimates will be made by obtaining a preliminary number of samples from the waste stream or from previous sampling from the waste stream.

Section 4.2 of this report addresses preliminary data results. Preliminary data has also been used to provide matrix related indications of analyte performance (Appendix A).

1.4 Waste Analysis Plan Compliant Sampling and Analysis Data

The INEEL TWCP has been subjected to two CBFO WAP certification audits during calendar year 2000. The purpose of these audits was to assess adequacy, implementation, and effectiveness. The audit conducted April 24-28, 2000 resulted in three CBFO generated Corrective Action Reports (CARs). All the CARs have been closed.

During the most recent audit addressing solidified sampling and analysis, conducted December 5-8, 2000, no CARs were issued by the CBFO. This reflects a strict programmatic adherence to WAP requirements. The INEEL TWCP has WAP complaint Resource Conservation and Recovery Act (RCRA) data it will use in confirming hazardous waste codes. Seven drums (see Table 1-3) have been randomly core sampled, selected, and analyzed in accordance with the WAP.

Table 1-3. Waste analysis plan compliant drums.

	ID	IDC	Description	Date Cored
1	IDRF741201882	001	WAP Compliant Sampling and Analysis	10/16/00
2	IDRF741205324	001	WAP Compliant Sampling and Analysis	12/03/00
3	IDRF741205311	001	WAP Compliant Sampling and Analysis	12/17/00
4	IDRF741200655	001	WAP Compliant Sampling and Analysis	12/17/00
5	IDRF741202121	001	WAP Compliant Sampling and Analysis	10/13/00
6	IDRF741202390	001	WAP Compliant Sampling and Analysis	12/05/00
7	IDRF741202216	001	WAP Compliant Sampling and Analysis	12/08/00

2. WASTE DESCRIPTION AND ACCEPTABLE KNOWLEDGE

This chapter summarizes the AK concerning the First/Second-Stage SWS. Additional detail may be found in the AK Document INEL-96/0280, INEEL Stored Transuranic Waste Rocky Flats Plant Waste, and EDF-1809, Waste Stream Summary Sheet - First/Second-Stage Sludge.

2.1 History

The waste evaluated in the scope of this study consists of accessibly stored solidified first/second-stage sludges generated in Building 774 at the RFP between 1972 and 1988. RFP Building 774 was built in 1952 to treat radioactive aqueous wastes generated in Building 771. Building 771 treated solid TRU wastes generated at the plant; therefore, the liquid process waste streams feeding Building 774 contained most of the radioactive and chemical compounds used at the plant. The treatment process originally employed precipitation technology to remove radionuclides. Other liquid treatment technologies were installed as Building 774 operations evolved. The aqueous wastes were treated in first and second stage processes to remove radioactive and chemical contaminants. The effluent from these processes was solidified for disposal. Around 1965, an evaporator was installed to augment liquid treatment, including wastewater from solar ponds. This evaporator was removed in 1979 when the liquids were transferred to Building 374 for treatment. The most common radioactive materials consisted of weapons-grade plutonium, americium, enriched uranium, and depleted uranium. The wastes were subsequently shipped to the RWMC at the INEEL in 55-gallon drums. The 6,752 drums are currently pending further characterization and shipment to the WIPP.

2.2 Waste Stream Identification

The WAP defines a waste stream as "waste material generated from a single process or from an activity that is similar in material, physical form, and hazardous constituents." The INEEL approach identifying waste streams is documented in EDF-922, Identification of Transuranic Waste Streams. This approach combines IDC's that have a similar physical composition and the same regulated constituents. Since the waste was generated from a single process line, is of a similar material and physical form, and has identical hazardous waste codes, the First/Second-Stage SWS (containing IDC's 001, 002, and 800) have logically been combined through this methodology. The resulting waste stream contains 6,752 drums.

2.2.1 Waste Description

The first- and second-stage sludges from the RFP Building 774 are assigned IDC's 001, 002, and 800. IDC assignment identifies nuclear material forms or process materials associated with waste generation. A detailed description of each IDC follows.

2.2.1.1 IDC 001: First-Stage Sludge. This waste consists of immobilized materials generated from first-stage treatment operations in Building 774. Aqueous liquids coming into the process originated from RFP Building 771 recovery operations. The liquids were made basic with sodium hydroxide to precipitate metals, plutonium, and americium hydrated oxides. The precipitate was filtered to produce a sludge that was placed in a drum with Portland cement. The Matrix Parameter Category (MPC) assigned to this IDC is S3121 (see EDF-805, Matrix Parameter Category Groups). As defined in the Department of Energy (DOE) Waste Treatability Group Guidance (DOE/LLW-2 17), this MPC consists of greater than 50 percent by volume secondary sludge, or filtercake from wastewater treatment processes or heavy metal sludges resulting from recovery processes. Additional items (less than 50 percent by volume) identified in the waste include Kimwipes, leaded rubber gloves, rubber gloves, and bottles. Absorbents added to the

waste during packaging include: 3 to 5 pounds of Portland cement in the bottom of the drum; 3 to 5 pounds of Portland cement in the bottom of the drum bag; approximately 30 pounds of Portland cement in the bottom of the poly-vinylchloride (PVC) o-ring bag; 1 to 2 quarts of Oil Dri on top of outer, sealed polyethylene bag; Vermiculite used to fill space between the sealed polyethylene bag and liner; and 3 to 5 pounds of Portland cement on top of the sludge, inside the o-ring bag.

2.2.1.2 IDC 002: Second-Stage Sludge. This waste consists of immobilized materials generated from second-stage treatment operations in Building 774. Aqueous liquids to be treated originated from first-stage treatment and from numerous buildings on the RFP site. The liquids were treated in the same manner as the liquids from the first stage, and the resulting sludge was placed into a drum with Portland cement. The MPC group assigned to this IDC is S3121, as defined in DOE/LLW-2 17 and further documented in EDF-805. Additional items (less than 50 percent by volume) identified in the waste include Kimwipes, leaded rubber gloves, rubber gloves, and bottles. Until 1973, items such as, electric motors, bottles of compatible liquid chemical wastes, mercury batteries, lithium batteries, and small amounts of contaminated mercury in pint bottles may also be contained in this waste. Absorbents added to the waste during packaging include: 3 to 5 pounds of Portland cement in the bottom of the drum; 3 to 5 pounds of Portland cement in the bottom of the drum bag; approximately 30 pounds of Portland cement layered throughout the drum; 1 to 2 quarts of Oil Dri on top of outer, sealed polyethylene bag; Vermiculite used to fill space between the sealed polyethylene bag and liner; and 3 to 5 pounds of Portland cement on top of the sludge, inside the plastic bag.

2.2.1.3 IDC 800: Solidified Sludge-Bldg. 774. This waste was generated from a process that was similar to the IDC 001 waste generation process. The difference between the two IDCs is in the immobilization process. For IDC 800, the sludge was co-fed into a drum with a diatomite and Portland cement mixture, forming a solid monolith after curing. The MPC assigned to this IDC is S3150 (see EDF-805). This MPC is defined to consist of greater than 50 percent by volume of solidified form such as a sludge waste immobilized with cement and cured into a solid (DOE/LLW-2 17). Absorbents added to the waste during packaging included Vermiculite used to fill the space between the sealed polyethylene bag and liner.

2.2.2 Waste Generation Process

The solidified first/second-stage waste from Building 774 was generated from a two-stage liquid treatment process. Aqueous treatment operations included neutralization, precipitation, filtration, flocculation, clarification, immobilization, and evaporation. These processes were used to remove radioactive and chemical contaminants and to convert the waste to a solid for disposal. A diagram depicting the aqueous treatment process is shown in Figure 2-1. Stage one treatment processes were performed on the following RFP waste streams:

- Plutonium ion column effluent
- Americium ion column effluent
- Thiocyanate waste solution
- Caustic scrubber solution
- Nitric, sulfuric, and hydrofluoric acids
- Nitric acid distillate from feed evaporator
- Water distillate from peroxide precipitation filtrate evaporator
- Steam condensate.

AK has identified the following compounds as potentially being present in first/second-stage sludges from first-stage treatment:

- Nitric acid
- Aluminum nitrate
- Calcium fluoride
- Potassium hydroxide
- Ferrous sulfamate
- Sulfuric acid
- Hydrogen peroxide
- Calcium
- Magnesium oxide
- Magnesium
- Sodium peroxide
- Potassium iodate
- Hydrogen fluoride
- Sodium nitrate
- Hydrochloric acid
- Hydrofluoric acid
- Sodium hypochlorite
- Potassium fluoride.

A vacuum inside a rotating filter drum drew slurry from first-stage treatment through diatomite filter media. The filter media and trapped solids were continually scraped off the drum filter and placed into a 55-gallon drum. Portland cement may also have been added to the top of the sludge. This sludge was assigned IDC 001. In 1986, the immobilization process changed and IDC 001 was discontinued.

The process of pulling the combined slurry through diatomite filter media remained unchanged. As the sludge was scraped off the drum filter, it was co-fed into a drum with a diatomite and Portland cement mixture that formed a solid monolith after curing. This waste was assigned IDC 800.

Second-stage treatment included liquids treated by first-stage treatment, decanted liquids from a slurry holding tank, and low-level or nonradioactive aqueous process wastes from numerous buildings at the RFP site (see the AK document, INEL-96/0280, for a list of source buildings). The second-stage process included two separate radioactive decontamination systems: (1) a batch precipitation system used to remove radioactive materials from wastes in which both the radioactive and chemical contaminants exceeded the standards, and (2) a continuous precipitation system used to remove radioactive materials from wastes meeting the standards for chemical, but not for radioactive contaminants. Second-stage sludge was precipitated in the same manner as first-stage sludge (IDC 001) and was assigned IDC 002.

3. ACCEPTABLE KNOWLEDGE HAZARDOUS WASTE CODE DETERMINATION

The First/Second-Stage SWS generated from Building 774 treatment processes, contains chemical constituents reflective of the operations performed throughout the plant. Process knowledge, summarized in Section 2, indicates the waste may contain both characteristic and listed constituents. However, the mere presence of hazardous constituents does not necessarily cause a waste to be hazardous, by definition, if such constituents do not result from a prescribed use or do not exceed regulatory limits in a representative sample. Below is a summary of AK relative to characteristic and listed constituents.

3.1 Characteristic Determination

3.1.1 Corrosivity

Under 40 CFR 261.22, a solid waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties:

- It is aqueous with a pH less than or equal to 2, or greater than or equal to 12.5, as determined by a pH meter using Method 9040 in EPA Publication SW-846, Test Methods for Evaluating Solid Waste, Physical and Chemical Methods.
- It is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 mm (0.250 inch) per year at a test temperature of 55°C (130°F) as determined by its test method specified in National Association of Corrosion Engineer (NACE) Standard TM-01-69 as standardized in SW-846.

The waste stream does not meet the characteristic of corrosivity (D002) as defined. The waste is not aqueous. As has been determined by radiography and visual examination, none of these drums contain 20% by volume, aqueous waste. Since 20% by volume is required in order to measure pH, the corrosive characteristic does not apply.

The First/Second-Stage SWS does not meet the definition of liquid in making a determination of corrosivity toward steel because the waste is not a liquid. A knowledge-based determination is allowable when determining whether or not the waste stream is a liquid relative to corrosivity under the Federal Register, 50 FR 18372, dated April 30, 1985. It is stated in the FR that "EPA believes that, for purposes of the characteristic of ignitability and corrosivity, it will generally be obvious whether or not the waste is a liquid."

The generator (RFP) states in the Backlog Waste Reassessment book that, "The characteristic of corrosivity (D002) as defined in 40 CFR 261.22 does not apply because the final waste form is solid." This statement was in regard to the first stage sludge. It also states: "The second stage sludge would carry the same EPA waste codes as the first stage sludge" and "EPA Codes D001 and D002 are not assigned to the IDC 800 subpopulation." As stated previously, the solid state is confirmed using radiography and visual examination.

3.1.2 Toxicity

To exhibit the toxicity characteristic, concentrations of certain metals or organics must equal or exceed the regulatory threshold limits (RTLs) in an extract generated using a test method known as the Toxicity Characteristic Leaching Procedure (TCLP). Results of the TCLP test are compared with levels that the EPA has identified as hazardous to projected receptors. In lieu of the TCLP, totals analysis can be used to estimate a worst-case situation. AK information shows evidence of toxic characteristic level for arsenic (As), barium (Ba), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), selenium (Se), and silver (Ag). The EPA Hazardous Waste Codes assigned to the first/second-stage sludge, based on AK, are listed in Table 3-1.

One toxicity constituent, chloroform, exceeded the headspace gas PRQL (10 ppmv) at the 90% confidence level (13.3 ppmv). AK and solid sampling did not indicate the presence of this constituent, but the D022 will be applied to the waste stream as a conservative measure

Table 3-1. Characteristic (toxicity) hazardous waste codes assigned to first/second-stage sludge based on acceptable knowledge.

Hazardous Waste Code	Description	CAS Number	Regulatory Threshold Level (mg/L)
D004	Arsenic	7440-35-2	5.0
D005	Barium	7440-39-3	100.0
D006	Cadmium	7440-43-9	1.0
D007	Chromium	7440-47-3	5.0
D008	Lead	7439-92-1	5.0
D009	Mercury	7439-97-6	0.2
D010	Selenium	7782-49-2	1.0
D011	Silver	7440-22-4	5.0

3.1.3 Ignitability

Based on knowledge of the waste stream and generation processes, it has been determined that the waste does not meet the definition of an ignitable waste under RCRA. To be considered ignitable under RCRA, a material must possess any of the following properties:

- It is a liquid other than an aqueous solution containing > 24 % alcohol and a flash point of < 140°F (60°C)
- It is not a liquid but is capable of causing fire through friction, adsorption of moisture, or spontaneous chemical changes
- It is an ignitable compressed gas
- It is an oxidizer as defined by U.S. Department of Transportation (DOT) regulations.

The materials in this waste stream do not meet the definition of ignitability (D001) as defined in 40 CFR 261.21. AK indicates that containers with small amounts of compatible liquid chemical wastes were added to the second-stage sludge generated prior to 1973. According to the Backlog Waste Reassessment Baseline Book, it was common practice to add small quantities of containerized wastes to the process waste stream (as opposed to piped waste water). These residual liquid chemical wastes were compatible with the first and second stage treatment processes. Only drums with liquids below the WIPP waste acceptance criteria [less than or equal to 1 inch of liquid in internal containers and less than or equal to 0.55 gal (2082 ml) total volume in the drum] will be shipped.

3.1.4 Reactivity

Based on knowledge of the waste stream and generation processes, it has been determined that the waste does not meet the definition of a reactive waste under RCRA. To be considered a reactive waste under RCRA, a material must possess any one of the following properties:

- It is unstable and can undergo violent change
- It reacts violently with water
- It forms potentially explosive mixtures with water
- It reacts with water to generate toxic gases, vapors, or fumes that are harmful
- It contains cyanide or sulfide that can generate toxic gases, vapors, or fumes
- It can detonate or explode at standard temperature and pressure
- It is a DOT forbidden or Class A or B explosive.

The waste stream does not meet the characteristic of reactivity (D003) as defined under RCRA 40 CFR 261.23. The waste materials are stable and will not react violently with water, form potentially explosive mixtures with water, or generate toxic gases, vapors or fumes when mixed with water. The materials do not contain sulfides and are not capable of detonation or explosive reaction. The waste may contain trace quantities of cyanide derived from electroplating wastes, and containers with small amounts of liquid chemical wastes added to the process waste stream (as opposed to piped waste water). Only trace amounts of cyanide are expected in the waste stream feed and would not cause the resulting waste to be reactive. Based on the levels of concentration of cyanide in the feed waste, the alkalinity of the sludges (9 to 11 pH), and the presence of metals (for example, Fe+3, Cu+2, Al+3), cyanide is not available for release because all free cyanide exists as stable metal complexes. According to the Backlog Waste Reassessment Baseline Book, the small amounts of liquid chemicals present in any internal containers are wastes that are compatible with the sludge. This waste does not present compatibility hazards due to the chemicals identified with each other or with the packaging of the waste.

Second-stage sludge generated before 1973 may contain lithium batteries. However, the batteries are spent/used and therefore not reactive. The following rationale was used to support the decision to not assign EPA hazardous waste codes D003 (reactivity) or D001 (ignitability) to this waste stream due to the potential presence of lithium batteries.

- As stated in the AK Document, "Second-stage sludge generated before 1973 may contain lithium batteries. Lithium metal, which is highly reactive with water, was used as an anode in lithium alkaline batteries. As the battery discharges, the lithium metal is converted to lithium oxide, which is not reactive. The materials in this waste group are therefore neither ignitable (D001) nor reactive wastes (D003) due to the potential presence of batteries."
- Considering the cost of lithium batteries in this time frame, there is no reason a user would replace and discard a lithium battery until the voltage dropped. One of the important features of lithium batteries is the constant voltage (such as, flat discharge curve), which lasts until all of the lithium has been converted into a non-reactive lithium compound. At that time, virtually all of the lithium is no longer present in the reactive metallic state and there is a sharp voltage drop.
- The lithium contained in batteries present in the 1970-1973 generated second stage sludge waste is no longer reactive or ignitable. According to battery manufacturer information, current lithium batteries have shelf lives of approximately 10 to 20 years (early lithium batteries did not have shelf lives of this length). This is the period of time that it takes for a battery to lose its charge (discharge) due to the electrochemical reaction over time. As a result of discharge, the lithium metal is converted to lithium oxide. By design lithium batteries are constructed with an excess of positive electrode material to assure that there is enough positive material to react with all of the metallic lithium present. Spent (discharged) lithium batteries do not contain lithium metal and are not toxic, not ignitable, nor reactive. Any battery in the pre-1973 drums is currently 28 years old or older. Based on shelf life, any batteries present have completely discharged.

The materials in this waste stream do not meet the definition of reactivity and will not be assigned the D003 waste code.

3.2 Listed Determination

Waste is potentially subject to RCRA regulation as a hazardous waste if it meets a listing description. Wastes in this waste stream were derived from the treatment of aqueous electroplating wastes, and aqueous wastes containing small quantities of halogenated- and non-halogenated (NH)-solvents, resulting in an F-listed hazardous waste. Tetrachloroethylene, trichloroethylene, 1,1,1-trichloroethane, 1,1, 2-trichloro- 1,2,2- trifluoroethane, and carbon tetrachloride were used primarily for cleaning and degreasing, and small quantities of these constituents may be present in the waste.

Methylene chloride was used primarily for paint removal. Acetone, methanol, xylene, benzene, and toluene were used as solvents primarily in laboratory operations. The codes associated with the chlorinated solvents are listed in Table 3-2. Since previous AK documents reflect a generator assigned F003 code associated with acetone, benzene, butanol, ethyl benzene, ethyl ether, methanol, toluene, and xylene used as solvents in laboratory operations, the following rationale is provided for the removal of the F003 code. Assessment of the non-toxic F003 constituents, indicates the waste is non-hazardous for the flammability characteristic and the F003 code was removed as provided for in the WAP Section B4-10. None of these compounds have a 90% confidence level that exceeds the PRQL criteria in either the headspace gas samples or the solid samples. While the compounds, except for methanol, were detected in one or more of the headspace gas samples for these drums, and methanol and xylene were both detected in one or more solid samples, the F003 code does not apply. These compounds are F003 listed for their ignitability. These F003 wastes were mixed with other solid wastes and do not exhibit the characteristic of ignitability and do not meet the definition of an F003 waste.

At one time, Building 774 treated spent stripping, cleaning, and plating solutions from electroplating operations in which cyanides were used. Since the first/second-stage sludge was derived from treatment of these wastes, the associated F-listed codes also apply. No other waste codes apply since this waste stream did not come from specific sources, and the waste does not contain discarded commercial chemical product, off-specification chemical species, container residue, or spill residue associated with such products. The EPA Hazardous Waste Codes assigned to the first/second-stage sludge and based on the above AK discussion, are listed in Table 3-3 for F-listed constituents.

Table 3-2. Listed hazardous waste codes assigned to first/second-stage sludge based on acceptable knowledge.

Hazardous Waste Code	Hazardous Waste Code Description	Constituents Causing Listing Using AK
F001	Spent halogenated solvents used in degreasing, spent solvent mixtures/blends used in degreasing (F001, F002, F004, F005 constituents), still bottoms from the recovery of spent solvents and spent solvent mixtures used in degreasing.	Tetrachloroethylene, trichloroethylene, 1,1,1-trichloroethane, carbon tetrachloride, methylene chloride
F002	Spent halogenated solvents, spent solvent mixtures/blends (F001, F002, F004, F005), still bottoms from the recovery of these spent solvents and spent solvent mixtures.	Tetrachloroethylene, Trichloroethylene, 1,1,1-trichloroethane, carbon tetrachloride, methylene chloride, 1,1,2-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,1,2-trifluoroethane
F005	Spent NH solvents, spent solvent mixtures/blends containing NH solvents and halogenated solvents (F001, F002, F004, F005), still bottoms from the recovery of these spent solvents and spent solvent mixtures.	Toluene, benzene
F006	Wastewater treatment sludges from electroplating operations	Cadmium, hexavalent chromium, cyanide (complexed)
F007	Spent cyanide plating operations	Cyanide (salts)
F009	Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process.	Cyanide (salts)

The pre-1973 second-stage SWS does not meet the definition for U codes under 40 CFR 261.33. This definition is: (a) any commercial chemical product, or manufacturing chemical intermediate having the generic name listed in paragraph (f), (b) any off-specification commercial chemical product or manufacturing chemical intermediate, which, if it met specifications, would have the generic name, listed paragraph (f) of this section, (c) any residue remaining in a container or in an inner liner removed from a container that has held any commercial chemical product or manufacturing chemical intermediate having the generic name listed in paragraphs (f) of this section, unless the container is empty as defined in 261.7(b) of this chapter.

AK indicates the presence of small amounts of contaminated mercury in pint bottles, and containers (bottles) with small amounts of compatible liquid chemical wastes in the second-stage sludge generated prior to 1973. The mercury is described as "contaminated," which denotes that it was used and discarded as waste. According to the Backlog Waste Reassessment Baseline Book, the liquid chemical wastes in internal container are compatible process wastes, not commercially pure grade chemicals. None of the residual liquids present in internal containers will be greater than 1 in. nor will the total volume of residual liquid in any drum be greater than 1% in compliance with the WIPP WAC.

The EPA codes applicable to the liquid chemical wastes referred to the above paragraph did not include additional codes that were different from those cited for pipeline-transferred wastes. U-listed EPA codes only apply to discarded commercial chemical products, off-specification products, and residues of commercial chemical or off-specification products. By definition, the pre-1973 second stage sludge component of the waste stream is not U coded waste due to contaminated mercury or the presence of liquid chemical wastes in bottles. The entire waste stream does carry the D009 characteristic code (D009) for mercury.

3.3 Additional Waste Analysis Plan/Waste Acceptance Criteria Characterization Data

The WAP and Waste Acceptance Criteria (WAC) requires additional characterization to (a) verify the AK documented for this waste stream, and (b) support other WAP requirements. Included in this section are those intrusive and non-intrusive examinations and analyses conducted to ensure that the requirements for the disposal of waste in WAP were met, and confirm the AK hazardous waste determination.

3.3.1 Radionuclides

The aqueous wastes treated in Building 774 at the RFP received wastes from throughout the plant site. As a result, the first/second-stage sludge that was generated during Building 774 waste treatment operations may contain any of the radioisotopes used at the plant. The most common radioactive materials handled were weapons-grade plutonium, americium-241, enriched uranium, and depleted uranium. All drums are subjected to radioassay to ensure compliance with WAC requirements prior to shipment to the WIPP.

3.3.2 Radiography/Visual Examination

All drums are physically characterized using real-time radiography (RTR). A statistically selected portion of this waste stream has been characterized through VE. These examinations provide confirmation that the waste consists of sludge, that the packaging is appropriate, and that there are no prohibited items within the waste. The RTR and VEs for this waste stream have confirmed expectations.

4. CONFIRMATION OF HAZARDOUS WASTE CODE ASSIGNMENTS BASED ON HEADSPACE GAS SAMPLING AND HOMOGENOUS SOLIDS ANALYSIS

4.1 Headspace Gas Sampling and Analysis Results

The headspace analysis results for spent solvents have been assessed per the requirements in the WAP. Results of the WAP compliant headspace gas analyses for 41 drums are summarized in Table 4-1. Based on the results given in Table 4-1, three F-listed volatile organic solvents exceeded the program-required quantitation limit (PRQL) at the 90%-confidence level. The UCL₉₀ value for 1,1,1 trichloroethane was 102 ppmv, 64.2 for carbon tetrachloride and 19.2 ppmv for trichloroethylene. The F001 and F002 code have already been added (see Table 3-3). In addition, the occurrences of tentatively identified compounds (TIC's) were evaluated. One toxicity constituent exceeded the PRQL at the 90%-confidence level. The UCL₉₀ value for chloroform was 13.3. AK and solid sampling did not indicate the presence of this constituent, but the D022 will be applied to the waste stream as a conservative measure. No TIC's listed in Appendix VIII 40 CFR Part 261 were detected, therefore no hazardous waste codes were assigned based on TIC's.

Table 4-1. Headspace gas summary data.

Analyte	Number of samples	Number of samples above MDL ^a	Mean (ppmv)	Standard deviation (ppmv)	Maximum concn. (ppmv)	Upper 90% confidence limit (ppmv)	PRQL (ppmv)	EPA Code Assigned based on AK
1,1,1-Trichloroethane	41	41	89.9	57.6	230	102	10	F001/F002
1,1,2,2-Tetrachloroethane	41	0	0.215	0.208	0.700	^b	10	N/A
1,1,2-Trichloro-1,2,2-Trifluoroethane	41	13	1.35	3.31	11.0	2.60	10	F002
1,1-Dichloroethane	41	26	0.675	0.919	3.30	0.913	10	N/A
1,1-Dichloroethylene	41	31	1.67	1.29	5.50	1.97	10	N/A
1,2,4-Trimethylbenzene	41	11	0.287	0.260	0.900	0.395	10	N/A
1,2-Dichloroethane	41	0	0.181	0.212	0.750	^b	10	N/A
1,3,5-Trimethylbenzene	41	11	0.246	0.223	0.800	0.338	10	N/A
Acetone	41	34	2.48	1.18	5.10	2.74	100	N/A ^c
Benzene	41	21	0.346	0.258	1.10	0.421	10	F005
Bromoform	41	0	0.244	0.255	0.950	^b	10	N/A
Butanol	41	11	1.42	1.49	4.50	2.03	100	N/A ^c
Carbon tetrachloride	41	19	35.4	94.6	300	64.2	10	F001
Chlorobenzene	41	0	0.218	0.206	0.750	^b	10	F002
Chloroform	41	6	5.09	13.6	43.0	13.3	10	D022 ^d

Table 4-1. (Continued).

Analyte	Number of samples	Number of samples above MDL ^a	Mean (ppmv)	Standard deviation (ppmv)	Maximum concn. (ppmv)	Upper 90% confidence limit (ppmv)	PRQL (ppmv)	EPA Code Assigned based on AK
cis-1,2-Dichloroethylene	41	9	0.404	0.522	1.90	0.647	10	N/A
Cyclohexane	41	0	0.200	0.229	0.850	^b	10	N/A
Ethyl benzene	41	17	0.407	0.366	1.40	0.526	10	N/A ^c
Ethyl ether	41	0	0.397	0.466	1.70	^b	10	N/A ^c
Methanol	41	0	4.88	1.23	6.50	^b	100	N/A ^c
Methyl ethyl ketone	41	19	0.487	0.280	1.00	0.573	100	N/A
Methyl isobutyl ketone	41	9	0.262	0.236	0.850	0.373	100	N/A
Methylene chloride	41	20	1.17	4.34	28.0	2.46	10	F001/F002
Tetrachloroethylene	41	22	2.94	7.07	23.0	4.93	10	F001/F002
Toluene	41	35	2.75	1.52	8.20	3.09	10	F005
Trichloroethylene	41	36	16.3	13.5	43.0	19.2	10	F001/F002
m&p-Xylene	41	18	0.758	0.737	3.30	0.990	10	N/A ^c
o-Xylene	41	8	0.324	0.280	1.30	0.464	10	N/A ^c

Did the data verify the Acceptable Knowledge? Yes ☐ No ☒ ^d

If no, describe the basis for assigning the EPA Hazardous Waste Codes.

- When a measurement is reported as below detection, one-half the analysis method detection limit (MDL) is used. Note that the MDL for a given analyte may vary from sample to sample.
- The mean and standard deviation presented are the mean and standard deviation of the method detection limits (after dividing by 2) since all measurements (or all but one) are below detection. Therefore, there are no degrees of freedom associated with the t statistic and the upper 90% confidence limit cannot be calculated.
- The EPA code associated with these constituents (F003) is not applicable. All drums to be shipped to WIPP are tested for ignitability. Drums shipped to WIPP will not exhibit the characteristic of ignitability as defined under 40 CFR 261.21. The F003 code has been removed from the waste stream as provided in the WAP.
- The toxicity code for chloroform, D022, has been assigned on the basis of the gas headspace results. AK and solid sampling results do not indicate that chloroform is present in this waste.

4.2 Preliminary Data

Preliminary first/second stage data generated prior to the WAP issuance has been evaluated. As discussed in Section 1.3, the preliminary data has been used to determine the WAP compliant sample size and provide matrix related indications of analyte performance. The preliminary data received WAP compliant project level validation and verification reviews prior to statistical reduction. NCRs have been generated on this data. If dispositions did not reject the data, the data were utilized "as-is". Due to the fact that the data was generated under the QAPP, there are anomalies present that do not affect data quality (for example, missing "Z" flags for matrix spike recovery if metals were present at more than four times the spiking matrix spike levels). Therefore, the data have been accepted for use unless generated significantly after holding times expired.

In the following sections an assessment summary of the preliminary data is given. In each area Matrix Spike (MS)/Matrix Spike Duplicate (MSD), surrogate, and Laboratory Control Sample (LCS) performance was evaluated and conclusions drawn. A detailed preliminary data use assessment is given in Appendix A. In Appendix A, precision and accuracy performance indicators are addressed individually by analytical method, such as, metals, semi-volatile organic compounds (SVOC's), total volatile organic compounds (VOC's), and NH VOC's. The indicators include: LCS, MSs, MSDs, and surrogates (where applicable). Recoveries were compiled and average recoveries calculated by analyte as well as relative percent differences (RPDs), as appropriate, and plotted. Error bars associated with the recovery averages were set at one standard deviation. These data are provided in tables and figures included in the appendix.

4.2.1 Preliminary Metals Data Assessment Summary

Relative to the characteristic metals, these results indicate that the preliminary data generated on the first/second-stage SWS can be used to evaluate WAP compliant sampling needs and/or determine potential bias. The LCS data were within the required accuracy window indicating that the laboratory methods were in control and any biases observed in the data were due to matrix effects. As a general rule MS/MSD and surrogate recoveries were well within both the accuracy and precision Quality Control (QC) limits. Exceptions are discussed in Appendix A.

4.2.2 Preliminary Semivolatile Organic Compound Assessment Summary

Based on the performance of the matrix dependent (MS/MSD and surrogates) and non-matrix dependent (LCS) indicators, the data are acceptable to assess additional sampling requirements and formulate impact to the waste stream profile.

The LCS average recoveries were within the WAP accuracy criteria demonstrating that the laboratory methods were in control. There is no indication that there were problems associated with the other target compounds not found in the LCS. This conclusion is reinforced by the performance of the MS/MSDs. The MS/MSD recoveries were generally within WAP criteria but recovered on the low end, with the exception of hexachloroethane. For details see Appendix A, Section A-2.1. All RPDs met WAP criteria.

The performance of two surrogates, nitrobenzene-d5 (NBZ) and 2-fluorobiphenyl (FBP), were acceptable. The two other surrogate recovery averages or associated error [2-fluorophenol (2FP) and 2,4,6-triborophenol (TBP)] generally reflected a low bias. Therefore, the phenol data may be biased low.

Individual surrogate data points are plotted in Appendix A, Figures V-4 through V-7. Three sigma (3σ) limits specific to this waste stream (versus the limits determined over time by the laboratory spanning different waste streams) are reflected on each of the graphs. This provides a picture of surrogate performance specific to the IDC 001, 002, and 800 waste stream, that is, the acceptance criteria is based solely on data from this waste stream, confirming that these data are appropriate for use as preliminary data. These data also reflect the fact that the laboratory methods performed consistently.

4.2.3 Preliminary Purgeable Volatile Organic Compound Assessment Summary

VOC MS/MSD performance, precision, and accuracy were acceptable and did not reflect any bias for this waste stream. LCS recoveries are also compliant. Individual surrogate data points are plotted in Appendix A, Figures V-4 through V-7. Three sigma (3σ) limits specific to this waste stream are reflected on each of the graphs. These data also reflect the fact that the laboratory methods performed consistently.

4.2.4 Preliminary Nonhalogenated Volatile Organic Compound Data Assessment

Based on the acceptable performance of the MS/MSD and LCS indicators, the preliminary NH VOC sample data is usable with no matrix effects noted.

4.2.5 Preliminary Data Tentatively Identified Compound Assessment

The WAP requires that TIC's meeting criteria defined in the WAP and appearing in the Appendix VIII list be compared to AK data to determine if the TIC is a listed waste. A list of the TIC's from Total VOC and SVOC analyses is given in Table 4-2. All TIC concentrations are low. One compound, bis (2-ethylhexyl) phthalate, appeared in > 25% of the preliminary samples and is an Appendix VIII list compound. This compound was not added to the target analyte list. The WAP allows for the exclusion to the target analyte list if the TIC is a constituent in an F-listed waste and its presence is attributable to waste packaging materials or radiolytic degradation. Bis (2-ethylhexyl) phthalate is a common organic contaminant whose presence is attributable to the presence of plastic packaging material in the drum. As a result, no code has been added nor was the compound added to the target analyte list.

Table 4-2. First/second-stage sludge tentatively identified compounds and summary statistics.

Analyte	Number of samples	Minimum (mg/kg)	Maximum (mg/kg)	Mean (mg/kg)	Standard deviation (mg/kg)
2,5-Cyclohexadiene-1,4-dione, 1,6-bi	1	4.1	4.1	4.10	^a
2-Methyl-2,3-pentanediol	1	0.43	0.43	0.430	^a
2-Nitro-phenol	7	0.4	3.2	1.06	1.04
4-Nitro-Phenol	2	0.4	0.71	0.555	0.219
Bis(2-ethylhexyl)phthalate	46	0.11	29.5	5.61	6.82
Butanenitrile, 4-(dimethylanino)	1	0.23	0.23	0.230	^a
Butylbenzyl phthalate	4	0.28	0.56	0.405	0.117
Di-n-butylphthalate	18	0.39	11	3.43	2.67
Fluoranthene	4	0.42	17	7.50	8.34
Phenol	3	2.8	4.8	3.77	1.00

a. Standard deviations cannot be calculated due to a sample size of one.

4.2.6 Preliminary Data Results and Sample Size Determination

The results of preliminary data are summarized in Table 4-3. Table 4-3 also identifies the number of drums to be sampled per the WAP. The sample size calculation performed did not include contaminants associated with EPA spent solvent hazardous waste codes. If the solvent code was already applied to the waste stream as part of the AK evaluation (because solvent codes are listed codes), the code remains with the waste stream. Therefore, no additional sampling is required to confirm the EPA hazardous waste code assignment for spent solvent contaminants. In addition, if a toxicity code had been assigned based on AK the sample size was not determined. The INEEL will assign the code. Based on the results given in Table 4-3, five drums require coring to confirm preliminary results.

Table 4-3. First/second-stage sludge waste analysis plan compliant sample size determination.

Analyte	Number of samples	Number of samples above MDL ^a	Minimum (mg/kg)	Maximum (mg/kg)	Mean (mg/kg)	Standard deviation (mg/kg)	RTL PRQL ^b (mg/kg)	Toxicity characteristic contaminant code	AK hazardous waste code assigned	WAP compliant sample size ^c
Volatiles	1,1-Dichloroethylene	73	2	0.415	3.7	0.557	0.386	14	D029	5
	1,2-Dichloroethane	73	0	0.415	1.08	0.508	0.083	10	D028	5
	Benzene	73	0	0.415	1.08	0.508	0.083	10	D018	5
	Carbon Tetrachloride	73	4	0.415	15	0.735	1.69	10	D019	F001 F002
	Chlorobenzene	73	0	0.415	1.08	0.508	0.083	10	D021	F002
	Chloroform	73	0	0.415	1.08	0.508	0.083	120	D022	5
	Methyl Ethyl Ketone	73	8	0.485	8.5	1.10	1.40	100	D035	5
	Pyridine	73	6	0.475	10	1.29	1.54	100	D038	5
	Tetrachloroethylene	73	5	0.415	2.95	0.577	0.335	10	D039	F001 F002
	Trichloroethylene	73	15	0.415	16.9	1.70	3.53	10	D040	F001 F002
	Vinyl Chloride	73	0	0.415	1.08	0.508	0.083	4	D043	5
SVs	2,4-Dinitrotoluene	73	0	0.06	0.65	0.087	0.07	2.6	D030	5
	1,4-Dichlorobenzene	74	0	0.019	7.5	0.155	0.866	40	D027	5
	Cresols	74	5	0.06	6.75	0.224	0.782	40	D026	5
	Hexachloroethane	74	0	0.02	8.5	0.172	0.982	60	D034	5
	Hexachlorobenzene	73	0	0.055	0.6	0.091	0.07	2.6	D032	5
	Nitrobenzene	74	2	0.038	7.5	0.184	0.881	40	D036	5
	Pentachlorophenol	74	0	0.09	9.5	0.263	1.09	2000	D037	5
Metals	Ag	75	64	0.25	550	122	147	100	D011	-
	As	75	48	0.7	38	4.37	5.29	100	D004	-
	Ba	75	75	7	290	43.4	41.4	2000	D005	-
	Cd	75	74	0.135	130	12.9	19.1	20	D006	-
	Cr	75	75	10	1700	198	225	100	D007	-
	Hg	75	32	0.044	14	1.11	2.33	4	D009	5
	Pb	75	74	2	3800	244	515	100	D008	-
	Se	75	7	0.47	1.5	0.656	0.27	20	D010	-

a. When a measurement is reported as below detection, one-half the analysis method detection limit (MDL) is used. Note that the MDL for a given analyte may vary from sample to sample.

b. For toxicity characteristic wastes, the TC limit expressed as the Regulatory Threshold Limit (RTL) is used. For listed wastes, the Program Required Quantitation Limit is used.

c. When all measurements for an analyte are below the detection level, the minimum sample size of five is used.

4.2.7 Non-Toxic Characteristic Analytes

For completeness, the summary statistics of non-toxic characteristic target analytes are given in Table 4-4 below.

Table 4-4. First/second-stage sludge summary statistics for analytes without regulatory thresholds.

	Analyte	Number of samples	Number of samples above MDL ^a	Minimum (mg/kg)	Maximum (mg/kg)	Mean (mg/kg)	Standard deviation (mg/kg)
Volatiles	1,1,1-Trichloroethane	73	19	0.415	1025	16.7	120
	1,1,2,2-Tetrachloroethane	73	3	0.415	5.45	0.646	0.755
	1,1,2-Trichloro-1,2,2-Trifluoroethane	73	3	0.415	171	2.89	20.0
	1,1,2-Trichloroethane	73	0	0.415	1.08	0.508	0.083
	Acetone	73	43	0.335	14.5	2.73	3.00
	Bromoform	73	0	0.415	1.08	0.508	0.083
	Butanol	73	45	0.55	39	3.36	4.99
	Carbon Disulfide	73	0	0.415	1.08	0.508	0.083
	Ethyl Ether	73	2	0.335	4	1.37	0.634
	Ethylbenzene	73	3	0.415	27	0.951	3.14
	Isobutanol	73	9	0.468	46.5	1.59	5.50
	m&p-Xylene	73	5	0.415	116	2.46	13.6
	Methanol	73	28	0.875	62.5	6.11	11.0
	Methylene Chloride	73	10	0.415	24.5	1.10	3.08
	o-Xylene	73	3	0.415	10.5	0.738	1.33
	Toluene	73	3	0.415	53	1.23	6.14
	Trichlorofluoromethane	73	0	0.453	10.8	4.29	1.91
SVs	2,4-Dinitrophenol	74	0	0.047	11	0.288	1.27
	ortho-Dichlorobenzene	74	0	0.028	6	0.138	0.692
Metals	Be	75	75	1.1	3400	617	823
	Ni	75	75	23	760	115	105
	Sb	75	46	0.55	79	10.7	16.2
	Tl	75	30	0.7	11	2.88	2.36
	V	75	75	3.6	150	25.2	27.8
	Zn	74	74	25	1600	245	263

a. When a measurement is reported as below detection, one-half the analysis method detection limit (MDL) is used. Note that the MDL for a given analyte may vary from sample to sample.

4.3 Waste Analysis Plan Compliant Drum Analysis/Confirmation of Hazardous Waste Codes Assigned

Based on the results given in Table 4-3, five drums required coring. Seven randomly selected drums from the First/Second-Stage SWS have been cored and analyzed (see Table 1-2) in accordance with the WAP. These drums were randomly selected from the entire waste stream. The final mean and variance estimates and the UCL_{90} for the mean concentration for each contaminant has been determined and reported in Table 4-5. As shown in Table 4-5 the solidified data results agreed well with the preliminary data and AK. The sample size determination are identical to the sample size determined with the preliminary data. Per the WAP, no additional sampling is required. In relation to AK, for those analytes whose UCL_{90} exceeded the regulatory threshold values the hazardous waste codes have already be added.

4.3.1 Metals Data Assessment

Four metals, Ag, Cd, Cr, and Pb were detected at concentrations which exceeded the regulatory threshold (shown in Table 4-3). In each case, the appropriate toxicity code has been previously assigned based on AK. For the remaining metal analytes, the UCL_{90} could not be determined (see Table 4-5, footnote b) or were at least an order of magnitude below the RTL. As a results, no hazardous waste codes are assigned based on WAP compliant sampling and analysis.

4.3.2 Semivolatile Organic Compound Data Assessment

The UCL_{90} value could not be determined for toxicity SVOC's (see Table 4-5, footnote b). This is consistent with AK. As a result, no hazardous waste codes are assigned based on WAP compliant sampling and analysis.

4.3.3 Purgeable Volatile Organic Assessment

The UCL_{90} value could not be determined for toxicity VOC's. No hazardous waste codes will be assigned based on WAP compliant sampling and analysis (see Table 4-5, footnote b). However, AK has assigned F001/F002 code for carbon tetrachloride, chloroform, tetrochloroethylene, and trichloroethylene. These codes will not be changed.

4.3.4 Nonhalogenated Volatile Organic Compound Assessment

The UCL_{90} value could not be determined for toxicity NH VOC's (see Table 4-5, footnote b). No hazardous codes will be assigned based on WAP compliant sampling and analysis.

4.3.5 Waste Analysis Plan Compliant Non-Characteristic Analytes

For completeness, the summary statistics of non-toxic characteristic target analytes are given in Table 4-6.

Table 4-5. Waste analysis plan compliant data analysis for first/second-stage sludge.

Table 4-5. Waste analysis plan compliant data analysis for first second-stage sludge.												
	Analyte	Number of samples	Number of samples above MDL ^a	Minimum (mg/kg)	Maximum (mg/kg)	Mean (mg/kg)	Standard deviation (mg/kg)	Upper 90% confidence limit (mg/kg)	RTL PRQ L (mg/kg) ^c	Toxicity characteristic contaminant code	AK hazardous waste code assigned	WAP compliant sample size ^d
Volatiles	1,1-Dichloroethylene	7	0	0.095	0.12	0.109	0.008	^b	14	D029		5
	1,2-Dichloroethane	7	0	0.095	0.12	0.109	0.008	^b	10	D028		5
	Benzene	7	0	0.095	0.12	0.109	0.008	^b	10	D018		5
	Carbon Tetrachloride	7	1	0.095	4.8	0.779	1.77	^b	10	D019	F001 F002	-
	Chlorobenzene	7	0	0.095	0.12	0.109	0.008	^b	10	D021	F002	-
	Chloroform	7	0	0.095	0.12	0.109	0.008	^b	120	D022		5
	Methyl Ethyl Ketone	7	0	1.1	2.15	1.79	0.381	^b	100	D035		5
	Pyridine	7	0	0.75	1.5	1.26	0.271	^b	100	D038		5
	Tetrachloroethylene	7	1	0.105	0.8	0.210	0.260	^b	10	D039	F001 F002	-
	Trichloroethylene	7	1	0.105	0.36	0.147	0.094	^b	10	D040	F001 F002	-
	Vinyl Chloride	7	0	0.095	0.12	0.109	0.008	^b	4	D043		5
SVs	1,4-Dichlorobenzene	7	0	0.12	0.12	0.120	0	^b	40	D027		5
	2,4-Dinitrotoluene	7	0	0.075	0.075	0.075	0	^b	2.6	D030		5
	Cresols	7	0	0.115	0.115	0.115	0	^b	40	D026		5
	Hexachlorobenzene	7	1	0.11	0.78	0.206	0.253	^b	2.6	D032		5
	Hexachloroethane	7	0	0.12	0.12	0.120	0	^b	60	D034		5
	Nitrobenzene	7	0	0.12	0.12	0.120	0	^b	40	D036		5
	Pentachlorophenol	7	0	0.05	0.05	0.050	0	^b	2000	D037		5
Metals	Ag	7	7	9.4	200	103	72.5	142	100	D011	D011	-
	As	7	7	0.87	3.3	1.77	0.907	2.27	100	D004	D004	-
	Ba	7	7	28	97	45.7	25	59.3	2000	D005	D005	-
	Cd	7	7	0.47	210	38.2	76.4	79.8	20	D006	D006	-
	Cr	7	7	14	290	171	101	225	100	D007	D007	-
	Hg	7	4	0.065	2.1	0.611	0.772	1.24	4	D009		5
	Pb	7	7	12	2500	632	947	1147	100	D008	D008	-
	Se	7	3	0.16	0.49	0.287	0.160	0.461	20	D010	D010	-

a When a measurement is reported as below detection, one-half the analysis method detection limit (MDL) is used. Note that the MDL for a given analyte may vary from sample to sample.

b The mean and standard deviation presented are the mean and standard deviation of the method detection limits (after dividing by 2) since all measurements (or all but one) are below detection. Therefore, there are no degrees of freedom associated with the t statistic and the upper 90% confidence limit cannot be calculated.

c For toxicity characteristic wastes, the TC limit expressed as the Regulatory Threshold Limit (RTL) is used. For listed wastes, the Program Required Quantitation Limit (PRQL) is used.

d When all measurements for an analyte are below the detection level, the minimum sample size of five is used.

Table 4-6. First/second-stage sludge summary statistics for analytes without regulatory thresholds.

	Analyte	Number of samples	Number of samples above MDL ^a	Minimum (mg/kg)	Maximum (mg/kg)	Mean (mg/kg)	Standard deviation (mg/kg)	Upper 90% confidence limit (mg/kg)
Volatiles	1,1,1-Trichloroethane	7	3	0.105	3	0.804	1.09	1.99
	1,1,2,2-Tetrachloroethane	7	0	0.095	0.12	0.109	0.008	b
	1,1,2-Trichloro-1,2,2-Trifluoroethane	7	0	0.095	0.12	0.109	0.008	b
	1,1,2-Trichloroethane	7	0	0.095	0.12	0.109	0.008	b
	Acetone	7	0	0.445	0.9	0.735	0.156	b
	Bromoform	7	0	0.095	0.12	0.109	0.008	b
	Butanol	7	0	3.35	6.5	5.36	1.13	b
	Carbon Disulfide	7	0	0.095	0.12	0.109	0.008	b
	Ethyl Ether	7	0	0.55	1.05	0.879	0.182	b
	Ethylbenzene	7	0	0.095	0.12	0.109	0.008	b
	Isobutanol	7	0	1.5	3	2.46	0.534	b
	m&p-Xylene	7	1	0.19	0.5	0.259	0.107	b
	Methanol	7	3	0.95	7.8	3.54	3.11	6.93
	Methylene Chloride	7	1	0.095	0.28	0.134	0.065	b
	o-Xylene	7	0	0.095	0.12	0.109	0.008	b
	Toluene	7	1	0.095	0.26	0.131	0.058	b
	Trichloromonofluoromethane	7	0	0.19	0.24	0.220	0.016	b
SVs	2,4-Dinitrophenol	7	0	0.01	0.01	0.010	0	b
	ortho-Dichlorobenzene	7	0	0.115	0.115	0.115	0	b
Metals	Be	7	7	48	2600	895	1055	1469
	Ni	7	7	9.7	310	177	90.2	226
	Sb	7	7	1.2	120	29.3	45.1	53.8
	Tl	7	5	0.24	4.7	1.87	1.89	3.17
	V	7	7	7.9	21	13.7	4.37	16.1
	Zn	7	7	18	1500	392	506	668

d. When a measurement is reported as below detection, one-half the analysis method detection limit (MDL) is used. Note that the MDL for a given analyte may vary from sample to sample.

e. The mean and standard deviation presented are the mean and standard deviation of the method detection limits (after dividing by 2) since all measurements (or all but one) are below detection. Therefore, there are no degrees of freedom associated with the t statistic and the upper 90% confidence limit cannot be calculated.

4.3.6 Tentatively Identified Compound Assessment

Given in Table 4-7 is a TIC summary for total SVOC compounds. No Appendix VIII VOC TICs were identified.

Table 4-7. Total semivolatile organic compound summary data tentatively identified compounds.

TIC	Maximum Observed Estimated Concentrations (mg/kg)	# of Samples Containing TIC	% Detected ^a
Bis(2-ethylhexyl)phthalate	3.50	6	86
Fluoranthene	9.50	3	43
Pentachorobenzene	0.36	1	14
Phenanthrene	1.10	2	18
Phenol	0.67	1	14
Phenol,2-Nitro-	0.40	1	14
Pyrene	0.20	1	14
Did the data verify the AK? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>			
If no, describe the basis for assigning the EPA Hazardous Waste Codes: N/A			

- a. All of the TICs listed in the above table appear in 40 CFR § 261, Appendix VIII. However, none of these compounds will be added to the target list for this waste stream or will have hazardous waste numbers added. There is no additional solids sampling and analyses planned for this waste stream, therefore new target analytes cannot be added. The hazardous waste codes associated with these TICs are all either K codes (Hazardous waste from specific sources) or U codes (discarded commercial chemical products). These codes are not applicable to waste generated at RFP.

5. NONCONFORMANCES

During the generation of the WAP compliant data, there were four NCRs generated: NCR 20694, 21492, 21262, and 21715. Three errors were identified with the sampling documentation associated with Argonne National Laboratory West (ANL-W) sampling batch WCS-00-0002 resulting in NCRs 20694, 21492, and 21715. These errors have been corrected and the NCR dispositioned "use-as-is". There is no impact to data use ability. The remaining NCR, NCR 21262, dealt with the RT window for GC analysis. Retention time windows for GC analysis method ACMM-9441 (NH VOCs) used for analysis of samples in Data Report ACL0003N (analytical batch number 00101710) were not determined in accordance with Plan (PLN)-190 and WIPP WAP requirements. PLN-190 and the WAP require that RT windows be determined as plus/minus 3 standard deviations around the mean ICAL standard RTs. Retention times windows calculated by this method are impossibly narrow and cannot be met. The RT windows used were determined per ACMM-9441 by EPA SW-846 recommended protocol, using three standards analyzed over a period of 72 hours. The RT windows were set at plus/minus 3 standard deviations around the mean RT of these three standards for each analyte. Samples were successfully analyzed within the SW-846-determined RT windows.

The WAP requirements for the RT window determination are ambiguous. Use of SW-846 methods is required. Continuing calibration verification (CCV) RT requirements given in Tables B3-5 and B3-7 state that CCV RTs must be within 3 standard deviation from the ICAL. This issue was first identified during the gap analysis performed on WAP requirements in October 1999. ACMM-9441 was revised to comply with SW-846 RT widow determination requirements. This NCR was closed on December 04, 2000. The RT window determination was compliant with Item 9 of the November 28, 2000 Class 1 modification of the WAP. There is no impact to data usability.

6. IMPLICATIONS AND FUTURE ACTIONS

Given the consistency between the preliminary data, AK, and WAP compliant data, the INEEL intends to assign hazardous waste codes for subsequent waste streams based on pre-WAP preliminary data. Use of preliminary data in this manner is believed to be acceptable after assessing for adequacy. Section B2-2a of the WAP states:

The preliminary estimates will be made by obtaining a preliminary number of samples for the waste stream or from previous sampling from the waste stream. Preliminary estimates will be based on samples from a minimum of 5 waste containers. Samples collected to establish preliminary estimates that are selected, sampled, and analyzed (in accordance with applicable provisions of the WAP) may be used as part of the required number of samples to be collected. The applicability of the preliminary estimates to the waste stream to be sampled shall be justified and documented.

WAP Attachment B2 goes on to state:

Upon collection and analysis of the preliminary samples, or at any time after the preliminary samples have been analyzed, the generator/storage site may assign hazardous waste codes to a waste stream. For waste streams with calculated upper confidence limits below the regulatory threshold, the site shall collect the required number of samples if the site intends to establish that the constituent is below the regulatory threshold.

This requirement states that the "required number of samples" must be collected if the generator site "intends to establish that the constituent is below the regulatory threshold." The WAP does not require collection of additional samples when considering constituents that preliminary data indicate are at or above the regulatory threshold, or for constituents where the preliminary data show concentrations below the regulatory threshold for which the site has no intention of establishing that result. In such a case, the waste may still be declared hazardous for the constituent consistent with RCRA regulations. In addition a WIPP WAP hotline question was submitted asking for concurrence with the above interpretation. The response is given below:

Yes, it is acceptable to use the existing preliminary data as the basis for confirming EPA hazardous waste codes. If the waste is determined to be hazardous based on the preliminary data (TRU-mixed) no further sampling is required. However, if the site wishes to demonstrate that the waste is non-hazardous (not TRU-mixed), then a minimum number of samples must be obtained in accordance with WAP equation B2-7.

Therefore, the INEEL TWCP intends to use existing data for subsequent waste streams as the basis for confirming EPA hazardous waste codes.

7. CONCLUSIONS

The pre-WAP data have been found to correlate extremely well with AK and the WAP compliant data. The INEEL has established that the hazardous waste codes assigned to First/Second-Stage SWS are accurate and complete.

8. REFERENCES

AKWSS-99-003, INEEL. Acceptable Knowledge Waste Stream Summary First/Second Stage Sludge. 7/13/99.

EPA NO. NM4890 139088, WIPP Part B Permit

INEEL-96/0280, AK Document for INEEL Stored Transuranic Waste Rocky Flats Plant Waste

DOE/LLW-2 17, DOE Waste Treatability Group Guidance

EDF-805, Matrix Parameter Category Groups

EDF-922, Identification of Transuranic Waste Streams

EDF-909, Transuranic Waste Sampling Plan for INEEL

EDF-803, Chemical Constituents in Transuranic Storage Area (TSA) Waste

EDF-363, Description of the SWEPP Certified Waste Sampling Program

MCP-2525, Drum Core Sample Plan

9. APPENDICES

Appendix A Detailed Preliminary Data Assessment

Appendix B Metals Back-up Data

Appendix C Semivolatile Organic Compound Back-up Data

Appendix D Volatile Organic Compound Back-up Data

Appendix E Nonhalogenated Volatile Organic Compound Back-up Data

Appendix A

Detailed Preliminary Data Assessment

Detailed Preliminary Data Assessment

Preliminary data generated under the Quality Assurance Program Plan (QAPP) and prior to the final Waste Analysis Plan (WAP) has been assessed. Per the WAP, preliminary data provides an estimated of additional sampling required to characterize a waste stream. The preliminary data assessed in this section will be used to estimate additional WAP compliant sampling. The waste stream addressed by this preliminary data is the First/Second-Stage SWS, Item Description Codes (IDC's) 001, 002, and 800.

Preliminary data were generated using the same SW-846 methods used to generate the WAP compliant data discussed in the body of this document. Precision and accuracy performance indicators are addressed individually in the following sub-sections by analytical method, such as, metals, semi-volatile organic compounds (SVOC's), total volatile organic compound (VOC's), and non-halogenated (NH) VOC's. The indicators include matrix independent, such as, laboratory control samples (LCS) and matrix dependent performance indicators, that is, matrix spikes (MS), matrix spike duplicates (MSDs) and surrogates (where applicable). Recoveries were compiled and average recoveries calculated by analyte as well as relative percent differences (RPDs) as appropriate. Error bars associated with the recovery averages were set at one standard deviation. These data are provided in tables and figures throughout Appendices A through E.

A-1. PRELIMINARY METALS DATA: DATA USE ASSESSMENT

As expected, several metals were detected at significant quantities throughout the preliminary data set associated with this waste stream. The data has been assessed from a waste stream perspective, that is, waste stream averages for the performance indicators were assessed for overall use of the data. Data results for individual elements whose averages and associated error indicated a potential bias are discussed individually and compared to AK expectations wherever possible.

The MS/MSD and LCS results discussed are summarized using a combination of tables and graphs. Figure M-1 depicts the average percent recoveries of each element for the MS/MSD pairs. The RPD for the MS/MSDs are included. The LCS results are illustrated in Figure M-2 and summarized in Table M-1. The data used to generate these graphs are presented by element in Table M-2. A standard deviation was determined and an error bar tied to each average data point.

Table M-1. Analytical Chemistry Laboratory metals quality control average percent recovery of metals matrix spikes and matrix spike duplicates.

Element	MS/MSD (% Recovery)	MS/MSD Standard Deviation	RPD	Data Points (n)
Sb	67.5	15.08	10.3	30
As	98.1	6.1	3.10	30
Ba	98.0	4.7	2.93	30
Be	136.4	173.0	5.87	30
Cd	81.7	24.6	8.54	30
Cr	102.3	49.9	7.66	30
Pb	90.3	28.9	8.13	30
Hg	99.5	17.7	4.06	30
Ni	86.6	18.1	6.07	30
Se	97.2	7.0	5.65	30
Ag	99.4	12.0	4.33	30
Tl	79.2	7.3	2.71	30
V	93.5	3.3	2.16	30
Zn	104.6	36.1	5.89	30

Table M-2. Analytical Chemistry Laboratory metals quality control average percent recovery of laboratory control samples.

Element	LCS (% Recovery)	LCS Standard Deviation	Data Points (n)
Sb	106.2	35.7	35
As	100.5	6.0	37
Ba	96.2	11.2	37
Be	100.8	5.6	37
Cd	101.4	9.5	37
Cr	99.2	6.7	37
Pb	101.3	8.2	37
Hg	112.7	8.1	22
Ni	100.8	6.8	37
Se	102.0	6.2	37
Ag	100.6	6.6	37
Tl	99.0	12.8	37
V	101.4	8.0	37
Zn	102.5	12.3	37

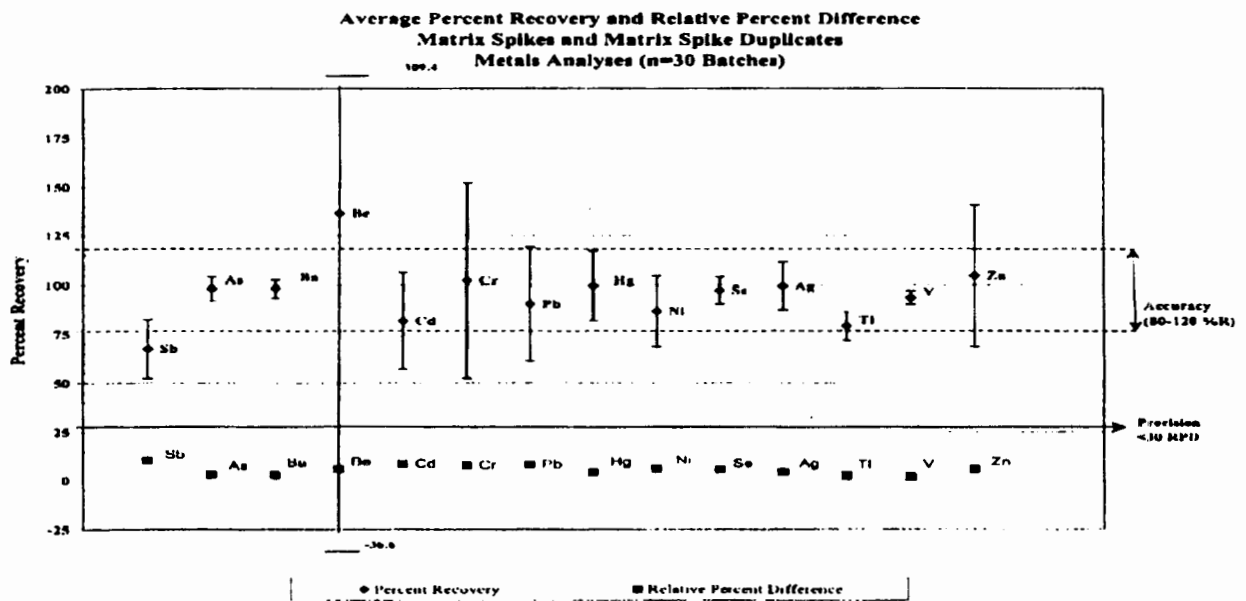


Figure M-1. Average percent recovery and relative percent difference matrix spikes and matrix spike duplicates metals analyses

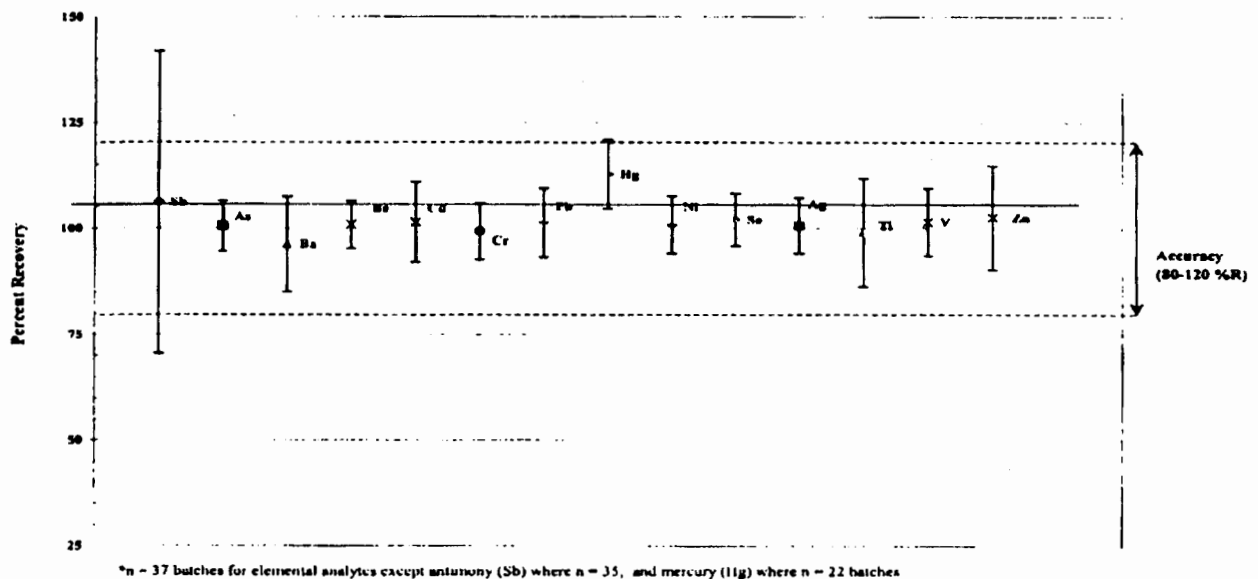


Figure M-2. Average percent recovery laboratory control samples metals analyses.

The detailed Quality Control (QC) data by element are provided in Appendix B, Table B-1 for the MS/MSD and LCS data. The summary provided by Table B-1, Appendix B, allows a quick view of all the data associated with each element. Those data that individually did not meet WAP criteria are bolded.

Elements that reflected problems from a waste stream average perspective are discussed in Section A-1.1, first, from the matrix effects indicated, and second from a laboratory control perspective. Data use conclusions are included where appropriate.

A-1.1 Preliminary Metals Data: Matrix Spike/Matrix Spike Duplicate Data Assessment

Table M-1 reflects the calculated averages (herein referred to as the waste stream average) with the associated error, and RPDs associated with the MS/MSD results by element. Fifteen MS/MSD pairs, or 30 data points, were used to calculate these averages. While MS/MSDs were run for every batch, the MS/MSDs from solidified wastes other than IDC's 001, 002, or 800 were not considered in this assessment. The data and associated error bars are represented in Figure M-1 by element, with the WAP acceptance limits indicated. Figure M-1 includes the acceptance limits for both recovery and RPD. Note that if the average RPD is below the acceptance limit shown on the graph, the data meet RPD criteria. Elements that, based on the MS/MSD average recoveries and/or associated error bars, do not meet the WAP criteria are discussed individually below. The base assumption is a bias is indicated if either the average or the error bar fall outside the WAP limits.

Antimony (Sb), which is not a toxicity characteristic (TC) element, is biased low (see Figure M-1). As shown, the waste stream MS/MSD average and associated error fall below the WAP acceptance criteria. Analysis of this element is difficult and recovery problems are not an uncommon occurrence. The summarized data in Appendix B, Table B-1 for Sb reflects that this element is problematic across all batches. The Sb data has a potential 30-50% low bias due to matrix effects. However, because this element does not effect the characterization of this waste stream from a waste stream profile perspective (such as, force the consideration of a RCRA code addition), no further discussion is necessary.

Beryllium (Be), also not a TC element, MS/MSD data reflect a large standard deviation (therefore a large error bar) and an average above the WAP criteria. The reason for this apparent variability in the recovery data is the concentration levels of Be found in the spiked samples. The concentration of Be in the samples spiked for MS/MSDs was significantly higher (> 4 times the spiking level -commonly referred to as the 4X rule) than the spike concentration. Because of this, the spikes are essentially hidden by the Be concentration in the sample. The Functional Guidelines recognizes this consequence of high sample analyte concentrations, and when the 4X rule applies to MS/MSD results, data is accepted "as-is" with no data use flag applied. Therefore, these data are sound for this intended use and may be used "as-is".

Cadmium (Cd) MS/MSD data reflect a possible low bias as indicated by the fact that the error bar falls below the WAP criteria. However, the waste stream MS/MSD average is within the WAP limit. Since this element was detected in the samples [the mean sample concentration for the whole waste stream is at approximately 1/2 of the regulatory threshold limit (RTL)], and the MS/MSD data indicate a low bias, the data should be considered carefully (such as, possibly adding the D006 code). The addition of the code could negate the need for additional sampling and is an expected code per AK. The WAP compliant data will verify whether the code should be added.

Chromium (Cr) MS/MSD data reflects a fairly high variance as indicated by the error bar associated with the average. The waste stream average MS/MSD recovery is well within the WAP criteria. The levels of Cr in the samples that were spiked is significant, and was often present at >4X the spiking levels, which would account for the spread in the data. High background levels of a target analyte will mask added spikes that are <4 times the background level. As stated previously, data may be used "as is" when MS/MSD recovery problems are due to high background levels of the analyte. These data are appropriate for preliminary data use. The mean concentration of Cr in the waste stream exceeds the TC limit and based on this preliminary data the D007 code should be added. The WAP compliant data and AK will be used to verify this conclusion.

The MS/MSD lead (Pb) waste stream average recovery is within the WAP criteria. Low bias is indicated since the lower end of the error bar falls below the criteria. The concentration of Pb in the spiked samples often exceeded 4 times the spiking level as well, which results in a recovery problem. The spike added was masked by a high background concentration of the analyte. The mean Pb concentration in the preliminary data exceeded the RTL. Therefore, the D008 code would apply. The WAP compliant drum data will be used to verify this conclusion which is consistent with AK expectations.

Nickel (Ni) is not a toxicity characteristic element. The average MS/MSD recovery is within the WAP criteria. The error associated with the average indicates a low bias, approximately 10%. Since this element is not a TC element, the low bias has no negative impact on data use.

The average recovery for zinc (Zn) falls within the WAP criteria. The error associated with the average extends outside the WAP criteria on both the high and low ends of the range. This is due to the fact that Zn concentrations in many of the spiked samples were significantly ($> 4X$) higher than the spiking levels. Since it is not a TC element, no further discussion is necessary.

As reflected Figure M-1, the RDPs meet the WAP precision criteria for every element.

A-1.2 Preliminary Metals Data: Laboratory Control Sample Assessment

The WAP, Table B3-8 footnote b, allows the laboratory to establish acceptance criteria for solidified waste LCSs. That is to say that solid LCS samples are not held to the $\pm 20\%$ criteria. While Figure M-2 uses the $\pm 20\%$ criteria for result comparison purposes, this figure must be interpreted carefully. Every LCS result generated by the laboratory for this preliminary data was within the laboratory established acceptance criteria, as allowed by the WAP. These data indicate that the laboratory was operating in control during the analysis of all the preliminary samples associated with the wastewater treatment SWS.

A-2 Preliminary Semivolatile Organic Compound Data: Data Use Assessment

The SVOC data have been assessed from a waste stream perspective, such as, waste stream averages, for the performance indicators MS/MSD and LCS. The performance of these indicators will demonstrate whether the preliminary SVOC data can be used for an assessment of additional sampling needs and/or waste stream profile conclusions. Data results for individual compounds whose averages indicate a potential bias, such as, the averages and/or associated error fall outside the WAP criteria, are discussed individually and compared to AK expectations wherever possible.

The MS/MSD and LCS are summarized using a combination of tables and graphs. The average data used to generate the MS/MSD graphs, Figures SV-1 and SV-2 are presented in Table SV-1. The figures contain the percent recoveries for the MS/MSDs and the RPDs respectively. The LCS results are illustrated in Figure SV-3 and summarized in Table SV-2. The data used to generate the LCS and MS/MSD graphs are presented by compound in Appendix C, Table C-1. The summary provided by Table C-1, Appendix C, allows a quick view of all the data associated with each compound. Those data that individually did not meet WAP criteria are bolded.

Table SV-1. Analytical Chemistry Laboratory semivolatile organic compounds quality control average percent recovery of volatile organic compounds matrix spike/matrix spike duplicates.

Compound	% Recovery	MS/MSD	RPD	Spikes (n)
	MS/MSD	Standard Deviation		
1,4-Dichlorobenzene	48.1	15.5	24.4	20
2,4-Dinitrotoluene	56.4	12.9	25.9	20
Hexachloroethane	50.5	16.6	24.5	20
Nitrobenzene	50.5	17.0	26.3	20

Table SV-2. Analytical Chemistry Laboratory semivolatile organic compounds quality control average percent recovery of semivolatile organic compounds laboratory control samples.

Compound	% Recovery LCS	LCS Standard Deviation	Count (n)
1,4-Dichlorobenzene	96.7	19.1	21
2,4-Dinitrophenol	106.5	4.9	2
2,4-Dinitrotoluene	87.0	18.4	21
Hexachlorobenzene	95.4	3.7	2
Hexachloroethane	96.6	15.8	21
m/p-Methylphenol	92.5	3.5	2
Nitrobenzene	92.0	22.0	22
o-Methylphenol	98.7	8.5	3
o-Dichlorobenzene	95.9	4.0	3
Pentachlorophenol	100.0	26.7	3

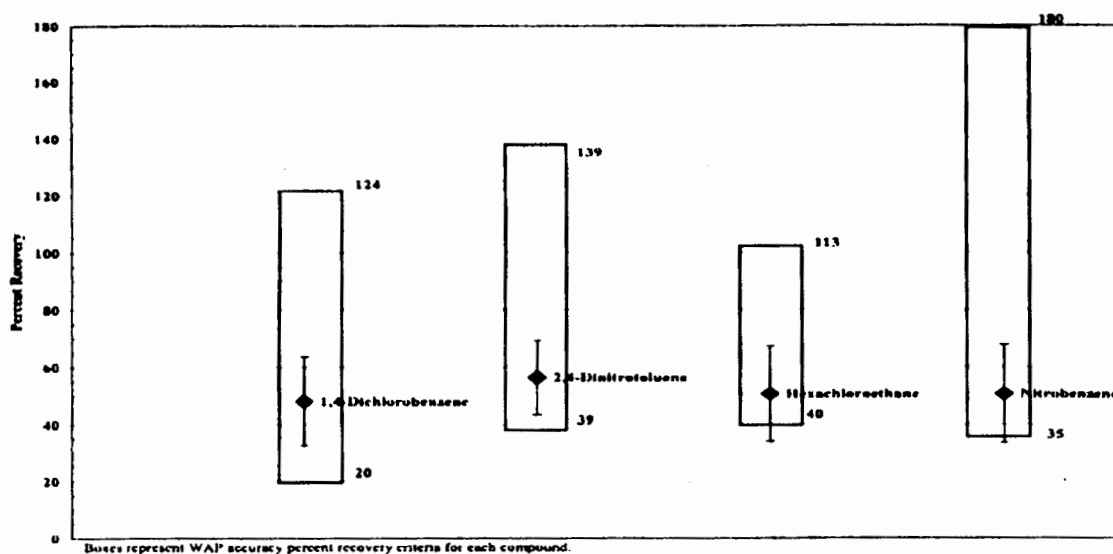


Figure SV-1. Average percent recovery matrix spike/matrix spike duplicates semivolatile organic compounds analyses (n=20).

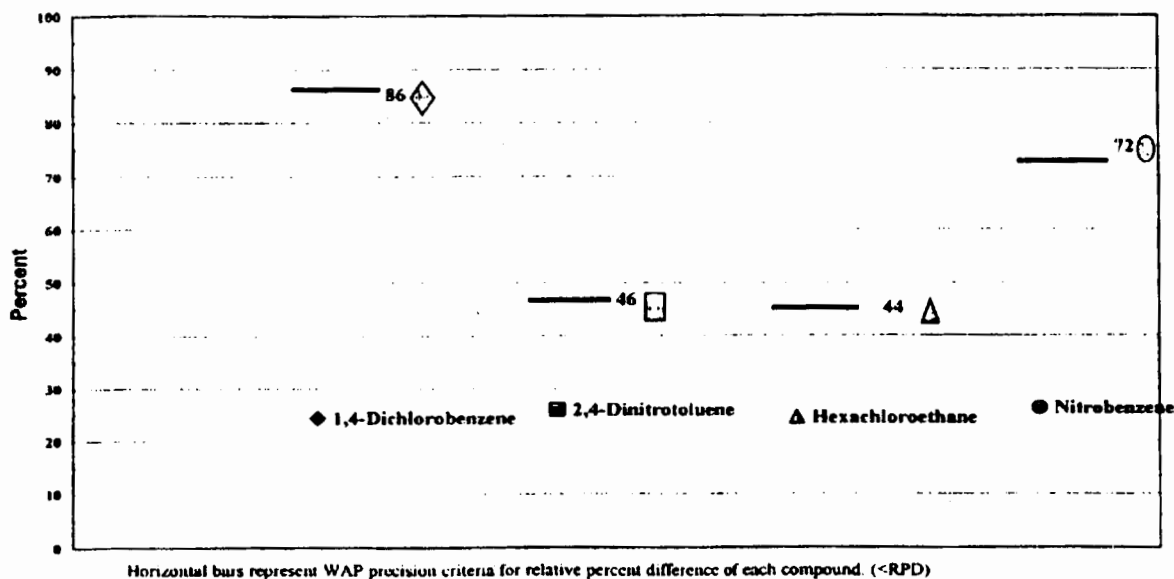


Figure SV-2. Average relative percent difference matrix spike/matrix spike duplicates semivolatile organic compounds analyses (N=20).

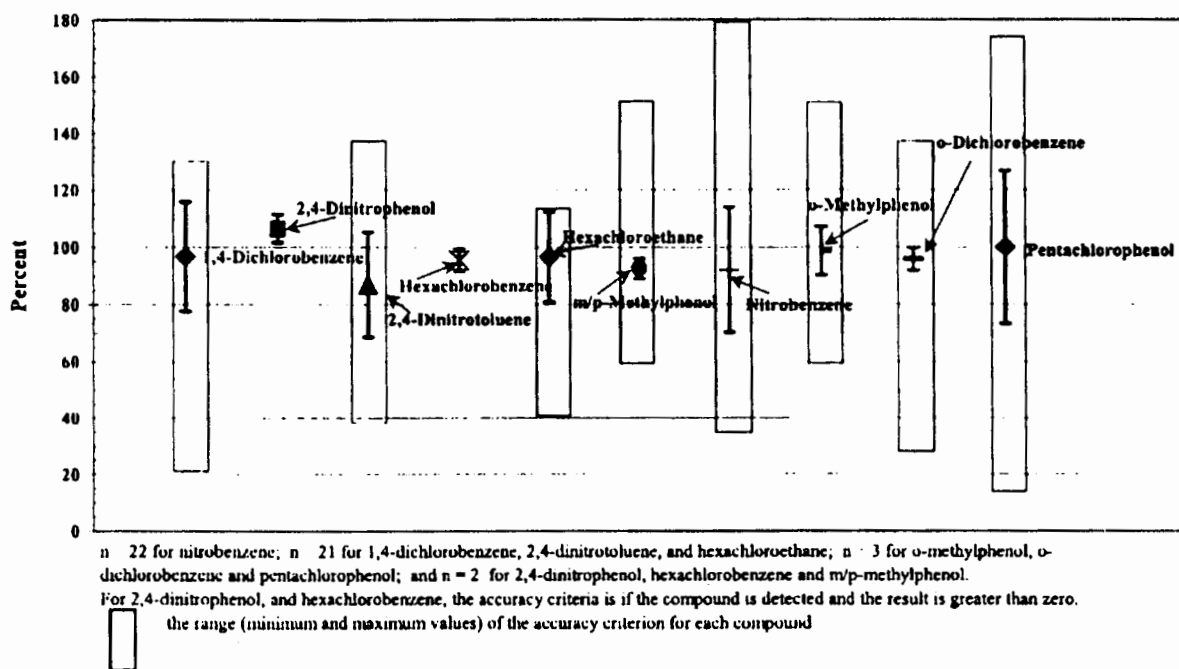


Figure SV-3. Average percent recovery laboratory control samples semivolatile organic compound analyses.

Compounds that reflected problems from a waste stream average perspective are discussed individually below, first, from the matrix effects indicated, and second from a laboratory control perspective.

A-2.1 Preliminary Semivolatile Organic Compound Data: Matrix Spike/Matrix Spike Duplicates Data Assessment

All the average MS/MSD data points were within the WAP criteria for each spiked compound. All of the RPD averages met criteria, as shown Figure SV-2. Figure SV-1 shows a potential low bias due to the error associated with the hexachloroethane MS/MSD average data. This low bias was the result of low recoveries in Batches ACL96005SV, ACL97004SV, and ACL97009SV.

Hexachloroethane MS/MSD performance data reflecting a low bias is summarized below. The sample results for this analyte were all non-detects. The mean sample-specific detection limit concentration of this compound in the waste stream is three orders of magnitude below the RTL. Based in this performance indicator, the data are appropriate for use as preliminary data for the assessment of sampling requirements. Batches that indicated a matrix effect are addressed below:

- Batch ACL96005SV – The MS/MSD average recovery was within WAP limits, but the error bar fell below the criteria. The potential low bias is approximately 10%. The sample results for this compound were all non-detects. Holding times were exceeded from extraction to analysis (by 20 days). However, since the hexachloroethane data from this batch are comparable to data generated in other batches, the bias appears to be independent of the holding time issue. The probability of analyte loss from the extract is low, and therefore the data are appropriate for use as preliminary data.
- Batch ACL97004SV – This batch reflects an approximate 5-12% low bias on the MS/MSD; all samples in the batch were non-detects. The data are useable as preliminary data.
- Batch ACL97009SV – the MS/MSD data was biased low by 3-10%. All samples in this batch were non-detects for this compound. The data are useable as preliminary data.

The RPD averages, as shown in Figure SV-2, for the MS/MSDs meet the WAP criteria without exception. Note that if the averages are below the solid lines on the graph, the compound RPD is acceptable.

A-2.2 Preliminary Semivolatile Organic Compound Data: Surrogate Compound Data Assessment

The surrogate averages from IDC 001, 002, and 800 samples are addressed in the following section by surrogate compound. Table SV-4 summarizes and Figures SV-4 through SV-7 illustrate surrogates nitrobenzene-d5 (NBZ), 2-fluorobiphenyl (FBP), 2-fluorophenol (2FP), and 2,4,6-tribromophenol (TBP), respectively. The data were compiled, the mean and standard deviation determined, and acceptance limits set at 3 sigma. The NBZ surrogate recoveries fall within the established criteria for all batches. Surrogates for which some data points fell outside the acceptance criteria are addressed individually below.

Surrogate FBP recoveries, Figure SV-5, fell within the 3 sigma acceptance criteria with the exception of one data point which fell just above the upper limit. Since the bias indicated by this is high (the data point could be an outlier), use of the data is conservative.

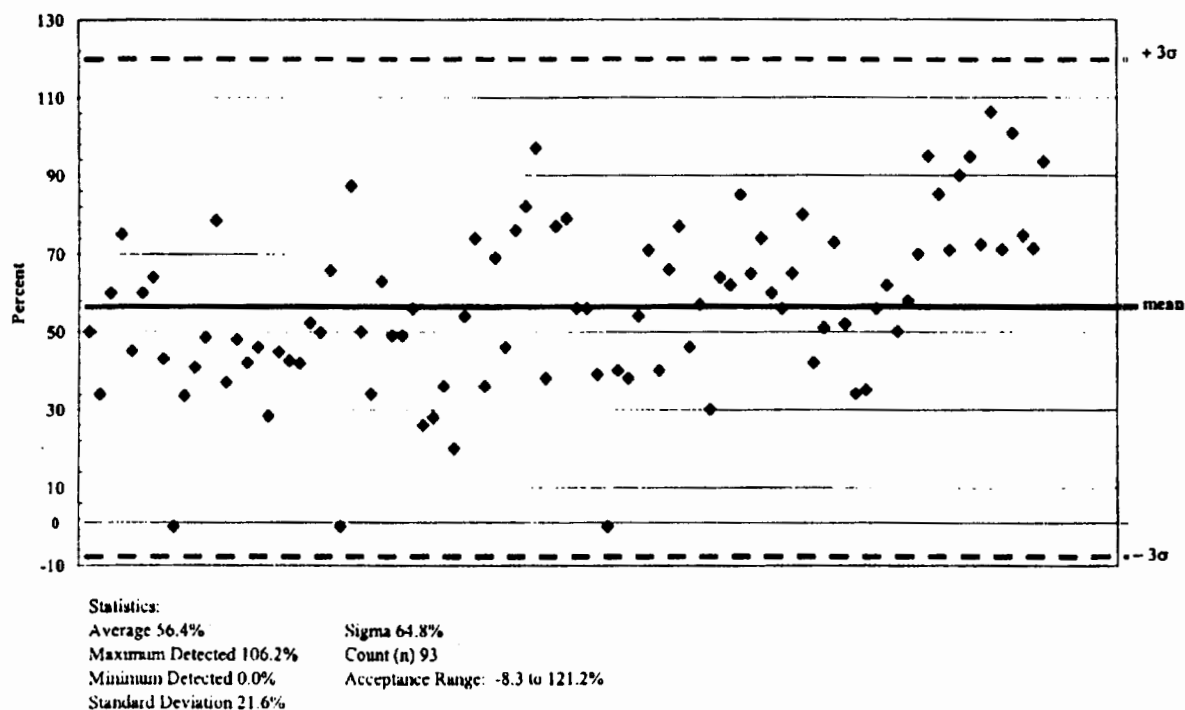


Figure SV-4. Average percent recovery of semivolatile organic compound analyses surrogate Nitrobenzene-d5 (NBZ).

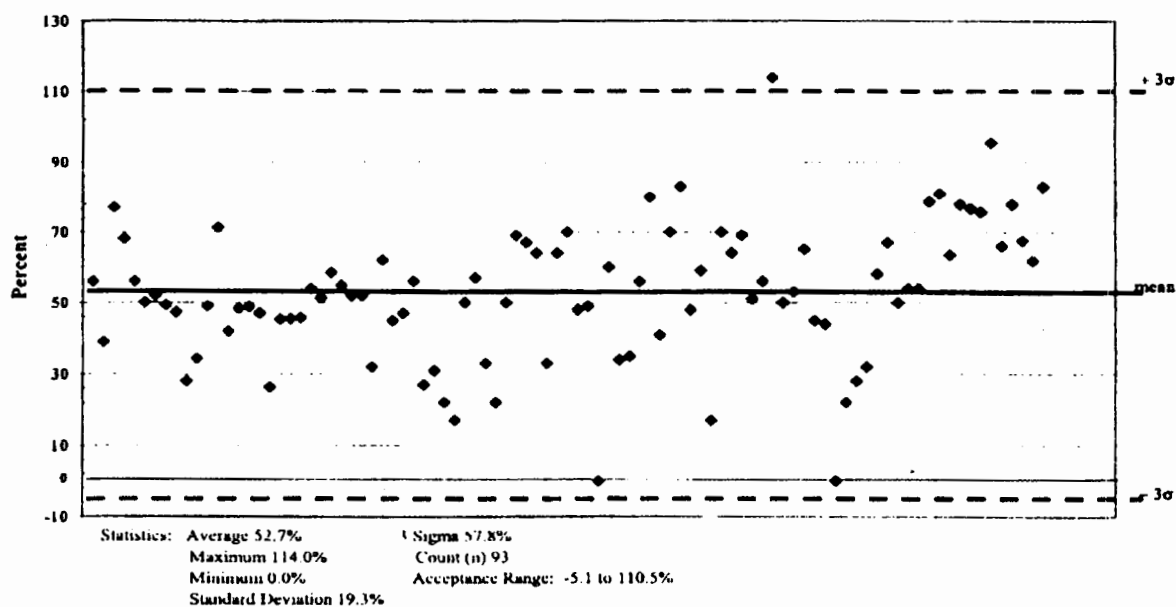


Figure SV-5. Average percent recovery of semivolatile organic compound analyses surrogate 2-Fluorobiphenyl (FBP).

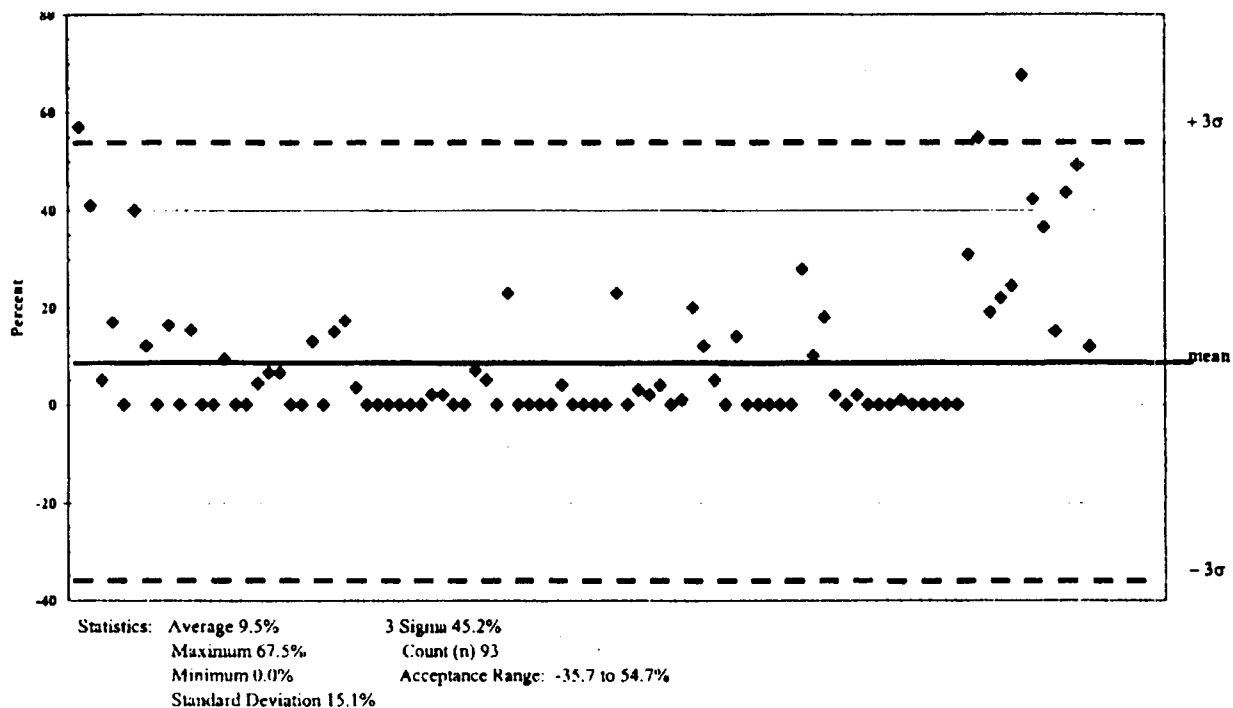


Figure SV-6. Average percent recovery of semivolatile organic compounds analyses surrogate 2-Fluorophenol (2FP).

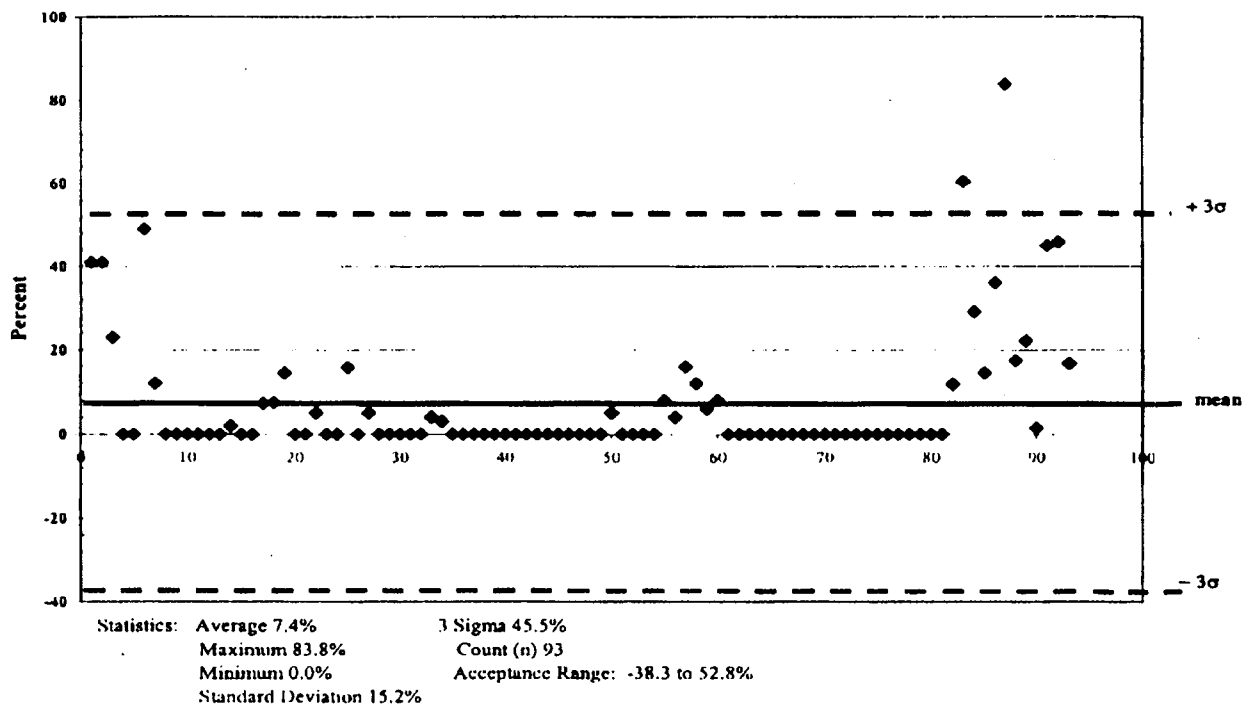


Figure SV-7. Average percent recovery of semivolatile organic compound analyses surrogate 2,4,6-Tribromophenol (TBP).

Recovery of surrogate 2FP was generally low as shown in Figure SV-6. The established acceptance criteria, per the WAP, falls below 0%, indicating that the low bias is expected and acceptable. Three data points actually fall above the upper acceptance criteria value, indicating some high bias in the data. However, the general trend, while acceptable, was low recovery of this surrogate. Phenol data could be biased low in general for this waste stream.

Figure SV-7 details the performance of TBP. The general bias for this surrogate is low, however, all recoveries fall within the 3 sigma acceptance criteria established for this data. Two data points actually fell above the +3 sigma criteria. However, because the recoveries, while acceptable, were generally low, all phenols may be biased low for this waste stream.

A-2.3 Preliminary Semivolatile Organic Compound Data: Laboratory Control Sample Data Assessment

All averages and associated standard deviations for the LCS, as shown in Appendix B, Figure SV-3, meet the WAP criteria.

A-3. Preliminary Purgeable Volatile Organic Compound Data: Data Use Assessment

The purgeable VOC data have been assessed from a waste stream perspective, such as, waste stream averages, for the performance indicators MS/MSD, LCS, and surrogates. The performance of these indicators will demonstrate whether the preliminary VOC data can be used to assess additional sampling needs and/or impacts to the waste stream profile. Data results for individual compounds whose averages indicate a potential bias, such as., the averages and associated error bars fall outside the WAP criteria, are discussed individually and compared to AK expectations wherever possible.

The MS/MSD and LCS results discussed in this appendix are summarized using a combination of tables and graphs. The average data used to generate the MS/MSD graph, Figure V-1, are presented in Table V-1. Figure V-2 reflects the RPD results for the MS/MSD averages. The LCS results are illustrated in Figure V-3 and summarized by compound in Table V-2. The data used to generate these graphs are presented by compound in Appendix D, Tables D-1 and D-2. The summaries provided by Tables D-1 and D-2, Appendix D, allow a quick view of the data associated with each compound. Those data that individually did not meet WAP criteria are bolded.

Table V-1. Analytical Chemistry Laboratory volatile organic compounds quality control average percent recovery of volatile organic compounds matrix spike/matrix spike duplicates.

Compound	% Recovery MS/MSD	MS Standard Deviation	RPD	Count (n)
1,1-Dichloroethylene	104.6	77.4	30.1	26
Benzene	85.2	4.8	4.0	26
Chlorobenzene	96.8	11.4	4.4	24
Toluene	95.2	8.6	5.1	24
Trichloroethylene	87.3	8.8	7.7	24

Table V-2. Analytical Chemistry Laboratory volatile organic compounds quality control average percent recovery of volatile organic compounds laboratory control samples.

Compound	LCS % Recovery	LCS Standard Deviation	Count (n)
1,1,1-Trichloroethane	91.7	10.7	24
1,2-Dichloroethane	103.4	11.7	24
Carbon Tetrachloride	89.4	18.2	24
Chlorobenzene	99.1	7.0	23
Chloroform	93.3	7.5	24
Ethylbenzene	100.5	6.6	24
m-Xylene and p-Xylene	96.5	5.4	24
o-Xylene	97.5	6.7	24
Tetrachloroethylene	89.4	17.0	24
Toluene	100.4	13.6	24

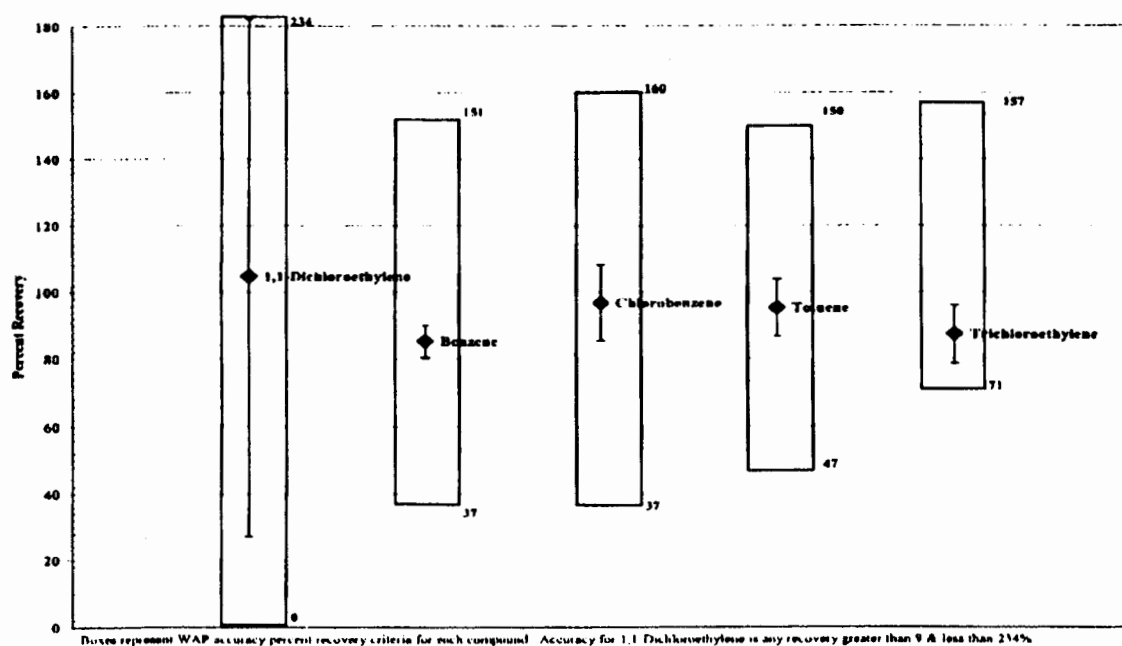
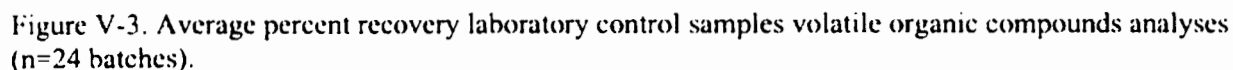
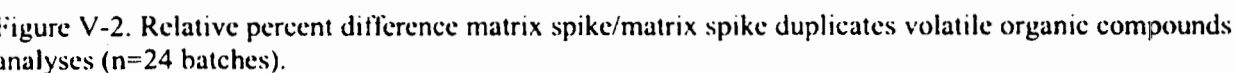


Figure V-1. Average percent recovery matrix spike/matrix spike duplicates volatile organic compound analyses (n=24 batches).



The recovery data for the four surrogate compounds are presented in detail in Appendix D, Table D-3, and was used to generate graphs (Figures V-4, V-5, V-6 and V-7).

In general, those data that individually did not meet WAP criteria are bolded or indicated with an “***” as appropriate. Any NCRs generated throughout the analysis were considered and if the disposition for the data was “reject” the data were not used.

Compounds that reflected problems from a waste stream average perspective are discussed individually, first, from the matrix effects indicated, and second from a laboratory control perspective. The overall data use is then summarized.

A-3.1 Preliminary Purgeable Volatile Organic Compound: Matrix Spike/Matrix Spike Duplicate Data Assessment

The data graphically shown in Figure V-1 illustrate that the average MS/MSD results with the associated errors all fall within the WAP criteria. Upper and lower limits for individual compounds are represented by solid lines (each compound has a unique limit). Figure V-2 reflects the RPD results and WAP acceptance criteria are represented by dotted lines. Note that the average RPD data are all below the WAP acceptance criteria shown on the graph, demonstrating that the data meet WAP precision requirements.

A-3.2 Preliminary Purgeable Volatile Organic Compound: Surrogate Compound Data Assessment

Most of the surrogate compound recoveries were within the acceptance criteria, as reflected in Figures V-4 through Figure V-7. The surrogates used were dibromofluoromethane (BFM), toluene-d5, 4-bromofluorobenzene (BFB), and 1,2-dichloroethane (DCA). The preliminary surrogate recoveries are plotted by compound. These data were used to generate a mean, standard deviation, and 3 sigma values to set the waste stream-specific acceptance criteria (per the WAP). Exceptions are discussed individually below.

Surrogate BFM, reflected in Figure V-4, recoveries were within the laboratory generated criteria with the exception of one data point which fell above the acceptance range. The performance of this surrogate is within the bounds of the method. There is no apparent bias due to matrix effects in this waste stream based on the performance of this surrogate.

The performance of the TOL surrogate, Figure V-5, is also acceptable. Only one recovery fell outside the acceptance criteria and this data point was biased high. Since the bias was high, use of this data is conservative. There is no apparent bias due to matrix effects in this waste stream based on the performance of this surrogate.

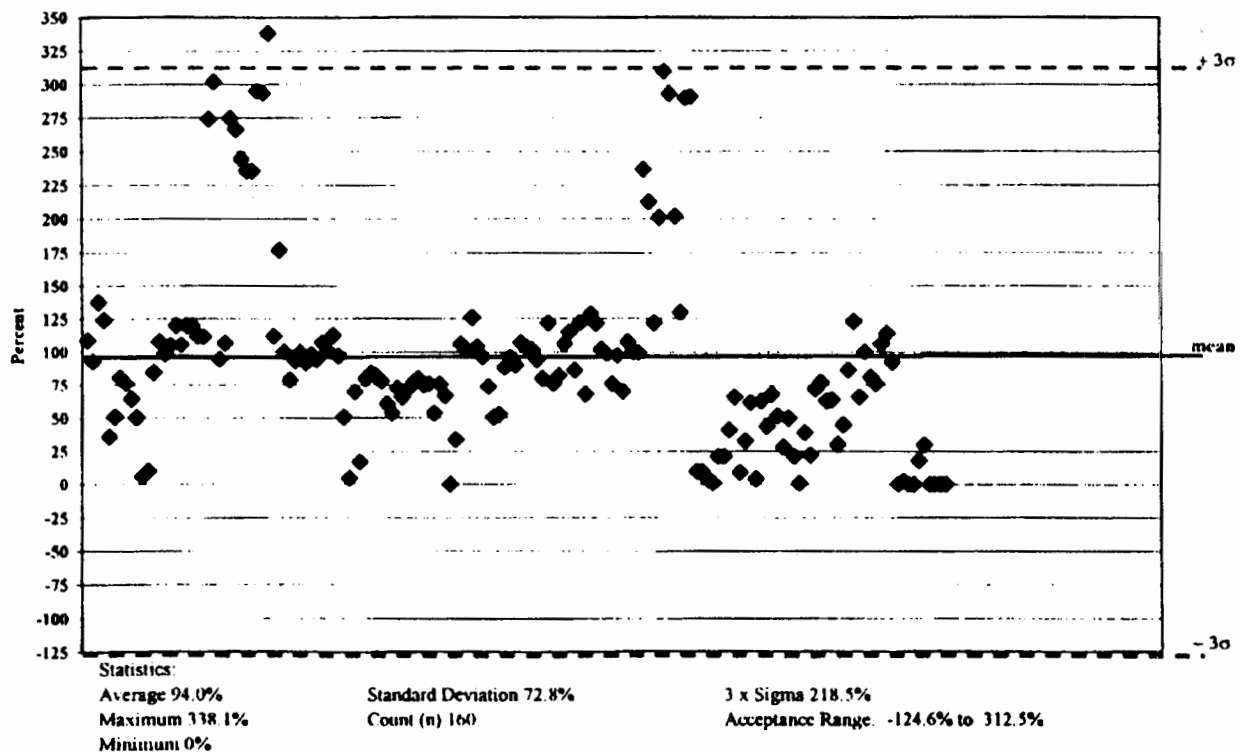


Figure V-4. Average percent recovery of surrogate Dibromofluoromethane (BFM) volatile organic compounds analyses.

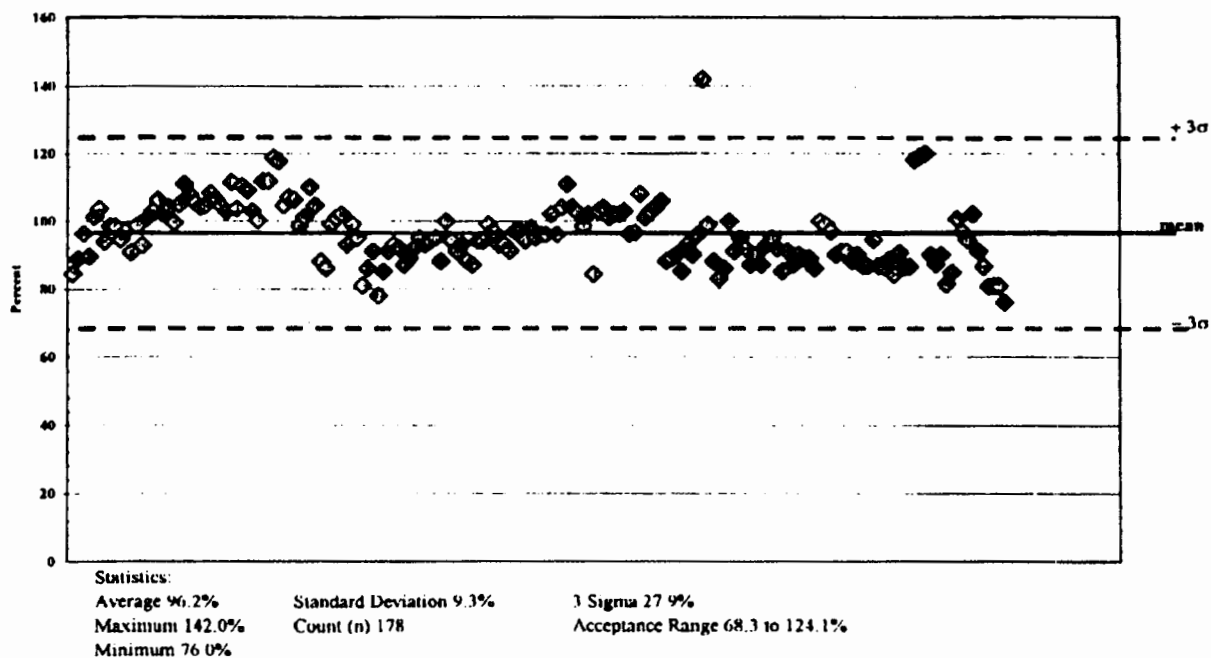


Figure V-5. Average percent recovery of surrogate Toluene-d8 (TOL) volatile organic compounds analyses.

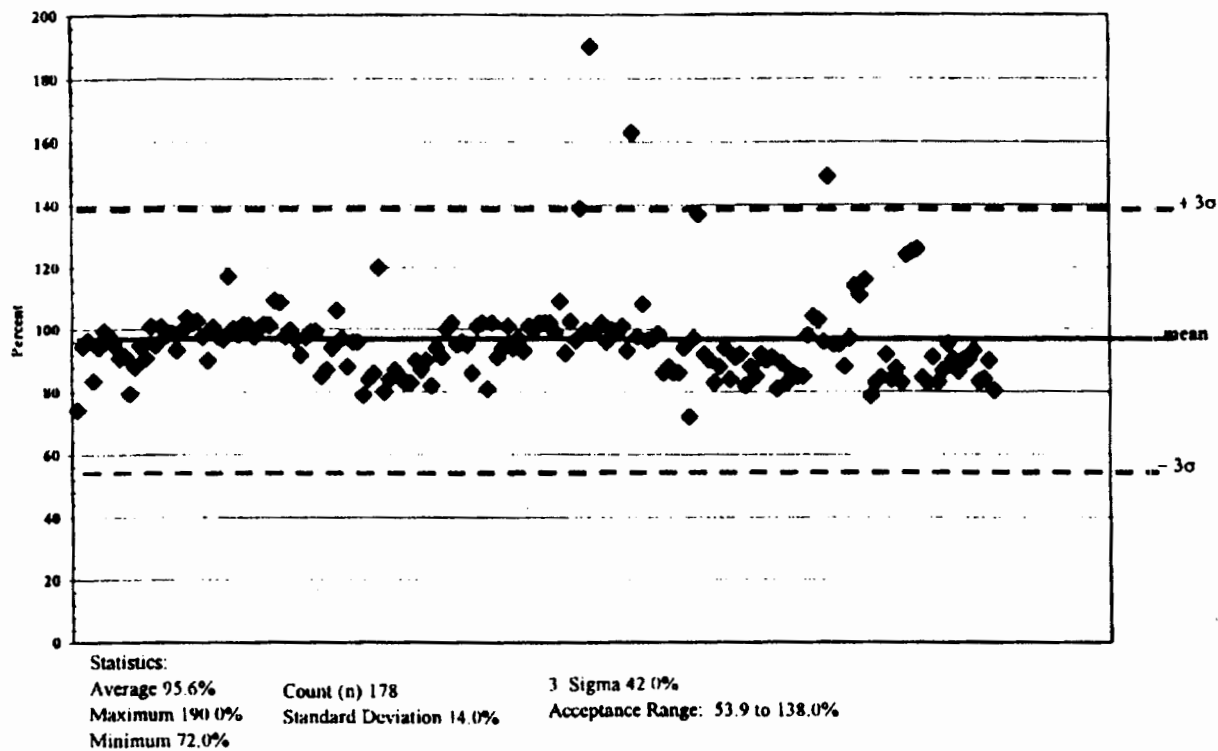


Figure V-6. Average percent recovery of surrogate 4-Bromofluorobenzene (BFB) volatile organic compounds analyses.

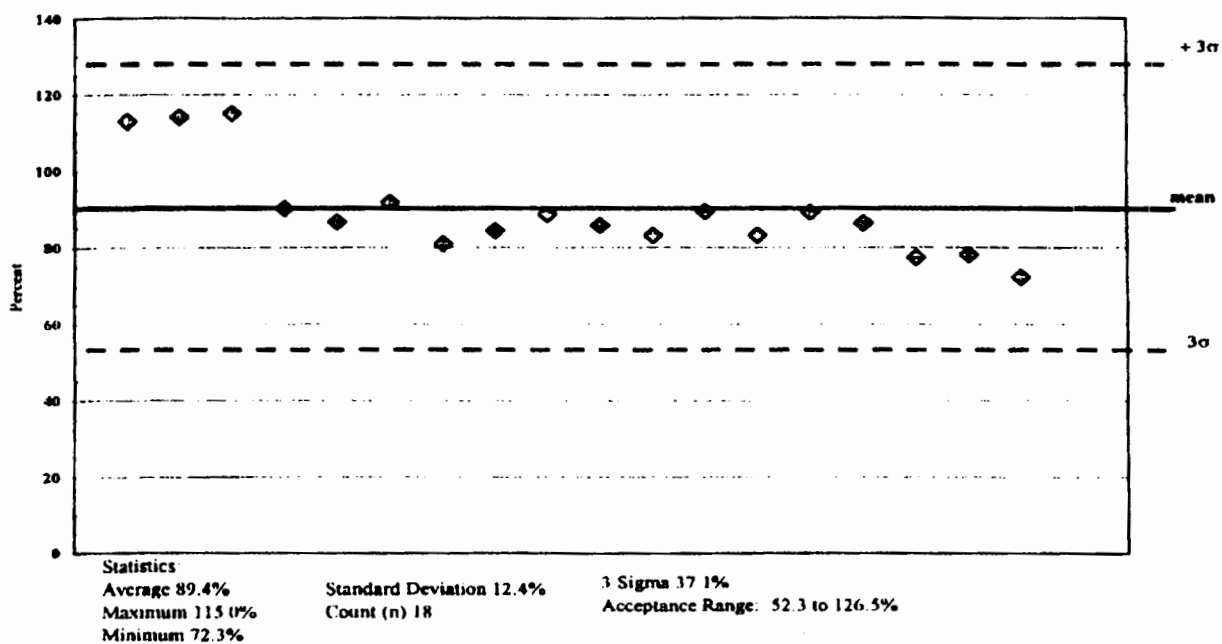


Figure V-7. Average percent recovery of surrogate 1,2-Dichloroethane (DCA) volatile organic compounds analyses.

Four data points for the BFB surrogate, Figure V-6, fall above the acceptance criteria. Surrogates from samples in batches ACL96008V and ACL98005V recovered high and therefore indicated a possible high bias associated with matrix effects. There is no apparent bias due to matrix effects in this waste stream based on the performance of this surrogate.

- Three samples (three drums) in batch ACL96008V had high recoveries (139, 163 and 190%). Because the bias was high, use of the data is conservative and the data are appropriate for use as preliminary data.
- One sample in batch ACL98005V was above the acceptance criteria (126%). However, the error was large due to the range of recoveries (82.8 – 126%). Since the bias was high, use of the data is conservative and the data are appropriate for use as preliminary data.

In 1998, the BFM surrogate was changed to DCA, impacting five batches (four 1998 and one 1999) associated with this waste stream. All recoveries associated with this surrogate fall within the determined acceptance criteria.

A-3.3 Preliminary Purgeable Volatile Organic Compound: Laboratory Control Sample Data Assessment

The LCS averages and associated standard deviations were within the WAP criteria. Based on the performance of this matrix independent standard, the laboratory method was performing consistently and in control.

A-4. Preliminary Nonhalogenated Volatile Organic Compound Data: Data Use Assessment

The NH VOC data has been assessed from a waste stream perspective, such as, waste stream averages, for the performance indicators MS/MSD and LCS. The performance of these indicators show that the NH VOC data is acceptable for use as preliminary data. In all cases, individual compound averages and associated errors (derived from the standard deviations) fell within the WAP criteria.

The MS/MSD and LCS results discussed in this section are summarized using a combination of tables and graphs. The average data used to generate the MS/MSD graph, Figure N-1, are summarized in Table N-1. The LCS results are illustrated in Figure N-2 and summarized in Table N-2. The data used to generate these graphs are presented by compound in Appendix E, Table E-1. The summary provided in Table E-1, Appendix E, allows for a quick view of all the data associated with each compound. Those data that individually did not meet WAP criteria are bolded.

Table N-1. Analytical Chemistry Laboratory nonhalogenated volatile organic compounds quality control average percent recovery of metals matrix spikes/matrix spike duplicates.

Compound	Average Percent Recovery MS/MSD	Standard Deviation	RPD	Batches (n)
Acetone	98.0	7.5	2.8	20
Butanol	101.7	8.5	4.0	20
Ethyl ether	75.3	22.8	5.1	20
Isobutanol	103.5	8.7	3.2	20
Methanol	100.1	11.6	3.8	20
Methyl ethyl ketone	98.4	8.8	2.7	20
Pyridine	97.1	6.0	4.6	20

Table N-2. Analytical Chemistry Laboratory nonhalogenated volatile organic compounds quality control average percent recovery of nonhalogenated volatile organic compound laboratory control samples.

Compound	LCS % Recovery	LCS Standard Deviation	Batches (n)
Acetone	101.3	3.7	21
Butanol	100.9	3.6	21
Ethyl ether	98.9	5.5	21
Isobutanol	101.9	4.0	21
Methanol	103.1	5.7	21
Methyl ethyl ketone	101.4	4.3	21
Pyridine	98.6	4.2	21

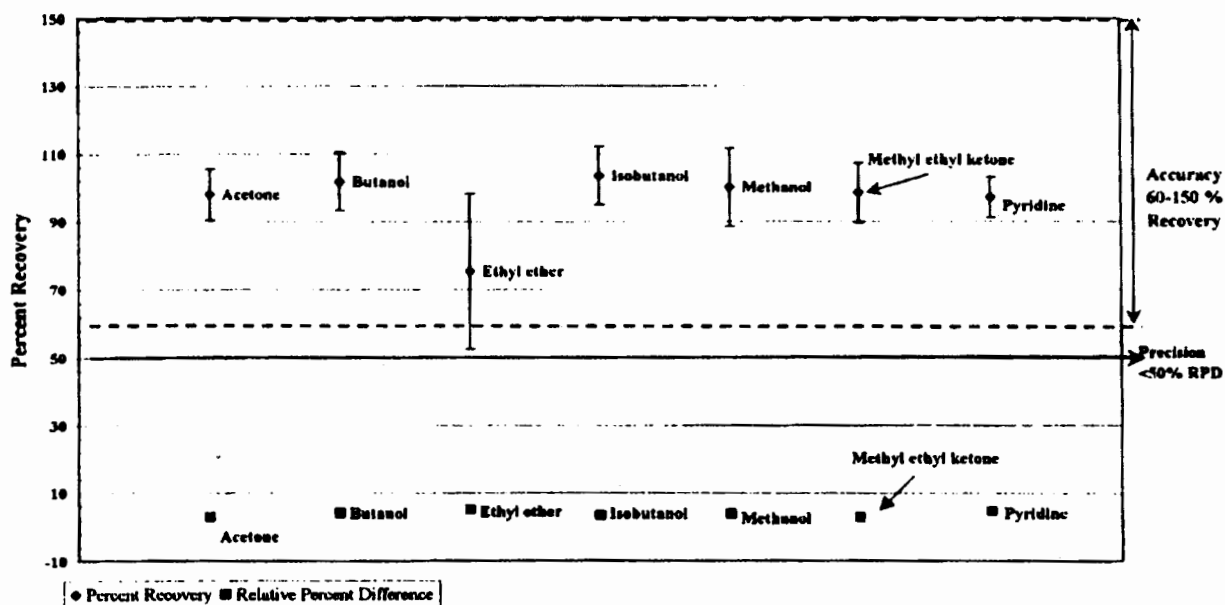


Figure N-1. Average percent recovery and relative percent difference matrix spike/matrix spike duplicates nonhalogenated volatile organic compounds analyses (n=20 batches).

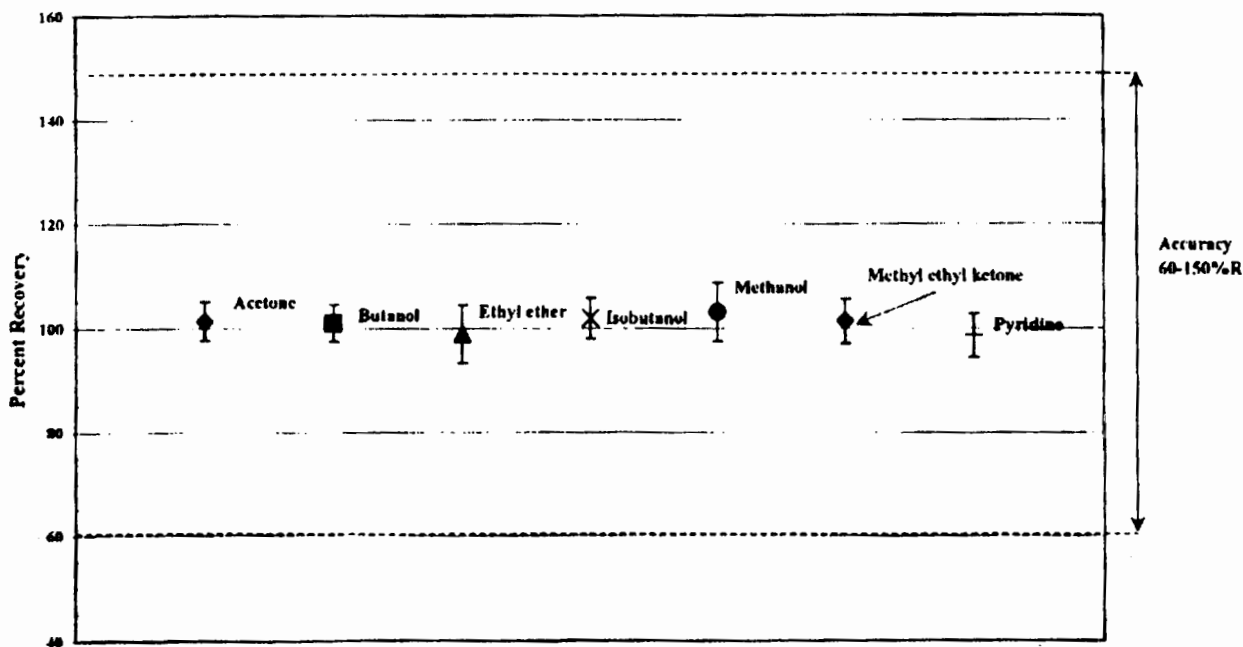


Figure N-2. Average percent recovery laboratory control sample nonhalogenated volatile organic compounds analyses (n=21 batches).

A-4.1 Preliminary Nonhalogenated Volatile Organic Compound Data: Matrix Spike/Matrix Spike Duplicate Assessment

All the MS/MSD averages and associated errors fall within the WAP criteria of 60-150% recovery as reflected in Figure N-1. This performance data indicate that the associated sample data are appropriate for use as preliminary data.

The average RPDs associated with the NH VOC MS/MSD data, also illustrated in Figure N-1, meet the WAP criteria without exception. Note that if the data points fall below the solid line of the graph, the compound met the RPD criteria.

A-4.2 Preliminary Nonhalogenated Volatile Organic Compound Data: Laboratory Control Sample Assessment

The preliminary LCS average data and associated standard deviations were all well within the WAP criteria of 60-150% (illustrated in Figure N-2). This demonstrates that the laboratory was performing this analysis consistently and in control throughout the analysis of the preliminary samples.

Appendix B
Metals Back-up Data

Table B-1. Analytical Chemistry Laboratory metals quality control matrix spikes and laboratory control samples summary by element.

Element	Batch No	MS (80 – 120 %)			LCS*		
		MS (% Recovery)	MSD (% Recovery)	RPD (30%)	LCS (% R)	LCSD (% R)	LCSD2 (% R)
Antimony	AC1.96002M	67.8	65.5	5.1	80.3	77.1	
	AC1.96004M	53.3	56.4	3.5	70.1		
	AC1.96005M	36	66.2	55.4	71.5		
	AC1.96007M	51.1	54.8	10.2	52.6	65.4	
	AC1.96008M	42.2	48.3	12	96.4		
	AC1.97001M	76.7	83.8	9.8	227	149.9	
	AC1.97002M				103.5	111.4	
	AC1.97003M				141.5	137.6	126
	AC1.97004M	65.1	64	0.4	121.6	125.8	124.5
	AC1.97005M				12.8	105.3	
	AC1.97006M	82.7	102.6	15.6	131.3	128.7	
	AC1.97007M				90	119.3	
	AC1.97008M				115.3	91.9	
	AC1.97009M	74.5	76	0.3	119.9	83.5	
	AC1.97012M	74.3	74.1	3.3	129.1	128.4	
	AC1.98005M				86.4		
	AC1.98007M	88.8	93.3	5.8	115.8		
	AC1.98010M	66.7	61.2	7.8	88.7		
	AC1.98012M	51.2	84.1	21.1	116.3		
	AC1.98013M	70.6	70.9	0.5	100.4		
	AC1.99001M	63	60.7	3.8	70.4		
MS/MSD Average		67.5		10.3	106.2		
Standard Deviation		15.1			35.7		
Count (n)		30		15	35		
Antimony had very few matrix spike or matrix spike duplicate results within the %R range for the WAP accuracy criterion (80 to 120% R). However none of the matrix spike duplicates exceeded the WAP precision criterion (30% RPD). (Bolded results indicate those outside the ranges specified)							
Arsenic	AC1.96002M	85.8	80.1	8.8	99.2	97.7	
	AC1.96004M	98.7	95.9	4.7	93.7		
	AC1.96005M	95.7	97.3	2.2	96.8	99	
	AC1.96007M	92.5	90.4	1.7	99.6	97.9	
	AC1.96008M	100	99.3	1.6	100	104.1	
	AC1.97001M	94.6	96.5	6.1	121.1	107.2	
	AC1.97002M				100	102.1	
	AC1.97003M				101.7	99.9	105.1
	AC1.97004M	100.3	98.3	0.1	97.1	98.4	94
	AC1.97005M				97.7	102.9	
	AC1.97006M	94.2	97.8	1.2	99.4	95.1	
	AC1.97007M				95.1	103.1	
	AC1.97008M				97	100.6	
	AC1.97009M	95.2	96.8	0.1	97.4	96.3	
	AC1.97012M	102.9	99	0.3	103.4	101.3	
	AC1.98005M				89.2		
	AC1.98007M	95.9	106.3	11.1	93.9		
	AC1.98010M	101.6	105.2	3.3	111.2		
	AC1.98012M	102.1	103.3	1.2	103.4		
	AC1.98013M	111	106.9	3	115.4		
	AC1.99001M	100	99.4	0.8	101.5		
MS/MSD Average		98.1		3.1	100.5		
Standard Deviation		6.1			6.0		
Count (n)		30		15	37		

All of the matrix spike and matrix spike duplicate results were within both accuracy and precision criteria.

Table B-1. (Continued).

Element	Batch No	MS (80 – 120 %)			LCS*		
		MS (% Recovery)	MSD (% Recovery)	RPD (30%)	LCS (% R)	LCS D (% R)	LCS D2 (% R)
Barium	ACL 96002M	86.9	89.5	1.1	76.6	73.5	
	ACL 96004M	94.8	98.4	1.8	75		
	ACL 96005M	104.9	103.5	5.2	82.5	85.4	
	ACL 96007M	96.1	95.9	3.7	78	78.8	
	ACL 96008M	97.1	91.8	7.2	104	101.5	
	ACL 97001M	101.9	101.1	1.2	114.1	120.3	
	ACL 97002M				97.7	92.8	
	ACL 97003M				95.5	94.1	106.8
	ACL 97004M	96.7	98.4	3.8	92.7	101.4	94.4
	ACL 97005M				108.7	104	
	ACL 97006M	96.3	97.4	3.8	100.9	100.4	
	ACL 97007M				106.7	106.7	
	ACL 97008M				93.4	91.7	
	ACL 97009M	103.7	106	0.6	96.1	97.4	
	ACL 97012M	97.5	92.5	1.7	113.2	106.6	
	ACL 98005M				87.2		
	ACL 98007M	96.2	96.5	1.1	93.8		
	ACL 98010M	97.6	94.1	3.6	94.1		
	ACL 98012M	103.9	102.9	0.7	104.4		
	ACL 98013M	99.3	105.9	6.8	96.1		
	ACL 99001M	96.2	98	1.7	94.4		
MS/MSD Average		98.0		2.9	96.2		
Standard Deviation		4.7			11.2		
Count (n)		30		15	37		
All of the matrix spike and matrix spike duplicate results were within both accuracy and precision criteria.							
Beryllium	ACL 96002M	76.7	89.4	5.5	105.8	102.5	
	ACL 96004M	88.7	90.4	0	110		
	ACL 96005M	106	103.5	4.2	101	93.1	
	ACL 96007M	90.4	95	6.8	94.9	95.7	
	ACL 96008M	99.7	103.6	0.9	96.2	94.5	
	ACL 97001M	97.4	86.7	3.4	107.1	102.8	
	ACL 97002M				100.9	97.7	
	ACL 97003M				98.2	96	99.6
	ACL 97004M	0	0	3.8	102.8	107.8	99.5
	ACL 97005M				100	98.7	
	ACL 97006M	96.2	93.5	6.8	96.3	94.6	
	ACL 97007M				104.8	101	
	ACL 97008M				106	95.5	
	ACL 97009M	590.8	763.5	11.5	97.6	96.7	
	ACL 97012M	95.1	95.1	2.6	108.5	100.3	
	ACL 98005M				90.3		
	ACL 98007M	86.7	115.3	17.6	97.4		
	ACL 98010M	113	103.2	3.9	109.7		
	ACL 98012M	102.4	97.9	4.2	105.4		
	ACL 98013M	42.8	532.9	12.7	116.9		
	ACL 99001M	2.9	34.6	4.2	104.4		
MS/MSD Average		136.4		5.9	100.8		
Standard Deviation		173.0			5.6		
Count (n)		30		15	37		

Table B-1. (Continued).

Element	Batch No	MS (80 - 120 %)		RPD (30%)	LCS*		
		MS (% Recovery)	MSD (% Recovery)		LCS (% R)	LCSD (% R)	LCSD2 (% R)
Cadmium	AC1.96002M	90.5	72.6	15.7	129.7	102	
	AC1.96004M	132.6	28.2	24.9	97.9		
	AC1.96005M	83.2	98.7	5.4	110.6	111.7	
	AC1.96007M	87.4	96.9	11	103.7	100.1	
	AC1.96008M	94.3	91.9	3.6	97	94.7	
	AC1.97001M	49.7	61	8.8	128.7	121.5	
	AC1.97002M				102.8	100.5	
	AC1.97003M				97.6	89.5	102.1
	AC1.97004M	83.9	83	1	88.2	91.7	95.9
	AC1.97005M				103.9	101.8	
	AC1.97006M	91.6	96.4	0.1	103.1	97.7	
	AC1.97007M				91.3	101.5	
	AC1.97008M				92.2	93.9	
	AC1.97009M	102.3	91	8.2	99.8	100.6	
	AC1.97012M	91	93.2	4.1	101.8	95.2	
	AC1.98005M				93.7		
	AC1.98007M	81.1	89.7	9.5	95.4		
	AC1.98010M	84.3	82.3	1.9	107.3		
	AC1.98012M	0	105.8	30.3	95.4		
	AC1.98013M	52.2	62.6	3.1	109.5		
	AC1.99001M	87.3	87	0.5	102.3		
MS/MSD Average		81.7		8.5	101.4		
Standard Deviation		24.6			9.5		
Count (n)		30		15	37		
Chromium	AC1.96002M	82	115.9	4	99.8	96.2	
	AC1.96004M	106.8	88.2	9.1	96		
	AC1.96005M	90.7	111.6	6.9	98.2	98.3	
	AC1.96007M	88.6	83.8	0.8	96.6	96.3	
	AC1.96008M	98.6	91.7	3.3	102.2	99.2	
	AC1.97001M	101.8	122.4	3	127.8	109.4	
	AC1.97002M				100.5	102.8	
	AC1.97003M				95.9	94.9	106.9
	AC1.97004M	91	67.2	9.1	95.1	95.5	95.9
	AC1.97005M				102.5	103.5	
	AC1.97006M	88.3	105.4	4.2	100.3	94.2	
	AC1.97007M				92	96.9	
	AC1.97008M				93.5	99.1	
	AC1.97009M	172.1	26.1	23.7	93.2	96.3	
	AC1.97012M	91.9	89.1	0.1	107.1	98.4	
	AC1.98005M				90.5		
	AC1.98007M	115.2	336.9	27.5	90.3		
	AC1.98010M	88.1	87.3	0.4	102.7		
	AC1.98012M	76.9	94.5	9.9	98.3		
	AC1.98013M	70.3	96.3	8.8	107.3		
	AC1.99001M	90.9	99.9	4.1	98.6		
MS/MSD Average		102.3		7.7	99.2		
Standard Deviation		49.9			6.7		
Count (n)		30		15	37		

Table B-1. (Continued).

Element	Batch No	MS (80 - 120 %)			LCS*		
		MS (% Recovery)	MSD (% Recovery)	RPD (30%)	LCS (% R)	LCSD (% R)	LCSD2 (% R)
Lead	ACL96002M	86.3	85.1	2	96.6	101.5	
	ACL96004M	94.7	98.2	0.5	93.6		
	ACL96005M	84.7	105.5	6.5	108.3	106.1	
	ACL96007M	91.7	105.1	11.1	94.9	93.8	
	ACL96008M	92	97.8	2.7	100.3	96.8	
	ACL97001M	122.7	126.8	1.4	120.6	133.9	
	ACL97002M				97.3	94.8	
	ACL97003M				97.6	90.2	108.9
	ACL97004M	94.7	69.1	15.3	96.5	93.4	99
	ACL97005M				103.5	101.2	
	ACL97006M	94.5	95.5	2.8	106.3	103.5	
	ACL97007M				91.5	99.9	
	ACL97008M				98.9	98.6	
	ACL97009M	69.1	9.5	15.8	99.5	101.6	
	ACL97012M	98.3	94.2	0.5	106.9	101.8	
	ACL98005M				98		
	ACL98007M	87.6	108.9	18.1	94.7		
	ACL98010M	87.7	87.8	0.1	106.2		
	ACL98012M	0	143.4	32.2	98.3		
	ACL98013M	67.9	132.3	8.2	111.2		
	ACL99001M	87.2	92	4.8	103.9		
MS/MSD Average		90.3		8.1	101.3		
Standard Deviation		28.9			8.2		
Count (n)		30		15	37		
Mercury	ACL96002M	110.5	115	1.3	102	101.3	
	ACL96004M	130.5	110.7	9.9	109.9		
	ACL96005M	98	90.8	1.6	117.5		
	ACL96007M	108.6	112.8	11		112.3	
	ACL96008M	106.9	103.9	1.3	113.6		
	ACL97001M	104.4	103.7	0.3	124.8		
	ACL97002M				116.1		
	ACL97003M				118.8		
	ACL97004M	106.2	105.8	0.7	110.7		
	ACL97005M				99.8		
	ACL97006M	110.3	108.7	0.3	114.7		
	ACL97007M				116.7		
	ACL97008M				119.2		
	ACL97009M	39	64.6	17.5	116.3		
	ACL97012M	76.8	81.6	1.4		116.3	
	ACL98005M				96.7		
	ACL98007M	94.9	97.9	3	115.6		
	ACL98010M	91.8	91.1	0.7	118.7		
	ACL98012M	107.1	112.5	5	112.2		
	ACL98013M	112.5	115.9	3	100.2		
	ACL99001M	88.4	85	3.9	126.9		
MS/MSD Average		99.5		4.1	112.7		
Standard Deviation		17.7			8.1		
Count (n)		30		15	22		

Table B-1. (Continued).

Element	Batch No	MS (80 - 120 %)		RPD (30%)	LCS*		
		MS (% Recovery)	MSD (% Recovery)		LCS (% R)	LCS2 (% R)	LCS2 (% R)
Nickel	AC1.96002M	87.6	83.6	3.9	94.1	90.4	
	AC1.96004M	112.9	92.4	15.6	93.9		
	AC1.96005M	85.9	96.4	4	97.1	96.8	
	AC1.96007M	87.9	90.5	3.9	99.4	96.8	
	AC1.96008M	109.2	93.8	5.5	99	107.4	
	AC1.97001M	94.4	101	5.2	120.4	110.5	
	AC1.97002M				97.8	100.1	
	AC1.97003M				100.9	94.9	101.1
	AC1.97004M	88.7	75.6	7	96	92.4	95.1
	AC1.97005M				102.5	100	
	AC1.97006M	33	35	0.2	102.5	96.7	
	AC1.97007M				96.5	108.2	
	AC1.97008M				100.1	99.4	
	AC1.97009M	99.6	84.7	7.3	96.1	98.4	
	AC1.97012M	86.3	96.2	5.2	107.1	102.1	
	AC1.98005M				95.7		
	AC1.98007M	83.4	110	10.5	99.6		
	AC1.98010M	83.2	83.9	0.5	113.1		
	AC1.98012M	59.2	106	20	101.1		
	AC1.98013M	80.1	77	1	118.9		
	AC1.99001M	89.2	91.3	1.3	107.5		
MS/MSD Average		86.6		6.1	100.8		
Standard Deviation		18.1			6.8		
Count (n)		30		15	37		
Selenium	AC1.96002M	90.7	82.6	11.3	97.8	95.8	
	AC1.96004M	98.1	95.2	4.9	96.3		
	AC1.96005M	92.9	95.5	1.2	96.3	99.3	
	AC1.96007M	95.1	91.3	0.2	97	96.5	
	AC1.96008M	95.9	98.7	1.3	102.3	101.3	
	AC1.97001M	100.7	104.3	7.7	122	110.7	
	AC1.97002M				102.2	99.1	
	AC1.97003M				99.7	98.1	107.5
	AC1.97004M	100.3	95.6	2.7	101.3	103.9	99.4
	AC1.97005M				104.6	103.7	
	AC1.97006M	98.7	104	0.2	107.3	102.4	
	AC1.97007M				99.1	103.6	
	AC1.97008M				99	95.3	
	AC1.97009M	100.3	100.9	1.1	96.5	100.7	
	AC1.97012M	112.2	111.8	3.2	105.3	105.6	
	AC1.98005M				89		
	AC1.98007M	87.4	101.1	15.3	97.7		
	AC1.98010M	100.3	95.7	4.8	116		
	AC1.98012M	102.9	79	22.3	105.9		
	AC1.98013M	95	97.3	3.1	111.5		
	AC1.99001M	98.9	93.8	5.4	105.2		
MS/MSD Average		97.2		5.6	102.0		
Standard Deviation		7.0			6.2		
Count (n)		30		15	37		

Table B-1. (Continued).

Element	Batch No	MS (80 – 120 %)		RPD (30%)	LCS*		
		MS (% Recovery)	MSD (% Recovery)		LCS (% R)	LCSD (% R)	LCSD2 (% R)
Silver	ACI.96002M	88	95.1	1.8	92.3	106.6	
	ACI.96004M	82.6	84.8	0.6	110		
	ACI.96005M	94.7	94.8	3.8	101.5	101.2	
	ACI.96007M	87.9	95.9	10.7	94.5	95.4	
	ACI.96008M	107.9	112.1	2.2	94.9	96.1	
	ACI.97001M	107	110.1	0.9	100.2	126.3	
	ACI.97002M				99.8	104	
	ACI.97003M				97.4	93.6	99.5
	ACI.97004M	86	91.1	5.9	98	102.1	104.8
	ACI.97005M				93.9	97.8	
	ACI.97006M	102.8	96.4	7.9	99.6	97.7	
	ACI.97007M				101.2	103.4	
	ACI.97008M				105.5	105.8	
	ACI.97009M	105.8	102.4	4.2	101.5	98.4	
	ACI.97012M	89.7	97.5	4.9	108	105.8	
	ACI.98005M				87.3		
	ACI.98007M	88.7	124.5	14.6	102.7		
	ACI.98010M	99.1	98.3	0.4	96.9		
	ACI.98012M	100.7	99.1	1.5	96.4		
	ACI.98013M	131.8	124.1	1.3	107.8		
	ACI.99001M	89.4	93.8	4.2	95.9		
MS/MSD Average		99.4		4.3	100.6		
Standard Deviation		12.0			6.6		
Count (n)		30		15	37		
Thallium	ACI.96002M	88	95.1	1.8	69.1	71.6	
	ACI.96004M	78.9	78.6	2.3	75.4		
	ACI.96005M	72.8	74.1	2.2	77.2	83.7	
	ACI.96007M	80.3	77.4	0.2	82.6	82.9	
	ACI.96008M	80.6	85.2	4	91.8	102.2	
	ACI.97001M	81.3	83.9	7.4	106.6	99.2	
	ACI.97002M				110.4	109.2	
	ACI.97003M				118.7	116.7	115.5
	ACI.97004M	76.6	74.6	0.5	93.9	97.1	96.4
	ACI.97005M				97.1	108.9	
	ACI.97006M	72.9	77.4	1	97.1	101.4	
	ACI.97007M				94.1	109.1	
	ACI.97008M				108.5	113.4	
	ACI.97009M	79.1	82.4	2.5	94.6	98.7	
	ACI.97012M	86.2	87.4	4.9	117.3	106.1	
	ACI.98005M				100.9		
	ACI.98007M	75.8	79.7	5.8	102.4		
	ACI.98010M	83.1	81.9	1.4	99.1		
	ACI.98012M	60.6	57.1	5.6	105.5		
	ACI.98013M	80.3	79.9	0.1	105.1		
	ACI.99001M	83.1	82.4	1	104.4		
MS/MSD Average		79.2		2.7	99.0		
Standard Deviation		7.3			12.8		
Count (n)		30		15	37		

Table B-1. (Continued).

Element	Batch No	MS (80 - 120 %)		RPD (30%)	LCS*		
		MS (% Recovery)	MSD (% Recovery)		LCS (% R)	LCS2 (% R)	LCS22 (% R)
Vanadium	AC1.96002M	85.7	83.8	2.9	97.7	95.5	
	AC1.96004M	91.2	92.9	0.1	96.5		
	AC1.96005M	91.9	93.2	2.3	102.9	106.8	
	AC1.96007M	93.8	91.4	1.2	102.5	102.4	
	AC1.96008M	97.5	96	2.9	98.6	94	
	AC1.97001M	95.4	94	1.8	133	114.8	
	AC1.97002M				101.5	104.1	
	AC1.97003M				105.5	103.3	100.2
	AC1.97004M	95.1	95.1	1.7	96.9	104.5	92.7
	AC1.97005M				97	98.7	
	AC1.97006M	93.2	92.1	4.6	101.5	97.3	
	AC1.97007M				110.1	110.2	
	AC1.97008M				95.3	94.2	
	AC1.97009M	94.4	98.2	2.2	97.4	97.3	
	AC1.97012M	95.5	96.3	3.9	105.7	98.8	
	AC1.98005M				85.1		
	AC1.98007M	94.2	94.8	1.2	96.3		
	AC1.98010M	92.2	91	1.1	101.9		
	AC1.98012M	93.1	90.4	0.9	102.7		
	AC1.98013M	101.3	95	4.4	113.9		
	AC1.99001M	92.2	93.6	1.2	96		
MS/MSD Average		93.5		2.2	101.4		
Standard Deviation		3.3			8.0		
Count (n)		30		15	37		
Zinc	AC1.96002M	111.7	82	10	135.5	117.6	
	AC1.96004M	95.5	87.8	2.1	121		
	AC1.96005M	85.7	89.2	0	124.2	117.8	
	AC1.96007M	89.9	95.1	5.3	100.4	98.8	
	AC1.96008M	97.9	96.7	1.2	95	95.1	
	AC1.97001M	79.8	93.4	6.6	130.3	108.5	
	AC1.97002M				92.9	94.9	
	AC1.97003M				101.1	95.3	101.6
	AC1.97004M	97.5	78.7	7.4	93.4	92.1	93.1
	AC1.97005M				102	97	
	AC1.97006M	98.4	108.7	1.4	98.9	93.5	
	AC1.97007M				86.4	95.1	
	AC1.97008M				89	90.4	
	AC1.97009M	249.7	203.6	8.7	93.6	95.6	
	AC1.97012M	126.9	131.3	0.7	101	95.5	
	AC1.98005M				97.2		
	AC1.98007M	84.8	101.9	15.1	96.3		
	AC1.98010M	90.4	77.3	4	109.5		
	AC1.98012M	84.6	105.4	9.7	115		
	AC1.98013M	89.6	116.3	11.5	122.6		
	AC1.99001M	91.5	97.3	4.7	106.3		
MS/MSD Average		104.6		5.9	102.5		
Standard Deviation		36.1			12.3		
Count (n)		30		15	37		

MS & MSD samples for the following batches were not IIX' 001, 002 or 800 and were not included.

AC1.97002M, 97003M, 97005M, 97007M, 97008M and 98005M

** Control limits are laboratory established per the WAP.
Reference: WAP Table B3-8, footnote b.

Appendix C

Semivolatile Organic Compounds Back-up Data

Appendix C

Semivolatile Organic Compounds Back-up Data

Table C-1. Analytical Chemistry Laboratory semivolatile organic compounds quality control matrix spike and laboratory control samples summary by compound.

Compound	Batch #	Matrix Spikes		RPD	LCS	
		% Recovery MS	% Recovery MSD		% Recovery LCS	% Recovery LCS-2
1,4-Dichlorobenzene	ACL96002S	40.3	37.5	7.1	99.3	
	ACL96004O	53	49	8	97	
	ACL96005S	50	33.3	40	96	
	ACL96007S	42.6	49.1	14.2	97.5	
	ACL96008S	53.8	42.4	23.6	95	104
	ACL97001S	70.3	39	57.2	101.3	
	ACL97002S				108	
	ACL97003S				109.7	
	ACL97004S	39	27.3	35.5	111.5	
	ACL97005S				97.8	
	ACL97006S				90.5	
	ACL97007S				99.3	
	ACL97008S				19	
	ACL97009S	23.5	31.6	29.3	109.7	
	ACL97012S				88	
	ACL98005S				110.4	
	ACL98007S	70	77	10	107	
	ACL98012S				97	
	ACL98013S				103.8	
	ACL99001S	72.8	60	19.3	89	
Average		48.1		24.4	96.7	
Standard Deviation		15.5		16.2	19.1	
Count (n)		20		10	21	
2,4-Dinitrophenol	ACL98013S				103	
	ACL99001S				110	
Average					106.5	
Standard Deviation					4.9	
Count (n)					2	
2,4-Dinitrotoluene	ACL96002S	55	51.5	6.6	82.8	
	ACL96004O	49	63	25	80	
	ACL96005S	66.3	44.2	40	94.8	
	ACL96007S	69.2	81	15.7	91	
	ACL96008S	65.5	43.7	40	85.3	81.3
	ACL97001S	75	51	38.1	83.3	
	ACL97002S				80.3	
	ACL97003S				107.5	
	ACL97004S	47	32.3	37.2	101	
	ACL97005S				86.5	
	ACL97006S				89.8	
	ACL97007S				82.3	
	ACL97008S				16.8	
	ACL97009S	48	62.9	26.8	97.3	
	ACL97012S				80.3	
	ACL98005S				98.8	
	ACL98007S	44	46	4.4	110	
	ACL98012S				89	

Table C-1. (Continued).

Compound	Batch #	Matrix Spikes		RPD	LCS	
		% Recovery MS	% Recovery MSD		% Recovery LCS	% Recovery LCS-2
	AC1.98013S				92.3	
	AC1.99001S	75	58	25.6	96	
Average		56.4		25.9	87.0	
Standard Deviation		12.9		13.4	18.4	
Count (n)		20		10	21	
Hexachlorobenzene	AC1.98013S				92.8	
	AC1.99001S				98	
Average					95.4	
Standard Deviation					3.7	
Count (n)					2	
Hexachloroethane	AC1.96002S	41.3	40.3	2.5	99.5	
	AC1.96004O	52	52	0	99	
	AC1.96005S	51.3	29.2	54.9	93	
	AC1.96007S	47.9	62.4	26.3	94	
	AC1.96008S	56.5	42.4	28.5	96.3	102.5
	AC1.97001S	71.3	41.3	53.3	98	
	AC1.97002S				93	
	AC1.97003S				109.5	
	AC1.97004S	34.5	26.3	27.2	116	
	AC1.97005S				105.8	
	AC1.97006S				88.3	
	AC1.97007S				95.8	
	AC1.97008S				34	
	AC1.97009S	30	36.8	20.4	104.5	
	AC1.97012S				92.3	
	AC1.98005S				106.4	
	AC1.98007S	72	76	6.1	105.2	
	AC1.98012S				98.5	
	AC1.98013S				101.8	
	AC1.99001S	83.2	64.2	25.8	95	
Average		50.5		24.5	96.6	
Standard Deviation		16.6		18.9	15.8	
Count (n)		20		10	21	
m,p-Methylphenol	AC1.98013S				95	
	AC1.99001S				90	
Average					92.5	
Standard Deviation					3.5	
Count (n)					2	
Nitrobenzene	AC1.96002S	35.5	34	4.3	75.8	
	AC1.96004O	56	53	6	88	
	AC1.96005S	53.8	33.3	46.9	81.8	
	AC1.96007S	51.9	67.7	26.4	83.3	
	AC1.96008S	56.5	40.2	33.8	79.8	101.8
	AC1.97001S	80	47	52	95.5	
	AC1.97002S				98.8	
	AC1.97003S				116	
	AC1.97004S	42	31.8	27.8	111.1	

Table C-1. (Continued).

Compound	Batch #	Matrix Spikes		RPD	LCS	
		% Recovery MS	% Recovery MSD		% Recovery LCS	% Recovery LCS-2
	ACL97005S				108	
	ACL97006S				88.3	
	ACL97007S				93	
	ACL97008S				8.6	
	ACL97009S	26.3	32.6	21.5	102	
	ACL97012S				75	
	ACL98005S				110.2	
	ACL98007S	78	82	3.8	106.6	
	ACL98012S				97.5	
	ACL98013S				102.8	99.4
	ACL99001S	65.8	43.5	40.8	101	
Average		50.5		26.3	92.0	
Standard Deviation		17.0		17.6	22.0	
Count (n)		20		10	22	
o-Methylphenol	ACL98013S				102	105
	ACL99001S				89	
Average					98.7	
Standard Deviation					8.5	
Count (n)					3	
ortho-Dichlorobenzene	ACL98013S				100	95.6
	ACL99001S				92	
Average					95.9	
Standard Deviation					4.0	
Count (n)					3	
Pentachlorophenol	ACL98013S				110.3	69.6
	ACL99001S				120	
Average					100.0	
Standard Deviation					26.7	
Count (n)					3	

Table C-2. Analytical Chemistry Laboratory semivolatile organic compounds quality control average percent recovery of surrogate compounds by batch.

Batch #	Sample #	Percent Recovery				
		%R Surrogate NBZ	%R Surrogate FBP	%R Surrogate 2FP	%R Surrogate TBP	%R Surrogate PHN
ACL96002S	ID00421910CM1	50	56	57	41	
	ID00421920CM1	34	39	41	41	
	ID03267410CM1	60	77	5	23	
Average		48.0	57.3	34.3	35.0	
Standard Deviation		13.1	19.0	26.6	10.4	
Count (n)		3	3	3	3	0
ACL96004O	ID01060410CM1	75	68	17	0	19
	ID01060420CM1	45	56	0	0	0
	ID01093110CM1	60	50	40	49	50
	ID01228710CM1	64	52	12	12	37
Average		61.0	56.5	17.3	15.3	26.5
Standard Deviation		12.4	8.1	16.8	23.2	21.8
Count (n)		4	4	4	4	4
ACL96005S	ID01054910CM1	43	49.3	0	0	
	ID01054910CM1RE	0	47.3	16.3	0	
	ID01078810CM1	33.5	28	0	0	
	ID01078820CM1	40.8	34.3	15.3	0	
	ID01570010CM1	48.5	49	0	0	
	ID01815210CM1	78.5	71.3	0	0	
	ID02250610CM1	37	42	9.3	2	
	ID02979310CM1	48	48.3	0	0	
	ID03034110CM1	42	48.8	0	0	
Average		41.3	46.5	4.5	0.2	
Standard Deviation		20.2	12.0	7.1	0.7	
Count (n)		9	9	9	9	0
ACL96007S	ID01053410CM1	46	47	4.3	7.3	
	ID01053420CM1	28.3	26.3	6.5	7.5	
	ID01085910CM1	44.8	45.3	6.5	14.5	
	ID01145010CM1	42.5	45.5	0	0	
	ID01275610CM1	41.8	45.8	0	0	
	ID01403110CM1	52.3	54	13	5	
	ID02356110CM1	49.8	51.3	0	0	
	ID03036210CM1	65.8	58.5	15	0	
	ID03114210CM1	0	54.8	17.3	15.8	
Average		45.9	48.1	6.6	5.0	
Standard Deviation		22.6	8.9	6.4	6.2	
Count (n)		10	10	10	10	0
ACL96008S	ID00708510CM1	50	52	0	5	
	ID01141210CM1	34	32	0	0	
	ID01352210CM1	63	62	0	0	
	ID01361310CM1	49	45	0	0	
	ID01361320CM1	49	47	0	0	
	ID01606910CM1	56	56	0	0	
	ID01833310CM1	26	27	2	4	

Table C-2. (continued).

Batch #	Sample #	Percent Recovery				
		%R Surrogate NBZ	%R Surrogate FBP	%R Surrogate 2FP	%R Surrogate TBP	%R Surrogate PHN
	ID01833320CM1	28	31	2	3	
Average		44.4	44.0	0.5	1.5	
Standard Deviation		13.5	12.8	0.9	2.1	
Count (n)		8	8	8	8	0
ACL97001S	ID00108010CM1	36	22	0	0	
	ID00108020CM1	20	17	0	0	
	ID00322710CM1	54	50	7	0	
	ID00569510CM1	74	57	5	0	
	ID01342310CM1	36	33	0	0	
Average		44.0	35.8	2.4	0.0	
Standard Deviation		20.6	17.3	3.4	0.0	
Count (n)		5	5	5	5	0
ACL97002S	ID00088710CM1RE	69	22	23	0	
	ID00847310CM1RE	46	50	0	0	
Average		57.5	36.0	11.5	0.0	
Standard Deviation		16.3	19.8	16.3	0.0	
Count (n)		2	2	2	2	0
ACL97003S	ID00393210CM1	76	69	0	0	
	ID00393220CM1	82	67	0	0	
	ID00422110CM1	97	64	0	0	
	ID00504910CM1	38	33	4	0	
	ID01287310CM1	77	64	0	0	
	ID01367210CM1	79	70	0	0	
	ID02003310CM1	56	48	0	0	
	ID02414810CM1	56	49	0	0	
Average		70.1	58.0	0.5	0.0	
Standard Deviation		18.7	13.2	1.4	0.0	
Count (n)		8	8	8	8	0
ACL97004S	ID00835510CM1	39	0	23	5	
	ID01865710CM1DL1	0	60	0	0	
	ID02074910CM1	40	34	3	0	
	ID02074920CM1	38	35	2	0	
	ID02371710CM1	54	56	4	0	
	ID02382110CM1	71	80	0	8	
	ID02382120CM1	40	41	1	4	
	ID02449810CM1	66	70	20	16	
	ID02467010CM1	77	83	12	12	
	ID02526510CM1	46	48	5	6	
Average		47.1	50.7	7.0	5.1	
Standard Deviation		22.0	24.9	8.4	5.6	
Count (n)		10	10	10	10	0
ACL97005S	ID00334410CM1	57	59	0	8	
Average		57.0	59.0	0.0	8.0	
Standard Deviation						
Count (n)		1	1	1	1	0

Table C-2. (continued).

Batch #	Sample #	Percent Recovery				%R Surrogate PHN
		%R Surrogate NBZ	%R Surrogate FBP	%R Surrogate 2FP	%R Surrogate TBP	
ACL97006S	ID00672910CM1	30	17	14	0	
	ID01176110CM1	64	70	0	0	
	ID01787610CM1	62	64	0	0	
Average		52.0	50.3	4.7	0.0	
Standard Deviation		19.1	29.0	8.1	0.0	
Count (n)		3	3	3	3	0
ACL97007S	ID00326810CM1	85	69	0	0	
	ID00326820CM1	65	51	0	0	
	ID00683610CM1	74	56	0	0	
	ID00834410CM1	60	114	28	0	
	ID00837110CM1	56	50	10	0	
	ID00837120CM1	65	53	18	0	
	ID01791710CM1	80	65	2	0	
Average		69.3	65.4	8.3	0.0	
Standard Deviation		10.7	22.6	11.0	0.0	
Count (n)		7	7	7	7	0
ACL97008S	ID01314610CM1	42	45	0	0	
	ID01880610CM1	51	44	2	0	
	ID02075710CM1	73	0	0	0	
	ID02075710CM1RE	52	22	0	0	
	ID02393810CM1RE	34	28	0	0	
Average		50.4	27.8	0.4	0.0	
Standard Deviation		14.6	18.5	0.9	0.0	
Count (n)		5	5	5	5	0
ACL97009S	ID03123710CM1RE	35	32	1	0	
Average		35.0	32.0	1.0	0.0	
Standard Deviation						
Count (n)		1	1	1	1	0
ACL97012S	ID02734310CM1	56	58	0	0	
	ID02734320CM1	62	67	0	0	
	ID02745510CM1	50	50	0	0	
	ID02801810CM1	58	54	0	0	
	ID02863310CM1	70	54	0	0	
Average		59.2	56.6	0.0	0.0	
Standard Deviation		7.4	6.5	0.0	0.0	
Count (n)		5	5	5	5	0
ACL98005S	ID00158410CM1	95	78.8	31	11.8	
	ID02275410CM1RE	85.2	81	54.8	60.5	
	ID02943010CM1	71	63.5	19	29	
Average		83.7	74.4	34.9	33.8	
Standard Deviation		12.1	9.5	18.2	24.7	
Count (n)		3	3	3	3	0
ACL98007S	ID00684710CM1DL5	90	78	22	14.5	
Average		90.0	78.0	22.0	14.5	
Standard Deviation						
Count (n)		1	1	1	1	0

Table C-2. (continued).

Batch #	Sample #	Percent Recovery				
		%R Surrogate NBZ	%R Surrogate FBP	%R Surrogate 2FP	%R Surrogate TBP	%R Surrogate PHN
ACL98012S	ID01002910CM1RE (001)	94.8	76.8	24.5	36	
	ID02315310CM1	72.5	75.8	67.5	83.8	
Average		83.7	76.3	46.0	59.9	
Standard Deviation		15.8	0.7	30.4	33.8	
Count (n)		2	2	2	2	0
ACL98013S	ID01006010CM1	106.2	95.5	42.2	17.5	
	ID01196110CM1	71.2	66	36.5	22.2	
	ID01196120CM1	100.8	78	15	1.5	
	ID01196120CM1	74.8	67.5	43.5	45	
Average		88.3	76.8	34.3	21.6	
Standard Deviation		17.8	13.6	13.2	18.0	
Count (n)		4	4	4	4	0
ACL99001S	ID01935810CM1	71.5	61.8	49.2	45.8	
	ID01935820CM1	93.5	83	11.8	16.8	
Average		82.5	72.4	30.5	31.3	
Standard Deviation		27.7	25.2	12.6	13.0	
Count (n)		2	2	2	2	0

NBZ - Nitrobenzene-d5

FBP - 2-Fluorobiphenyl

2FP - 2-Fluorophenol

TBP - 2,4,6-Tribromophenol

PHN - Phenol-d6

Appendix D

Volatile Organic Compound Back-up Data

Table D-1. Analytical Chemistry Laboratory volatile organic compound quality control matrix spike and matrix spike duplicate summary by compound.

Compound	Batch #	Matrix Spikes		
		MS % Recovery	MSD % Recovery	RPD
1,1-Dichloroethylene	ACL96002V	141	107.9	26.6
	ACL96004V	80.9	97.3	18.5
	ACL96005V	107	29	114.7
	ACL96007V	8.4	43.5	135.2
	ACL96008V	389	305	24.2
	ACL97001V	86	90	4.2
	ACL97002V	83	86	
	ACL97003V	80	78	3.2
	ACL97004V	77	85	10.2
	ACL97005V			
	ACL97006V			
	ACL97007V	134	117	14
	ACL97008V			
	ACL97009V			
	ACL97012V			
	ACL98005V			
	ACL98012V	87.8	92.4	5.06
	ACL98013V	84.44	81.5	3.54
	ACL99001V	75.05	74.05	1.34
	Average	104.6		30.1
	Standard deviation	77.4		
	Count	26		12
Benzene	ACL96002V	87.1	82.4	5.6
	ACL96004V	79.7	84.2	5.49
	ACL96005V	85.9	86.8	1.1
	ACL96007V	89.7	85.9	4.3
	ACL96008V	88.8	83.4	6.25
	ACL97001V	87	89	2.7
	ACL97002V	84	85	
	ACL97003V	84	78	6.5
	ACL97004V	85	89	4.9
	ACL97005V			
	ACL97006V			
	ACL97007V	94	90	4.4
	ACL97008V			
	ACL97009V			
	ACL97012V			
	ACL98005V			
	ACL98012V	90.4	89.6	0.89
	ACL98013V	84.13	83.4	0.87
	ACL99001V	72.5	76.08	4.81
	Average	85.2		4.0
	Standard deviation	4.8		
	Count	26		12
Chlorobenzene	ACL96002V	89.6	97.2	8.2
	ACL96004V	86.9	91.3	5
	ACL96005V	91.5	97	5.8
	ACL96007V	95.2	91.1	4.5
	ACL96008V	96	95.2	7.38
	ACL97001V	92	93	1.9
	ACL97002V			

Table D-1. (Continued).

Compound	Batch #	Matrix Spikes		
		MS % Recovery	MSD % Recovery	RPD
	ACL97003V	89	84	5.4
	ACL97004V	92	93	1.3
	ACL97005V			
	ACL97006V			
	ACL97007V	94	92	1.6
	ACL97008V			
	ACL97009V			
	ACL97012V			
	ACL98005V			
	ACL98012V	133	128.2	3.66
	ACL98013V	102.4	105.28	2.77
	ACL99001V	94.08	99.41	5.51
Average		96.8		4.4
Standard deviation		11.4		
Count		24		12
Toluene	ACL96002V	93	95.2	2.3
	ACL96004V	83.3	90.4	8.21
	ACL96005V	89.3	108.4	19.4
	ACL96007V	94.7	104	9.3
	ACL96008V	91.6	94.5	3.32
	ACL97001V	95	97	2.8
	ACL97002V			
	ACL97003V	97	95	1.9
	ACL97004V	105	101	3.5
	ACL97005V			
	ACL97006V			
	ACL97007V	98	97	0.7
	ACL97008V			
	ACL97009V			
	ACL97012V			
	ACL98005V			
	ACL98012V	111.1	110	0.98
	ACL98013V	88.46	86.82	1.87
	ACL99001V	77.26	82.57	6.64
Average		95.2		5.1
Standard deviation		8.6		
Count		24		12
Trichloroethylene	ACL96002V	92.1	91.8	0.4
	ACL96004V	79.5	103.2	25.9
	ACL96005V	95	65.9	36.1
	ACL96007V	89.4	85.2	4.9
	ACL96008V	87.9	85.7	2.47
	ACL97001V	79	85	7.6
	ACL97002V			
	ACL97003V	77	79	2.2
	ACL97004V	80	84	4.1
	ACL97005V			
	ACL97006V			
	ACL97007V	93	90	3
	ACL97008V			
	ACL97009V			
	ACL97012V			
	ACL98005V			

Table D-1. (Continued).

Compound	Batch #	Matrix Spikes		
		MS % Recovery	MSD % Recovery	RPD
	ACL98012V	102.7	100.7	2
	ACL98013V	92.02	92.54	0.56
	ACL99001V	80.74	83.44	3.29
Average		87.3		7.7
Standard deviation		8.8		
Count		24		12

*Acceptance Criteria taken from WAP Table B3-4

**Detected: result must be greater than zero

***Nonconformances do not apply to matrix related exceedances.

MS & MSD samples for the following batches were not IDC 001, 002 or 800 and were not included.

Table D-2. Analytical Chemistry Laboratory volatile organic compound quality control laboratory control samples summary by compound.

Compound	Batch No.	Laboratory Control Sample (LCS)		
		LCS % Recovery	LCS-3 % Recovery	LCS-2 % Recovery
1,1,1-Trichloroethane	ACL96002V	87.4		
	ACL96004V	97.9		
	ACL96005V	84		
	ACL96007V	80.5		
	ACL96008V	78		
	ACL97001V			
	ACL97002V	86		
	ACL97003V	83		
	ACL97004V	79		
	ACL97005V	82		
	ACL97006V	94		
	ACL97007V	81		
	ACL97008V	108		
	ACL97009V	96		
	ACL97012V	91		
	ACL98005V	108.9	107.1	
	ACL98007V	116.65		
	ACL98012V	82.8	85.2	87.28
	ACL98013V	92.26		
	ACL99001V	94.4	93.84	103.56
Average		91.7		
Standard deviation		10.7		
Count		24		
1,2-Dichloroethane	ACL96002V	114.6		
	ACL96004V	121.1		
	ACL96005V	120		
	ACL96007V	133.4		
	ACL96008V	120		
	ACL97001V			
	ACL97002V	103		
	ACL97003V	90		
	ACL97004V	97		
	ACL97005V	90		
	ACL97006V	105		
	ACL97007V	98		
	ACL97008V	104		
	ACL97009V	108		
	ACL97012V	98		
	ACL98005V	105.5	104.3	
	ACL98007V	112.25		
	ACL98012V	95.66	96.58	94.14
	ACL98013V	96.66		

Table D-2. (Continued).

Compound	Batch No.	Laboratory Control Sample (LCS)		
		LCS % Recovery	LCS-3 % Recovery	LCS-2 % Recovery
	ACL99001V	91.64	93.44	88.28
Average		103.4		
Standard deviation		11.7		
Count		24		
Carbon Tetrachloride	ACL96002V	84.1		
	ACL96004V	100.1		
	ACL96005V	83		
	ACL96007V	80.8		
	ACL96008V	77		
	ACL97001V			
	ACL97002V	88		
	ACL97003V	74		
	ACL97004V	83		
	ACL97005V	88		
	ACL97006V	92		
	ACL97007V	93		
	ACL97008V	104		
	ACL97009V	105		
	ACL97012V	79		
	ACL98005V	35.7	97.4	
	ACL98007V	147.05		
	ACL98012V	90.12	91.94	92.98
	ACL98013V	90.86		
	ACL99001V	94.34	90.74	83.78
Average		89.4		
Standard deviation		18.2		
Count		24		
Chlorobenzene	ACL96002V	101.8		
	ACL96004V	95		
	ACL96005V	99		
	ACL96007V	113.2		
	ACL96008V	100		
	ACL97001V			
	ACL97002V	99		
	ACL97003V	91		
	ACL97004V	94		
	ACL97005V	89		
	ACL97006V	102		
	ACL97007V	92		
	ACL97008V	99		
	ACL97009V	101		
	ACL97012V	86		
	ACL98005V		106.7	
	ACL98007V	107.6		

Table D-2. (Continued).

Compound	Batch No.	Laboratory Control Sample (LCS)		
		LCS % Recovery	LCS-3 % Recovery	LCS-2 % Recovery
	ACL98012V	107.38	112	99.24
	ACL98013V	97.3		
	ACL99001V	97.96	97.96	92.12
Average		99.1		
Standard deviation		7.0		
Count		23		
Chloroform	ACL96002V	93.7		
	ACL96004V	102.8		
	ACL96005V	92		
	ACL96007V	86.6		
	ACL96008V	83		
	ACL97001V			
	ACL97002V	91		
	ACL97003V	86		
	ACL97004V	89		
	ACL97005V	90		
	ACL97006V	95		
	ACL97007V	83		
	ACL97008V	108		
	ACL97009V	95		
	ACL97012V	81		
	ACL98005V	105.6	100.2	
	ACL98007V	98.5		
	ACL98012V	88.36	86.18	89.78
	ACL98013V	95.46		
	ACL99001V	96.08	98.66	104.56
Average		93.3		
Standard deviation		7.5		
Count		24		
Ethylbenzene	ACL96002V	107.1		
	ACL96004V	102.9		
	ACL96005V	104		
	ACL96007V	116.7		
	ACL96008V	108		
	ACL97001V			
	ACL97002V	104		
	ACL97003V	100		
	ACL97004V	101		
	ACL97005V	96		
	ACL97006V	106		
	ACL97007V	99		
	ACL97008V	108		
	ACL97009V	108		
	ACL97012V	92		

Table D-2. (Continued).

Compound	Batch No.	Laboratory Control Sample (LCS)		
		LCS % Recovery	LCS-3 % Recovery	LCS-2 % Recovery
	ACL98005V	99.4	95.6	
	ACL98007V	99.05		
	ACL98012V	100.34	102.74	91
	ACL98013V	93.08		
	ACL99001V	96.32	93.46	88.78
Average		100.5		
Standard deviation		6.6		
Count		24		
m-Xylene and p-Xylene	ACL96002V	101		
	ACL96004V	91.4		
	ACL96005V	98		
	ACL96007V	110.3		
	ACL96008V	100		
	ACL97001V			
	ACL97002V	98		
	ACL97003V	91		
	ACL97004V	92		
	ACL97005V	87		
	ACL97006V	100		
	ACL97007V	99		
	ACL97008V	101		
	ACL97009V	100		
	ACL97012V	86		
	ACL98005V	92	97.3	
	ACL98007V	96.75		
	ACL98012V	102.03	99.79	91.7
	ACL98013V	94.32		
	ACL99001V	98.38	93.92	94.85
Average		96.5		
Standard deviation		5.4		
Count		24		
o-Xylene	ACL96002V	101		
	ACL96004V	92.5		
	ACL96005V	97		
	ACL96007V	116.6		
	ACL96008V	101		
	ACL97001V			
	ACL97002V	99		
	ACL97003V	90		
	ACL97004V	91		
	ACL97005V	86		
	ACL97006V	104		
	ACL97007V	99		
	ACL97008V	102		

Table D-2. (Continued).

Compound	Batch No.	Laboratory Control Sample (LCS)		
		LCS % Recovery	LCS-3 % Recovery	LCS-2 % Recovery
	ACL97009V	100		
	ACL97012V	89		
	ACL98005V	97.2	97.5	
	ACL98007V	100.7		
	ACL98012V	107.72	100.5	93.2
	ACL98013V	90.02		
	ACL99001V	98.74	94.32	93.1
Average		97.5		
Standard deviation		6.7		
Count		24		
Tetrachloroethylene	ACL96002V	94.6		
	ACL96004V	83.8		
	ACL96005V	95		
	ACL96007V	80.6		
	ACL96008V	17.43		
	ACL97001V			
	ACL97002V	88		
	ACL97003V	87		
	ACL97004V	91		
	ACL97005V	85		
	ACL97006V	91		
	ACL97007V	91		
	ACL97008V	87		
	ACL97009V	90		
	ACL97012V	78		
	ACL98005V	103.5	100.3	
	ACL98007V	98.75		
	ACL98012V	106.38	104.82	95.6
	ACL98013V	100.16		
	ACL99001V	92.44	88.8	95.72
Average		89.4		
Standard deviation		17.0		
Count		24		
Toluene	ACL96002V	111.5		
	ACL96004V	99.8		
	ACL96005V	110		
	ACL96007V	94.6		
	ACL96008V	106		
	ACL97001V			
	ACL97002V	108		
	ACL97003V	109		
	ACL97004V	112		
	ACL97005V	104		
	ACL97006V	110		

Table D-2. (Continued).

Compound	Batch No.	Laboratory Control Sample (LCS)		
		LCS % Recovery	LCS-3 % Recovery	LCS-2 % Recovery
	ACL97007V	106		
	ACL97008V	112		
	ACL97009V	112		
	ACL97012V	92		
	ACL98005V	102.6	101	
	ACL98007V	99.3		
	ACL98012V	102.78	104.44	91.58
	ACL98013V	47.05		
	ACL99001V	93.1	87.58	94.06
Average		100.4		
Standard deviation		13.6		
Count		24		

Table D-3. Analytical Chemistry Laboratory volatile organic compound quality control average percent recovery of surrogate compounds by batch.

Batch #	Sample #	Surrogate Organic Compounds			
		BFM %Recovery	TOL %Recovery	BFB %Recovery	DCA %Recovery
ACL96002V	ID004219101V1	108.8	84.4	74.2	
	ID004219102V1	92.7	88.8	94.5	
	ID004219201V1	137.5	96.3	96.4	
	ID004219202V1	124.2	89.5	83.5	
	ID032674101V1	36.0	101.2	94.1	
	ID032674102V1	51.2	103.7	99.5	
ACL96004V	ID010604101V1	80.7	93.8	98.0	
	ID010604102V1	76.5	98.5	95.1	
	ID010604201V1	64.6	98.5	90.7	
	ID010604202V1	50.6	94.4	91.5	
	ID010931101V1	6.1	96.9	79.4	
	ID010931102V1	9.9	90.7	88.0	
	ID012287101V1	84.3	98.6	94.7	
	ID012287102V1	107.7	92.8	90.8	
ACL96005V	ID010549101V1	98.2	101.0	101.0	
	ID010549102V1	105.0	103.1	94.9	
	ID010788101V1	119.9	106.3	100.8	
	ID010788102V1	105.4	102.1	98.0	
	ID010788201V1	119.9	104.2	98.8	
	ID010788202V1	120.1	99.5	93.4	
	ID015700101V1	112.1	104.9	99.5	
	ID015700102V1	111.6	111.1	103.8	
	ID018152101V1	274.1	107.9	101.9	
	ID018152102V1	301.9	105.4	102.7	
	ID022506101V1	94.4	104.1	97.5	
	ID022506102V1	106.8	104.7	90.0	
	ID029793101V1	274.8	108.3	100.7	
	ID029793102V1	266.5	106.5	97.7	
	ID030341101V1	244.6	104.5	96.7	
	ID030341102V1	235.5	102.8	117.1	
ACL96007V	ID031142101V1	235.6	111.6	100.3	
	ID031142102V1	295.0	103.8	98.1	
	ID030362101V1	293.5	110.4	101.4	
	ID030362102V1	338.1	109.1	101.1	
	ID031142201V1	111.9	102.9	97.7	
	ID031142202V1	176.9	100.2	100.5	
	ID023561101V1	100.1	111.8	101.6	
	ID023561102V1	78.7	111.9	101.3	
	ID014031101V1	93.4	118.8	109.2	
	ID014031102V1	99.8	117.7	108.7	

Table D-3. (Continued).

Batch #	Sample #	Surrogate Organic Compounds			
		BFM %Recovery	TOL %Recovery	BFB %Recovery	DCA %Recovery
	ID010534201V1	91.6	104.7	97.7	
	ID010534101V1	98.3	107.1	99.7	
	ID010534102V1	93.9	106.4	96.7	
	ID010534202V1	107.0	98.7	91.7	
	ID011450101V1	100.7	101.3	97.3	
	ID012756101V2	112.8	110.2	99.2	
	ID011450102V2	96.9	104.7	99.4	
	ID012756102V1	121.7	110.9	92.3	
	ID010859101V1	102.2	104.2	102.6	
	ID010859102V1	98.6	102.6	96.4	
ACL96008V	ID016069101V1	75.9	98.5	139.0	
	ID016069102V1	97.5	102.0	99.6	
	ID013613101V1	70.2	84.3	190.0	
	ID013613102V1	108.0	103.0	100.0	
	ID013613202V1	100.0	104.0	102.0	
	ID007085101V1	99.7	101.0	96.0	
	ID013522101V1	237.0	102.0	100.0	
	ID007085102V1	213.0	102.0	98.8	
	ID013613201V1	122.0	103.0	101.0	
	ID013522102V1	201.0	96.2	93.1	
	ID018333201V1	310.0	96.6	163.0	
	ID018333202V1	293.0	108.0	97.7	
	ID018333101V1	202.0	101.0	108.0	
	ID018333102V1	130.0	103.0	96.4	
	ID011412101V1	290.0	104.0	96.9	
	ID011412102V1	291.0	106.0	98.6	
ACL97001V	ID001080101V1	9.6	88.0	86.0	
	ID001080102V1	9.8	89.0	88.0	
	ID001080201V1	3.5	90.0	86.0	
	ID001080202V1	1.2	85.0	86.0	
	ID003227101V1	21.0	93.0	94.0	
	ID003227102V1	21.0	90.0	72.0	
	ID005695101V1	41.0	96.0	97.0	
	ID005695102V1	66.0	142.0	137.0	
	ID013423101V1	8.9	99.0	92.0	
	ID013423102V1	33.0	88.0	90.0	
ACL97002V	ID000887101V1	62.0	83.0	83.0	
	ID000887102V1	4.2	86.0	88.0	
	ID008473101V1	63.0	100.0	94.0	
	ID008473102V1	44.0	91.0	84.0	
ACL97003V	ID003932101V1	68.0	95.0	91.0	
	ID003932102V1	52.0	92.0	92.0	
	ID003932201V1	28.0	87.0	82.0	
	ID003932202V1	50.0	90.0	88.0	

Table D-3. (Continued).

Batch #	Sample #	Surrogate Organic Compounds			
		BFM %Recovery	TOL %Recovery	BFB %Recovery	DCA %Recovery
	ID004221101V1	21.0	87.0	85.0	
	ID004221102V1	0.7	93.0	92.0	
	ID005049101V1	39.0	95.0	90.0	
	ID005049102V1	22.0	92.0	91.0	
	ID012873101V1	72.0	85.0	81.0	
	ID012873102V1	77.0	91.0	89.0	
	ID013672101V1	63.0	87.0	83.0	
	ID013672102V1	64.0	90.0	86.0	
	ID020033101V1	30.0	89.0	85.0	
	ID020033102V1	45.0	89.0	85.0	
	ID024148101V1	51.0	88.0	85.0	
	ID024148102V1	4.6	86.0	87.0	
ACL97004V	ID008355101V1	70.0	99.0	94.0	
	ID008355102V1	17.0	101.0	106.0	
	ID020749101V1	80.0	102.0	97.0	
	ID020749102V1	84.0	93.0	88.0	
	ID020749201V1	82.0	99.0	96.0	
	ID020749202V1	78.0	95.0	96.0	
	ID023717101V1	61.0	81.0	79.0	
	ID023717102V1	54.0	86.0	84.0	
	ID023821101V1	73.0	91.0	86.0	
	ID023821102V1	66.0	78.0	120.0	
	ID023821201V1	72.0	85.0	80.0	
	ID023821202V1	77.0	91.0	84.0	
	ID024498101V1	80.0	93.0	87.0	
	ID024498102V1	75.0	92.0	85.0	
	ID024670101V1	76.0	87.0	83.0	
	ID024670102V1	54.0	89.0	83.0	
	ID025265101V1	76.0	92.0	90.0	
	ID025265102V1	67.0	95.0	87.0	
	ID028657101V1DL	D	D	D	
	ID028657102V1DL	D	D	D	
	ID028657101V1	0.0	93.0	90.0	
	ID028657102V1	34.0	94.0	82.0	
ACL97005V	ID003344101V1	106.0	95.0	94.0	
	ID003344102V1	102.0	88.0	91.0	
ACL97006V	ID006729101V1DL	126.0	100.0	100.0	
	ID006729101V1DL.2	104.0	94.0	102.0	
	ID006729102V1DL	96.0	91.0	95.0	
	ID006729102V1DL.2	74.0	93.0	96.0	
	ID011761101V1	51.0	88.0	95.0	
	ID011761102V1	53.0	87.0	86.0	
	ID017876101V1	88.0	94.0	101.0	
	ID017876102V1	96.0	94.0	102.0	

Table D-3. (Continued).

Batch #	Sample #	Surrogate Organic Compounds			
		BFM %Recovery	TOL %Recovery	BFB %Recovery	DCA %Recovery
AC1.97007V	ID017917101V1	90.0	99.0	81.0	
	ID017917102V1	107.0	97.0	102.0	
	ID006836101V1	104.0	93.0	91.0	
	ID006836102V1	102.0	93.0	94.0	
	ID008371101V1	94.0	91.0	101.0	
	ID008371102V1	80.0	97.0	94.0	
	ID008371201V1	122.0	97.0	97.0	
	ID008371202V1	76.0	94.0	93.0	
	ID008344101V1	82.0	98.0	101.0	
	ID008344102V1	106.0	95.0	100.0	
	ID003268101V1	115.0	96.0	102.0	
	ID003268102V1	86.0	96.0	102.0	
	ID003268201V1	122.0	102.0	102.0	
	ID003268202V1	68.0	96.0	99.0	
AC1.97008V	ID013146101V1	129.0	104.0	109.0	
	ID013146102V1	86.0	86.0	98.0	
	ID018806101V1	123.0	100.0	104.0	
	ID018806102V1	66.0	99.0	103.0	
	ID020757101V1	100.0	97.0	96.0	
	ID020757102V1	81.0	90.0	149.0	
	ID023938101V1	76.0	91.0	95.0	
	ID023938102V1	106.0	91.0	95.0	
AC1.97009V	ID031237101V1	114.0	88.0	88.0	
	ID031237102V1	92.0	90.0	97.0	
AC1.97012V	ID028633101V1	0.0	86.8	114.0	
	ID028633102V1	2.5	86.6	111.0	
	ID028018101V1	0.0	94.4	116.0	
	ID028018102V1	0.0	86.7	78.6	
	ID027455101V1	17.9	86.5	82.9	
	ID027455102V1	29.6	88.6	84.6	
	ID027343101V1	0.0	84.1	91.8	
	ID027343102V1	0.0	90.7	83.8	
	ID027343201V1	0.0	86.4	87.4	
	ID027343202V1	0.0	86.5	82.9	
AC1.98005V	ID022754101V1		118.0	124.0	113
	ID022754102V1		119.0	125.0	114
	ID001584101V1		120.0	126.0	115
	ID001584102V1		90.0	84.4	90.2
	ID029430102V1		87.3	82.8	86.7
	ID017148102V1		90.0	91.1	91.8
AC1.98007V	ID006847101V1		81.4	83.1	80.96
	ID006847102V1		84.8	86.7	84.3
AC1.98010V	Data Deleted				
AC1.98012V	ID023153101V1		100.7	95.4	88.6

Table D-3. (Continued).

Batch #	Sample #	Surrogate Organic Compounds			
		BFM %Recovery	TOL %Recovery	BFB %Recovery	DCA %Recovery
	ID023153102V1		96.8	90.2	85.82
	ID010029102V1		94.4	86.4	83.18
	ID010029101V1		102.1	90.1	89.46
ACL98013V	ID010060101V1		91.1	90.3	83.16
	ID010060102V1		86.5	93.1	89.2
ACL99001V	ID019358101V1		80.8	83.2	86.28
	ID019358102V1		80.8	84.0	77.27
	ID019358202V1		80.8	89.9	78.05
	ID019358201V1		76.0	80.3	72.3

BFM = Dibromofluoromethane

TOL = Toluene-d8

BFB = 4-Bromofluorobenzene

DCA = 1,2-Dichloroethane

Appendix E

Nonhalogenated Volatile Organic Background Back-up Data

Table E-1. Analytical Chemistry Laboratory nonhalogenated volatile organic compounds quality control matrix spike and laboratory control sample summary by compound.

Compound	Batch No	MS		RPD	LCS	
		MS % Recovery	MSD % Recovery		LCS %Recovery	LCSD %Recovery
Acetone	ACL96004O	90	83	8.1	100	
	ACL96005O	80	90	12	100	
	ACL96007O	100	100	0	95	
	ACL96008O	100	100	0	100	
	ACL97001N	97	96	1	100	
	ACL97002N				100	110
	ACL97003N	100	100	0	100	
	ACL97004N	110	110	0	100	
	ACL97005N				100	
	ACL97006N				103	
	ACL97007N	99	97	2	106	
	ACL97008N				106	
	ACL97009N				104	
	ACL97012N				100	
	ACL98005N				99.7	
	ACL98007N*				98.61	
	ACL98010N	103.4	102.0	1.3	94.1	
	ACL98012N				105.0	
	ACL98013N				100.9	
	ACL99001N	103.0	98.9	4.0	105.3	
Average		98.0		2.8	101.3	
Standard Deviation		7.5			3.7	
Count (n)		20		10	21	
Butanol	ACL96004O	91	83	9.2	100	
	ACL96005O	85	90	5.7	95	
	ACL96007O	110	100	9.5	95	
	ACL96008O	110	100	9.5	100	
	ACL97001N	101	100	1	100	
	ACL97002N				100	110
	ACL97003N	110	110	0	100	
	ACL97004N	110	110	0	100	
	ACL97005N				100	
	ACL97006N				104	
	ACL97007N	108	107	0.9	104	
	ACL97008N				104	
	ACL97009N				102	
	ACL97012N				98	
	ACL98005N				101.0	
	ACL98007N*				102.44	
	ACL98010N	103.9	102.9	1.0	95.1	
	ACL98012N				103.3	
	ACL98013N				100.4	

Table E-1. (Continued).

Compound	Batch No	MS		RPD	LCS	
		MS % Recovery	MSD % Recovery		LCS % Recovery	LCSD % Recovery
	ACL99001N	103.3	99.6	3.7	105.6	
Average		101.7		4.0	100.9	
Standard Deviation		8.5			3.6	
Count (n)		20		10	21	
Ethyl ether	ACL96004O	78	69	12	95	
	ACL96005O	47	52	10	100	
	ACL96007O	87	80	8.4	90	
	ACL96008O	88	92	7.2	100	
	ACL97001N	84	84	0	100	
	ACL97002N				100	100
	ACL97003N	88	89	1.1	100	
	ACL97004N	75	74	1.3	100	
	ACL97005N				95	
	ACL97006N				92	
	ACL97007N	21	21	0	96	
	ACL97008N				106	
	ACL97009N				108	
	ACL97012N				98	
	ACL98005N				96.4	
	ACL98007N*				93.7	
	ACL98010N	98.7	94.8	4.1	90.5	
	ACL98012N				109.6	
	ACL98013N				108.2	
	ACL99001N	95.1	89.2	6.4	98.0	
Average		75.3		5.1	98.9	
Standard Deviation		22.8			5.5	
Count (n)		20		10	21	
Isobutanol	ACL96004O	89	88	1.1	100	
	ACL96005O	89	93	4.4	100	
	ACL96007O	110	110	0	95	
	ACL96008O	110	100	9.5	100	
	ACL97001N	104	103	1	100	
	ACL97002N				100	110
	ACL97003N	110	110	0	100	
	ACL97004N	120	110	8.7	110	
	ACL97005N				100	
	ACL97006N				105	
	ACL97007N	110	109	0.9	106	
	ACL97008N				105	
	ACL97009N				104	
	ACL97012N				100	
	ACL98005N				101.0	
	ACL98007N*				100.95	
	ACL98010N	104.2	101.6	2.5	96.0	

Table E-1. (Continued).

Compound	Batch No	MS		RPD	LCS	
		MS % Recovery	MSD % Recovery		LCS % Recovery	LCSD % Recovery
	ACL98012N				103.0	
	ACL98013N				98.5	
	ACL99001N	101.8	97.7	4.1	105.8	
Average		103.5		3.2	101.9	
Standard Deviation		8.7			4.0	
Count (n)		20		10	21	
Methanol	ACL96004O	78	69	12	100	
	ACL96005O	94	96	2.1	105	
	ACL96007O	100	100	0	95	
	ACL96008O	100	94	6.2	100	
	ACL97001N	101	101	0	110	
	ACL97002N				100	110
	ACL97003N	100	100	0	120	
	ACL97004N	120	110	8.7	100	
	ACL97005N				100	
	ACL97006N				105	
	ACL97007N	117	114	2.6	106	
	ACL97008N				108	
	ACL97009N				105	
	ACL97012N				98	
	ACL98005N				100.0	
	ACL98007N*				99.72	
	ACL98010N	104.1	102.4	1.6	96.7	
	ACL98012N				102.7	
	ACL98013N				98.9	
	ACL99001N	102.8	98.1	4.6	105.7	
Average		100.1		3.8	103.1	
Standard Deviation		11.6			5.7	
Count (n)		20		10	21	
Methyl ethyl ketone	ACL96004O	89	81	9.4	100	
	ACL96005O	83	85	2.4	95	
	ACL96007O	100	100	0	95	
	ACL96008O	100	100	0	100	
	ACL97001N	102	101	1	100	
	ACL97002N				100	110
	ACL97003N	100	100	0	100	
	ACL97004N	120	110	8.7	110	
	ACL97005N				100	
	ACL97006N				106	
	ACL97007N	97	96	1	106	
	ACL97008N				105	
	ACL97009N				104	
	ACL97012N				98	
	ACL98005N				99.5	

Table E-1. (Continued).

Compound	Batch No	MS		RPD	LCS	
		MS % Recovery	MSD % Recovery		LCS % Recovery	LCS % Recovery
	ACL98007N*				100.21	
	ACL98010N	102.1	101.1	0.9	94.5	
	ACL98012N				102.8	
	ACL98013N				99.2	
	ACL99001N	101.5	98.3	3.3	103.4	
Average		98.4		2.7	101.4	
Standard Deviation		8.8			4.3	
Count (n)		20		10	21	
Pyridine	ACL96004O	110	88	22	105	
	ACL96005O	89	96	7.6	100	
	ACL96007O	93	93	0	95	
	ACL96008O	94	94	0	100	
	ACL97001N	93	92	1.1	100	
	ACL97002N				100	100
	ACL97003N	95	95	0	100	
	ACL97004N	110	100	9.5	100	
	ACL97005N				100	
	ACL97006N				97	
	ACL97007N	100	98	2	98	
	ACL97008N				99.5	
	ACL97009N				100	
	ACL97012N				91	
	ACL98005N				89.8	
	ACL98007N*				90.42	
	ACL98010N	103.1	102.8	0.3	97.0	
	ACL98012N				102.9	
	ACL98013N				98.5	
	ACL99001N	99.9	96.8	3.2	106.0	
Average		97.1		4.6	98.6	
Standard Deviation		6.0			4.2	
Count (n)		20		10	21	

Batch ACL96002O: QC data was not included in the data package.

*Batch ACL98007N MS & MSD were not prepared nor analyzed by the lab. Sample too small.