Final Report

South Landfill Remedial Action

Reynolds Metals Company
TROUTDALE FACILITY

CH2MHILL

May 2005

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SECTION 1

Introduction

This report documents the removal of contaminated soil from the south landfill (SLF) area at the Reynolds Metals Company/Alcoa, Inc. (RMC/Alcoa) facility in Troutdale, Oregon, during calendar years 2003 and 2004. The work was conducted in accordance with the U.S. Environmental Protection Agency's (EPA) *Unilateral Administrative Order for Remedial Design and Remedial Action* (2003); *Record of Decision for Interim Remedial Action* (2002); *Scope of Work for Early Remedial Action Reynolds Metals Superfund Site* (2003); and CH2M HILL's *Memorandum WP No. 57: South Landfill Early Remedial Action Work Plan* (August 2003).

This remedial action included excavation of contaminated soil, confirmation sampling, offsite transport and disposal of the excavated material, final site restoration activities, and reporting. Removal actions were discontinued in late 2003 because of the onset of wet weather conditions. Results following the 2003 removal action are summarized in *South Landfill Early Remedial Action Interim Report* (April 2004). Remedial actions were completed at the south landfill site in the fall of 2004.

Remedial action objectives (RAOs) for the SLF site are as follows:

- Prevent human exposure through direct contact (ingestion, inhalation, and dermal contact) with contaminated soil and debris that would result in unacceptable excess lifetime cancer risk or exceed a hazard index of 1.
- Reduce or control the migration of contaminants from waste and soils to groundwater.

The following site-specific cleanup goal was identified for the SLF remedial action (EPA, 2002):

> Excavate (and remove for offsite disposal) waste material and additional underlying soil, as needed, to achieve a mean total fluoride concentration in soil of less than 4,000 milligrams per kilogram (mg/kg) and mean benzo(a)pyrene and dibenzo(a,h)anthracene concentrations of less than 36 mg/kg.

This final report presents background information on the site; a summary of the 2003 and 2004 remedial actions; and results of site confirmation sampling and analysis. In addition, the quantities and types of material removed and the ultimate destination of the removed materials are identified.

This report is organized into the following sections:

- Section 1: Introduction
- Section 2: Background
- Section 3: South Landfill Remedial Action
- Section 4: Sampling and Analysis
- Section 5: Costs
- Section 6: Certification
- Section 7: References
- Appendixes

SECTION 2

Background

This section describes the south landfill area, previous site investigations, and cultural resource findings.

2.1 Area Description

The SLF area is a flat, sparsely vegetated area approximately 5.8 acres in size located south of the scrap yard and north of Graham Road, as shown on Figure 2-1. Historically, the landfill was used for disposal of miscellaneous waste material from the RMC-Troutdale aluminum reduction plant. The landfill was active from the 1940s until the late 1960s. Constituents detected in samples collected from the SLF prior to implementation of the remedial action included fluoride, metals, polychlorinated biphenyls (PCBs), and polynuclear aromatic hydrocarbons (PAHs). A summary of historical analytical data for the SLF is included as Appendix A.

2.2 Previous Investigations

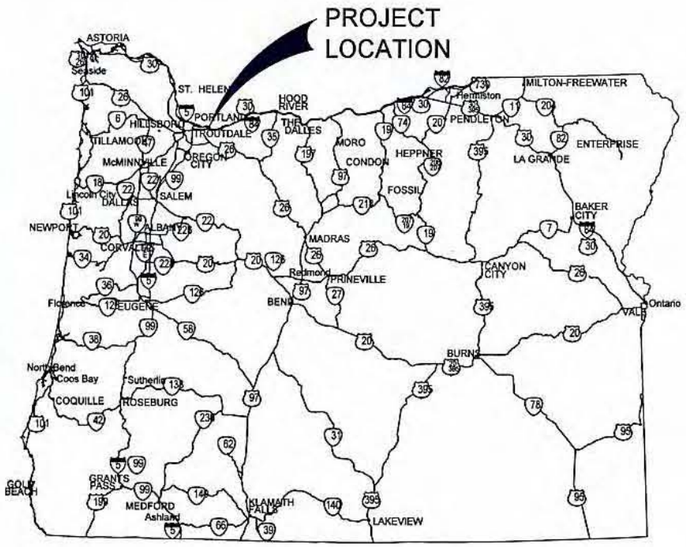
Site investigations were accomplished at the SLF area in 1994, 1995, 1997, 1998, and 2000. Investigation activities included waste sample collection, excavation of test pits, collection of surface and subsurface soil samples, and evaluation of groundwater quality. A summary of information obtained from these investigations can be found in the following documents:

- *Draft Current Situation Summary* (CH2M HILL, April 5, 1996)
- *Technical Memorandum DS No. 16: Data Summary for the Soil and Debris Areas Addendum to the RI/FS Work Plan – 1997 Sampling at North Landfill, South Landfill, and Scrap Yard* (CH2M HILL, December 15, 1997)
- *Draft Groundwater Remedial Investigation Report* (CH2M HILL, June 1999)
- *Draft Nongroundwater Remedial Investigation Report* (CH2M HILL, August 1999)
- *Technical Memorandum DS No. 21*: *South Landfill Area Supplemental Data Gathering Summary* (CH2M HILL, November 2000)
- *Specifications for Excavation and Transportation of South Landfill Waste Material* (CH2M HILL, June 2003)

On the basis of historical analytical results and test pit observations, waste cut limits were estimated for the remedial action at the SLF site. Anticipated waste thickness and cross sections showing removal limits are shown in drawings SL-3 and SL-5 of *Specifications for Excavation and Transportation of South Landfill Waste Material* (CH2M HILL, June 2003). Waste removal actions began in September 2003 and were completed in October 2004.

2.3 Cultural Resources

CH2M HILL completed a pedestrian survey of the SLF work area and reviewed proposed plans for potential impacts to area cultural resources in June 2003. On the basis of available information, a CH2M HILL cultural resource specialist recommended no additional cultural resource testing or monitoring for the SLF work site. No cultural deposits were encountered during site construction and restoration activities completed in 2003 and 2004.



OREGON STATE

REYNOLDS METALS COMPANY / ALCOA, INC. TROUTDALE FACILITY

OFFICE (SITE)

DECON PAD

LIMIT OF EXCAVATION

SOUTH LANDFILL

SOUTH WETLANDS

GRAHAM ROAD

RD. GRAHAM RD.

N

0 100 200 300

Scale In Feet

FIGURE 2-1
SOUTH LANDFILL SITE PLAN
REYNOLDS METALS COMPANY/ALCOA, INC.
TROUTDALE, OREGON
FINAL REPORT
SOUTH LANDFILL REMEDIAL ACTION

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SECTION 3

South Landfill Remedial Action

Approximately 56,681 tons of waste material and underlying soil were removed from the SLF site from September 22, 2003, through November 24, 2003. Of this total, approximately 54,377 tons were transported directly to the Wasco County Landfill for final disposal. The remaining 2,304 tons were hauled in solo dump trucks to Company Lake and mixed with process residue (PR) from Company Lake, to aid stabilization of the PR, prior to transport and disposal at Hillsboro Landfill (April 2004).

Approximately 18,372 additional tons of waste material and underlying soil were removed from the SLF site between July 28, 2004, and October 4, 2004. All of the waste material removed during 2004 was hauled in solo dump trucks to Company Lake and mixed with process residue (PR) from Company Lake, to aid stabilization of the PR, prior to transport and disposal at Wasco County Landfill. A natural gas pipeline was also removed to facilitate excavation. Confirmation soil samples were collected from the SLF area in 2003 and 2004 after excavation activities were completed. Photographs documenting 2003 and 2004 field activities are contained in Appendix B.

CH2M HILL was responsible for design, bid document preparation, confirmation sampling, analytical laboratory selection, data quality evaluation, owner construction oversight, and reporting. In 2003, Tetra Tech/Foster Wheeler, Inc. (TTFW) provided excavation, waste loadout, and final grading services. Enviro-Con Trucking, Inc. (ECTI), under subcontract to TTFW, transported waste materials to the Wasco County Landfill for final disposal. In 2004, BBL Environmental Services, Inc. (BBLES) served as prime subcontractor for the SLF removal activities. ENTACT, Inc., provided excavation, waste loadout, and final grading services. Celorie Trucking, Inc., transported waste materials to the Wasco County Landfill for final disposal.

The following sections describe the major work components involved in the remedial actions at the SLF site.

3.1 Traffic Management

Vehicular traffic was restricted to designated routes, as shown on Figure 3-1 for 2003 and on Figure 3-2 for 2004. Real-time communications between field crew members and truck drivers were maintained through the use of citizens band (CB) and hand-held radios. Access to the site was controlled in 2003 by TTFW through the use of a manned entry control station located at Graham Road. In 2004, access to the site was the responsibility of BBLES. Traffic was routed in and out of the site through existing plant roadways. No access from Graham Road was allowed.

3.2 Excavation

Excavation activities began on September 22, 2004. Excavation depths ranged from 1 to 6 feet below ground surface (bgs). Trackhoe excavators were used to remove waste material from the site for direct loading into dump trucks. In general, excavation activities proceeded in a west-to-east direction. The depth of cut was carefully controlled during excavation activities to minimize the amount of clean underlying soil removed with waste material.

Two additional excavations were performed once confirmation sampling results were received because the cleanup goals were not met. At sample location 14 on the east side of the landfill, a 50-foot by 50-foot-wide area was excavated an additional 6 to 12 inches deep and resampled (sample location 31). Similarly, at sample location 29 on the northeast side of the landfill, a 50-foot by 50-foot-wide area was excavated an additional 6 to 12 inches deep and resampled (sample location 32). Cleanup goals were met and no additional excavation was performed. Confirmation sample locations following the 2003 and 2004 remedial actions at SLF are shown on Figure 3-3. The results of confirmation sampling are presented in Section 4.

Groundwater monitoring wells located within the excavation limits of the SLF site were reconfigured and surveyed by others in December 2004.

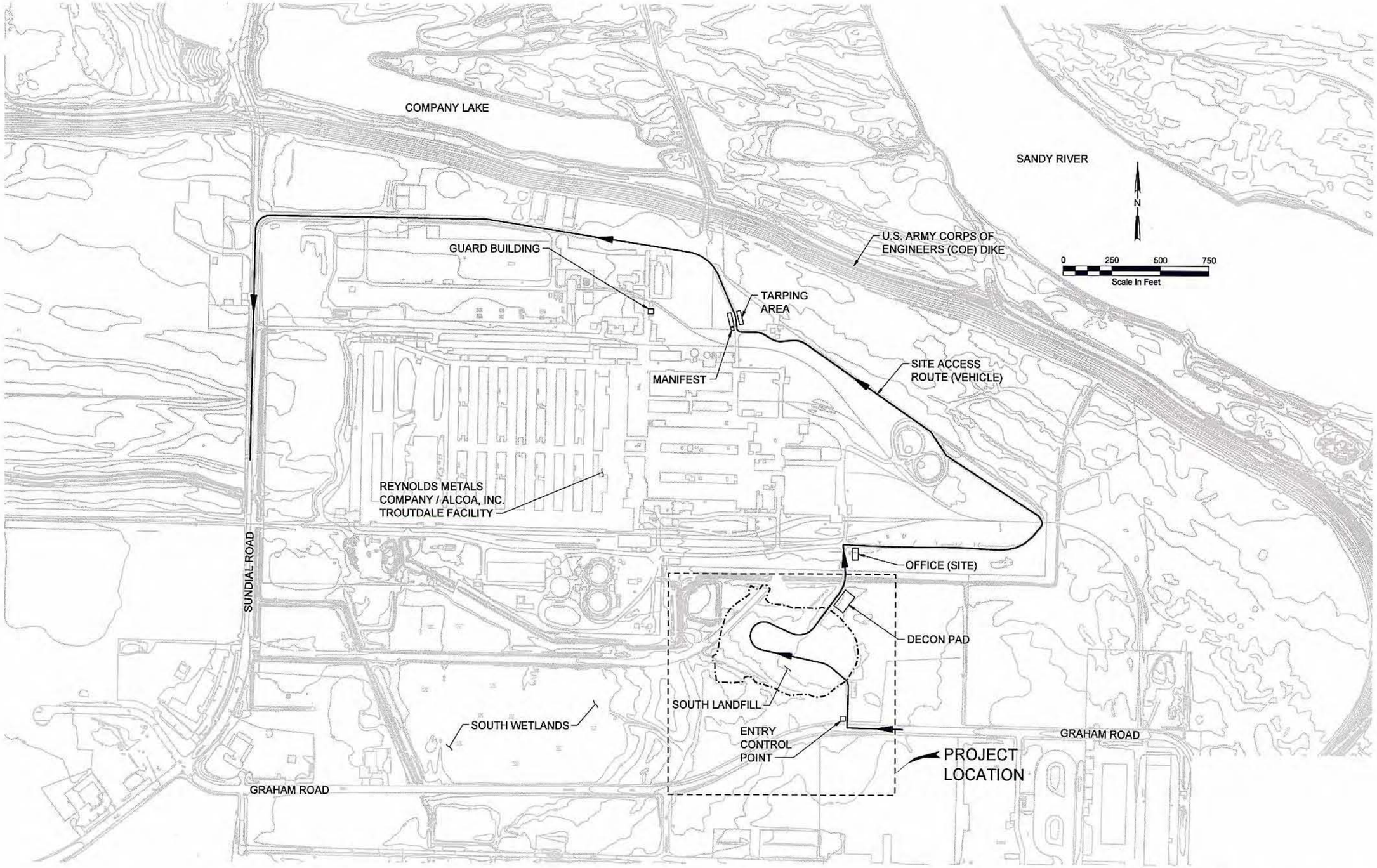

FIGURE 3-1
2003 VEHICLE ACCESS PLAN
REYNOLDS METALS COMPANY/ALCOA, INC.
TROUTDALE, OREGON
FINAL REPORT
SOUTH LANDFILL REMEDIAL ACTION

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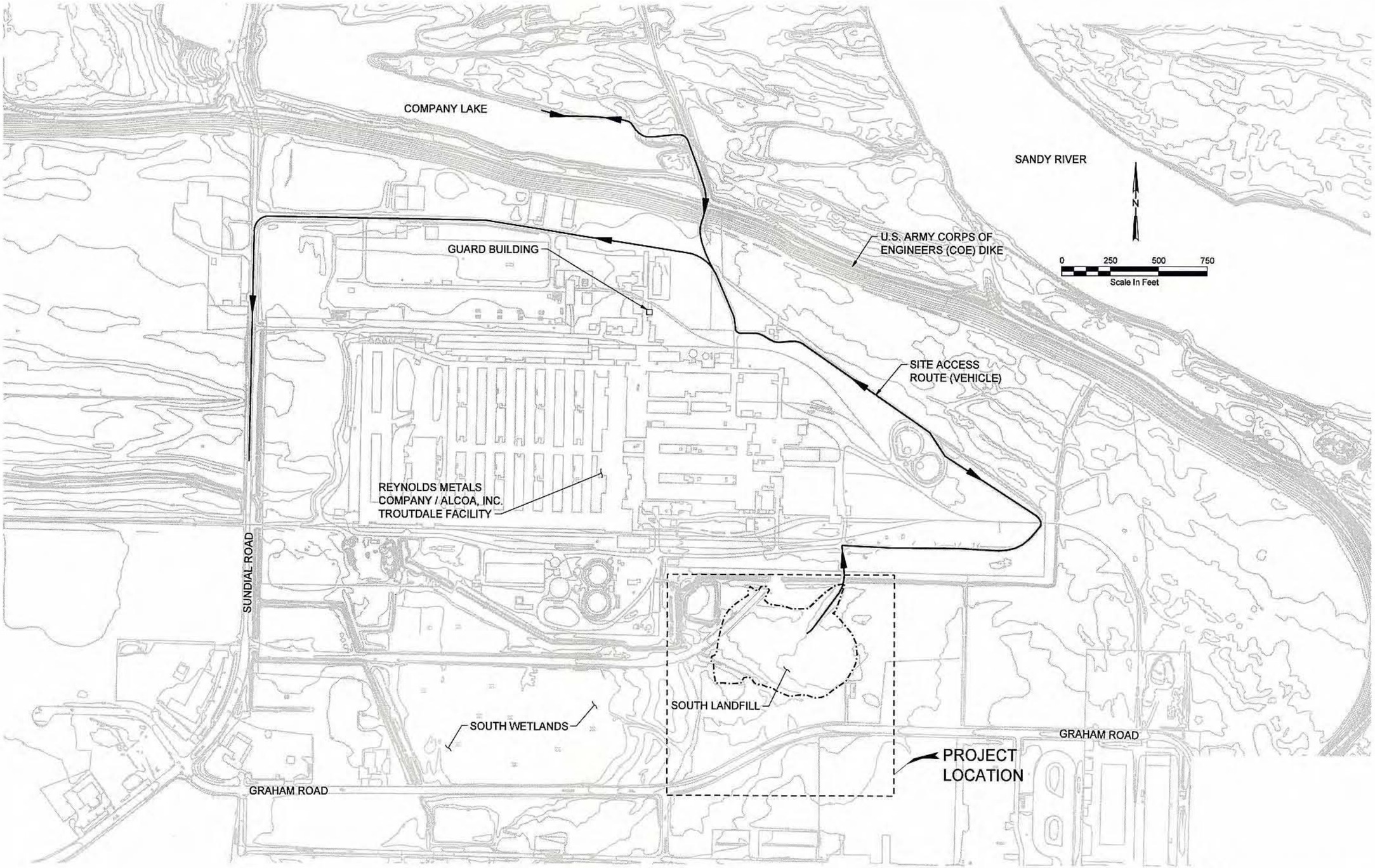

FIGURE 3-2
2004 VEHICLE ACCESS PLAN
REYNOLDS METALS COMPANY/ALCOA, INC.
TROUTDALE, OREGON
FINAL REPORT
SOUTH LANDFILL REMEDIAL ACTION

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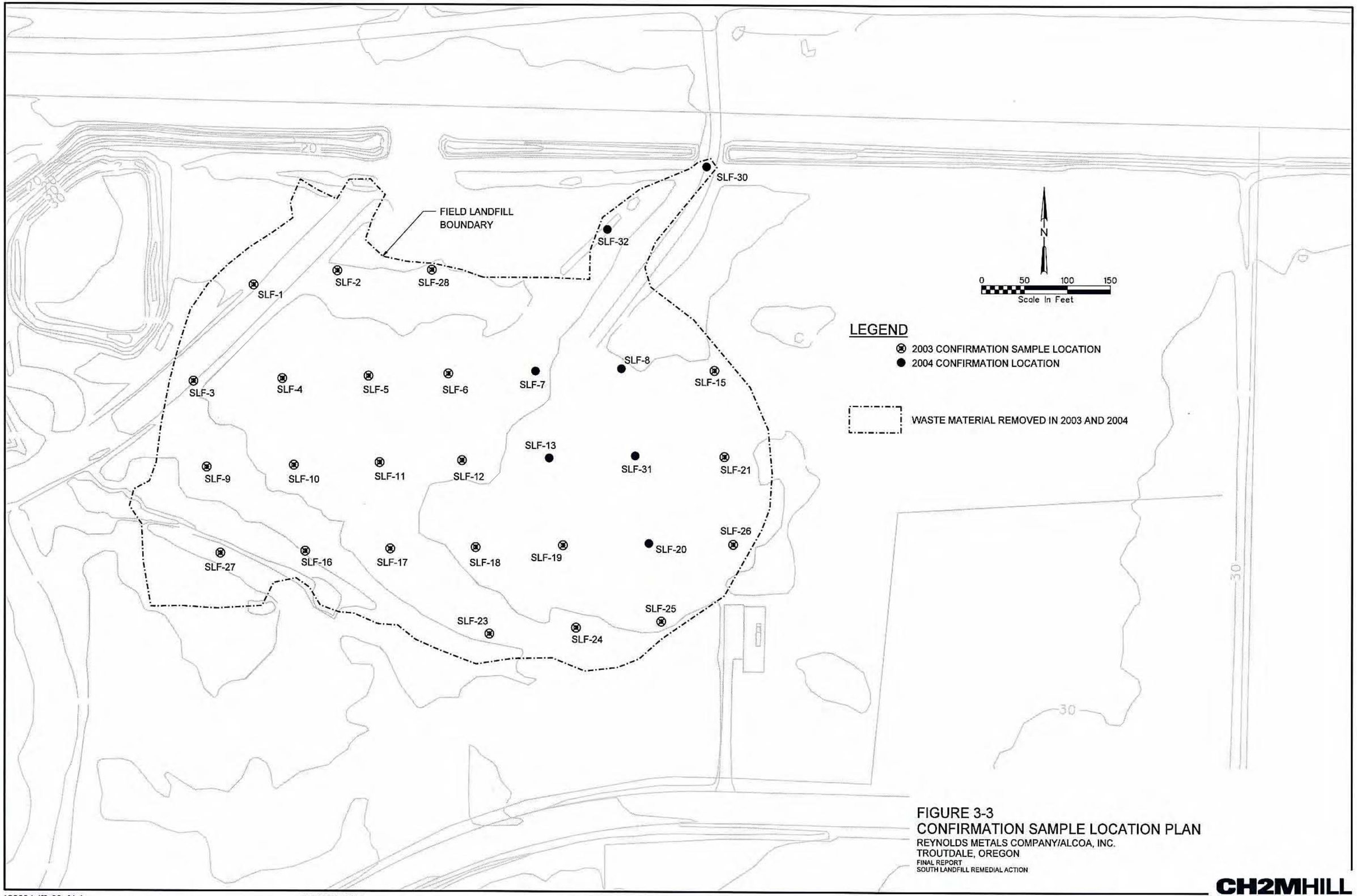

FIGURE 3-3
CONFIRMATION SAMPLE LOCATION PLAN
REYNOLDS METALS COMPANY/ALCOA, INC.
TROUTDALE, OREGON
FINAL REPORT
SOUTH LANDFILL REMEDIAL ACTION

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3.3 Dust Monitoring

In 2003, TTFW conducted personal air monitoring to provide real-time total airborne dust concentrations at the work site. No measurements were taken on rainy days or when the ground surface was wet. If dry conditions were encountered or dust was observed, a fire hose or water truck was used to wet the roads and work areas. Personal air monitoring results from 2003 are presented in *South Landfill Early Remedial Action Interim Report* (CH2M HILL, April 2004).

No dust monitoring was required in 2004 based on the continued use of water trucks for dust control when appropriate.

3.4 Offsite Transportation and Disposal

Waste material removed from SLF in 2003 was transported by ECTI to Wasco County Landfill outside The Dalles, Oregon, for disposal under waste profile permit nos. 2042-03-067 and 2042-03-074 (asbestos-contaminated soil). In addition, a 6-inch-diameter, natural gas pipeline was removed in 2003.

Approximately 2,304 tons of waste material was hauled to Company Lake for mixing with PR from November 3 to November 8, 2003. Waste material hauled to Company Lake was transported by ECTI to Waste Management, Inc.'s landfill in Hillsboro, Oregon, for disposal under waste profile permit no. 6802. Rather than sampling for PCBs, the natural gas pipeline was handled as PCB-containing waste. The pipeline was double wrapped with plastic and transported by ECTI to Chemical Waste Management's Arlington, Oregon, landfill for disposal under waste profile permit no. CW1229.

In 2004, 18,372 tons of waste material was hauled to Company Lake for mixing with PR. Following mixing, the waste material was loaded into trucks by Entact, Inc., and transported by Celorie Trucking, Inc., to Wasco County Landfill for disposal under waste profile permit no. 2042-04-057.

On the basis of average historical fluoride concentrations, approximately 1,876,335 pounds (851,856 kg) of total fluoride mass were removed during the 2003 and 2004 remedial actions.

Daily truck logs and nonhazardous waste manifests are presented in Appendix C.

Table 3-1 is a summary of tonnage removed from south landfill during 2003.

Table 3-1
2003 Weekly South Landfill Removal Tonnage

Week	No. of Loads	Weekly Total for Offsite Disposal (tons)	Weekly Total to Company Lake (tons)	Weekly Cumulative Total from South Landfill (tons)	Cumulative Total (tons)
9/22/03	155	5,089.1	-	-	5,089.1
9/29/03	128	4,203.4	-	-	9,292.5
10/6/03	191	6,292.4	-	-	15,584.8
10/13/03	213	6,990.2	-	-	22,575.1
10/20/03	192	6,288.5	-	-	28,863.6
10/27/03	168	5,490.0	-	-	34,353.6
11/3/03	234	7,658.0	2,304.0	9,962.0	44,315.6
11/10/03	196	6,416.9	-	-	50,732.5
11/17/03	174	5,720.1	-	-	56,452.6
11/24/03	7	228.8	-	-	56,681.4

Table 3-2 is a summary of tonnage removed from south landfill during 2004.

Table 3-2
2004 Weekly South Landfill Removal Tonnage

Week	No. of Loads	Weekly Total to Company Lake (tons)	Cumulative Total (tons)
8/1/2004	137	2,192.0[a]	2,192.0
8/8/2004	231	3,696.0 [a]	5,888.0
8/15/2004	60	960.0 [a]	6,848.0
8/22/2004	0	0	6,848.0
8/29/2004	235	3,760.0 [a]	10,608.0
9/5/2004	254	4,064.0 [a]	14,672.0
9/12/2004	85	1,360.0 [a]	16,032.0
9/19/2004	0	0	16,032.0
9/26/2004	0	0	16,032.0
10/3/2004	34	765.0[b]	16,797.0
10/10/2004	70	1,575.0 [b]	18,372.0

[a] Weight determined using the estimate of 16 tons of material/load multiplied by the number of loads.

[b] Weight determined using the estimate of 22.5 tons of material/load multiplied by the number of loads (using off-road dump trucks).

3.5 Site Restoration

Following waste removal actions, bulldozers were used to final grade all excavated areas. Work areas were graded to a maximum slope of 3 horizontal to 1 vertical (3H:1V). New gravel access roads were constructed within the excavation to allow vehicle access to area groundwater monitoring wells.

3.6 EPA Oversight

EPA oversight activities were provided by Mr. Chip Humphrey, EPA Region 10 in 2003, and by Mr. John Howland, Parametrix, Inc., in 2004.

SECTION 4

Sampling and Analysis

Sampling and analysis activities associated with the SLF removal actions included collection of the following samples:

- Waste characterization soil samples from various locations across the SLF site to profile waste material for disposal at the Wasco County Landfill (2003) (data presented in *South Landfill Early Remedial Action Interim Report* [CH2M HILL, April 2004])
- Confirmation soil samples to demonstrate the effectiveness of the removal effort (2003 and 2004)

4.1 Confirmation Sampling Procedure

In 2003, twenty-two (22) confirmation soil samples plus two duplicates were collected following excavation activities. In 2004, seven (7) additional confirmation soil samples plus one duplicate were collected following excavation activities. Confirmation soil samples were analyzed for total fluoride and PAHs in accordance with *Memorandum No. 25: South Landfill Field Sampling Plan, RMC-Troutdale* (July 30, 2003). Soil samples were collected from a depth interval of 0 to 6 inches below final excavation limits (confirmation sample locations are shown on Figure 3-3). Complete analytical results from 2003 and 2004 are included in Appendix D.

4.1.1 Quality Control

Duplicate soil samples were collected at locations SLSC06, SLFSC07, and SLSC16. Quality assurance/quality control (QA/QC) samples met all acceptance criteria, except as noted on data validation reports. Data validation reports for analytical results are included in Appendix E.

4.1.2 Analysis and Residual Risk

In 2003, confirmation soil samples were sent to CH2M HILL's Applied Sciences Laboratory in Corvallis, Oregon, for total fluoride analysis, and to Columbia Analytical Services, Inc. laboratories in Redding, California, and Kelso, Washington, for PAH analysis. In 2004, confirmation soil samples were sent to CH2M HILL's Applied Sciences Laboratory in Corvallis, Oregon, for total fluoride and PAH analyses. A summary of both the 2003 and 2004 analytical results is presented in Table 4-1.

Site-specific cleanup goals identified in *Memorandum WP No. 57: South Landfill Early Remedial Action Work Plan* (CH2M HILL, August 2003) for the SLF site include the following:

- Removal and offsite disposal of waste material currently present in the SLF area
- Removal of waste material and underlying soil to achieve a total fluoride concentration of less than 4,000 mg/kg

- Removal of waste material and underlying soil to achieve a benzo(a)pyrene and dibenzo(a,h)anthracene concentration of less than 36 mg/kg

All site-specific cleanup goals were achieved as a result of this removal action. Surface and subsurface waste material was removed based on visual observations by site representatives (see Appendix B). Confirmation soil sample results for total fluoride were below 4,000 mg/kg, and results for benzo(a)pyrene and dibenzo(a,h)anthracene were below 36 mg/kg. The maximum concentration of total fluoride observed at the SLF site following excavation was 2,280 mg/kg (SLSC09). The maximum concentrations of benzo(a)pyrene (1.1 mg/kg) and dibenzo(a,h)anthracene (0.21 mg/kg) were observed at sample location SLSC25. Mean total fluoride and PAH concentrations following removal were 427 and 1.9 mg/kg, respectively.

Analytical results were also used to estimate the risk to human health receptors after the removal actions were implemented. The estimated risk was calculated by using the exposure scenarios presented in *Draft Baseline Risk Assessment, Part 1 – Nongroundwater Media* (CH2M HILL, May 1999). Appendix F provides risk calculations for the trespasser, intermittent maintenance worker, and trench worker scenarios.

The risk estimates for the above exposure scenarios before and after implementation of the removal actions are summarized in Table 4-2. Estimated risks are below EPA's target risk levels of 1×10^{-4} excess lifetime cancer risk and below EPA's hazard index of 1 for all three exposure scenarios. In addition, estimated risks are below the Oregon Department of Environmental Quality's (DEQ) target risk level of 1×10^{-5} for cumulative contaminant exposure and 1×10^{-6} for individual contaminants of potential concern. Risk reductions achieved at the south landfill area following removal actions ranged from 96 to 99 percent.

Table 4-1 (Page 1 of 2)
South Landfill Confirmation Soil Sample Results
South Landfill Remedial Action
Reynolds Metals Company/Alcoa, Inc., Troutdale, Oregon

Analyte	SLSC01-0005-101303-0	SLSC02-0005-102803-0	SLSC03-0005-102803-0	SLSC04-0005-102803-0	SLSC05-0005-111003-0	SLSC06-0005-112403-0	SLSC06-0005-112403-1	SLSC09-0005-100203-0	SLSC10-0005-102803-0	SLSC11-0005-111003-0	SLSC12-0005-112403-0	SLSC15-0005-110603-0	SLSC16-0005-100203-0	SLSC16-0005-100203-1	SLSC17-0005-101303-0	SLSC18-0005-101303-0
Sample Date	10/13/2003	10/28/2003	10/28/2003	10/28/2003	11/10/2003	11/24/2003	11/24/2003	10/02/2003	10/28/2003	11/10/2003	11/24/2003	11/24/2003	10/02/2003	10/02/2003	10/13/2003	10/13/2003
Inorganic Compound (mg/kg)																
Fluoride	367	613	190	1710	353	184	433	2280	599	170	758	297	1590	1430	554	657
Polynuclear Aromatic Hydrocarbons (mg/kg)																
Acenaphthene	0.006 U	0.0029 J	0.0056 U	0.068 D	0.025 J	0.0046 U	0.035	0.01	0.0056 U	0.0058 U	0.0046 U	0.0052 U	0.0058 U	0.0027 J	0.0062 U	0.0062 U
Acenaphthylene	0.006 U	0.0068 U	0.0056 U	0.056 U	0.054 U	0.0046 U	0.0075 U	0.0058 U	0.0056 U	0.0058 U	0.0046 U	0.0052 U	0.0058 U	0.006 U	0.0062 U	0.0062 U
Anthracene	0.0014 J	0.0074	0.001 J	0.12 D	0.08	0.0049	0.028	0.015	0.0056 U	0.0058 U	0.0046 U	0.00064 J	0.0022 J	0.0057 J	0.0021 J	0.0011 J
Benzo (a) anthracene	0.003 J	0.078	0.011	0.62 D	0.65	0.15	0.0047 U	0.087	0.0056 U	0.0032 J	0.015	0.0058 B	0.012	0.024	0.0083 B	0.0014 J
Benzo (a) pyrene	0.0041 J	0.094	0.019	0.75 D	0.62	0.22	0.0047 U	0.092	0.00066 J	0.0032 J	0.018	0.0059 B	0.022	0.032	0.012	0.0016 J
Benzo (b) fluoranthene	0.0058 J	0.21	0.042	0.98 D	0.95	0.53	0.0047 U	0.14	0.00079 J	0.0036 J	0.022	0.0074 B	0.02	0.033	0.014	0.0014 J
Benzo (g,h,i) perylene	0.0051 J	0.087	0.025	0.63 D	0.43	0.23	0.0047 U	0.07	0.0056 U	0.0033 J	0.018	0.0059 B	0.017	0.023	0.0096 B	0.0014 J
Benzo (k) fluoranthene	0.0031 J	0.061	0.014	0.37 D	0.34	0.26	0.0047 U	0.044	0.0056 U	0.0017 J	0.016	0.0034 J	0.0063	0.012	0.0066 B	0.0012 J
Chrysene	0.0041 J	0.12	0.019	0.8 D	0.94	0.3	0.0047 U	0.11	0.0007 J	0.0034 J	0.024	0.0072 B	0.015	0.028	0.009	0.0012 J
Dibenzo (a,h) anthracene	0.0021 J	0.025	0.0067	0.16 D	0.14	0.0046 U	0.0047 U	0.032	0.0056 U	0.0058 U	0.0046 U	0.0013 J	0.016	0.018	0.0034 J	0.0014 J
Fluoranthene	0.0038 J	0.074	0.0082	0.82 D	1.1	0.089	0.01	0.14	0.0011 J	0.0048 J	0.022	0.0066	0.02	0.037	0.011	0.0014 J
Fluorene	0.006 U	0.0068 U	0.0056 U	0.032 DJ	0.017 J	0.0046 U	0.079	0.0049 J	0.0056 U	0.0058 U	0.0046 U	0.0052 U	0.0058 U	0.0034 J	0.0062 U	0.0062 U
Indeno (1,2,3-cd) pyrene	0.0053 J	0.1	0.028	0.7 D	0.48	0.2	0.0047 U	0.08	0.00094 J	0.0031 J	0.016	0.0058 B	0.023	0.03	0.011	0.0015 J
Naphthalene	0.0014 J	0.0015 J	0.00029 J	0.023 DJ	0.0093 J	0.0046 U	0.068	0.0037 J	0.00018 J	0.0058 U	0.0046 U	0.0052 U	0.0006 J	0.0017 J	0.0017 J	0.0015 J
Phenanthrene	0.0024 J	0.025	0.0027 J	0.4 D	0.35	0.026	0.19	0.08	0.0056 U	0.002 J	0.0092	0.0032 J	0.012	0.027	0.0051 J	0.0012 J
Pyrene	0.0041 J	0.08	0.0087	0.86 D	0.87	0.1	0.036	0.12	0.00094 J	0.0034 J	0.027	0.0068	0.018	0.03	0.0097 B	0.0014 J
2-Methylnaphthalene	0.0041 J					0.0046 U	0.64				0.0046 U					

B = This flag is used when the analyte is found in the associated blank as well as the sample.
D = This qualifier is used for all compounds identified in an analysis at a secondary dilution factor.
J = Indicates an estimated value.
U = Indicates the compound was analyzed for but not detected.

Table 4-1 (Page 2 of 2)
South Landfill Confirmation Soil Sample Results
South Landfill Remedial Action
Reynolds Metals Company/Alcoa, Inc., Troutdale, Oregon

Analyte	SLSC19-0005-111003-0	SLSC21-0005-110603-0	SLSC23-0005-103003-0	SLSC24-0005-103003-0	SLSC25-0005-111003-0	SLSC26-0005-110603-0	SLSC27-0005-100203-0	SLSC28-0005-112403-0	SLFSC07-0000-0913040	SLFSC07-0000-0913041*	SLF-SC08-00-083004-0	SLF-SC13-00-083004-0	SLF-SC20-00-083004-0	SLFSC30-0000-0913040	SLSC031-0000-1005040	SLSC032-0000-1005040
Sample Date	11/10/2003	11/06/2003	10/30/2003	10/30/2003	11/10/2003	11/06/2003	10/02/2003	11/24/2003	09/13/2004	09/13/2004	08/30/2004	08/30/2004	08/30/2004	09/13/2004	10/05/2004	10/05/2004
Inorganic Compound (mg/kg)																
Fluoride	620	278	376	334	490	239	330	388	193	176	280	226	546	416	209	187
Polynuclear Aromatic Hydrocarbons (mg/kg)																
Acenaphthene	0.0054 U	0.0021 J	0.0066	0.0057 U	0.037 J	0.0056 U	0.0056 U	0.016	0.00486	0.00333	0.00747	0.00306 U	0.00729	0.0275	0.003 U	0.00592
Acenaphthylene	0.0054 U	0.0055 U	0.0055 U	0.0057 U	0.053 U	0.0056 U	0.0056 U	0.0047 U	0.00318 U	0.00297 U	0.00307 U	0.00306 U	0.00299 U	0.00336 U	0.003 U	0.0032 U
Anthracene	0.0054 U	0.003 J	0.012	0.0057 U	0.069	0.00074 J	0.0056 U	0.041	0.0129 J	0.00706 J	0.0115	0.00306 U	0.0111	0.0483 J	0.003 U	0.01
Benzo (a) anthracene	0.0054 U	0.034	0.11	0.0011 J	0.79	0.0066 B	0.00061 J	0.28	0.065	0.0441	0.104	0.00971	0.101	0.423 D	0.0163	0.157
Benzo (a) pyrene	0.0054 U	0.044	0.15	0.0012 J	1.1	0.0082 B	0.0099	0.37	0.0776	0.0539	0.158	0.0116	0.156	0.486 D	0.0183	0.168
Benzo (b) fluoranthene	0.0054 U	0.05	0.18	0.0022 J	1.4	0.012	0.0011 J	0.5	0.087	0.069	0.16	0.0118	0.151	0.147 D	0.0172	0.265 D
Benzo (g,h,i) perylene	0.0054 U	0.035	0.092	0.0013 J	0.75	0.01	0.0068	0.37	0.0718	0.0475	0.145	0.0105	0.144	0.413 D	0.0144	0.191
Benzo (k) fluoranthene	0.0054 U	0.021	0.085	0.001 J	0.55	0.0052 J	0.00048 J	0.3	0.0711	0.0444	0.118	0.00971	0.126	0.0923 D	0.0162	0.175
Chrysene	0.0054 U	0.036	0.12	0.0016 J	0.91	0.0079 B	0.0011 J	0.46	0.0931	0.0647	0.134	0.012	0.13	0.617 D	0.0192	0.279 D
Dibenzo (a,h) anthracene	0.0054 U	0.0087 B	0.026	0.0057 U	0.21	0.0025 J	0.0056 U	0.0075	0.0181	0.0123	0.0368	0.00306 U	0.0365	0.116	0.00425	0.0509
Fluoranthene	0.0054 U	0.036	0.11	0.0012 J	0.86	0.0082	0.0056 U	0.44	0.111	0.0709	0.119	0.0164	0.116	0.61 D	0.0265	0.117
Fluorene	0.0054 U	0.0055 U	0.0036 J	0.0057 U	0.018 J	0.0056 U	0.0056 U	0.013	0.00328	0.00297 U	0.00383	0.00306 U	0.00372	0.0143	0.003 U	0.00331
Indeno (1,2,3-cd) pyrene	0.0054 U	0.04	0.12	0.0015 J	0.91	0.012	0.012	0.34	0.0587	0.0392	0.122	0.00865	0.119	0.398 D	0.0129	0.159
Naphthalene	0.0054 U	0.0055 U	0.0014 J	0.00026 J	0.0036 J	0.0056 U	0.00024 J	0.008	0.00318 U	0.00297 U	0.00307 U	0.00306 U	0.00299 U	0.0123	0.003 U	0.0032 U
Phenanthrene	0.0054 U	0.012	0.044	0.00074 J	0.26	0.0033 J	0.0056 U	0.22	0.0629	0.0287	0.0466	0.00814	0.0454	0.222	0.0134	0.0451
Pyrene	0.0054 U	0.033	0.11	0.0012 J	0.8	0.0078	0.0056 U	0.39	0.115	0.0688	0.116	0.0153	0.114	0.6 D	0.0228	0.123
2-Methylnaphthalene								0.0058								

* = Duplicate of SLFC-07-0000-091340

B = This flag is used when the analyte is found in the associated blank as well as the sample.

D = This qualifier is used for all compounds identified in an analysis at a secondary dilution factor.

J = Indicates an estimated value.

U = Indicates the compound was analyzed for but not detected.

Table 4-2
Human Health Risk Reduction

	Trespasser (RME)		Intermittent Maintenance Worker (RME)		Trench Worker (RME)	
	ELCR	**HI**	**ELCR**	**HI**	**ELCR**	**HI**
Prior to Excavation	4.63E-05	0.208	2.87E-05	0.026	1.40E-04	0.155
After Excavation	9.75E-08	1.96E-05	6.10E-08	2.45E-06	1.97E-07	6.00E-03
Risk Reduction	99.80%	99.99%	99.80%	99.99%	99.90%	96.10%

RME = reasonable maximum exposure.

SECTION 5

Costs

Costs for the removal action at SLF are summarized in Table 5-1. Included in the table are costs for CH2M HILL, the analytical laboratories, and the transportation and disposal contractors. Costs incurred by EPA and RMC/Alcoa are not included.

Table 5-1
Summary of Costs for Removal Actions at South Landfill

Contractor	Description of Work	Cost*
CH2M HILL	Remedial action options analysis, preconstruction sampling, agency submittals, design, construction oversight, bid document preparation, laboratory analysis, confirmation sampling, waste profile sampling, and reporting	$151,452
TTFW, BBLES (ENTACT), ECTI, and Celorie Trucking, Inc.	Excavation, site restoration, and waste transportation	$1,430,170
Waste Connections	Disposal of material at Wasco County Landfill	$818,082
	Total	**$2,399,704**

* EPA oversight and RMC/Alcoa costs not included.

SECTION 6

Certification

Under penalty of law, I certify that to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of the report, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

EXPIRES: December 31, 2005

Scott W. Dethloff, P.E.
Oregon Professional Engineer 18336 PE
CH2M HILL, Inc.

May 12, 2005
Date

Steven M. Shaw
Troutdale Superfund Project Coordinator
Reynolds Metals Company/Alcoa

May 9, 2005
Date

SECTION 7

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APPENDIX A
Historical Analytical Data Summary

South Landfill
Waste Analysis Results

Analyte	Units	Concentration Range	Analyte	Units	Concentration Range
Conventional Chemistry			Aroclor 1242	mg/Kg	ND
Cyanide, Total	mg/Kg	ND - 44	Aroclor 1248	mg/Kg	ND -0.77
Fluoride by 340.1/.2 (Bellack Dist.)	mg/Kg	ND - 48000	Aroclor 1254	mg/Kg	ND
Fluoride by 300.0 (Soluble)	mg/Kg	ND - 1900	Aroclor 1260	mg/Kg	ND - 1.7
Fluoride by 340.2 Mod.	mg/Kg	6.1 - 1000	Aroclor 1262	mg/Kg	ND
Fluoride, GI Extraction	mg/Kg	1260 - 5940	Aroclor 1268	mg/Kg	ND - 24 P
			Total PCBs	mg/Kg	ND -1.1
PAHs/SVOCs					
2-Methylnaphthalene	mg/Kg	ND	**Total Metals**		
Acenaphthene	mg/Kg	ND - 24	Aluminum	mg/Kg	16600 - 37200
Acenaphthylene	mg/Kg	ND - 0.33	Antimony	mg/Kg	ND - 31
Anthracene	mg/Kg	ND - 50	Arsenic	mg/Kg	ND - 24.2
Benzo(a)anthracene	mg/Kg	ND - 340	Barium	mg/Kg	52.5 - 152
Benzo(a)pyrene	mg/Kg	ND - 370	Beryllium	mg/Kg	ND - 9.1
Benzo(b)fluoranthene	mg/Kg	ND - 540	Cadmium	mg/Kg	ND - 5.2
Benzo(g,h,i)perylene	mg/Kg	ND - 340	Chromium	mg/Kg	4.5 - 220
Benzo(k)fluoranthene	mg/Kg	ND -290	Copper	mg/Kg	52 - 36000
Chrysene	mg/Kg	ND - 440	Lead	mg/Kg	ND - 520
Dibenzo(a,h)anthracene	mg/Kg	ND - 71	Mercury	mg/Kg	ND -0.82
Fluoranthene	mg/Kg	ND - 590	Nickel	mg/Kg	3.3 - 290
Fluorene	mg/Kg	ND - 8.8	Selenium	mg/Kg	ND - 2.7
Indeno(1,2,3-cd)pyrene	mg/Kg	ND - 200	Silver	mg/Kg	ND - 1.9
Naphthalene	mg/Kg	ND - 3.4	Thallium	mg/Kg	ND
Phenathrene	mg/Kg	ND - 230	Vanadium	mg/Kg	71.3 - 172
Pyrene	mg/Kg	ND - 450	Zinc	mg/Kg	14 - 850
Total PAHs	mg/Kg	ND - >10000			
PCBs			**TPH**		
Aroclor 1016	mg/Kg	ND	Diesel by HCID	mg/Kg	ND
Aroclor 1221	mg/Kg	ND	Gas by HCID	mg/Kg	ND
Aroclor 1232	mg/Kg	ND	Heavy Oil by HCID	mg/Kg	2700

ND = Not Detected
NA = Not Analyzed
mg/kg = milligrams per kilogram
PAHs = Polynuclear Aromatic Hydrocarbons
SVOCs = Semivolatile Organic Compounds
PCBs = Polychlorinated Biphenyls
TPH = Total Petroleum Hydrocarbons
P = The GC or HPLC confirmation criteria was exceeded

South Wetlands
Waste Analysis Results

Analyte	Units	Concentration Range	Analyte	Units	Concentration Range
Conventional Chemistry			**Total Metals**		
Cyanide, Total	mg/Kg	ND - 2.9	Antimony	mg/Kg	ND
Fluoride by 340.2 Mod.	mg/Kg	500 - 600	Arsenic	mg/Kg	5.9 - 14
			Beryllium	mg/Kg	ND - 3
PAHs/SVOCs			Cadmium	mg/Kg	ND
Total PAHs	mg/Kg	ND - 14	Chromium	mg/Kg	11 - 56
			Copper	mg/Kg	19 - 440
PCBs			Lead	mg/Kg	29 - 49
Aroclor 1016	mg/Kg	ND	Mercury	mg/Kg	ND - 0.68
Aroclor 1221	mg/Kg	ND	Nickel	mg/Kg	490 - 830
Aroclor 1232	mg/Kg	ND	Selenium	mg/Kg	ND - 1.5
Aroclor 1242	mg/Kg	ND - 31	Silver	mg/Kg	ND
Aroclor 1248	mg/Kg	ND	Thallium	mg/Kg	ND
Aroclor 1254	mg/Kg	ND	Zinc	mg/Kg	47 - 70
Aroclor 1260	mg/Kg	ND - 14			
Total PCBs	mg/Kg	ND - 42			
			TPH		
Pesticides			Diesel by HCID	mg/Kg	ND
4,4' - DDD	mg/Kg	ND - 0.08	Gas by HCID	mg/Kg	ND
4,4' - DDE	mg/Kg	ND - 0.05	Heavy Oil by HCID	mg/Kg	ND - 260
4,4' - DDT	mg/Kg	ND - 0.28			

ND = Not Detected
mg/kg = milligrams per kilogram
PAHs = Polynuclear Aromatic Hydrocarbons
SVOCs = Semivolatile Organic Compounds
PCBs = Polychlorinated Biphenyls
TPH = Total Petroleum Hydrocarbons

South Ditch
Waste Analysis Results

Analyte	Units	Concentration Range
Conventional Chemistry		
Cyanide, Total	mg/Kg	ND - 11
Fluoride by 300.0 (Soluble)	mg/Kg	26 - 660
Fluoride by 340.1/.2 (Bellack Dist.)	mg/Kg	220 - 127000
Fluoride, GI Extraction	mg/Kg	ND - 4110
Fluoride, with Distillation	mg/Kg	167 - 17600
PAHs/SVOCs		
1,2,4-Trichlorobenzene	mg/Kg	ND
1,2-Dichlorobenzene	mg/Kg	ND
1,3-Dichlorobenzene	mg/Kg	ND
1,4-Dichlorobenzene	mg/Kg	ND
2,4,5-Trichlorophenol	mg/Kg	ND
2,4,6-Trichlorophenol	mg/Kg	ND
2,4-Dichlorophenol	mg/Kg	ND
2,4-Dimethylphenol	mg/Kg	ND
2,4-Dinitrophenol	mg/Kg	ND
2,4-Dinitrotoluene	mg/Kg	ND
2,6-Dinitrotoluene	mg/Kg	ND
2-Chloronaphthalene	mg/Kg	ND
2-Chlorophenol	mg/Kg	ND
2-Methylnaphthalene	mg/Kg	ND - 1.7
2-Methylphenol	mg/Kg	ND
2-Nitroaniline	mg/Kg	ND
2-Nitrophenol	mg/Kg	ND
3,3'-Dichlorobenzidine	mg/Kg	ND
3-Nitroaniline	mg/Kg	ND
4,6-Dinitro-2-Methylphenol	mg/Kg	ND
4-Bromophenyl Phenyl Ether	mg/Kg	ND
4-Chloro-3-Methylphenol	mg/Kg	ND
4-Chloroaniline	mg/Kg	ND
4-Chlorophenyl Phenyl Ether	mg/Kg	ND
4-Methylphenol	mg/Kg	ND
4-Nitroaniline	mg/Kg	ND
4-Nitrophenol	mg/Kg	ND
Acenaphthene	mg/Kg	ND - 58
Acenaphthylene	mg/Kg	ND - 1.3
Anthracene	mg/Kg	ND - 88
Benzo (a) anthracene	mg/Kg	ND - 1100
Benzo (a) pyrene	mg/Kg	ND - 810
Benzo (b) fluoranthene	mg/Kg	ND - 1400
Benzo (k) fluoranthene	mg/Kg	ND - 570
Benzo [g,h,i] perylene	mg/Kg	ND - 520
Benzoic Acid	mg/Kg	ND
Benzyl Alcohol	mg/Kg	ND
Bis(2-Chloroethoxy) Methane	mg/Kg	ND
Bis(2-Chloroethyl) Ether	mg/Kg	ND
Bis(2-Chloroisopropyl) Ether	mg/Kg	ND
Bis(2-Ethylhexyl) Phthalate	mg/Kg	ND - 22
Butyl Benzyl Phthalate	mg/Kg	ND
Chrysene	mg/Kg	29 - 1900
Di-n-Butyl Phthalate	mg/Kg	ND - 1.0
Di-n-Octyl Phthalate	mg/Kg	ND
Dibenzo (a,h) anthracene	mg/Kg	0.088 - 240
Dibenzofuran	mg/Kg	ND - 6.5
Diethyl Phthalate	mg/Kg	ND
Dimethyl Phthalate	mg/Kg	ND
Fluoranthene	mg/Kg	ND - 1600
Fluorene	mg/Kg	ND - 30
Hexachlorobenzene	mg/Kg	ND
Hexachlorobutadiene	mg/Kg	ND
Hexachlorocyclopentadiene	mg/Kg	ND
Hexachloroethane	mg/Kg	ND
Indeno (1,2,3-cd) pyrene	mg/Kg	ND - 580
Isophorone	mg/Kg	ND
n-Nitrosodi-n-Propylamine	mg/Kg	ND
n-Nitrosodiphenylamine	mg/Kg	ND
Naphthalene	mg/Kg	ND - 3.1
Nitrobenzene	mg/Kg	ND
Pentachlorophenol	mg/Kg	ND
Phenanthrene	mg/Kg	ND - 350
Phenol	mg/Kg	ND
Pyrene	mg/Kg	ND - 2000
Pest/PCB	mg/Kg	ND
Total Metals		
Aluminum	mg/Kg	3420 - 121000
Antimony	mg/Kg	ND
Arsenic	mg/Kg	ND - 64.8
Barium	mg/Kg	13.7 - 276
Beryllium	mg/Kg	ND - 4.4
Cadmium	mg/Kg	ND - 16.9
Calcium	mg/Kg	1840 - 126000
Chromium	mg/Kg	4.9 - 91
Cobalt	mg/Kg	ND - 20
Copper	mg/Kg	9.1 - 626
Iron	mg/Kg	4770 - 31000
Lead	mg/Kg	ND - 165
Magnesium	mg/Kg	518 - 3980
Manganese	mg/Kg	30.1 - 2660
Mercury	mg/Kg	ND - 3.1
Nickel	mg/Kg	3.1 - 542
Potassium	mg/Kg	ND - 950
Selenium	mg/Kg	ND
Silver	mg/Kg	ND - 2.5
Sodium	mg/Kg	460 - 2320
Thallium	mg/Kg	ND - 1.0
Vanadium	mg/Kg	17.7 - 144
Zinc	mg/Kg	14 - 668
TPH		
Diesel by HCID	mg/Kg	50
Gas by HCID	mg/Kg	ND
Heavy Oil by HCID	mg/Kg	100
VOCs	mg/Kg	ND

ND = Not Detected
mg/kg = milligrams per kilogram
VOCs = Volatile Organic Compounds
PAHs = Polynuclear Aromatic Hydrocarbons
SVOCs = Semivolatile Organic Compounds
PCBs = Polychlorinated Biphenyls
TPH = Total Petroleum Hydrocarbons

Focused Extraction Well Cuttings
Waste Analysis Results

Analyte	Units	Concentration Range
Conventional Chemistry		
Cyanide, Total	mg/Kg	ND - 1.1
Fluoride by 300.0 (Soluble)	mg/Kg	ND - 1600
PAHs/SVOCs		
Acenaphthene	mg/Kg	ND - 0.26
Acenaphthylene	mg/Kg	ND
Anthracene	mg/Kg	ND - 0.46
Benzo (a) anthracene	mg/Kg	ND - 4.1
Benzo (a) pyrene	mg/Kg	ND - 4.3
Benzo (b) fluoranthene	mg/Kg	ND - 8.5
Benzo (k) fluoranthene	mg/Kg	ND - 1.7
Benzo [g,h,i] perylene	mg/Kg	ND - 4.4
Chrysene	mg/Kg	ND - 5.8
Dibenzo (a,h) anthracene	mg/Kg	ND - 1
Fluoranthene	mg/Kg	ND - 4.7
Fluorene	mg/Kg	ND - 0.097
Indeno (1,2,3-cd) pyrene	mg/Kg	ND - 3.9
Naphthalene	mg/Kg	ND
Phenanthrene	mg/Kg	ND - 1.7
Pyrene	mg/Kg	ND - 5
Total PAHs	mg/Kg	ND - 110
PCBs		
Aroclor 1016	mg/Kg	ND
Aroclor 1221	mg/Kg	ND
Aroclor 1232	mg/Kg	ND
Aroclor 1242	mg/Kg	ND
Aroclor 1248	mg/Kg	ND
Aroclor 1254	mg/Kg	ND
Aroclor 1260	mg/Kg	ND - 1.2
Total PCBs	mg/Kg	ND - 1.1

Analyte	Units	Concentration Range
Total Metals		
Aluminum		
Antimony	mg/Kg	7200 - 27000
Arsenic	mg/Kg	ND
Barium	mg/Kg	ND - 4.1
Beryllium	mg/Kg	34 - 190
Cadmium	mg/Kg	ND
Calcium	mg/Kg	ND
Chromium	mg/Kg	3800 - 6700
Cobalt	mg/Kg	5.3 - 35
Copper	mg/Kg	ND - 8.3
Iron	mg/Kg	12 - 470
Lead	mg/Kg	12000 - 35000
Magnesium	mg/Kg	ND - 100
Manganese	mg/Kg	1500 - 8000
Mercury	mg/Kg	78 - 530
Nickel	mg/Kg	ND
Potassium	mg/Kg	4.7 - 66
Selenium	mg/Kg	220 - 2700
Silver	mg/Kg	ND
Sodium	mg/Kg	ND
Thallium	mg/Kg	430 - 8300
Vanadium	mg/Kg	ND
Zinc	mg/Kg	34 - 83
	mg/Kg	18 - 91
TPH		
Diesel by HCID		
Gas by HCID	mg/Kg	ND
Heavy Oil by HCID	mg/Kg	ND
TPH	mg/Kg	ND - 1700
	mg/Kg	87 - 430

ND = Not Detected
mg/kg = milligrams per kilogram
PAHs = Polynuclear Aromatic Hydrocarbons
SVOCs = Semivolatile Organic Compounds
PCBs = Polychlorinated Biphenyls
TPH = Total Petroleum Hydrocarbons

Note: Focused extraction cutting data based on historical boring log information.

Company Lake Outfall Ditch
Process Residue Analyses

Analyte	Units	Concentration Range
Conventional Chemistry		
Cyanide, Total	mg/Kg	1.3 to 7.9
Fluoride by 340.1/.2 (Bellack Dist.)	mg/Kg	7,000 to 57,000
Fluoride by 300.0 (Soluble)	mg/Kg	3.5 to 170
Total Organic Carbon	mg/Kg	20,100 to 185,000
PAHs		
2-Methylnaphthalene	mg/Kg	ND
Acenaphthene	mg/Kg	0.1 to 1.0
Acenaphthylene	mg/Kg	ND
Anthracene	mg/Kg	0.06 to 26
Benzo(a)anthracene	mg/Kg	0.5 to 220
Benzo(a)pyrene	mg/Kg	0.05 to 180
Benzo(b)fluoranthene	mg/Kg	0.3 to 370
Benzo(g,h,I)perylene	mg/Kg	1.3 to 120
Benzo(k)fluoranthene	mg/Kg	0.2 to 150
Chrysene	mg/Kg	0.7 to 460
Dibenzo(a,h)anthracene	mg/Kg	0.06 to 22
Fluoranthene	mg/Kg	1.0 to 180
Fluorene	mg/Kg	0.1 to 11
Indeno(1,2,3-cd)pyrene	mg/Kg	1.4 to 93
Naphthalene	mg/Kg	ND
Phenanthrene	mg/Kg	0.1 to 39
Pyrene	mg/Kg	0.2 to 160
PCBs		
Aroclor 1016	mg/Kg	ND
Aroclor 1221	mg/Kg	ND
Aroclor 1232	mg/Kg	ND
Aroclor 1242	mg/Kg	ND
Aroclor 1248	mg/Kg	0.4 to 2.1
Aroclor 1254	mg/Kg	ND
Aroclor 1260	mg/Kg	ND
Aroclor 1262	mg/Kg	ND
Aroclor 1268	mg/Kg	0.5 to 1.0

Analyte	Units	Concentration Range
Total Metals		
Aluminum	mg/Kg	16,100 to 74,200
Antimony	mg/Kg	ND to 3.6
Arsenic	mg/Kg	5.0 to 16.5
Barium	mg/Kg	87.1 to 267
Beryllium	mg/Kg	0.8 to 3.4
Cadmium	mg/Kg	0.7 to 8.5
Calcium	mg/Kg	10,100 to 70,500
Chromium	mg/Kg	20.8 to 123
Cobalt	mg/Kg	6.8 to 32.2
Copper	mg/Kg	43.3 to 288
Iron	mg/Kg	9,500 to 26,500
Lead	mg/Kg	23,8 to 114
Magnesium	mg/Kg	1,700 to 5,920
Manganese	mg/Kg	155 to 2,220
Mercury	mg/Kg	0.2 to 1.1
Nickel	mg/Kg	42.5 to 790
Potassium	mg/Kg	715 to 3,350
Selenium	mg/Kg	1.3 to 6.7
Silver	mg/Kg	ND to 1.1
Sodium	mg/Kg	1,260 to 6,800
Thallium	mg/Kg	ND to 1.3
Vanadium	mg/Kg	62.2 to 271
Zinc	mg/Kg	73.9 to 1,010
TCLP Metals		
Arsenic	mg/L	ND
Barium	mg/L	0.53
Cadmium	mg/L	0.019
Chromium	mg/L	ND
Lead	mg/L	ND
Mercury	mg/L	ND
Selenium	mg/L	ND
Silver	mg/L	ND
TPH		
Diesel by 8015	mg/Kg	280 to 2,200
Gasoline	mg/Kg	ND
Heavy Oil	mg/Kg	ND

ND = Not Detected

mg/kg = milligrams per kilogram

PAHs = Polynuclear Aromatic Hydrocarbons

PCBs = Polychlorinated Biphenyls

TPH = Total Petroleum Hydrocarbons

APPENDIX B
Photo Log of South Landfill Remedial Effort


2004 10 4


CATERPILLAR


United Rentals
KOBELCO
SK 210


KOBELCO

APPENDIX C
Daily Truck Logs and Waste Manifests

APPENDIX D
Confirmation Sample Results

Appendixes C and D consist of very large data files—too large to post on this Web site.

If you need access to these data, please contact Carol Plambeck, CH2M HILL, 503-736-4319.

APPENDIX E
Data Validation Reports

Data Usability Review for Alcoa Sampling Events – October 2, 2003

Prepared for: Patrick Heins/PDX
Tina Rice/PDX

Prepared by: Kerry Byun/PDX

Date: March 18, 2005

Summary

This memorandum summarizes the review of the QA/QC data associated with the analysis of four waters collected October 2, 2003 from the Alcoa site.

Samples SL-SC09-0005-100203-0, SL-SC16-0005-100203-0, SL-SC16-0005-100203-1, and SL-SC27-0005-100203-0 collected in October were submitted for fluoride analyses to the Applied Science Laboratory (ASL), located in Corvallis, Oregon. Data was reported in analytical batch C2181.

EPA Contract Laboratory Program (CLP) *National Functional Guidelines (NFG) for Low Concentration Organic Data Review* (June 2001), *National Functional Guidelines (NFG) for Organic Data Review* (October 1999), and *National Functional Guidelines (NFG) for Inorganic Data Review* (July 2002) provided guidelines for data qualification, where applicable.

The intent of this review was to assess the appropriate use or "usability" of the analytical data based on the QA/QC data reported by the laboratory. This QA review focuses on criteria for the following QA/QC parameters and their overall effect on the data:

- Sample custody, handling, and preservation
- Holding time compliance
- Summary initial and continuing calibration data
- Method blanks
- Surrogate spike recovery
- Precision and Accuracy (laboratory control samples and spike/spike duplicates)

Only summary QA/QC information was reviewed for each analytical parameter. Analytical results and QA/QC summary information were provided by ASL laboratory for the sample analyses. These data sets are usable when used in conjunction with information discussed below and any flags applied to the hard copy data by the laboratory or during this review.

Sample Custody, Handling, and Holding Times

Chain-of-custody (COC) forms and laboratory sample receiving checklists were reviewed and no discrepancies were found.

Initial Calibration

Initial calibration data were provided were provided by ASL laboratory for each instrument used for analysis. All target compounds met initial calibration QC acceptance criteria.

Continuing Calibration

Continuing calibration data were provided by ASL laboratory for each instrument used for analysis. All target compounds met continuing calibration QC acceptance criteria.

Holding Times

Extraction and analysis holding times were met for all samples and analytes.

Method Blanks

Method blanks were provided for all analyses. All method blanks were contamination-free, therefore meeting QC acceptance criteria.

Surrogate Recovery

Al surrogate recoveries were within the specified QC control limits.

Laboratory Control Samples

Percent recovery and relative percent difference (RPD) values for the laboratory control samples (LCS) and LCS duplicates met frequency criteria and QC control limits.

Matrix Spike Samples

Matrix Spike and Matrix Spike Duplicates (MS/MSD) were not requested on either COC. The laboratories do not routinely report MS/MSD pairs when not requested to do so. However, they do routinely run this QA/QC check and inspect them internally.

Other Comments

Some of the samples were run as dilutions to bring high concentration analytes into range of the calibration curves. As the samples are diluted some of the lower concentration analytes become non-detect. All of the runs are presented in this data set. For any one analyte the analysis with the least dilution, and therefore lowest detection limit, that has not been flagged "E" should be used.

Data Usability Review for Alcoa Sampling Events – October 13, 2003

Prepared for: Patrick Heins/PDX
Tina Rice/PDX

Prepared by: Kerry Byun/PDX

Date: March 18, 2005

Summary

This memorandum summarizes the review of the QA/QC data associated with the analysis of three waters collected October 13, 2003 from the Alcoa site.

Samples SL-SC01-0005-101303-0, SL-SC17-0005-101303-0, and SL-SC18-0005-101303-0, collected in October were submitted for fluoride analyses to the Applied Science Laboratory (ASL), located in Corvallis, Oregon. Data was reported in analytical batch C2237.

EPA Contract Laboratory Program (CLP) *National Functional Guidelines (NFG) for Low Concentration Organic Data Review* (June 2001), *National Functional Guidelines (NFG) for Organic Data Review* (October 1999), and *National Functional Guidelines (NFG) for Inorganic Data Review* (July 2002) provided guidelines for data qualification, where applicable.

The intent of this review was to assess the appropriate use or "usability" of the analytical data based on the QA/QC data reported by the laboratory. This QA review focuses on criteria for the following QA/QC parameters and their overall effect on the data:

- Sample custody, handling, and preservation
- Holding time compliance
- Summary initial and continuing calibration data
- Method blanks
- Surrogate spike recovery
- Precision and Accuracy (laboratory control samples and spike/spike duplicates)

Only summary QA/QC information was reviewed for each analytical parameter. Analytical results and QA/QC summary information were provided by ASL laboratory for the sample analyses. These data sets are usable when used in conjunction with information discussed below and any flags applied to the hard copy data by the laboratory or during this review.

Sample Custody, Handling, and Holding Times

Chain-of-custody (COC) forms and laboratory sample receiving checklists were reviewed and no discrepancies were found.

Initial Calibration

Initial calibration data were provided were provided by ASL laboratory for each instrument used for analysis. All target compounds met initial calibration QC acceptance criteria.

Continuing Calibration

Continuing calibration data were provided by ASL laboratory for each instrument used for analysis. All target compounds met continuing calibration QC acceptance criteria.

Holding Times

Extraction and analysis holding times were met for all samples and analytes.

Method Blanks

Method blanks were provided for all analyses. All method blanks were contamination-free, therefore meeting QC acceptance criteria.

Surrogate Recovery

Al surrogate recoveries were within the specified QC control limits.

Laboratory Control Samples

Percent recovery and relative percent difference (RPD) values for the laboratory control samples (LCS) and LCS duplicates met frequency criteria and QC control limits.

Matrix Spike Samples

Matrix Spike and Matrix Spike Duplicates (MS/MSD) were not requested on either COC. The laboratories do not routinely report MS/MSD pairs when not requested to do so. However, they do routinely run this QA/QC check and inspect them internally.

Other Comments

Some of the samples were run as dilutions to bring high concentration analytes into range of the calibration curves. As the samples are diluted some of the lower concentration analytes become non-detect. All of the runs are presented in this data set. For any one analyte the analysis with the least dilution, and therefore lowest detection limit, that has not been flagged "E" should be used.

Data Usability Review for Alcoa Sampling Events – October 28, 2003

Prepared for: Patrick Heins/PDX
Tina Rice/PDX

Prepared by: Kerry Byun/PDX

Date: March 18, 2005

Summary

This memorandum summarizes the review of the QA/QC data associated with the analysis of six waters collected October 28, 2003 and October 30, 2003 from the Alcoa site.

Samples SL-SC02-0005-102803-0, SL-SC03-0005-102803-0, SL-SC04-0005-102803-0, SL-SC10-0005-102803-0, SL-SC23-0005-103003-0, and SL-SC24-0005-103003-0 collected in October were submitted for fluoride analyses to the Applied Science Laboratory (ASL), located in Corvallis, Oregon. Data was reported in analytical batch C2355.

EPA Contract Laboratory Program (CLP) *National Functional Guidelines (NFG) for Low Concentration Organic Data Review* (June 2001), *National Functional Guidelines (NFG) for Organic Data Review* (October 1999), and *National Functional Guidelines (NFG) for Inorganic Data Review* (July 2002) provided guidelines for data qualification, where applicable.

The intent of this review was to assess the appropriate use or "usability" of the analytical data based on the QA/QC data reported by the laboratory. This QA review focuses on criteria for the following QA/QC parameters and their overall effect on the data:

- Sample custody, handling, and preservation
- Holding time compliance
- Summary initial and continuing calibration data
- Method blanks
- Surrogate spike recovery
- Precision and Accuracy (laboratory control samples and spike/spike duplicates)

Only summary QA/QC information was reviewed for each analytical parameter. Analytical results and QA/QC summary information were provided by ASL laboratory for the sample analyses. These data sets are usable when used in conjunction with information discussed below and any flags applied to the hard copy data by the laboratory or during this review.

Sample Custody, Handling, and Holding Times

Chain-of-custody (COC) forms and laboratory sample receiving checklists were reviewed and no discrepancies were found.

Initial Calibration

Initial calibration data were provided were provided by ASL laboratory for each instrument used for analysis. All target compounds met initial calibration QC acceptance criteria.

Continuing Calibration

Continuing calibration data were provided by ASL laboratory for each instrument used for analysis. All target compounds met continuing calibration QC acceptance criteria.

Holding Times

Extraction and analysis holding times were met for all samples and analytes.

Method Blanks

Method blanks were provided for all analyses. All method blanks were contamination-free, therefore meeting QC acceptance criteria.

Surrogate Recovery

Al surrogate recoveries were within the specified QC control limits.

Laboratory Control Samples

Percent recovery and relative percent difference (RPD) values for the laboratory control samples (LCS) and LCS duplicates met frequency criteria and QC control limits.

Matrix Spike Samples

Matrix Spike and Matrix Spike Duplicates (MS/MSD) were not requested on either COC. The laboratories do not routinely report MS/MSD pairs when not requested to do so. However, they do routinely run this QA/QC check and inspect them internally.

Other Comments

Some of the samples were run as dilutions to bring high concentration analytes into range of the calibration curves. As the samples are diluted some of the lower concentration analytes become non-detect. All of the runs are presented in this data set. For any one analyte the analysis with the least dilution, and therefore lowest detection limit, that has not been flagged "E" should be used.

Data Usability Review for Alcoa Sampling Events – November 6, 2003

Prepared for: Patrick Heins/PDX
Tina Rice/PDX

Prepared by: Kerry Byun/PDX

Date: March 18, 2005

Summary

This memorandum summarizes the review of the QA/QC data associated with the analysis of three waters collected November 6, 2003 from the Alcoa site.

Samples SL-SC15-0005-110603-0, SL-SC21-0005-110603-0, and SL-SC26-0005-110603-0 collected in November were submitted for fluoride analyses to the Applied Science Laboratory (ASL), located in Corvallis, Oregon. Data was reported in analytical batch C2399.

EPA Contract Laboratory Program (CLP) *National Functional Guidelines (NFG) for Low Concentration Organic Data Review* (June 2001), *National Functional Guidelines (NFG) for Organic Data Review* (October 1999), and *National Functional Guidelines (NFG) for Inorganic Data Review* (July 2002) provided guidelines for data qualification, where applicable.

The intent of this review was to assess the appropriate use or "usability" of the analytical data based on the QA/QC data reported by the laboratory. This QA review focuses on criteria for the following QA/QC parameters and their overall effect on the data:

- Sample custody, handling, and preservation
- Holding time compliance
- Summary initial and continuing calibration data
- Method blanks
- Surrogate spike recovery
- Precision and Accuracy (laboratory control samples and spike/spike duplicates)

Only summary QA/QC information was reviewed for each analytical parameter. Analytical results and QA/QC summary information were provided by ASL laboratory for the sample analyses. These data sets are usable when used in conjunction with information discussed below and any flags applied to the hard copy data by the laboratory or during this review.

Sample Custody, Handling, and Holding Times

Chain-of-custody (COC) forms and laboratory sample receiving checklists were reviewed and no discrepancies were found.

Initial Calibration

Initial calibration data were provided were provided by ASL laboratory for each instrument used for analysis. All target compounds met initial calibration QC acceptance criteria.

Continuing Calibration

Continuing calibration data were provided by ASL laboratory for each instrument used for analysis. All target compounds met continuing calibration QC acceptance criteria.

Holding Times

Extraction and analysis holding times were met for all samples and analytes.

Method Blanks

Method blanks were provided for all analyses. All method blanks were contamination-free, therefore meeting QC acceptance criteria.

Surrogate Recovery

Al surrogate recoveries were within the specified QC control limits.

Laboratory Control Samples

Percent recovery and relative percent difference (RPD) values for the laboratory control samples (LCS) and LCS duplicates met frequency criteria and QC control limits.

Matrix Spike Samples

Matrix Spike and Matrix Spike Duplicates (MS/MSD) were not requested on either COC. The laboratories do not routinely report MS/MSD pairs when not requested to do so. However, they do routinely run this QA/QC check and inspect them internally.

Other Comments

Some of the samples were run as dilutions to bring high concentration analytes into range of the calibration curves. As the samples are diluted some of the lower concentration analytes become non-detect. All of the runs are presented in this data set. For any one analyte the analysis with the least dilution, and therefore lowest detection limit, that has not been flagged "E" should be used.

Data Usability Review for the South Landfill, Troutdale Sampling Event - August 30 to September 13, 2004

Prepared for: Patrick Heins/PDX
Tina Rice/PDX

Prepared by: Wendi Gale/CVO

Date: November 8, 2004

Summary

This memorandum summarizes the review of the QA/QC data associated with the analysis of seven soil and one field duplicate sample collected from August 30 to September 13, 2004 from the South Landfill area, Troutdale site. Samples submitted for semivolatile organic compound by SIM method (SVOC-SIM) and fluoride analyses were performed by the Applied Sciences Group laboratory, located in Corvallis, Oregon. Data were reported in analytical batches ASL D4060 and ASL D4146.

EPA Contract Laboratory Program (CLP) *National Functional Guidelines (NFG) for Low Concentration Organic Data Review* (June 2001), *National Functional Guidelines (NFG) for Organic Data Review* (October 1999), and *National Functional Guidelines (NFG) for Inorganic Data Review* (July 2002) provided guidelines for data qualification, where applicable.

The intent of this review was to assess the appropriate use or "usability" of the analytical data based on the QA/QC data reported by the laboratory. This QA review focuses on criteria for the following QA/QC parameters and their overall effect on the data:

- Sample custody, handling, and preservation
- Holding time compliance
- Summary initial and continuing calibration data
- Method blanks
- Surrogate spike recovery
- Precision and Accuracy (laboratory control samples and spike/spike duplicates)

Only summary QA/QC information were reviewed for each analytical parameter. Analytical results and QA/QC summary information were provided by the ASL laboratory for all sample analyses. The data set is usable when used in conjunction with information discussed below and any flags applied to the hard copy data by the laboratory or during this review.

Sample Custody, Handling, and Holding Times

Chain-of-custody (COC) forms and laboratory sample receiving checklists were reviewed. Extraction and analysis holding times were met for all samples and analytes.

Sample time discrepancies were found between the COC form and sample bottle in sample SLF-SC20-0000-083004-0. The time on the sample container was correct as per Patrick Heins.

Initial Calibration

Initial calibration data were provided by the ASL laboratory for each instrument used for analysis. All target compounds met initial calibration QC acceptance criteria.

Continuing Calibration

Continuing calibration data were provided by the ASL laboratory for each instrument used for analysis. Except for the instance noted below, all target compounds met continuing calibration QC acceptance criteria.

- The SVOC-SIM continuing calibration analyzed on September 20, 2004 at 2:41 for batch ASL D4146 reported the percent difference (%D) above 25% for anthracene (27.7%). The positive anthracene results for samples SLF-SC07-0000-091304-1, SLF-SC07-0000-091304-0, SLF-SC29-0000-091304-0, SLF-SC29-0000-091304-0DL, SLF-SC30-0000-091304-0, and SLF-SC30-0000-091304-0DL were qualified as estimates and flagged with a "J".

Method Blanks

Method blanks were provided for all analyses. All method blanks were contamination-free, therefore meeting QC acceptance criteria.

Surrogate Recovery

Except for the instances noted below, all surrogate recoveries were within the specified QC control limits.

- SVOC-SIM: In analytical batch ASL D4060, surrogates were not recovered in sample SLF-SC14-0000-083004-0 as a result of sample dilution. SVOC-SIM results for sample SLF-SC14-0000-083004-0 were qualified as estimates and flagged with a “J” for positive results or with a “UJ” for nondetected results.
- SVOC-SIM: In analytical batch ASL D4146, surrogates were not recovered in sample SLF-SC29-0000-091304-0DL as a result of sample dilution. SVOC-SIM results for sample SLF-SC29-0000-091304-0DL were qualified as estimates and flagged with a "J" for positive results or with an "UJ" for nondetect results.

Laboratory Control Samples

Percent recovery and relative percent difference (RPD) values for the laboratory control samples (LCS) and LCS duplicates met frequency criteria and QC control limits.

Matrix Spike Samples

Percent recovery and RPD values for the matrix spike (MS) and matrix spike duplicate (MSD) samples met frequency criteria and QC control limits.

APPENDIX F
Risk Estimate Calculation Spreadsheets

AGGREGATE RISK ESTIMATES
CURRENT AND FUTURE TRESPASSER, INTERMITTENT MAINTENANCE WORKER AND TRENCH WORKER
Surface and Subsurface Soil
Reynolds Metals Company, South Landfill

	TRESPASSER (AVE)				TRESPASSER (RME)				INTERMITTENT MAINTENANCE WORKER (AVE)				INTERMITTENT MAINTENANCE WORKER (RME)				TRENCH WORKER (AVE)				TRENCH WORKER (RME)			
Chemical	**INGESTION**	**DERMAL**	**SUM**	**% of Total ELCR**	**INGESTION**	**DERMAL**	**SUM**	**% of Total ELCR**	**INGESTION**	**DERMAL**	**SUM**	**% of Total ELCR**	**INGESTION**	**DERMAL**	**SUM**	**% of Total ELCR**	**INGESTION**	**DERMAL**	**SUM**	**% of Total ELCR**	**INGESTION**	**DERMAL**	**SUM**	**% of Total ELCR**
Arsenic	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.0E+00	0.0E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	8.4E-10	6.4E-11	9.02E-10	36.3%	5.64E-08	1.16E-09	5.75E-08	29.2%
Benzo(a)anthracene	2.12E-10	0.00E+00	2.12E-10	5.3%	5.02E-09	0.00E+00	5.02E-09	5.1%	3.2E-10	0.0E+00	3.18E-10	5.3%	3.14E-09	0.00E+00	3.14E-09	5.1%	1.0E-10	0.0E+00	1.01E-10	4.0%	6.38E-09	0.00E+00	6.38E-09	3.2%
Benzo(a)pyrene	2.61E-09	0.00E+00	2.61E-09	65.1%	6.15E-08	0.00E+00	6.15E-08	63.1%	3.9E-09	0.0E+00	3.91E-09	65.1%	3.85E-08	0.00E+00	3.85E-08	63.1%	1.0E-09	0.0E+00	9.97E-10	40.1%	7.76E-08	0.00E+00	7.76E-08	39.4%
Benzo(b)fluoranthene	3.34E-10	0.00E+00	3.34E-10	8.3%	8.04E-09	0.00E+00	8.04E-09	8.2%	5.0E-10	0.0E+00	5.01E-10	8.3%	5.02E-09	0.00E+00	5.02E-09	8.2%	1.6E-10	0.0E+00	1.64E-10	6.6%	1.01E-08	0.00E+00	1.01E-08	5%
Benzo(k)fluoranthene	1.53E-11	0.00E+00	1.53E-11	0.4%	3.54E-10	0.00E+00	3.54E-10	0.4%	2.3E-11	0.0E+00	2.29E-11	0.4%	2.21E-10	0.00E+00	2.21E-10	0.4%	5.6E-12	0.0E+00	5.65E-12	0.2%	4.57E-10	0.00E+00	4.57E-10	0.2%
Chrysene	2.92E-12	0.00E+00	2.92E-12	0.1%	7.05E-11	0.00E+00	7.05E-11	0.1%	4.4E-12	0.0E+00	4.38E-12	0.1%	4.41E-11	0.00E+00	4.41E-11	0.1%	1.5E-12	0.0E+00	1.47E-12	0.1%	8.86E-11	0.00E+00	8.86E-11	0.04%
Dibenz(a,h)anthracene	6.09E-10	0.00E+00	6.09E-10	15.2%	1.74E-08	0.00E+00	1.74E-08	17.8%	9.1E-10	0.0E+00	9.13E-10	15.2%	1.09E-08	0.00E+00	1.09E-08	17.8%	2.3E-10	0.0E+00	2.34E-10	9.4%	3.84E-08	0.00E+00	3.84E-08	19%
Indeno(1,2,3-cd)pyrene	2.24E-10	0.00E+00	2.24E-10	5.6%	5.18E-09	0.00E+00	5.18E-09	5.3%	3.4E-10	0.0E+00	3.36E-10	5.6%	3.24E-09	0.00E+00	3.24E-09	5.3%	8.3E-11	0.0E+00	8.27E-11	3.3%	6.57E-09	0.00E+00	6.57E-09	3%
SUM OF RISKS	4.0E-09	0.0E+00	4.01E-09		9.8E-08	0.0E+00	9.75E-08		6.0E-09	0.0E+00	6.01E-09		6.1E-08	0.0E+00	6.10E-08		2.4E-09	6.4E-11	2.49E-09		1.96E-07	1.16E-09	1.97E-07	

EXPOSURE ASSUMPTIONS						
Exposure Setting	Trespasser	Trespasser	Intermittent Maintenance Worker	Intermittent Maintenance Worker	Trench Worker	Trench Worker
Exposure Case	Average	Reasonable Maximum	Average	Reasonable Maximum	Average	Reasonable Maximum
Soil Ingestion Rate - Child (mg/day)	100	200	na	na	na	na
Soil Ingestion Rate - Adult (mg/day)	na	na	50	50	100	480
Skin Surface Area - Child (cm2)	5400	6600	na	na	na	na
Skin Surface Area - Adult (cm2)	na	na	840	1130	3160	4100
Soil to Skin Adherence Rate - Child (mg/cm2-event)	0.3	0.3	na	na	na	na
Soil to Skin Adherence Rate - Adult (mg/cm2-event)	na	na	0.08	0.08	0.08	0.08
Body Weight - Child (kilograms)	35	35	na	na	na	na
Body Weight - Adult (kilograms)	na	na	70	70	70	70
Number of Days/Year Exposed	4	26	12	26	10	20
Number of Years Exposed - Child	5	5	na	na	na	na
Number of Years Exposed - Adult	na	na	10	25.0	1	7
Averaging Time - Cancer (yrs)	70	70	70	70	70	70

AGGREGATE HAZARD ESTIMATES
CURRENT AND FUTURE TRESPASSER, INTERMITTENT MAINTENANCE WORKER AND TRENCH WORKER
Surface and Subsurface Soil
Reynolds Metals Company, South Landfill

Chemical	TRESPASSER (AVE) INGESTION	DERMAL	SUM	% of Total HI	TRESPASSER (RME) INGESTION	DERMAL	SUM	% of Total HI	INTERMITTENT MAINTENANCE WORKER (AVE) INGESTION	DERMAL	SUM	% of Total HI	INTERMITTENT MAINTENANCE WORKER (RME) INGESTION	DERMAL	SUM	% of Total HI	TRENCH WORKER (AVE) INGESTION	DERMAL	SUM	% of Total HI	TRENCH WORKER (AVE) INGESTION	DERMAL	SUM	% of Total HI
Acenaphthene	5.31E-09	0.00E+00	5.31E-09	0.64%	1.51E-07	NA	1.51E-07	0.77%	3.98E-09	0.00E+00	3.98E-09	0.70%	1.89E-08	0.00E+00	1.89E-08	0.77%	1.03E-08	0.00E+00	1.03E-08	<0.01%	2.19E-07	0.00E+00	2.19E-07	<0.01%
Aluminum	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	3.10E-04	7.83E-06	3.17E-04	49.22%	2.97E-03	2.03E-05	2.99E-03	50%
Anthracene	1.80E-09	0.00E+00	1.80E-09	0.22%	5.74E-08	0.00E+00	5.74E-08	0.29%	1.35E-09	0.00E+00	1.35E-09	0.24%	7.18E-09	0.00E+00	7.18E-09	0.29%	5.02E-09	0.00E+00	5.02E-09	<0.01%	6.78E-08	0.00E+00	6.78E-08	<0.01%
Arsenic	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	1.30E-04	9.89E-06	1.40E-04	21.77%	1.25E-03	2.57E-05	1.28E-03	21%
Barium	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	1.26E-05	3.18E-07	1.29E-05	2.00%	1.21E-04	8.25E-07	1.22E-04	2.0%
Chromium	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	2.14E-07	5.41E-09	2.19E-07	0.03%	2.05E-06	1.40E-08	2.07E-06	0.0%
Copper	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	3.14E-05	7.94E-07	3.22E-05	4.99%	3.02E-04	2.06E-06	3.04E-04	5%
Cyanide	4.38E-07	7.10E-08	5.09E-07	61.47%	5.70E-06	1.50E-07	5.85E-06	29.8%	3.29E-07	4.42E-09	3.33E-07	58.18%	7.12E-07	1.29E-08	7.25E-07	29.6%	5.41E-07	1.37E-08	5.55E-07	0.09%	9.39E-06	6.42E-08	9.46E-06	0.2%
Fluoranthene	1.32E-07	0.00E+00	1.32E-07	15.95%	3.17E-06	0.00E+00	3.17E-06	16.1%	9.91E-08	0.00E+00	9.91E-08	17.31%	3.97E-07	0.00E+00	3.97E-07	16.2%	3.86E-07	0.00E+00	3.86E-07	0.06%	2.85E-06	0.00E+00	2.85E-06	0.0%
Fluorene	6.54E-09	0.00E+00	6.54E-09	0.79%	2.10E-07	0.00E+00	2.10E-07	1.07%	4.90E-09	0.00E+00	4.90E-09	0.86%	2.62E-08	0.00E+00	2.62E-08	1.07%	2.81E-08	0.00E+00	2.81E-08	<0.01%	3.46E-07	0.00E+00	3.46E-07	<0.01%
Naphthalene	8.82E-09	0.00E+00	8.82E-09	1.06%	3.27E-07	0.00E+00	3.27E-07	1.7%	6.61E-09	0.00E+00	6.61E-09	1.16%	4.08E-08	0.00E+00	4.08E-08	1.7%	5.76E-08	0.00E+00	5.76E-08	<0.01%	6.33E-07	0.00E+00	6.33E-07	0.0%
Nickel	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	1.43E-05	3.61E-07	1.46E-05	2.27%	1.37E-04	9.36E-07	1.38E-04	2%
Pyrene	1.65E-07	0.00E+00	1.65E-07	19.87%	9.88E-06	0.00E+00	9.88E-06	50.3%	1.24E-07	0.00E+00	1.24E-07	21.57%	1.23E-06	0.00E+00	1.23E-06	50.4%	4.17E-07	0.00E+00	4.17E-07	0.06%	3.54E-06	0.00E+00	3.54E-06	0.1%
Vanadium	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	1.20E-04	3.02E-06	1.23E-04	19.02%	1.15E-03	7.85E-06	1.16E-03	19%
Zinc	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	0.00E+00	0.00E+00	0.00E+00	<0.01%	2.94E-06	7.42E-08	3.01E-06	0.47%	2.82E-05	1.93E-07	2.84E-05	0.5%
HAZARD INDEX (Sum of DI/RfD)	0.000	0.0000	0.000		0.00	0.0000	0.00		0.0000	0.00000	0.0000		0.000	0.00000	0.000		0.0006	0.00002	0.0006		0.006	0.00006	0.006	

EXPOSURE ASSUMPTIONS

Exposure Setting	Trespasser	Trespasser	Intermittent Maintenance Worker	Intermittent Maintenance Worker	Trench Worker	Trench Worker
Exposure Case	Average	Reasonable Maximum	Average	Reasonable Maximum	Average	Reasonable Maximum
Soil Ingestion Rate - Child (mg/day)	100	200	na	na	na	na
Soil Ingestion Rate - Adult (mg/day)	na	na	50	50	100	480
Skin Surface Area - Child (cm2)	5400	6600	na	na	na	na
Skin Surface Area - Adult (cm2)	na	na	840	1130	3160	4100
Soil to Skin Adherence Rate - Child (mg/cm2-event)	0.3	0.3	na	na	na	na
Soil to Skin Adherence Rate - Adult (mg/cm2-event)	na	na	0.08	0.08	0.1	0.1
Body Weight - Child (kilograms)	35	35	na	na	na	na
Body Weight - Adult (kilograms)	na	na	70	70	70	70
Number of Days/Year Exposed	4	26	12	26	10	20
Number of Years Exposed - Child	5	5	na	na	na	na
Number of Years Exposed - Adult	na	na	10	25	1	7
Averaging Time - Noncancer (yrs)	5	5	10	25	1	7