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

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ABSTRACT

This document, Hazardous Waste Code Determination for the First/Second-Stage Sludge Waste Stream, summarizes the efforts performed at the Idaho National Engineering and Environmental Laboratory (INEEL) to make a hazardous waste code determination on Item Description Codes (IDCs) 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 Sludge Waste Stream.

SUMMARY

This document, Hazardous Waste Code Determination for the First/Second-Stage Sludge Waste Stream, summarizes the efforts performed at the INEEL to make a hazardous waste determination on IDCs 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 Sludge Waste Stream.

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TABLES

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 Plat
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
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 Compoud
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 (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 steams and make U.S. Environmental Protection Agency (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 Sludge Waste Stream. 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 nonconforming 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 Sludge [Item Description Codes (IDCs) 001, 002, 800] Waste Stream. 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 IDCs. The impacted IDCs (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 WAP.

	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

Table 1-1. (continued).

	Drum Identification (ID)	IDC	Phase #/Description	Year Cored
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
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

Table 1-1. (continued).

	Drum Identification (ID)	IDC	Phase #/Description	Year Cored
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-WAP) 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 WAP 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 1-2) have been randomly core sampled, selected, and analyzed in accordance with the WAP.

Table 1-2. WAP 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 Sludge Waste Stream. 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 aqueous 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 IDCs 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 Sludge Waste Stream (containing IDCs 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 IDCs 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 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 aqueous 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.

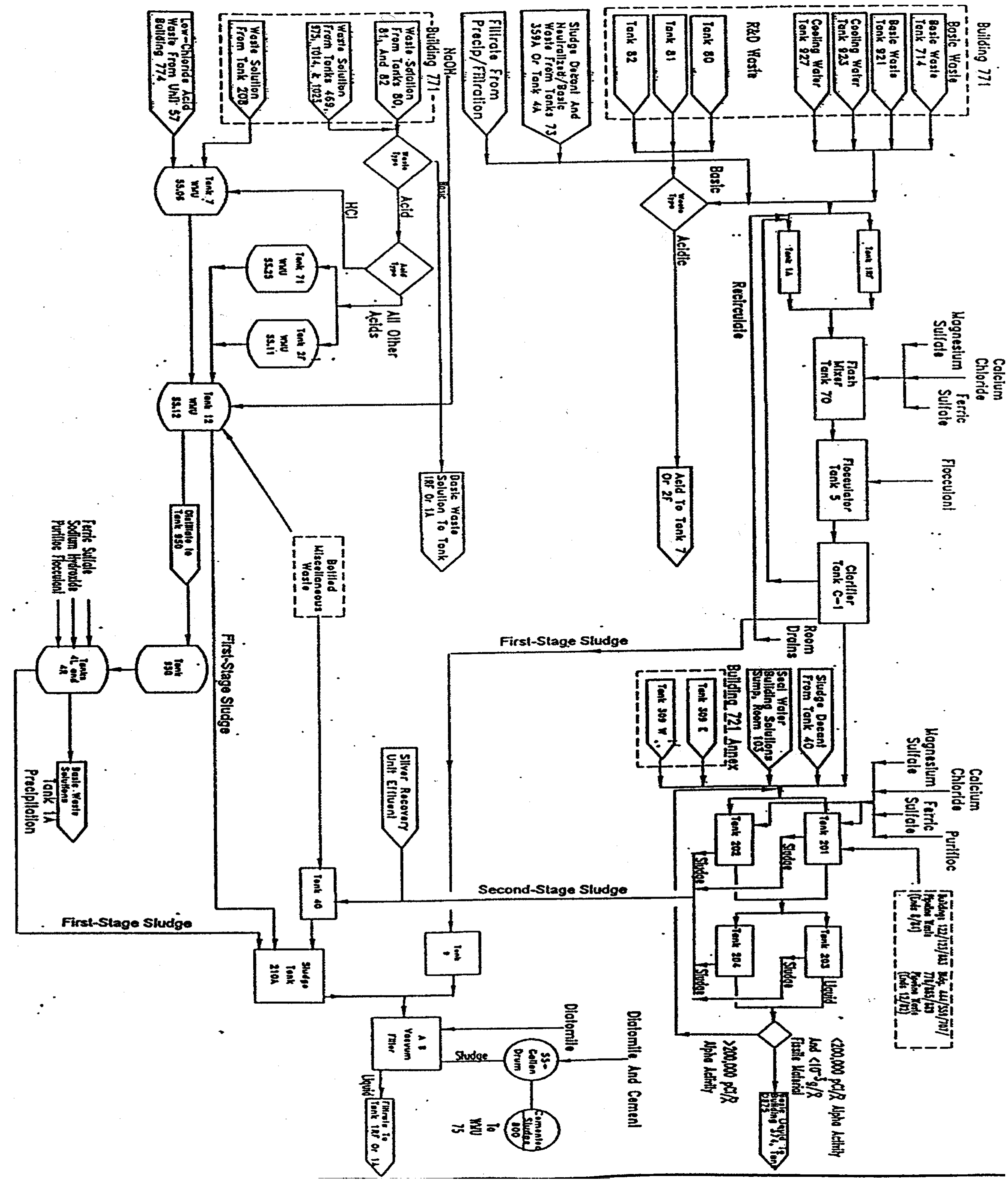


Figure 2-1. Aqueous Treatment Process.

AK has identified the following compounds as potentially being present in aqueous 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 Sludge waste stream 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

Based on testing and knowledge of the waste stream, it has been determined that the First/Second-Stage Waste Stream does not meet the definition of a characteristic waste due to corrosivity. To be a corrosive waste under RCRA, a material must possess either of the following properties:

- It is aqueous with a pH ≤ 2, or, ≥ 12.5. To measure the pH, the EPA prescribes the use of Method 9040 in the definition of corrosivity found at 40 CFR Section 261.22. This method requires that > 20% of the total waste volume is aqueous; or
- A liquid as determined by its ability to pass through a certain type of filter and will corrode steel at a rate of 0.25 inches per year.

As has been determined by radiography and confirmed by visual examination (VE), none of these drums contain 20% by volume, aqueous waste; thus, the corrosive characteristic does not apply. If a waste is not a liquid by definition, a determination of its ability to corrode steel would be inappropriate. Consequently, it is not appropriate to test the pH of the waste or its ability to corrode steel pursuant to the required methodologies.

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.

Table 3-1. Characteristic (Toxicity) Hazardous Waste Codes Assigned to First/Second-Stage Sludge Based on AK.

Hazardous Waste Code	Description	CAS Number	Regulatory Threshold Level (mgIL)
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
D0l0	Selenium	7782-49-2	1.0
D0l1	Silver	7440-22-4	5.0

3.1.3 Ignitibility

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^{0}F (60^{0}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.

As discussed above, the waste does not contain liquids. Nothing in the waste stream is a solid that has qualities likely to ignite through friction, moisture adsorption, or chemical changes. As has been determined through radiography and confirmed through VE, no compressed-gas cylinders exist in the waste. AK indicates that DOT oxidizers were not used in the process, therefore do not exist in the waste.

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.

No material was used or generated in these processes that, under the conditions specified above, could react violently, form harmful gases, contain cyanide or sulfide, or meet the DOT explosive definitions prescribed.

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,l, 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.

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 3-2 for F-listed constituents.

Table 3-2. Listed Hazardous Waste Codes Assigned to First/Second-Stage Sludge Based on AK.

Hazardous Waste Code	Description	Constituents Causing Listing Using AK
F001	Spent halogenated solvents used in degreasing, spent solvent mixtures/blends used in degreasing (F00l, F002, F004, F005 constituents), still bottoms from the recovery of spent solvents and spent solvent mixtures used in degreasing.	Tetrachloroethylene, trichloroethylene, 1,1,l-trichloroethane, carbon tetrachloride methylene chloride
F002	Spent halogenated solvents, spent solvent mixtures/blends (F00l, F002, F004, F005), still bottoms from the recovery of these spent solvents and spent solvent mixtures.	Tetrachloroethylene. Trichloroethylene, 1,1,l-trichloroethane, carbon tetrachloride, methylene chloride, 1,1,2-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,1,2-trifluoroethane
F003	Spent non-halogenated solvents, spent solvent mixtures/blends containing NH solvents and halogenated solvents (F00l, F002, F004, F005), still bottoms from the recovery of these spent solvents and spent solvent mixtures.	Xylene, ethylbenzene, methanol, acetone
F005	Spent NH solvents, spent solvent mixtures/blends containing NH solvents and halogenated solvents (F00l, 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)

3.3 Additional WAP/Waste Acceptance Criteria (WAC) Characterization Data

The WAP and 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 nonintrusive 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/VE

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 28 drums are summarized in Table 4-1. Based on the results given in Table 4-1, two F-listed volatile organic solvents exceeded the program-required quantitation limit (PRQL) at the 90%-confidence level. The UCL_{90} value for 1,1,1 trichloroethane was 81.1 ppmv and 36.5 ppmv for trichloroethylene. The F00l code has already been added (see Table 3-2). In addition, the occurrences of tentatively identified compounds (TICs) were evaluated. No TICs listed in Appendix VIII 40 CFR Part 261 were detected, therefore no hazardous waste codes were assigned based on TICs.

Table 4-1. 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 based on AK
1,1,1-Trichloroethane	28	28	72.5	34.7	150	81.1	10	F001/F002
1,1,2,2-Tetrachloroethane	28	0	0.240	0.150	0.7	[b]	10	N/A
1,1,2-Trichloro-1,2,2-Trifluoroethane	28	10	0.236	0.152	0.46	0.303	10	F002
1,1-Dichloroethane	28	14	0.627	1.10	5.8	1.03	10	N/A
1,1-Dichloroethylene	28	18	1.41	2.11	11	2.07	10	N/A
1,2,4-Trimethylbenzene	28	1	0.161	0.128	0.7	[b]	10	N/A
1,2-Dichloroethane	28	0	0.149	0.085	0.445	[b]	10	N/A
1,3,5-Trimethylbenzene	28	6	0.195	0.132	0.44	0.274	10	N/A
Acetone	28	27	2.39	2.27	13	2.96	100	F003
Benzene	28	3	0.180	0.208	1.1	0.407	10	F005
Bromoform	28	0	0.221	0.129	0.7	[b]	10	N/A
Butanol	28	10	1.11	0.857	3.2	1.48	100	F003
Carbon tetrachloride	28	19	0.696	2.61	14	1.49	10	F001/F002
Chlorobenzene	28	0	0.181	0.112	0.55	[b]	10	N/A
Chloroform	28	1	0.152	0.085	0.45	[b]	10	N/A
cis-1,2-Dichloroethylene	28	2	0.576	2.24	12	5.45	10	N/A

Table 4-1. (continued).

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 based on AK
Cyclohexane	28	0	0.100	0.057	0.295	[b]	10	N/A
Ethyl benzene	28	12	0.334	0.264	0.76	0.438	10	F003
Ethyl ether	28	0	0.341	0.203	1.1	[b]	10	N/A
Methanol	28	0	4.43	1.02	5	[b]	100	F003
Methyl ethyl ketone	28	1	0.388	0.234	1.3	[b]	100	N/A
Methyl isobutyl ketone	28	5	0.185	0.122	0.6	0.269	100	N/A
Methylene chloride	28	22	1.95	5.22	28	3.43	10	F001/F002
Tetrachloroethylene	28	10	46.9	246	1300	154	10	F001
Toluene	28	27	2.71	1.14	5.7	2.99	10	F005
Trichloroethylene	28	24	20.0	61.1	330	36.5	10	F001/F002
m&p-Xylene	28	9	0.479	0.501	1.9	0.712	10	F003
o-Xylene	28	7	0.273	0.196	0.63	0.379	10	F003

Did the data verify the Acceptable Knowledge? Yes __X__ No _____

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

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.

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 (SVOCs), total volatile organic compounds (VOCs), and NH VOCs. The indicators include: LCS, MSs, MSDs, and surrogates (where applicable). Recoveries were complied 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 sludge waste stream 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 SVOC 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-flurorbiphenyl (FBP), were acceptable. The two other surrogate recovery averages or associated error [2-flurorphenol (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 (3-σ) 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 VOC 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 (3-σ) 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 NH VOC 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 TIC Assessment

The WAP requires that TICs 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 TICs from Total VOC and SVOC analyses is given in Table 4-2. All TIC concentrations are low. One compound, bis (2-ethyhexyl) 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 TICs 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 WAP 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	D011	-
	As	75	48	0.7	38	4.37	5.29	100	D004	D004	-
	Ba	75	75	7	290	43.4	41.4	2000	D005	D005	-
	Cd	75	74	0.135	130	12.9	19.1	20	D006	D006	-
	Cr	75	75	10	1700	198	225	100	D007	D007	-
	Hg	75	32	0.044	14	1.11	2.33	4	D009		5
	Pb	75	74	2	3800	244	515	100	D008	D008	-
	Se	75	7	0.47	1.5	0.656	0.27	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. 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 WAP 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 Waste Stream 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 solified 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 SVOC Data Assessment

The UCL_{90} value could not be determined for toxicity SVOCs (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 VOC Assessment

The UCL_{90} value could not be determined for toxicity VOCs. 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 tricholoroethylene. These codes will not be changed.

4.3.4 NH VOC Assessment

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

4.3.5 WAP Compliant Non-Characteristic Analytes

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

Table 4-5. WAP 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/PRQL (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 TIC 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 SVOC Summary Data – TICs.

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 ____X___ No ________			
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 Waste Stream 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

INEL-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 – SVOCs Back-up Data

Appendix D – VOC Back-up Data

Appendix E – NH VOC 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 Sludge Waste Stream, Item Description Codes (IDCs) 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 (SVOCs), total volatile organic compound (VOCs), and non-halogenated (NH) VOCs. 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. ACL Metals Quality Control Average Percent Recovery of Metals MSs and MSDs.

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. ACL 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

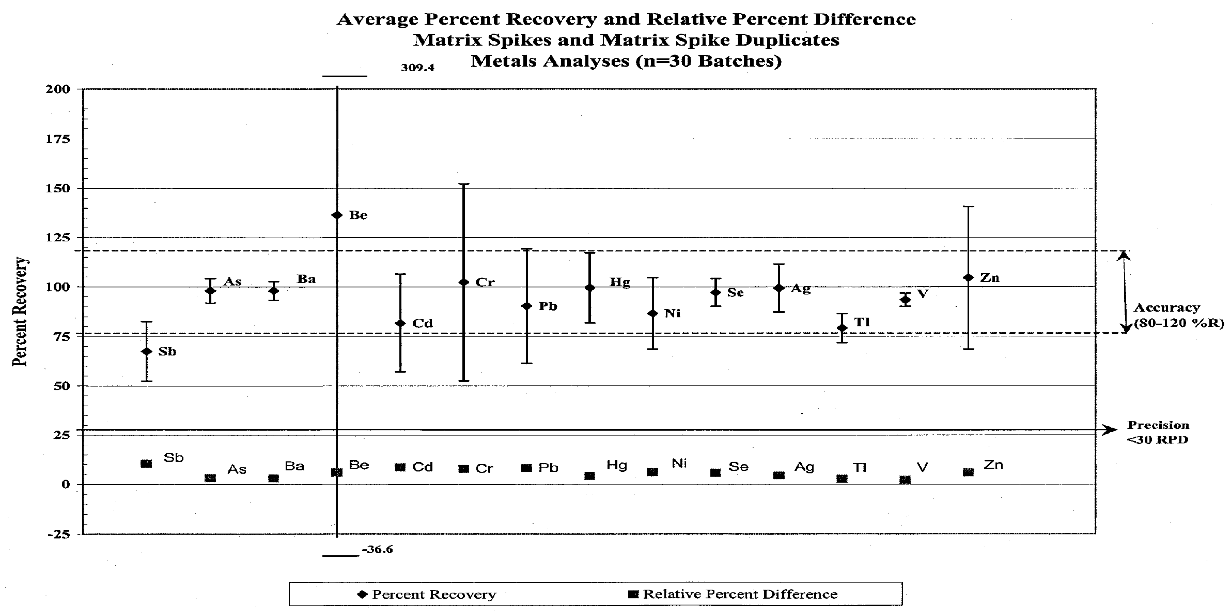


Figure M-1. Average Percent Recovery and RPD MSs and MSDs Metals Analyses

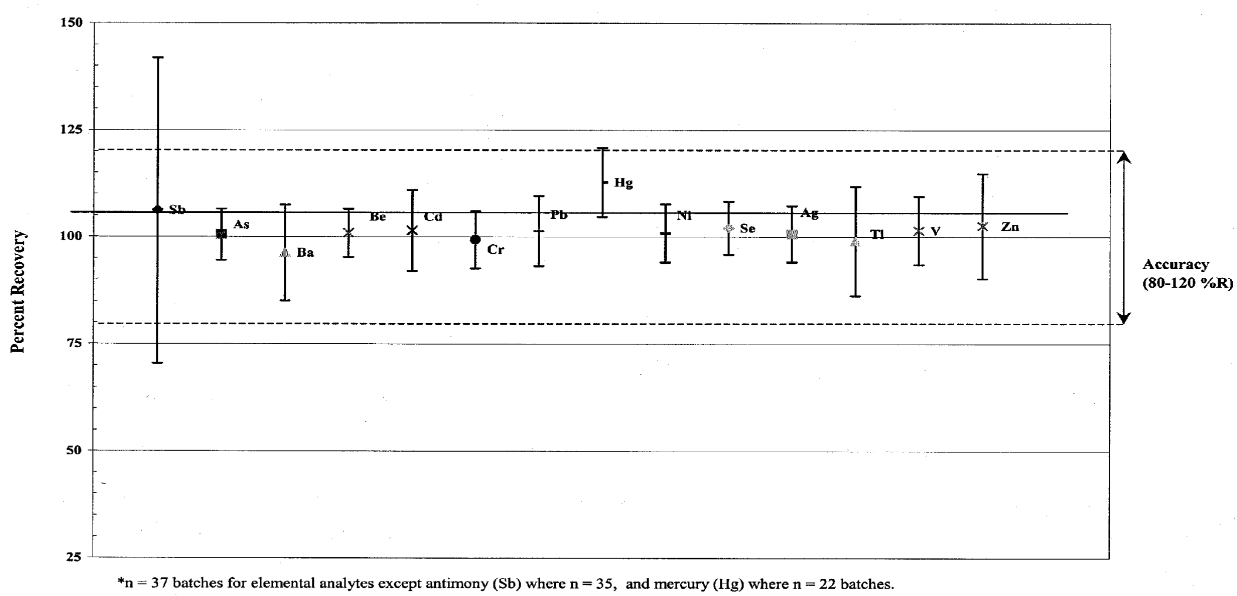


Figure M-2. Average Percent Recovery LCSs Metals Analyses.

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: MS/MSD 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 IDCs 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 ½ 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: LCS 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 ± 20% criteria. While Figure M-2 uses the ± 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 sludge waste stream.

A-2 Preliminary SVOC 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. ACL SVOCs Quality Control Average Percent Recovery of VOCs MS/MSDs.

Compound	% Recovery MS/MSD	MS/MSD Standard Deviation	RPD	Spikes (n)
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. ACL SVOCs Quality Control Average Percent Recovery of SVOCs LCSs.

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

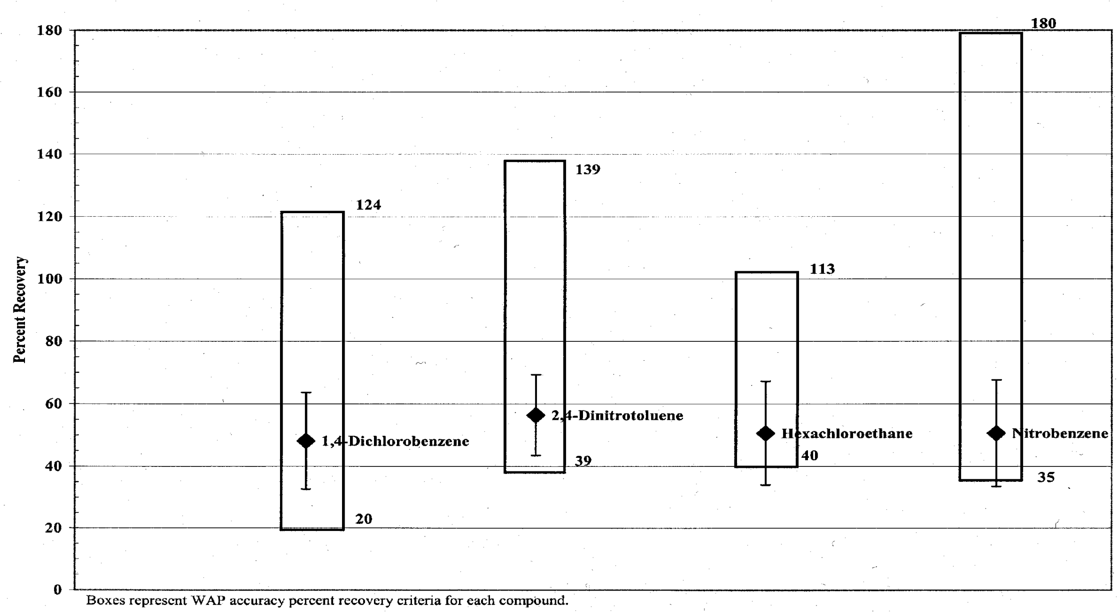
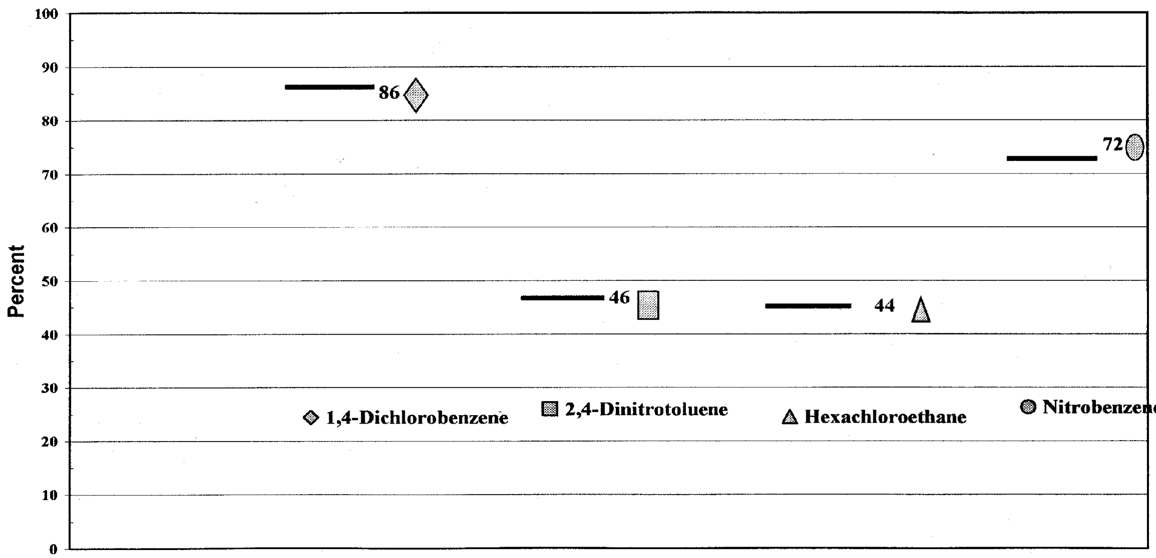
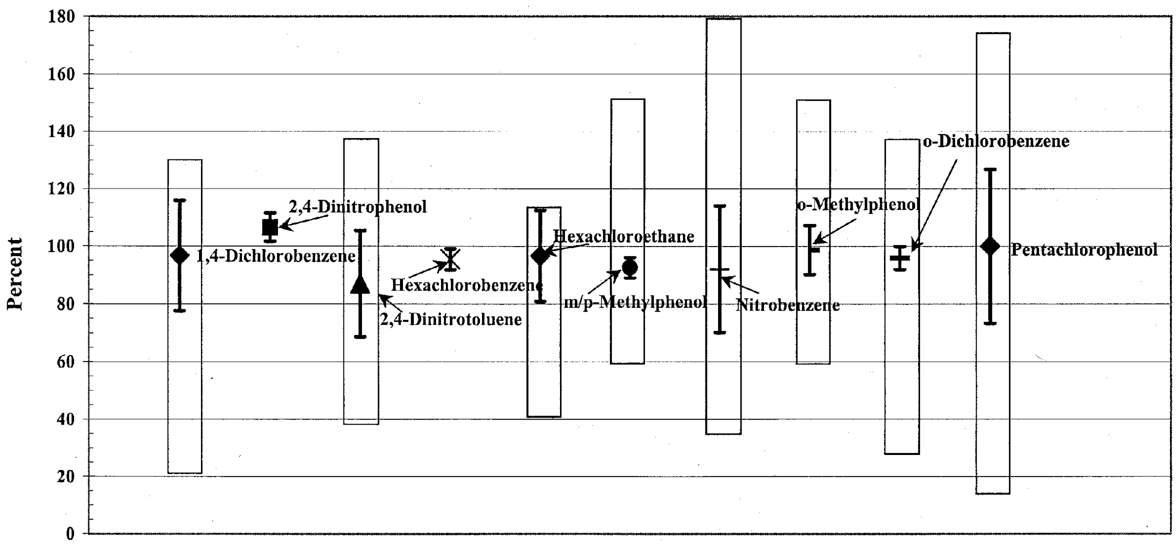


Figure SV-1. Average Percent Recovery MS/MSDs SVOCs Analyses (n=20).



Horizontal bars represent WAP precision criteria for relative percent difference of each compound. (<RPD)

Figure SV-2. Average RPD MS/MSDs SVOCs Analyses (N=20).



n = 22 for nitrobenzene; n = 21 for 1,4-dichlorobenzene, 2,4-dinitrotoluene, and hexachloroethane; n = 3 for o-methylphenol, o-dichlorobenzene and pentachlorophenol; and n = 2 for 2,4-dinitrophenol, hexachlorobenzene and m/p-methylphenol.
For 2,4-dinitrophenol, and hexachlorobenzene, the accuracy criteria is if the compound is detected and the result is greater than zero.
▯ = the range (minimum and maximum values) of the accuracy criterion for each compound

Figure SV-3. Average Percent Recovery LCSs SVOCs 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 SVOC Data: MS/MSD 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:

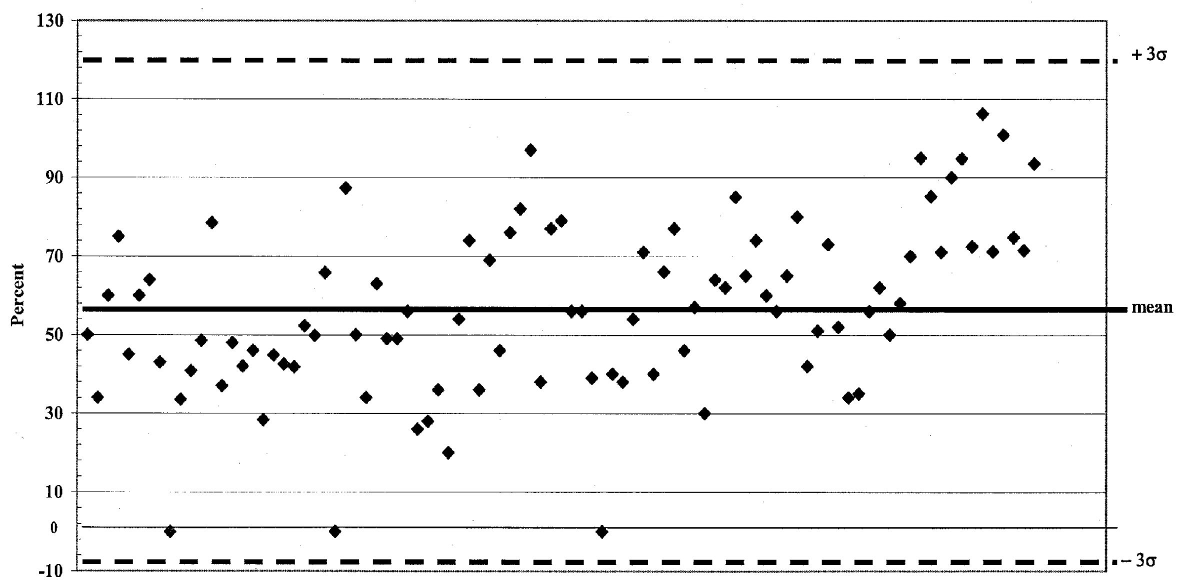
- Batch ACL96005SV – The MS/MSD average recovery was within WAP limits, but the error bar fell below the criteria. The potential low bias is approximately 10%. The sample results for this compound were all non-detects. Holding times were exceeded from extraction to analysis (by 20 days). However, since 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 SVOC 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.

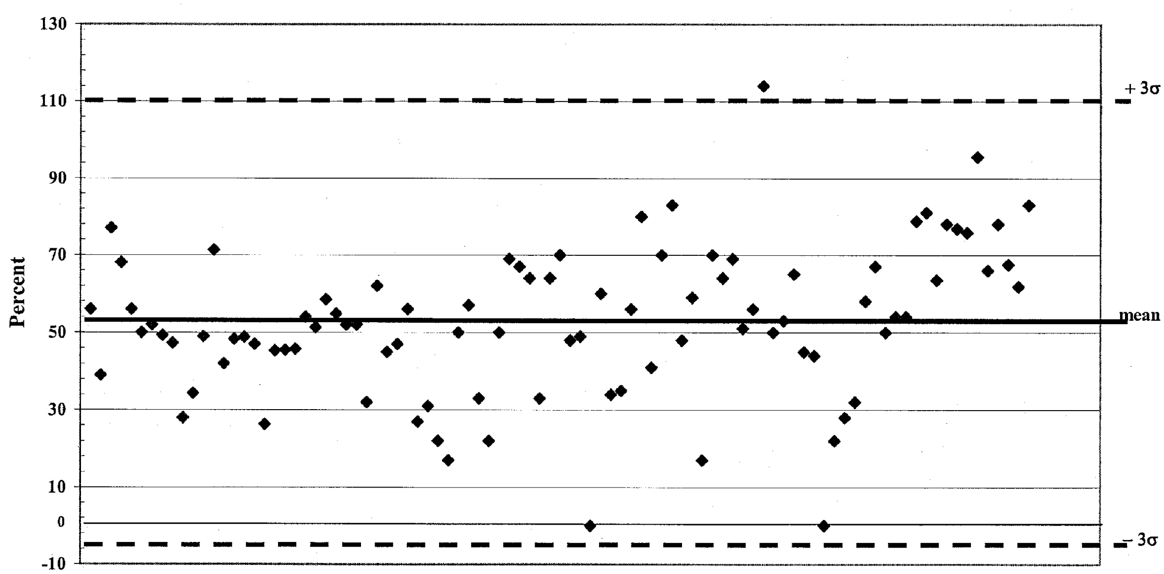
Surrogate FBP recoveries, Figure SV-5, fell within the 3 sigma acceptance criteria with the exception of one data point which fell just above the upper limit. Since the bias indicated by this is high (the data point could be an outlier), use of the data is conservative.



Statistics:
Average 56.4%
Maximum Detected 106.2%
Minimum Detected 0.0%
Standard Deviation 21.6%

Sigma 64.8%
Count (n) 93
Acceptance Range: -8.3 to 121.2%

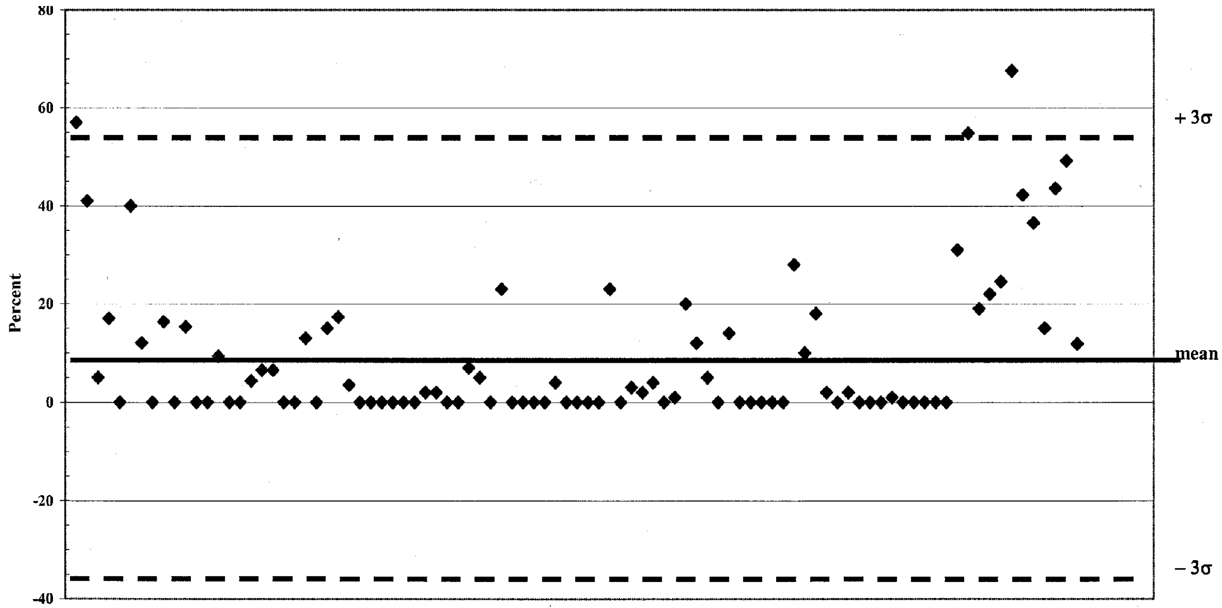
Figure SV-4. Average Percent Recovery of SVOCs Analyses Surrogate Nitrobenzene-d5 (NBZ).



Statistics: Average 52.7%
Maximum 114.0%
Minimum 0.0%
Standard Deviation 19.3%

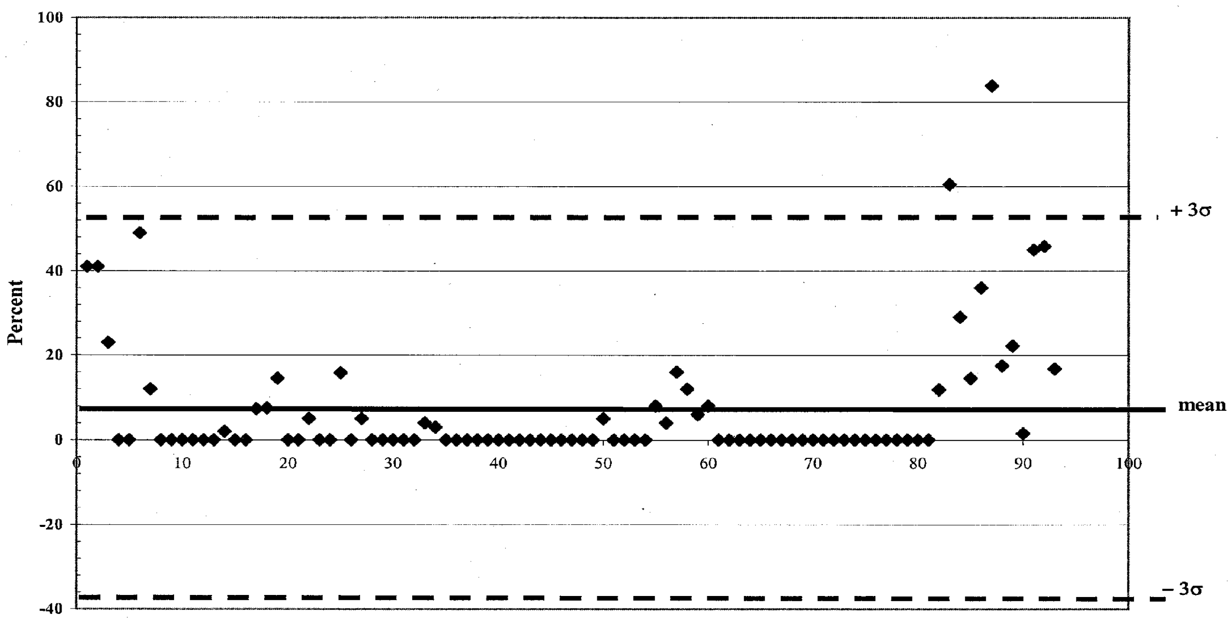
3 Sigma 57.8%
Count (n) 93
Acceptance Range: -5.1 to 110.5%

Figure SV-5. Average Percent Recovery of SVOCs Analyses Surrogate 2-Fluorobiphenyl (FBP).



Statistics: Average 9.5% | 3 Sigma 45.2%
Maximum 67.5% | Count (n) 93
Minimum 0.0% | Acceptance Range: -35.7 to 54.7%
Standard Deviation 15.1%

Figure SV-6. Average Percent Recovery of SVOCs Analyses Surrogate 2-Fluorophenol (2FP).



Statistics: Average 7.4% | 3 Sigma 45.5%
Maximum 83.8% | Count (n) 93
Minimum 0.0% | Acceptance Range: -38.3 to 52.8%
Standard Deviation 15.2%

Figure SV-7. Average Percent Recovery of SVOCs 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 SVOC Data: LCS 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 VOC 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. ACL VOCs Quality Control Average Percent Recovery of VOCs MS/MSDs.

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. ACL VOCs Quality Control Average Percent Recovery of VOCs LCSs.

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

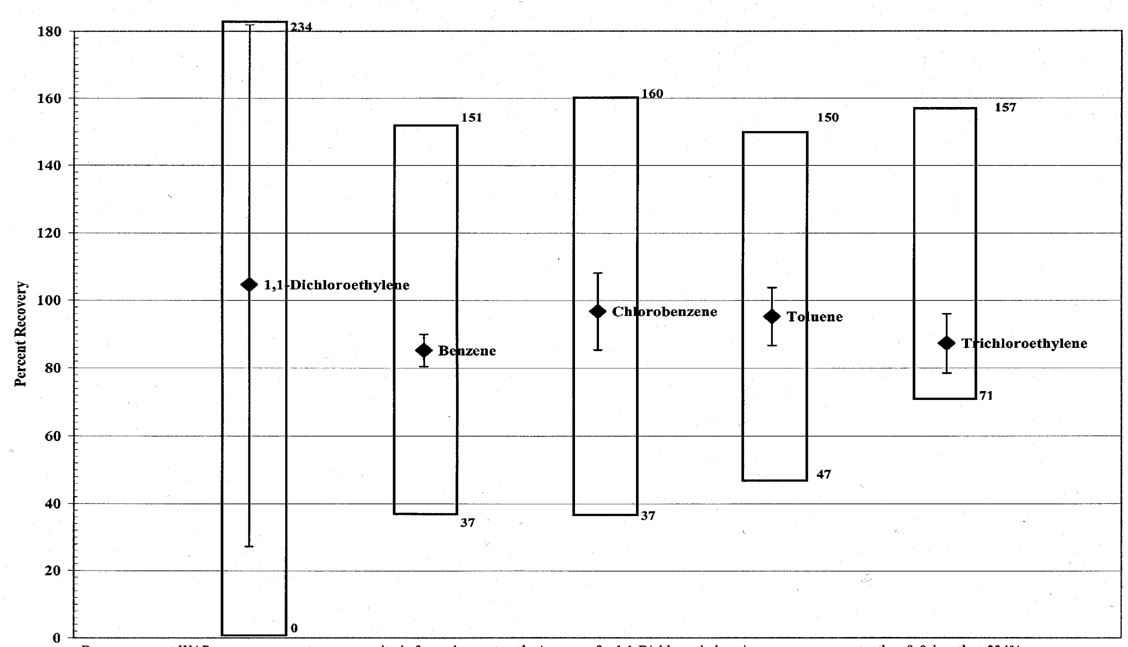


Figure V-1. Average percent recovery MS/MSDs VOC analyses (n=24 batches).

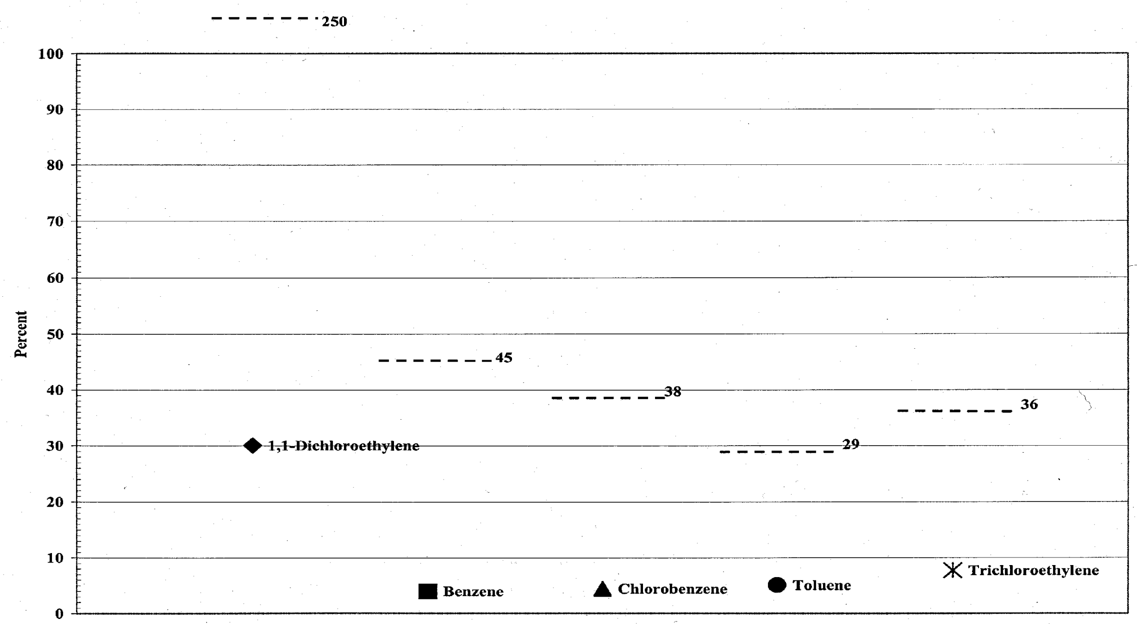


Figure V-2. Relative percent difference MS/MSDs VOCs analyses (n=24 batches).

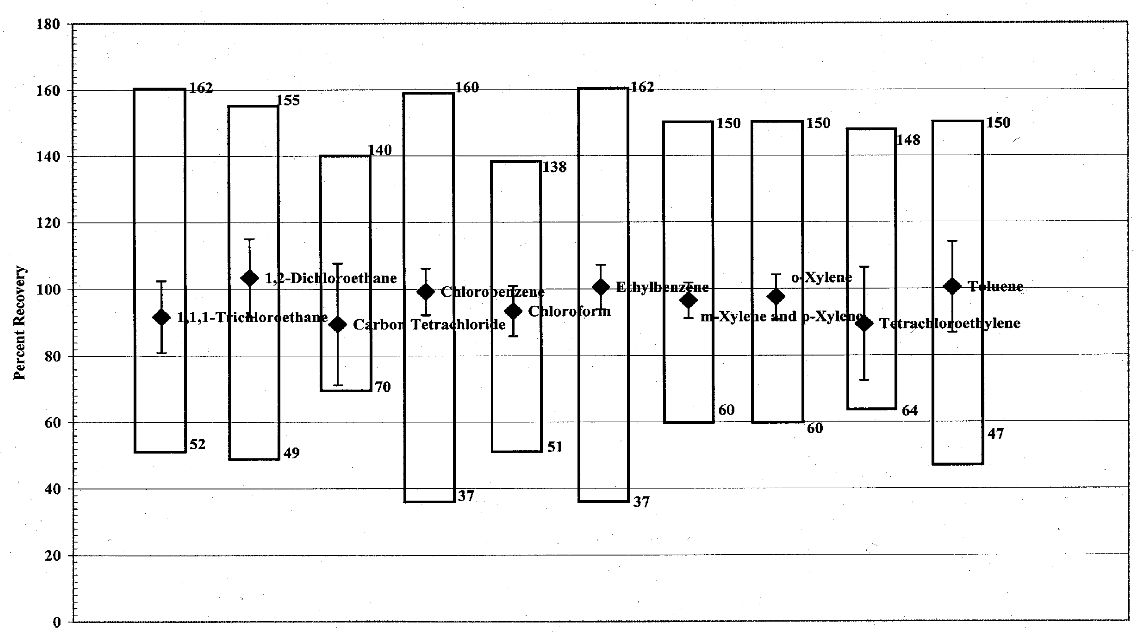


Figure V-3. Average percent recovery LCSs VOCs analyses (n=24 batches).

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 VOC: MS/MSD 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 VOC: 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 date 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.

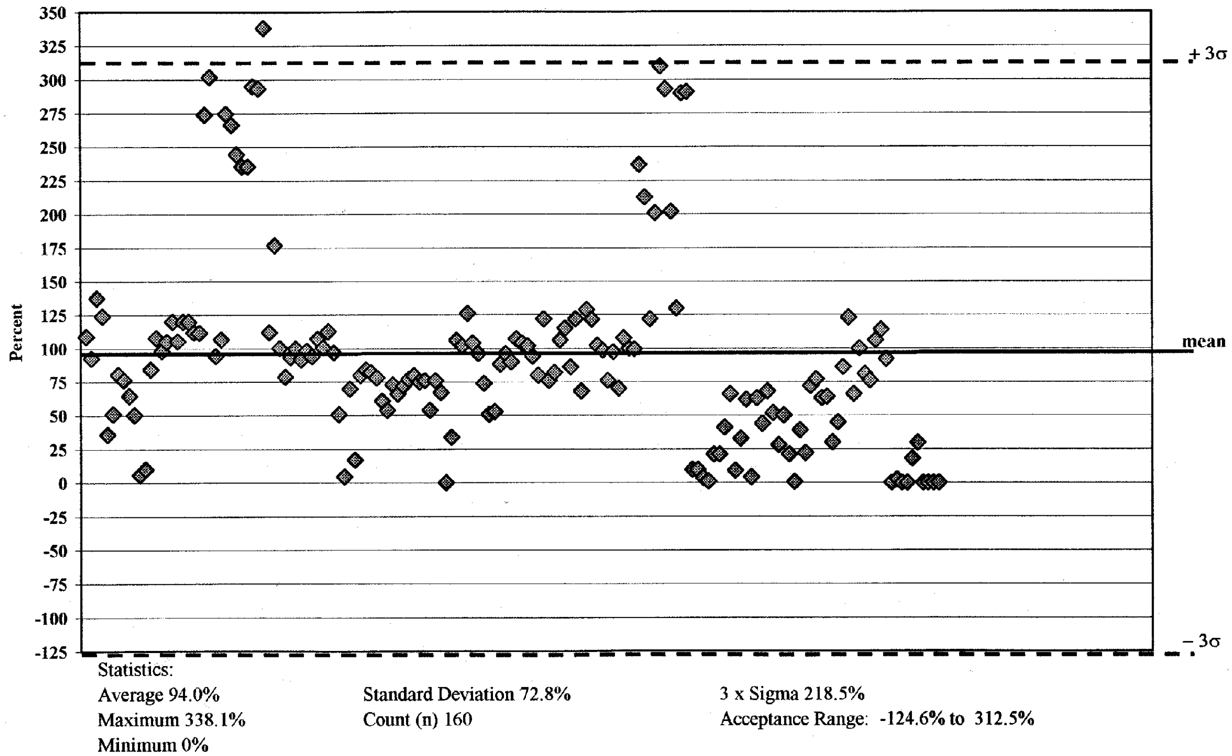


Figure V-4. Average Percent Recovery of Surrogate Dibromofluoromethane (BFM) VOCs Analyses.

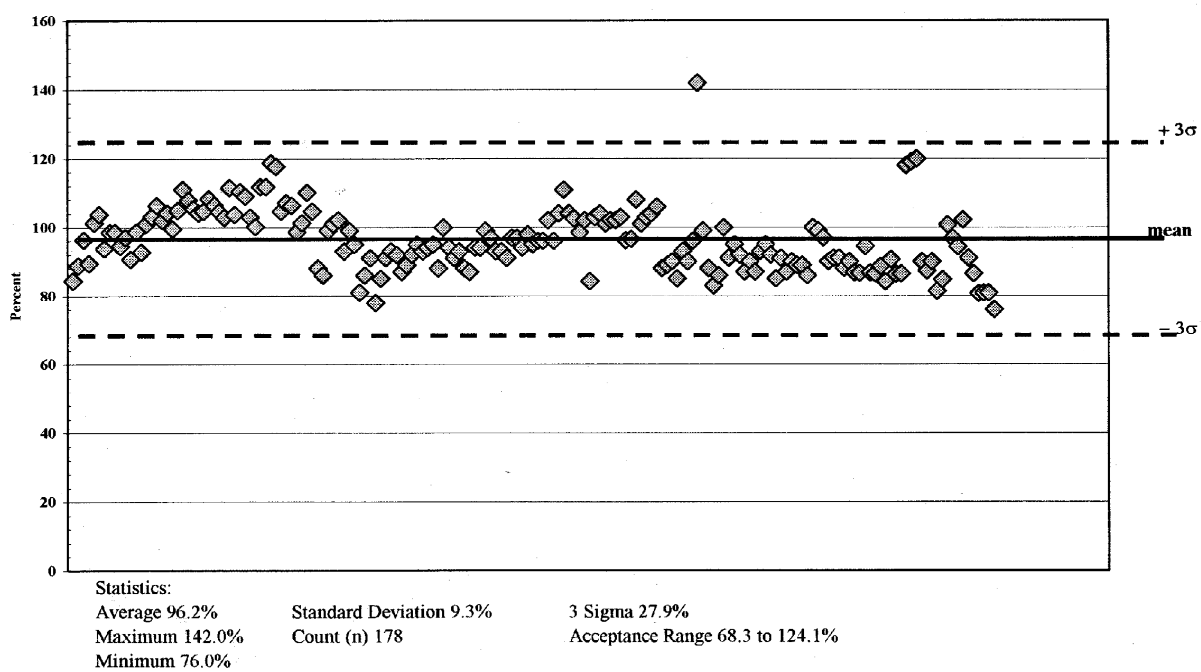


Figure V-5. Average Percent Recovery of Surrogate Toluene-d8 (TOL) VOCs Analyses.

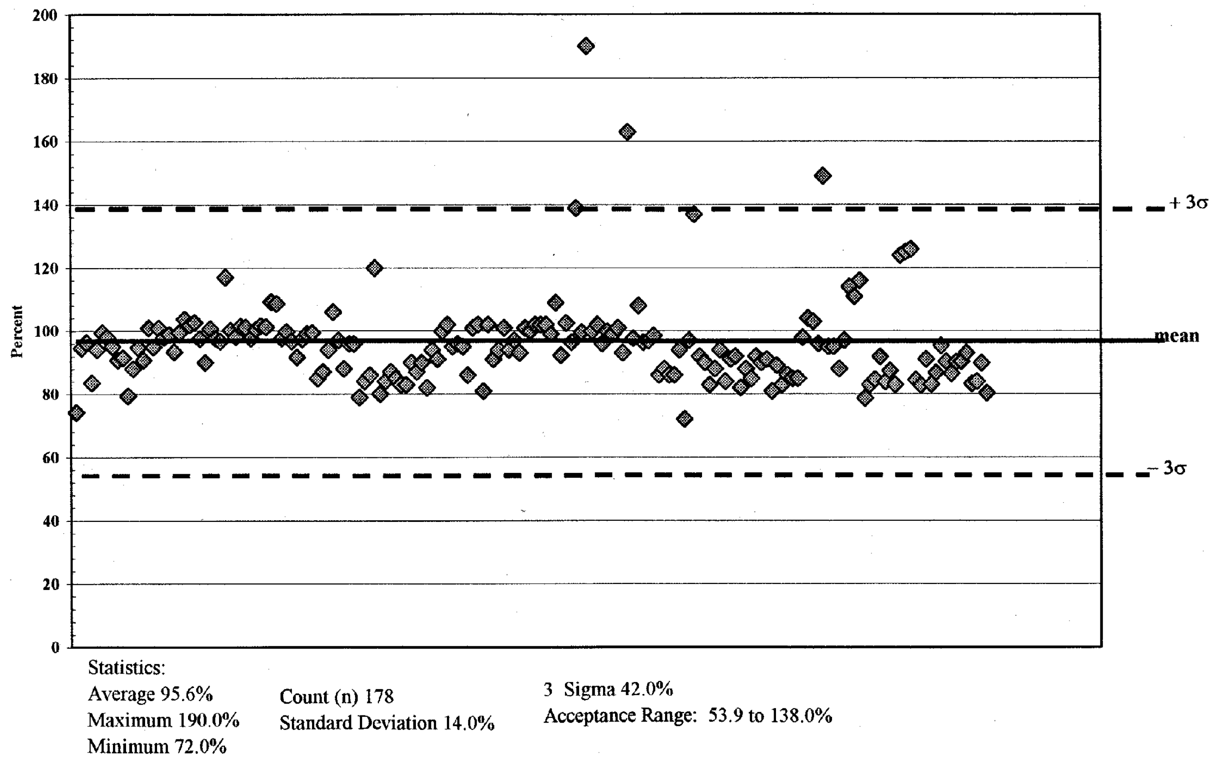


Figure V-6. Average Percent Recovery of Surrogate 4-Bromofluorobenzene (BFB) VOCs Analyses.

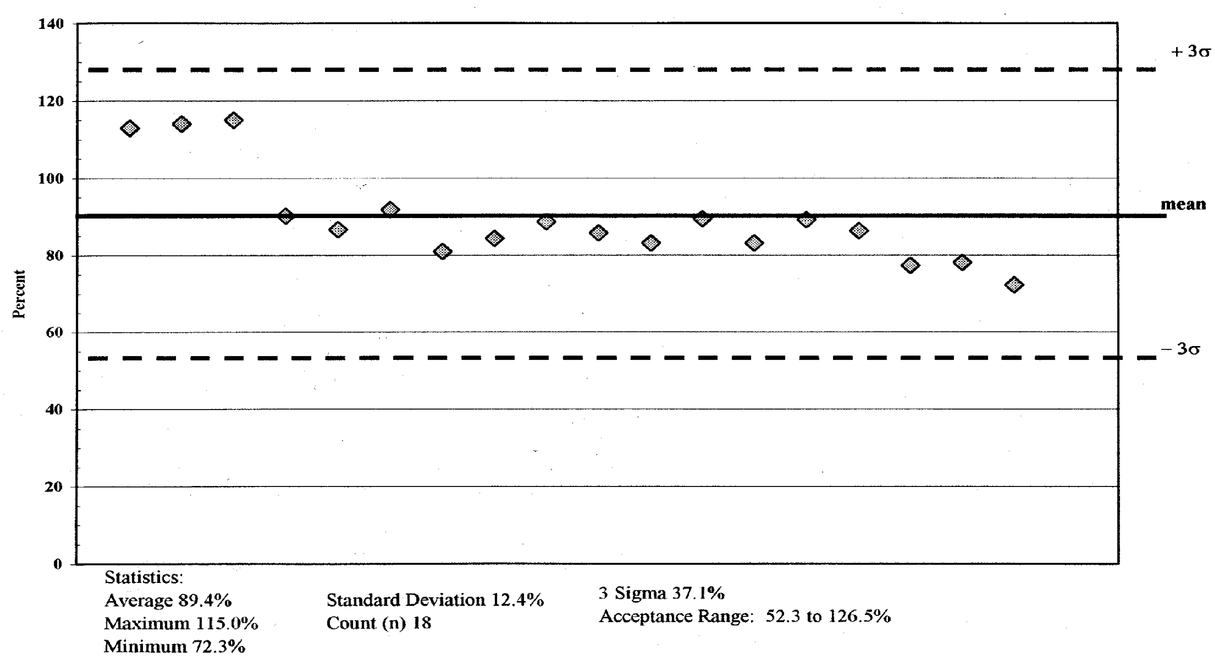


Figure V-7. Average Percent Recovery of Surrogate 1,2-Dichloroethane (DCA) VOCs Analyses.

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 VOC: LCS 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 NH VOC 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. ACL NH Organic Compounds Quality Control Average Percent Recovery of Metals MSs/MSDs.

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. ACL NH Organic Compounds Quality Control Average Percent Recovery of NH Organic Compounds LCSs.

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

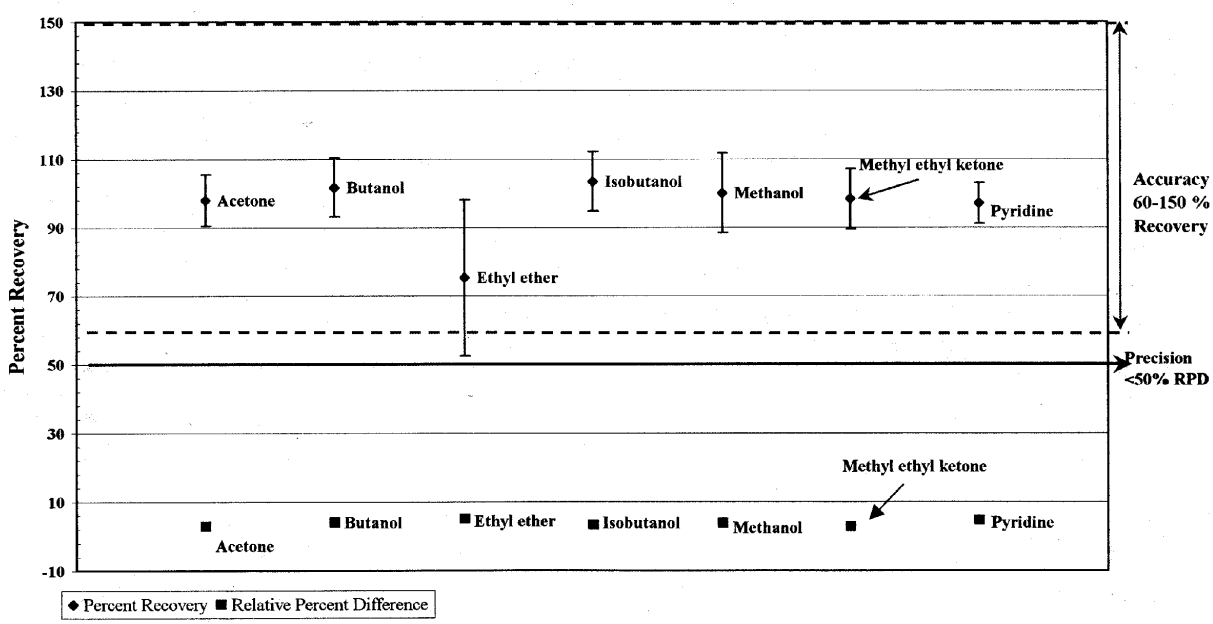


Figure N-1. Average percent recovery and RPD MS/MSDs duplicates NH organic compounds analyses (n=20 batches).

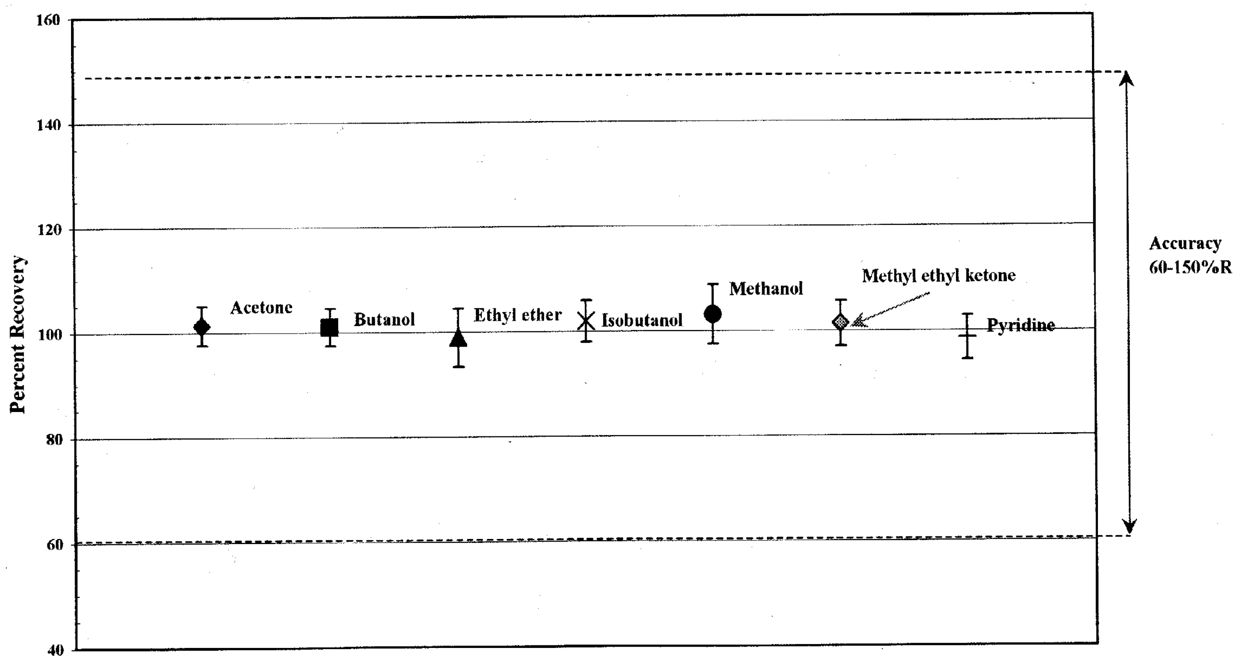


Figure N-2. Average percent recovery LCS NH organic compounds analyses (n=21 batches).

A-4.1 Preliminary NH VOC Data: MS/MSD 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 NH VOC Data: LCS 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. ACL Metals QC MSs and LCSs Summary by Element.

Element	Batch No	MS (80 – 120 %)			LCS*		
		MS (% Recovery)	MSD (% Recovery)	RPD (30%)	LCS (% R)	LCSD (% R)	LCSD2 (% R)
Antimony	ACL96002M	67.8	65.5	5.1	80.3	77.1	
	ACL96004M	53.3	56.4	3.5	70.1		
	ACL96005M	36	66.2	55.4	71.5		
	ACL96007M	51.1	54.8	10.2	52.6	65.4	
	ACL96008M	42.2	48.3	12	96.4		
	ACL97001M	76.7	83.8	9.8	227	149.9	
	ACL97002M				103.5	111.4	
	ACL97003M				141.5	137.6	126
	ACL97004M	65.1	64	0.4	121.6	125.8	124.5
	ACL97005M				12.8	105.3	
	ACL97006M	82.7	102.6	15.6	131.3	128.7	
	ACL97007M				90	119.3	
	ACL97008M				115.3	91.9	
	ACL97009M	74.5	76	0.3	119.9	83.5	
	ACL97012M	74.3	74.1	3.3	129.1	128.4	
	ACL98005M				86.4		
	ACL98007M	88.8	93.3	5.8	115.8		
	ACL98010M	66.7	61.2	7.8	88.7		
	ACL98012M	51.2	84.1	21.1	116.3		
	ACL98013M	70.6	70.9	0.5	100.4		
	ACL99001M	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)

Element	Batch No	MS (% Recovery)	MSD (% Recovery)	RPD (30%)	LCS (% R)	LCSD (% R)	LCSD2 (% R)
Arsenic	ACL96002M	85.8	80.1	8.8	99.2	97.7	
	ACL96004M	98.7	95.9	4.7	93.7		
	ACL96005M	95.7	97.3	2.2	96.8	99	
	ACL96007M	92.5	90.4	1.7	99.6	97.9	
	ACL96008M	100	99.3	1.6	100	104.1	
	ACL97001M	94.6	96.5	6.1	121.1	107.2	
	ACL97002M				100	102.1	
	ACL97003M				101.7	99.9	105.1
	ACL97004M	100.3	98.3	0.1	97.1	98.4	94
	ACL97005M				97.7	102.9	
	ACL97006M	94.2	97.8	1.2	99.4	95.1	
	ACL97007M				95.1	103.1	
	ACL97008M				97	100.6	
	ACL97009M	95.2	96.8	0.1	97.4	96.3	
	ACL97012M	102.9	99	0.3	103.4	101.3	
	ACL98005M				89.2		
	ACL98007M	95.9	106.3	11.1	93.9		
	ACL98010M	101.6	105.2	3.3	111.2		
	ACL98012M	102.1	103.3	1.2	103.4		
	ACL98013M	111	106.9	3	115.4		
	ACL99001M	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 %) MS (% Recovery)	MSD (% Recovery)	RPD (30%)	LCS* LCS (% R)	LCSD (% R)	LCSD2 (% R)
Barium	ACL96002M	86.9	89.5	1.1	76.6	73.5	
	ACL96004M	94.8	98.4	1.8	75		
	ACL96005M	104.9	103.5	5.2	82.5	85.4	
	ACL96007M	96.1	95.9	3.7	78	78.8	
	ACL96008M	97.1	91.8	7.2	104	101.5	
	ACL97001M	101.9	101.1	1.2	114.1	120.3	
	ACL97002M				97.7	92.8	
	ACL97003M				95.5	94.1	106.8
	ACL97004M	96.7	98.4	3.8	92.7	101.4	94.4
	ACL97005M				108.7	104	
	ACL97006M	96.3	97.4	3.8	100.9	100.4	
	ACL97007M				106.7	106.7	
	ACL97008M				93.4	91.7	
	ACL97009M	103.7	106	0.6	96.1	97.4	
	ACL97012M	97.5	92.5	1.7	113.2	106.6	
	ACL98005M				87.2		
	ACL98007M	96.2	96.5	1.1	93.8		
	ACL98010M	97.6	94.1	3.6	94.1		
	ACL98012M	103.9	102.9	0.7	104.4		
	ACL98013M	99.3	105.9	6.8	96.1		
	ACL99001M	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.							
Berylium	ACL96002M	76.7	89.4	5.5	105.8	102.5	
	ACL96004M	88.7	90.4	0	110		
	ACL96005M	106	103.5	4.2	101	93.1	
	ACL96007M	90.4	95	6.8	94.9	95.7	
	ACL96008M	99.7	103.6	0.9	96.2	94.5	
	ACL97001M	97.4	86.7	3.4	107.1	102.8	
	ACL97002M				100.9	97.7	
	ACL97003M				98.2	96	99.6
	ACL97004M	0	0	3.8	102.8	107.8	99.5
	ACL97005M				100	98.7	
	ACL97006M	96.2	93.5	6.8	96.3	94.6	
	ACL97007M				104.8	101	
	ACL97008M				106	95.5	
	ACL97009M	590.8	763.5	11.5	97.6	96.7	
	ACL97012M	95.1	95.1	2.6	108.5	100.3	
	ACL98005M				90.3		
	ACL98007M	86.7	115.3	17.6	97.4		
	ACL98010M	113	103.2	3.9	109.7		
	ACL98012M	102.4	97.9	4.2	105.4		
	ACL98013M	42.8	532.9	12.7	116.9		
	ACL99001M	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 %) MS (% Recovery)	MSD (% Recovery)	RPD (30%)	LCS* LCS (% R)	LCSD (% R)	LCSD2 (% R)
Cadmium	ACL96002M	90.5	72.6	15.7	129.7	102	
	ACL96004M	132.6	28.2	24.9	97.9		
	ACL96005M	83.2	98.7	5.4	110.6	111.7	
	ACL96007M	87.4	96.9	11	103.7	100.1	
	ACL96008M	94.3	91.9	3.6	97	94.7	
	ACL97001M	49.7	61	8.8	128.7	121.5	
	ACL97002M				102.8	100.5	
	ACL97003M				97.6	89.5	102.1
	ACL97004M	83.9	83	1	88.2	91.7	95.9
	ACL97005M				103.9	101.8	
	ACL97006M	91.6	96.4	0.1	103.1	97.7	
	ACL97007M				91.3	101.5	
	ACL97008M				92.2	93.9	
	ACL97009M	102.3	91	8.2	99.8	100.6	
	ACL97012M	91	93.2	4.1	101.8	95.2	
	ACL98005M				93.7		
	ACL98007M	81.1	89.7	9.5	95.4		
	ACL98010M	84.3	82.3	1.9	107.3		
	ACL98012M	0	105.8	30.3	95.4		
	ACL98013M	52.2	62.6	3.1	109.5		
	ACL99001M	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	ACL96002M	82	115.9	4	99.8	96.2	
	ACL96004M	106.8	88.2	9.1	96		
	ACL96005M	90.7	111.6	6.9	98.2	98.3	
	ACL96007M	88.6	83.8	0.8	96.6	96.3	
	ACL96008M	98.6	91.7	3.3	102.2	99.2	
	ACL97001M	101.8	122.4	3	127.8	109.4	
	ACL97002M				100.5	102.8	
	ACL97003M				95.9	94.9	106.9
	ACL97004M	91	67.2	9.1	95.1	95.5	95.9
	ACL97005M				102.5	103.5	
	ACL97006M	88.3	105.4	4.2	100.3	94.2	
	ACL97007M				92	96.9	
	ACL97008M				93.5	99.1	
	ACL97009M	172.1	26.1	23.7	93.2	96.3	
	ACL97012M	91.9	89.1	0.1	107.1	98.4	
	ACL98005M				90.5		
	ACL98007M	115.2	336.9	27.5	90.3		
	ACL98010M	88.1	87.3	0.4	102.7		
	ACL98012M	76.9	94.5	9.9	98.3		
	ACL98013M	70.3	96.3	8.8	107.3		
	ACL99001M	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 %) MS (% Recovery)	MSD (% Recovery)	RPD (30%)	LCS* LCS (% R)	LCSD (% R)	LCSD2 (% R)
Nickel	ACL96002M	87.6	83.6	3.9	94.1	90.4	
	ACL96004M	112.9	92.4	15.6	93.9		
	ACL96005M	85.9	96.4	4	97.1	96.8	
	ACL96007M	87.9	90.5	3.9	99.4	96.8	
	ACL96008M	109.2	93.8	5.5	99	107.4	
	ACL97001M	94.4	101	5.2	120.4	110.5	
	ACL97002M				97.8	100.1	
	ACL97003M				100.9	94.9	101.1
	ACL97004M	88.7	75.6	7	96	92.4	95.1
	ACL97005M				102.5	100	
	ACL97006M	33	35	0.2	102.5	96.7	
	ACL97007M				96.5	108.2	
	ACL97008M				100.1	99.4	
	ACL97009M	99.6	84.7	7.3	96.1	98.4	
	ACL97012M	86.3	96.2	5.2	107.1	102.1	
	ACL98005M				95.7		
	ACL98007M	83.4	110	10.5	99.6		
	ACL98010M	83.2	83.9	0.5	113.1		
	ACL98012M	59.2	106	20	101.1		
	ACL98013M	80.1	77	1	118.9		
	ACL99001M	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	ACL96002M	90.7	82.6	11.3	97.8	95.8	
	ACL96004M	98.1	95.2	4.9	96.3		
	ACL96005M	92.9	95.5	1.2	96.3	99.3	
	ACL96007M	95.1	91.3	0.2	97	96.5	
	ACL96008M	95.9	98.7	1.3	102.3	101.3	
	ACL97001M	100.7	104.3	7.7	122	110.7	
	ACL97002M				102.2	99.1	
	ACL97003M				99.7	98.1	107.5
	ACL97004M	100.3	95.6	2.7	101.3	103.9	99.4
	ACL97005M				104.6	103.7	
	ACL97006M	98.7	104	0.2	107.3	102.4	
	ACL97007M				99.1	103.6	
	ACL97008M				99	95.3	
	ACL97009M	100.3	100.9	1.1	96.5	100.7	
	ACL97012M	112.2	111.8	3.2	105.3	105.6	
	ACL98005M				89		
	ACL98007M	87.4	101.1	15.3	97.7		
	ACL98010M	100.3	95.7	4.8	116		
	ACL98012M	102.9	79	22.3	105.9		
	ACL98013M	95	97.3	3.1	111.5		
	ACL99001M	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	ACL96002M	88	95.1	1.8	92.3	106.6	
	ACL96004M	82.6	84.8	0.6	110		
	ACL96005M	94.7	94.8	3.8	101.5	101.2	
	ACL96007M	87.9	95.9	10.7	94.5	95.4	
	ACL96008M	107.9	112.1	2.2	94.9	96.1	
	ACL97001M	107	110.1	0.9	100.2	126.3	
	ACL97002M				99.8	104	
	ACL97003M				97.4	93.6	99.5
	ACL97004M	86	91.1	5.9	98	102.1	104.8
	ACL97005M				93.9	97.8	
	ACL97006M	102.8	96.4	7.9	99.6	97.7	
	ACL97007M				101.2	103.4	
	ACL97008M				105.5	105.8	
	ACL97009M	105.8	102.4	4.2	101.5	98.4	
	ACL97012M	89.7	97.5	4.9	108	105.8	
	ACL98005M				87.3		
	ACL98007M	88.7	124.5	14.6	102.7		
	ACL98010M	99.1	98.3	0.4	96.9		
	ACL98012M	100.7	99.1	1.5	96.4		
	ACL98013M	131.8	124.1	1.3	107.8		
	ACL99001M	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	ACL96002M	88	95.1	1.8	69.1	71.6	
	ACL96004M	78.9	78.6	2.3	75.4		
	ACL96005M	72.8	74.1	2.2	77.2	83.7	
	ACL96007M	80.3	77.4	0.2	82.6	82.9	
	ACL96008M	80.6	85.2	4	91.8	102.2	
	ACL97001M	81.3	83.9	7.4	106.6	99.2	
	ACL97002M				110.4	109.2	
	ACL97003M				118.7	116.7	115.5
	ACL97004M	76.6	74.6	0.5	93.9	97.1	96.4
	ACL97005M				97.1	108.9	
	ACL97006M	72.9	77.4	1	97.1	101.4	
	ACL97007M				94.1	109.1	
	ACL97008M				108.5	113.4	
	ACL97009M	79.1	82.4	2.5	94.6	98.7	
	ACL97012M	86.2	87.4	4.9	117.3	106.1	
	ACL98005M				100.9		
	ACL98007M	75.8	79.7	5.8	102.4		
	ACL98010M	83.1	81.9	1.4	99.1		
	ACL98012M	60.6	57.1	5.6	105.5		
	ACL98013M	80.3	79.9	0.1	105.1		
	ACL99001M	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 %) MS (% Recovery)	MSD (% Recovery)	RPD (30%)	LCS* LCS (% R)	LCSD (% R)	LCSD2 (% R)
Vanadium	ACL96002M	85.7	83.8	2.9	97.7	95.5	
	ACL96004M	91.2	92.9	0.1	96.5		
	ACL96005M	91.9	93.2	2.3	102.9	106.8	
	ACL96007M	93.8	91.4	1.2	102.5	102.4	
	ACL96008M	97.5	96	2.9	98.6	94	
	ACL97001M	95.4	94	1.8	133	114.8	
	ACL97002M				101.5	104.1	
	ACL97003M				105.5	103.3	100.2
	ACL97004M	95.1	95.1	1.7	96.9	104.5	92.7
	ACL97005M				97	98.7	
	ACL97006M	93.2	92.1	4.6	101.5	97.3	
	ACL97007M				110.1	110.2	
	ACL97008M				95.3	94.2	
	ACL97009M	94.4	98.2	2.2	97.4	97.3	
	ACL97012M	95.5	96.3	3.9	105.7	98.8	
	ACL98005M				85.1		
	ACL98007M	94.2	94.8	1.2	96.3		
	ACL98010M	92.2	91	1.1	101.9		
	ACL98012M	93.1	90.4	0.9	102.7		
	ACL98013M	101.3	95	4.4	113.9		
	ACL99001M	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	ACL96002M	111.7	82	10	135.5	117.6	
	ACL96004M	95.5	87.8	2.1	121		
	ACL96005M	85.7	89.2	0	124.2	117.8	
	ACL96007M	89.9	95.1	5.3	100.4	98.8	
	ACL96008M	97.9	96.7	1.2	95	95.1	
	ACL97001M	79.8	93.4	6.6	130.3	108.5	
	ACL97002M				92.9	94.9	
	ACL97003M				101.1	95.3	101.6
	ACL97004M	97.5	78.7	7.4	93.4	92.1	93.1
	ACL97005M				102	97	
	ACL97006M	98.4	108.7	1.4	98.9	93.5	
	ACL97007M				86.4	95.1	
	ACL97008M				89	90.4	
	ACL97009M	249.7	203.6	8.7	93.6	95.6	
	ACL97012M	126.9	131.3	0.7	101	95.5	
	ACL98005M				97.2		
	ACL98007M	84.8	101.9	15.1	96.3		
	ACL98010M	90.4	77.3	4	109.5		
	ACL98012M	84.6	105.4	9.7	115		
	ACL98013M	89.6	116.3	11.5	122.6		
	ACL99001M	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 IDC 001, 002 or 800 and were not included.
ACL97002M, 97003M, 97005M, 97007M, 97008M and 98005M

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

Appendix C

SVOCs Back-up Data

Table C-1. ACL SVOCs Quality Control MS and LCSs Summary by Compound.

		Matrix Spikes			LCS	
Compound	**Batch #**	**% Recovery MS**	**% Recovery MSD**	**RPD**	**% 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	

Table C-1. (continued).

Compound	Batch #	Matrix Spikes % Recovery MS	Matrix Spikes % Recovery MSD	RPD	LCS % Recovery LCS	LCS % Recovery LCS-2
	ACL98005S				98.8	
	ACL98007S	44	46	4.4	110	
	ACL98012S				89	
	ACL98013S				92.3	
	ACL99001S	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	ACL98013S				92.8	
	ACL99001S				98	
Average					95.4	
Standard Deviation					3.7	
Count (n)					2	
Hexachloroethane	ACL96002S	41.3	40.3	2.5	99.5	
	ACL96004O	52	52	0	99	
	ACL96005S	51.3	**29.2**	**54.9**	93	
	ACL96007S	47.9	62.4	26.3	94	
	ACL96008S	56.5	42.4	28.5	96.3	102.5
	ACL97001S	71.3	41.3	**53.3**	98	
	ACL97002S				93	
	ACL97003S				109.5	
	ACL97004S	**34.5**	**26.3**	27.2	116	
	ACL97005S				105.8	
	ACL97006S				88.3	
	ACL97007S				95.8	
	ACL97008S				**34**	
	ACL97009S	**30**	**36.8**	20.4	104.5	
	ACL97012S				92.3	
	ACL98005S				106.4	
	ACL98007S	72	76	6.1	105.2	
	ACL98012S				98.5	
	ACL98013S				101.8	
	ACL99001S	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	ACL98013S				95	
	ACL99001S				90	
Average					92.5	
Standard Deviation					3.5	
Count (n)					2	

Table C-1. (continued).

Compound	Batch #	Matrix Spikes % Recovery MS	Matrix Spikes % Recovery MSD	RPD	LCS % Recovery LCS	LCS % Recovery LCS-2
Nitrobenzene	ACL96002S	35.5	**34**	4.3	75.8	
	ACL96004O	56	53	6	88	
	ACL96005S	53.8	**33.3**	46.9	81.8	
	ACL96007S	51.9	67.7	26.4	83.3	
	ACL96008S	56.5	40.2	33.8	79.8	101.8
	ACL97001S	80	47	52	95.5	
	ACL97002S				98.8	
	ACL97003S				116	
	ACL97004S	42	**31.8**	27.8	111.1	
	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. ACL SVOCs QC 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	
	ID03114220CM1	87.3	52	3.5	0	
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

Table C-2. (continued).

		Percent Recovery				
Batch #	**Sample #**	**%R Surrogate NBZ**	**%R Surrogate FBP**	**%R Surrogate 2FP**	**%R Surrogate TBP**	**%R Surrogate PHN**
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	
	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	

Table C-2. (continued).

Batch #	Sample #	Percent Recovery %R Surrogate NBZ	%R Surrogate FBP	%R Surrogate 2FP	%R Surrogate TBP	%R Surrogate PHN
	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
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

Table C-2. (continued).

Batch #	Sample #	Percent Recovery: %R Surrogate NBZ	%R Surrogate FBP	%R Surrogate 2FP	%R Surrogate TBP	%R Surrogate PHN
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
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

VOC Back-up Data

Table D-1. ACL VOC Quality Control MS and MSD Summary by Compound.

		Matrix Spikes		
Compound	**Batch #**	**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

Table D-1. (continued).

Compound	Batch #	Matrix Spikes MS % Recovery	MSD % Recovery	RPD
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			
	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

Table D-1. (continued).

Compound	Batch #	Matrix Spikes MS % Recovery	 MSD % Recovery	 RPD
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			
	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. ACL VOC Quality Control LCSs Summary by Compound.

		Laboratory Control Sample (LCS)		
Compound	**Batch No.**	**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		

Table D-2. (continued).

Compound	Batch No.	Laboratory Control Sample (LCS) LCS % Recovery	LCS-3 % Recovery	LCS-2 % Recovery
	ACL97012V	98		
	ACL98005V	105.5	104.3	
	ACL98007V	112.25		
	ACL98012V	95.66	96.58	94.14
	ACL98013V	96.66		
	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		

Table D-2. (continued).

Compound	Batch No.	Laboratory Control Sample (LCS) LCS % Recovery	LCS-3 % Recovery	LCS-2 % Recovery
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		
	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		

Table D-2. (continued).

Compound	Batch No.	Laboratory Control Sample (LCS) LCS % Recovery	LCS-3 % Recovery	LCS-2 % Recovery
	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		
	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		

Table D-2. (continued).

Compound	Batch No.	Laboratory Control Sample (LCS) LCS % Recovery	LCS-3 % Recovery	LCS-2 % Recovery
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		
	ACL97009V	100		

Table D-2. (continued).

Compound	Batch No.	Laboratory Control Sample (LCS) LCS % Recovery	LCS-3 % Recovery	LCS-2 % Recovery
	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		

Table D-2. (continued).

Compound	Batch No.	Laboratory Control Sample (LCS) LCS % Recovery	LCS-3 % Recovery	LCS-2 % Recovery
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		
	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. ACL VOC QC 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	

Table D-3. **(continued).**

Batch #	Sample #	Surrogate Organic Compounds BFM %Recovery	TOL %Recovery	BFB %Recovery	DCA %Recovery
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	
	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	

Table D-3. **(continued).**

Batch #	Sample #	Surrogate Organic Compounds BFM %Recovery	TOL %Recovery	BFB %Recovery	DCA %Recovery
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	
	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	

Table D-3. **(continued).**

Batch #	Sample #	Surrogate Organic Compounds BFM %Recovery	TOL %Recovery	BFB %Recovery	DCA %Recovery
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	
	ID006729101V1DL2	104.0	94.0	102.0	
	ID006729102V1DL	96.0	91.0	95.0	
	ID006729102V1DL2	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
ACL97007V	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	
ACL97008V	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	
ACL97009V	ID031237101V1	114.0	88.0	88.0	
	ID031237102V1	92.0	90.0	97.0	
ACL97012V	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	

Table D-3. **(continued).**

		Surrogate Organic Compounds			
Batch #	**Sample #**	**BFM %Recovery**	**TOL %Recovery**	**BFB %Recovery**	**DCA %Recovery**
ACL98005V	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
ACL98007V	ID006847101V1		**81.4**	83.1	**80.96**
	ID006847102V1		84.8	86.7	**84.3**
ACL98010V	Data Deleted				
ACL98012V	ID023153101V1		100.7	95.4	88.6
	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

NH VOC Back-up Data

Table E-1. ACL NH Organic Compounds Quality Control MS and LCS Summary by Compound.

Compound	Batch No	MS MS % Recovery	MSD % Recovery	RPD	LCS 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	

Table E-1. **(continued).**

Compound	Batch No	MS MS % Recovery	 MSD % Recovery	RPD	LCS LCS %Recovery	 LCSD %Recovery
	ACL98005N				101.0	
	ACL98007N*				102.44	
	ACL98010N	103.9	102.9	1.0	95.1	
	ACL98012N				103.3	
	ACL98013N				100.4	
	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	

Table E-1. **(continued).**

Compound	Batch No	MS: MS % Recovery	MS: MSD % Recovery	RPD	LCS: LCS %Recovery	LCS: LCSD %Recovery
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	
	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	

Table E-1. (continued).

Compound	Batch No	MS MS % Recovery	MSD % Recovery	RPD	LCS LCS %Recovery	LCSD %Recovery
	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	
	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	

Table E-1. (continued).

Compound	Batch No	MS		RPD	LCS	
		MS % Recovery	MSD % Recovery		LCS %Recovery	LCSD %Recovery
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.