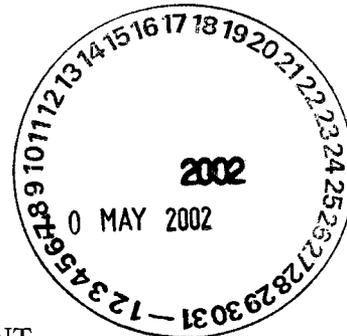




**DEPARTMENT OF THE AIR FORCE**

HEADQUARTERS 49TH FIGHTER WING (ACC)  
HOLLOMAN AIR FORCE BASE, NEW MEXICO



MEMORANDUM FOR NEW MEXICO ENVIRONMENT DEPARTMENT

Attn: Mr. James Bearzi  
Hazardous Waste Bureau  
2905 Rodeo Park Drive, East Bldg 1  
Santa Fe, NM 87505-6303

FROM: 49 CES/CD  
550 Tabosa Ave  
Holloman AFB, NM 88330-8458

SUBJECT: Submittal of First and Second Quarter 2001 Monitoring Reports, 20,000-Pound Open Detonation Unit (ODU) and Quality Assurance/Quality Control Reports

1. Attached are the 20,000-pound ODU First and Second Quarter 2001 Monitoring Reports and the First and Second Quarter 2001 Monitoring Reports Quality Assurance/Quality Control (Atchs 1 and 2, respectively).
2. The first and second quarterly monitoring reports contain the results of soil sampling following the detonation events of 4 Jan 01 and 20 Apr 01, respectively. These results were then compared to decision criteria specified in Attachment J of the Operating Permit. Results from these analyses show that the ODU operations are effective.
3. If you have any questions or require additional information, please contact Ms. Debbie Hartell or Mr. Darwin St. John at (505) 572-3931.

  
HOWARD E. MOFFITT  
Deputy Base Civil Engineer

Attachments:

1. First and Second Quarter 2001 Monitoring Report 20,000-Pound Open Detonation Unit
2. First and Second Quarter 2001 Monitoring Report Quality Assurance/Quality Control Results

cc w/Atchs:

Mr. Cornelius Amindyas  
New Mexico Environment Department  
Hazardous waste Bureau  
4131 Montgomery Blvd NE  
Albuquerque, NM 87109

2002  
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*Headquarters, Air Combat Command  
Langley Air Force Base,  
Virginia*

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*Final*

*First Quarter 2001 Monitoring Report  
20,000-Pound Open Detonation Unit*

*Holloman Air Force Base,  
New Mexico*

*April 2002*

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*49 CES/CEV  
Holloman Air Force Base,  
New Mexico*

**FINAL**  
**FIRST QUARTER 2001 MONITORING REPORT**  
**20,000-POUND OPEN DETONATION UNIT**

Prepared for:

Holloman Air Force Base  
49 CES/CEV  
550 Tabosa Avenue  
Holloman AFB, New Mexico 88330

Prepared by:

Foster Wheeler Environmental Corporation  
143 Union Boulevard, Suite 1010  
Lakewood, CO 80228

Under Contract No. DACW45-94-D-0003

Delivery Order 37, Work Authorization Directive 7

U.S. Army Corps of Engineers  
Omaha District  
Omaha, Nebraska

April 2002

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## LIST OF ACRONYMS

AFB	Air Force Base
DQO	data quality objective
EOD	explosive ordnance disposal
EPA	United States Environmental Protection Agency
mg/kg	milligrams per kilogram
NCP	National Contingency Plan
OD	open detonation
QA	quality assurance
QC	quality control
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
USAF	United States Air Force
UTL	upper tolerance limit
Work Plan	Final Work Plan Addendum

## 1.0 INTRODUCTION

During the first quarter of 2001, Holloman Air Force Base (AFB) performed the 11<sup>th</sup> quarterly sampling event at the 20,000-Pound Open Detonation (OD) Unit in accordance with Attachment J of the operating permit Sampling and Analysis Plan (USAF, 1996). Twelve locations were sampled for metals and explosive compounds and the analytical results were compared to the decision criteria outlined on page 33 of Attachment J of the operating permit. None of the sample results exceeded the decision criteria, and therefore, no changes to operations at the 20,000-Pound OD Unit are recommended. The following report summarizes the field operations, analytical results, potential risk, and conclusions from the 11<sup>th</sup> quarterly sampling event.

## 2.0 FIELD OPERATIONS

The first quarter 2001 detonation and sampling events occurred on January 4 and 5, 2001. A total of 12 soil samples were collected from 3 different strata within the boundaries of the 20,000-Pound OD Unit. Samples, including quality assurance/quality control (QA/QC) samples, were obtained following the procedures outlined in the Final Work Plan Addendum for the 20,000-Pound Open Detonation Unit (Work Plan) (Foster Wheeler, 1999). Samples were analyzed for metals and explosive compounds as specified in the Work Plan.

During the field operations, the dimensions of each stratum were measured and recorded, and a grid developed based on these measurements. Random sampling locations were determined following the guidelines established in the Work Plan. Sample locations are listed in Table 2-1.

**Table 2-1. First Quarter 2001 Sample Locations**

**Stratum: A**  
**Number of Samples: 4**  
**Number of Potential**  
**Sampling Locations (n): 16**  
**Scale Factor (n-1): 15**

Sample Number	Random Number	Scaled Random Number	Grid-to-Node Sample
1	0.309	4.6	A5
2	0.389	5.8	A6
3	0.778	11.7	A12
4	0.137	2.1	A2

**Stratum: B**  
**Number of Samples: 4**  
**Number of Potential**  
**Sampling Locations (n): 20**  
**Scale Factor (n-1): 19**

Sample Number	Random Number	Scaled Random Number	Grid-to-Node Sample
1	0.699	13.3	B13
2	0.105	2.0	B2
3	0.637	12.1	B12
4	0.415	7.9	B8

**Stratum: C**  
**Number of Samples: 4**  
**Number of Potential**  
**Sampling Locations (n): 24**  
**Scale Factor (n-1): 23**

Sample Number	Random Number	Scaled Random Number	Grid-to-Node Sample
1	0.060	1.4	C1
2	0.308	7.1	C7
3	0.260	6.0	C6
4	0.076	1.8	C2

Samples were labeled according to the following number sequence: OD-SO-s-x, where:

OD = open detonation

SO = soil

s = stratum (A, B, or C)

x = sequential sample number within each stratum (01, 02, 03, 04)

The area sampled was based on wind data recorded at the time of the October 11, November 29, December 13, December 15, 2000, and January 4, 2001 detonations. The assumption was made that any small particles from the detonation events would settle downwind of the detonation location. Figure 2-1 illustrates the strata layout and the sample locations associated with the January 5, 2001 sampling event. The wind data are presented below:

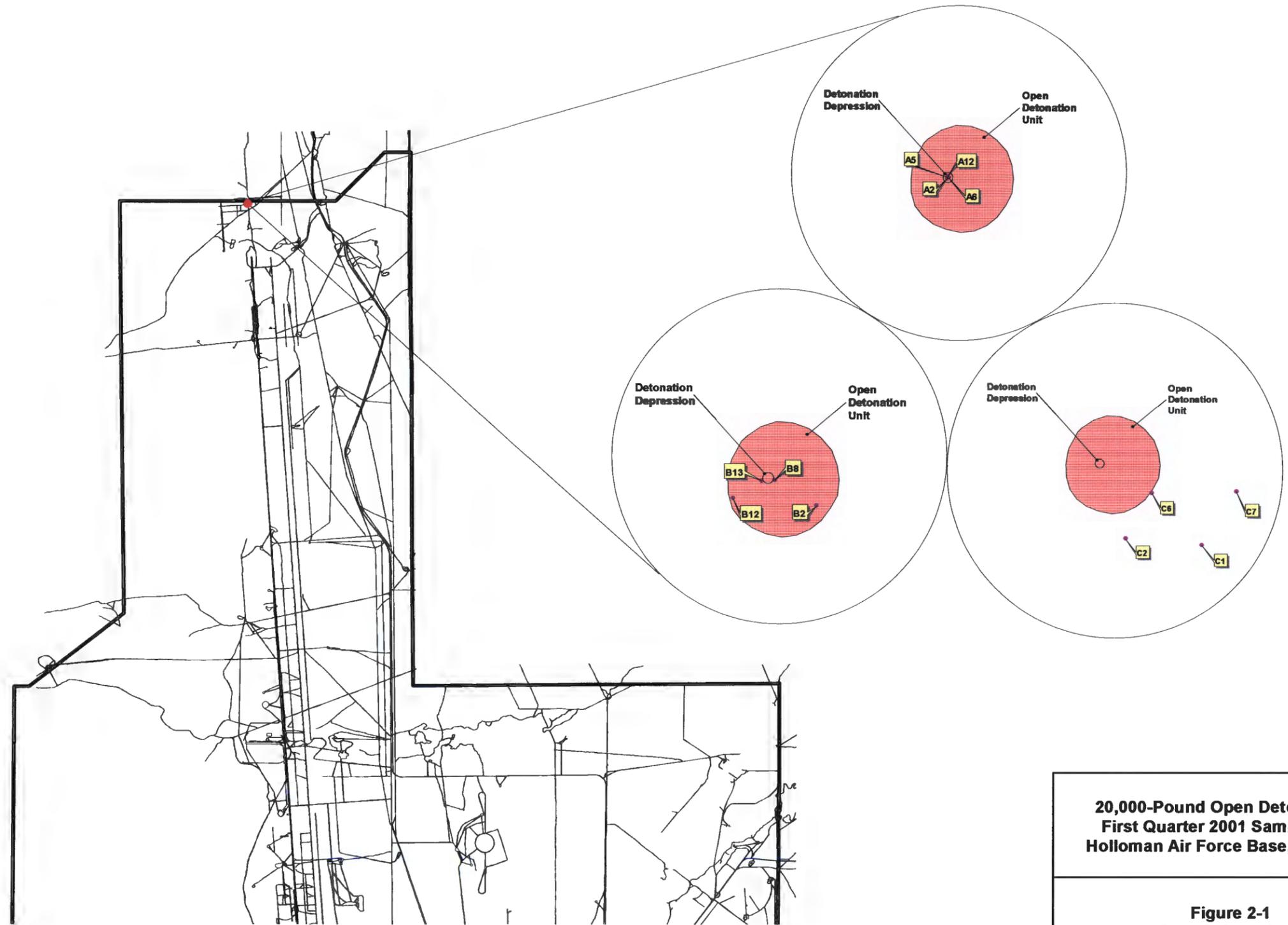
- October 11, 2000—wind direction 200 degrees/wind speed 12 knots
- November 29, 2000—wind direction 180 degrees/wind speed 8 knots
- December 13, 2000—wind direction 340 degrees/wind speed 4 knots
- December 15, 2000—wind direction variable/wind speed 6 knots
- January 4, 2001—wind direction variable/wind speed 4 knots

### 3.0 ANALYTICAL RESULTS

This section presents an evaluation of the QA/QC data associated with the analytical results for the first quarter 2001 monitoring event. Analytical methods for chemical analysis were taken from the latest revision of United States Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste, SW-846, Third Edition and Updates (EPA, 1986).

#### 3.1 QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

The QC data were reviewed to determine usability and achievement of project data quality objectives (DQOs). The review focused on laboratory method blanks, matrix and control sample



**LEGEND**

- Sample Locations
- Open Detonation Unit
- Roads
- Boundary

**20,000-Pound Open Detonation Unit  
First Quarter 2001 Sampling Event  
Holloman Air Force Base, New Mexico**

**Figure 2-1  
Sample Locations**



spikes, surrogate recoveries, and holding times. Overall, QC data associated with this sampling event indicate that project measurement data are reliable and fulfill project DQOs.

The explosives data (EPA SW-846 Methods 8330 and 8332) for this monitoring event are reported to the method detection limit. A “J” qualifier signifying an estimated concentration was assigned to concentrations reported below the sample-specific detection limit and above the method detection limit. Explosive compounds that were not detected are reported with a “U” qualifier accompanying the sample detection limit.

The reported metals results are uncensored; all instrument response measurements are reported as measured concentrations. A “B” qualifier was assigned to reported concentrations that were less than the sample detection limit and indicates that there is less confidence associated with the reported concentration (i.e., estimated quantitation). Metals that were not detected are reported with a “U” qualifier accompanying the sample detection limit.

## 3.2 RESULTS SUMMARY

Soil samples were collected and analyzed for the parameters specified in the operating permit and outlined in Table 3-1. Complete analytical results and the associated chain-of-custody record for the first quarter monitoring event are provided in Appendix A. This section summarizes the analytical results and provides a comparison of the sample results with the site-specific background values.

### 3.2.1 Explosives Results

Explosive compounds detected for this monitoring event were reported above and below the sample-specific detection limit. Compounds reported below the detection limit were assigned a “J” qualifier. The following explosive compounds were detected:

- Nitroglycerin in one sample within Stratum A (sample OD-SO-A-04)
- Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) in five samples above the sample detection limit and in one sample below the sample detection limit

**Table 3-1. Analytical Methods and Parameters**

<b>EPA SW-846 Method 6010B (Metals)</b>
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium (total)
Copper
Lead
Nickel
Selenium
Silver
<b>EPA SW-846 Method 7471A</b>
Mercury
<b>EPA SW-846 Method 8330 (Explosives)</b>
2-Amino-4,6-dinitrotoluene
4-Amino-2,6-dinitrotoluene
1,3,5-Trinitrobenzene
1,3-Dinitrobenzene
2,4,6-Trinitrotoluene
2,4-Dinitrotoluene
2,6-Dinitrotoluene
2-Nitrotoluene
3-Nitrotoluene
4-Nitrotoluene
HMX
Nitrobenzene
RDX
Tetryl
PETN
<b>EPA SW-846 Method 8332 (Nitroamine Explosives)</b>
Nitroglycerin

**Notes:**

EPA	United States Environmental Protection Agency
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
PETN	pentaerythritol tetranitrate
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
Tetryl	methyl-2,4,6-trinitrophenylnitramine

Because no site-specific background upper tolerance limits (UTLs) exist for explosives at this site (Radian, 1997), the detected compounds were carried forward to the risk evaluation phase.

The maximum detected concentrations of explosive compounds for the first quarter 2001 monitoring event are presented in Table 3-2. The risk evaluation is described in Section 4.0 of this report.

**Table 3-2. Maximum Detected Concentrations, Frequency of Detections, and UTLs for Explosives and Metals**

Constituent	Maximum Detected Concentration	Frequency of Detections	Site-Specific Background UTLs <sup>1</sup>
<b>Metals</b>	<b>mg/kg</b>		<b>mg/kg</b>
Antimony	0.647 B	1/12	7.3
Arsenic	1.88	1/12	37
Barium	92.1	12/12	84
Beryllium	0.662	12/12	0.4
Cadmium	4.44	9/12	1.0
Chromium	11.6	12/12	6.6
Copper	9.90	12/12	4.8
Lead <sup>2</sup>	6.66	12/12	na
Nickel	22.9	12/12	5.6
<b>Explosives</b>	<b>µg/kg</b>		<b>µg/kg</b>
Nitroglycerin	37,000	1/12	NA
RDX	378	6/12	NA

**Notes:**

- <sup>1</sup> UTLs are taken from 20,000-Pound Open Detonation Unit Background Study and Quarterly Monitoring Work Plan, Part II—Background Study (Radian, 1997).
- <sup>2</sup> A discussion of lead screening level is included in the text.
- B Estimated concentration reported below the sample detection limit
- µg/kg micrograms per kilogram
- mg/kg milligrams per kilogram
- na Background value not available in Background Study (Radian, 1997)
- NA Background values not applicable to organic constituents

3.2.2 Metals Results

Metals detected for this monitoring event were reported above the sample-specific detection limit (no laboratory qualifier) and below the sample-specific detection limit, but above the method detection limit (“B” qualifier). Metals that were not detected were reported at the sample detection limit accompanied by a “U” qualifier, signifying a nondetect value. The following metals were detected:

- Antimony in one sample below the sample detection limit (sample OD-SO-C-04)

- Barium, chromium, copper, and nickel in all samples above the sample detection limit
- Arsenic in one sample above the sample detection limit (sample OD-SO-C-01)
- Beryllium in three samples above the sample detection limit and in nine samples below the sample detection limit
- Cadmium in one sample above the sample detection limit and in eight samples below the sample detection limit
- Lead in eleven samples above the sample detection limit and in one sample below the sample detection limit

The metals analytical results were compared to the site-specific background UTLs listed in Table 3-2. The maximum detected concentrations for barium, beryllium, cadmium, chromium, copper, and nickel exceeded the UTLs. Since no UTL or toxicity values exist for lead, lead detections were compared to the EPA Region 6 Human Health Medium-Specific Screening Levels (EPA, 2000 [November]). The maximum detected concentrations for the first quarter 2001 monitoring event are presented in Table 3-2.

#### 4.0 EVALUATION OF POTENTIAL RISK

Inorganic constituents that exceeded background UTLs and all detected organic constituents were evaluated to determine if the levels present at the site pose a potential risk to human health. This section describes the methodology that was used for this evaluation, as well as the results of the noncarcinogenic and carcinogenic risk evaluations.

#### 4.1 METHODOLOGY

The 20,000-Pound OD Unit is located in an isolated area of Holloman AFB. Access to the area is restricted to authorized explosive ordnance disposal (EOD) personnel working at the site during a detonation, and unauthorized entry is prevented by security fences and continuous surveillance in addition to warning signs. The evaluation of potential risk was based on the amount of soil ingested by the EOD personnel in a realistic, but conservative, exposure scenario. This exposure scenario considered the frequency of detonations, the amount of time spent at the 20,000-Pound OD Unit for each detonation, and the length of time personnel would be assigned to this duty.

It was assumed that a maximum of 20 detonations would be conducted in 1 year. This is a conservative estimate because the actual number of detonations is approximately 15 per year. It was also assumed that EOD personnel are at the 20,000-Pound OD Unit for 2 days during each detonation. Typically, the site is inspected on the day after detonation, and so personnel are at the site 2 days for each detonation. Thus, 40 days per year was used as the exposure frequency in the risk assessment calculations. This estimate of exposure is still a very conservative assumption because the personnel are there for only a portion of each day before and after detonation. It was therefore assumed that only half of the soil that is incidentally ingested during those 40 days is obtained at the site. Finally, the exposure scenario assumed that the same personnel attend every detonation for 5 years. Since only military personnel staff the EOD office, 5 years is a conservative estimate because military personnel are frequently reassigned to different units or duties. The exposure scenario is further defined in the Risk Evaluation Calculation Sheet in Appendix B.

The maximum detected concentrations of antimony and arsenic did not exceed the site-specific background UTLs, so these analytes were not carried forward to the risk evaluation phase (see Table 3-2). Barium, beryllium, cadmium, chromium, copper, and nickel exceeded the site-specific background UTLs; therefore, these metals were evaluated in the risk evaluation phase.

The maximum detection of lead, 6.66 milligrams per kilogram (mg/kg), was compared to the EPA Region 6 Human Health Medium-Specific Screening Level (EPA, 2000) value for the industrial outdoor worker exposure scenario (2,000 mg/kg), since no background UTL or toxicity values have been established. Because the maximum detection is considerably less than 2,000 mg/kg, no risk attributed to lead exposure is anticipated at this site.

Nitroglycerin and RDX were the only organic constituents detected and were included in the risk evaluation.

The maximum detected concentrations for barium, beryllium, cadmium, chromium, copper, nickel, nitroglycerin, and RDX listed in Table 3-2 were used to calculate risk. It was conservatively assumed that personnel are exposed to this maximum concentration throughout the length of the exposure scenario described above.

## 4.2 RESULTS OF RISK EVALUATION

Table 4-1 presents the noncancer risk (i.e., hazard quotient) and cancer risk estimates for each of the constituents, as well as the cumulative hazard index (sum of the hazard quotients) and cancer risk. The National Contingency Plan (NCP) risk range goal is a hazard index of less than 1.0 and a cancer risk estimate less than  $1.0 \times 10^{-6}$  (Title 40 of the Code of Federal Regulations, Part 300). Below these levels, no significant adverse effects are anticipated. At the 20,000-Pound OD Unit, all of the hazard quotients are well below 1.0, and the hazard index is 0.0009 (see Table 4-1). The total cancer risk for the site of  $3 \times 10^{-9}$  is well below the NCP goal of  $1.0 \times 10^{-6}$ . The cancer risk was based solely on the cancer risks for nitroglycerin and RDX, which are the only constituents classified as carcinogens.

All constituents met the decision criteria specified in Attachment J of the operating permit. All inorganic constituents were either below site-specific background levels or the calculated site-specific risk estimates were well below the NCP goals. The calculated site-specific risk estimates for the two detected organic constituents (nitroglycerin and RDX) were also well below the NCP goals. The results of the site-specific risk estimates indicate that no adverse effects are anticipated from exposure during detonation events at the 20,000-Pound OD Unit.

**Table 4-1. Hazard Index and Cancer Risk**

Constituent	Non-carcinogenic Intake (mg/kg/day)	Carcinogenic Intake (mg/kg/day)	Oral RfD (mg/kg/day)	Oral RfD Source	Oral Slope Factor (mg/kg/day) <sup>1</sup>	Oral Slope Factor Source	Hazard Quotient <sup>1</sup>	Cancer Risk
<b>Metals</b>								
Barium	7.2E-06	5.1E-07	0.07	IRIS	na	na	0.0001	NC
Beryllium	5.2E-08	3.7E-09	0.002	IRIS	na	na	0.000026	NC
Cadmium	3.5E-07	2.5E-08	0.001	IRIS	na	na	0.00035	NC
Chromium <sup>2</sup>	9.1E-07	6.5E-08	0.003	IRIS	na	na	0.0003	NC
Copper			0.037	HEAST in EPA R6	na	na		NC
Nickel	7.7E-07	5.5E-08	0.02	IRIS	na	na	0.000021	NC
	1.8E-06	1.3E-07					0.00009	NC
<b>Explosives</b>								
Nitroglycerin	2.9E-06	2.1E-07	na	na	0.014	NCEA in EPA R3	na	2.9E-09
RDX	3.0E-08	2.1E-09	0.003	IRIS	0.11	IRIS	0.0000099	2.3E-10
Total =							0.0009	3 E-09

**Notes:**

- 1 The sum of the hazard quotients (HQs) is the hazard index (HI).
- 2 The toxicity value for hexavalent chromium was conservatively used.

- 1.0E-03 The designation of 1.0E-03 is equivalent to  $1.0 \times 10^{-3}$  or 0.001.
- EPA R3 EPA Region 3. Risk-Based Concentrations (RBCs). Last updated May 8, 2001.
- EPA R6 EPA Region 6. Human Health Medium-Specific Screening Levels. Last updated November 15, 2000.
- HEAST EPA Health Effects Assessment Summary Tables (EPA, 1997).
- IRIS EPA Integrated Risk Information System. Online. July 12, 2001.
- mg/kg/day milligrams per kilogram per day
- na not available
- NC Not calculated; constituent is non-carcinogenic
- NCEA National Center for Environmental Assessment
- RfD reference dose

## 5.0 CONCLUSION

The results of comparing the first quarter 2001 monitoring data (11<sup>th</sup> quarterly event) with the decision criteria specified in Attachment J of the operating permit indicate that the treatment operations at the 20,000-Pound OD Unit are effective. A statistical analysis will be performed on the risk evaluation results from the first eight quarterly monitoring events to determine whether further quarterly monitoring at the 20,000-Pound OD Unit will be recommended.

## 6.0 REFERENCES

EPA (United States Environmental Protection Agency)

1986 SW-846, Test Methods for Evaluating Solid Waste, Third Edition and Updates.

1997. Health Effects Assessment Summary Tables.

2000 (November). Region 6. Human Health Medium-Specific Screening Levels.

2001 (July). Integrated Risk Information System. On-line.

Foster Wheeler (Foster Wheeler Environmental Corporation)

1999 (January). Final Work Plan Addendum for the 20,000-Pound Open Detonation Unit, Holloman Air Force Base, New Mexico.

Radian (Radian Corporation)

1997 (December). 20,000-Pound Open Detonation Unit Background Study and Quarterly Monitoring Work Plan. Part II—Background Study, Holloman Air Force Base, New Mexico.

USAF (United States Air Force)

1996. Holloman Air Force Base Open Detonation Treatment Unit Permit Attachment J, Sampling and Analysis Plan.

**APPENDIX A**  
**Analytical Results**

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-A-01	1/5/01	CLP_SOLIDS	Percent Solids		79.6	%		
		SW6010B	Antimony	U	0.594	mg/kg		
			Arsenic	U	1.24	mg/kg		
			Barium		35.6	mg/kg		
			Beryllium	B	0.191	mg/kg		
			Cadmium		4.44	mg/kg	J	
			Chromium		3.49	mg/kg		
			Copper		4.64	mg/kg		
			Lead		2.17	mg/kg		
			Nickel		2.35	mg/kg		
			Selenium	U	1.24	mg/kg		
			Silver	U	0.746	mg/kg		
			SW7471A	Mercury	U	0.039	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	95.2	ug/kg	
		1,3-Dinitrobenzene		U	95.2	ug/kg		
		2,4,6-Trinitrotoluene		U	95.2	ug/kg		
		2,4-Dinitrotoluene		U	95.2	ug/kg		
		2,6-Dinitrotoluene		U	95.2	ug/kg		
		HMX		U	190	ug/kg		
		m-Nitrotoluene		U	190	ug/kg		
		Nitrobenzene		U	95.2	ug/kg		
		o-Nitrotoluene		U	190	ug/kg		
		p-Nitrotoluene		U	190	ug/kg		
		Pentaerythritol Tetranitrate		U	476	ug/kg		
		RDX			378	ug/kg		
		Tetryl		U	190	ug/kg		
		SW8332		Nitroglycerine	U	6280	ug/kg	
OD-SO-A-02		CLP_SOLIDS	Percent Solids		80	%		
		SW6010B	Antimony	U	0.594	mg/kg		
			Arsenic	U	1.24	mg/kg		
			Barium		36.4	mg/kg		
			Beryllium	B	0.184	mg/kg		

EPA Qualifier J = estimated detect based on QC criteria

Page 1 of 11

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>
OD-SO-A-02	1/5/01	SW6010B	Cadmium	B	0.379	mg/kg	J
			Chromium		3.83	mg/kg	
			Copper		4.76	mg/kg	
			Lead		2.09	mg/kg	
			Nickel		22.9	mg/kg	
			Selenium	U	1.24	mg/kg	
			Silver	U	0.743	mg/kg	
		SW7471A	Mercury	U	0.04	mg/kg	
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
		1,3-Dinitrobenzene	U	100	ug/kg		
		2,4,6-Trinitrotoluene	U	100	ug/kg		
		2,4-Dinitrotoluene	U	100	ug/kg		
		2,6-Dinitrotoluene	U	100	ug/kg		
		HMX	U	200	ug/kg		
		m-Nitrotoluene	U	200	ug/kg		
		Nitrobenzene	U	100	ug/kg		
		o-Nitrotoluene	U	200	ug/kg		
		p-Nitrotoluene	U	200	ug/kg		
		Pentaerythritol Tetranitrate	U	500	ug/kg		
		RDX		260	ug/kg		
		Tetryl	U	200	ug/kg		
		SW8332	Nitroglycerine	U	6250	ug/kg	
		OD-SO-A-02D		CLP_SOLIDS	Percent Solids		80.2
SW6010B	Antimony			U	0.594	mg/kg	
	Arsenic			U	1.23	mg/kg	
	Barium				37.5	mg/kg	
	Beryllium			B	0.204	mg/kg	
	Cadmium			B	0.369	mg/kg	J
	Chromium				3.77	mg/kg	
	Copper				4.73	mg/kg	
	Lead				2.32	mg/kg	
	Nickel				2.32	mg/kg	

EPA Qualifier J = estimated detect based on QC criteria

Page 2 of 11

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>		
OD-SO-A-02D	1/5/01	SW6010B	Selenium	U	1.23	mg/kg			
			Silver	U	0.74	mg/kg			
		SW7471A	Mercury	U	0.04	mg/kg			
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg			
			1,3-Dinitrobenzene	U	100	ug/kg			
			2,4,6-Trinitrotoluene	U	100	ug/kg			
			2,4-Dinitrotoluene	U	100	ug/kg			
			2,6-Dinitrotoluene	U	100	ug/kg			
			HMX	U	200	ug/kg			
			m-Nitrotoluene	U	200	ug/kg			
			Nitrobenzene	U	100	ug/kg			
			o-Nitrotoluene	U	200	ug/kg			
			p-Nitrotoluene	U	200	ug/kg			
			Pentaerythritol Tetranitrate	U	500	ug/kg			
			RDX	U	200	ug/kg			
			Tetryl	U	200	ug/kg			
			SW8332	Nitroglycerine	U	6230	ug/kg		
		OD-SO-A-03		CLP_SOLIDS	Percent Solids		79.5	%	
				SW6010B	Antimony	U	0.588	mg/kg	
					Arsenic	U	1.23	mg/kg	
Barium					37.7	mg/kg			
Beryllium	B				0.205	mg/kg			
Cadmium	B				0.33	mg/kg	J		
Chromium					3.74	mg/kg			
Copper					5.32	mg/kg			
Lead					2.86	mg/kg			
Nickel					2.64	mg/kg			
Selenium	U				1.23	mg/kg			
Silver	U				0.74	mg/kg			
SW7471A	Mercury				U	0.039	mg/kg		
SW8330	1,3,5-Trinitrobenzene				U	95.2	ug/kg		
	1,3-Dinitrobenzene	U	95.2	ug/kg					

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-A-03	1/5/01	SW8330	2,4,6-Trinitrotoluene	U	95.2	ug/kg		
			2,4-Dinitrotoluene	U	95.2	ug/kg		
			2,6-Dinitrotoluene	U	95.2	ug/kg		
			HMX	U	190	ug/kg		
			m-Nitrotoluene	U	190	ug/kg		
			Nitrobenzene	U	95.2	ug/kg		
			o-Nitrotoluene	U	190	ug/kg		
			p-Nitrotoluene	U	190	ug/kg		
			Pentaerythritol Tetranitrate	U	476	ug/kg		
			RDX		254	ug/kg		
OD-SO-A-04		SW8332	Tetryl	U	190	ug/kg		
			Nitroglycerine	U	6290	ug/kg		
			CLP_SOLIDS		80	%		
			SW6010B	Antimony	U	0.594	mg/kg	
				Arsenic	U	1.24	mg/kg	
				Barium		33.3	mg/kg	
				Beryllium	B	0.164	mg/kg	
				Cadmium	B	0.589	mg/kg	J
				Chromium		3.13	mg/kg	
				Copper		4.11	mg/kg	
Lead		2.07		mg/kg				
Nickel		2.27		mg/kg				
Selenium	U	1.24		mg/kg				
OD-SO-A-04		SW7471A	Silver	U	0.742	mg/kg		
			Mercury	U	0.039	mg/kg		
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
				2,6-Dinitrotoluene	U	100	ug/kg	
				HMX	U	200	ug/kg	
				m-Nitrotoluene	U	200	ug/kg	

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-A-04	1/5/01	SW8330	Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		
			p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX		356	ug/kg		
			Tetryl	U	200	ug/kg		
OD-SO-B-01		SW8332	Nitroglycerine		37000	ug/kg		
		CLP_SOLIDS	Percent Solids		81.7	%		
		SW6010B	Antimony	U	0.594	mg/kg		
			Arsenic	U	1.21	mg/kg		
			Barium		34.3	mg/kg		
			Beryllium	B	0.178	mg/kg		
			Cadmium	B	0.269	mg/kg	J	
			Chromium		3.1	mg/kg		
			Copper		3	mg/kg		
			Lead		1.7	mg/kg		
			Nickel		1.98	mg/kg		
			Selenium	U	1.21	mg/kg		
			Silver	U	0.727	mg/kg		
			SW7471A	Mercury	U	0.037	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
				2,6-Dinitrotoluene	U	100	ug/kg	
				HMX	U	200	ug/kg	
				m-Nitrotoluene	U	200	ug/kg	
		Nitrobenzene		U	100	ug/kg		
		o-Nitrotoluene		U	200	ug/kg		
		p-Nitrotoluene		U	200	ug/kg		
		Pentaerythritol Tetranitrate	U	500	ug/kg			
		RDX	J	181	ug/kg			

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-B-01	1/5/01	SW8330	Tetryl	U	200	ug/kg		
		SW8332	Nitroglycerine	U	6120	ug/kg		
OD-SO-B-02		CLP_SOLIDS	Percent Solids		79.3	%		
		SW6010B	Antimony	U	0.594	mg/kg		
			Arsenic	U	1.25	mg/kg		
			Barium		31.7	mg/kg		
			Beryllium	B	0.17	mg/kg		
			Cadmium	U	0.75	mg/kg		
			Chromium		2.88	mg/kg		
			Copper		2.64	mg/kg		
			Lead		1.09	mg/kg		
			Nickel		1.91	mg/kg		
			Selenium	U	1.25	mg/kg		
			Silver	U	0.75	mg/kg		
			SW7471A	Mercury	U	0.04	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	90.9	ug/kg	
				1,3-Dinitrobenzene	U	90.9	ug/kg	
				2,4,6-Trinitrotoluene	U	90.9	ug/kg	
				2,4-Dinitrotoluene	U	90.9	ug/kg	
				2,6-Dinitrotoluene	U	90.9	ug/kg	
				HMX	U	182	ug/kg	
				m-Nitrotoluene	U	182	ug/kg	
				Nitrobenzene	U	90.9	ug/kg	
				o-Nitrotoluene	U	182	ug/kg	
				p-Nitrotoluene	U	182	ug/kg	
				Pentaerythritol Tetranitrate	U	455	ug/kg	
				RDX	U	182	ug/kg	
				Tetryl	U	182	ug/kg	
				SW8332	Nitroglycerine	U	6150	ug/kg
OD-SO-B-03		CLP_SOLIDS	Percent Solids		76.7	%		
		SW6010B	Antimony	U	0.594	mg/kg		
			Arsenic	U	1.29	mg/kg		

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-B-03	1/5/01	SW6010B	Barium		37.6	mg/kg		
			Beryllium	B	0.232	mg/kg		
			Cadmium	U	0.775	mg/kg		
			Chromium		3.82	mg/kg		
			Copper		3.02	mg/kg		
			Lead		1.88	mg/kg		
			Nickel		2.54	mg/kg		
			Selenium	U	1.29	mg/kg		
			Silver	U	0.775	mg/kg		
			SW7471A	Mercury	U	0.041	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	90.9	ug/kg	
				1,3-Dinitrobenzene	U	90.9	ug/kg	
				2,4,6-Trinitrotoluene	U	90.9	ug/kg	
		2,4-Dinitrotoluene		U	90.9	ug/kg		
		2,6-Dinitrotoluene		U	90.9	ug/kg		
		HMX		U	182	ug/kg		
		m-Nitrotoluene		U	182	ug/kg		
		Nitrobenzene		U	90.9	ug/kg		
		o-Nitrotoluene		U	182	ug/kg		
		p-Nitrotoluene		U	182	ug/kg		
		SW8332	Pentaerythritol Tetranitrate	U	455	ug/kg		
			RDX	U	182	ug/kg		
			Tetryl	U	182	ug/kg		
Nitroglycerine	U		6520	ug/kg				
OD-SO-B-04	CLP_SOLIDS		Percent Solids		80.6	%		
			SW6010B	Antimony	U	0.594	mg/kg	
				Arsenic	U	1.23	mg/kg	
		Barium			34.7	mg/kg		
		Beryllium		B	0.174	mg/kg		
		Cadmium		B	0.361	mg/kg	J	
		Chromium			3.33	mg/kg		
Copper		4.94	mg/kg					

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>			
OD-SO-B-04	1/5/01	SW6010B	Lead		2.12	mg/kg				
			Nickel		2.45	mg/kg				
			Selenium	U	1.23	mg/kg				
			Silver	U	0.737	mg/kg				
		SW7471A	Mercury	U	0.04	mg/kg				
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg			
				1,3-Dinitrobenzene	U	100	ug/kg			
				2,4,6-Trinitrotoluene	U	100	ug/kg			
				2,4-Dinitrotoluene	U	100	ug/kg			
				2,6-Dinitrotoluene	U	100	ug/kg			
				HMX	U	200	ug/kg			
				m-Nitrotoluene	U	200	ug/kg			
				Nitrobenzene	U	100	ug/kg			
			SW8332	o-Nitrotoluene	U	200	ug/kg			
				p-Nitrotoluene	U	200	ug/kg			
			OD-SO-C-01		CLP_SOLIDS	Percent Solids		81.3	%	
						SW6010B	Antimony	U	0.588	mg/kg
					Arsenic			1.88	mg/kg	
					Barium			92.1	mg/kg	
					Beryllium			0.662	mg/kg	
Cadmium	B	0.306			mg/kg		J			
Chromium		11.6			mg/kg					
Copper		9.9			mg/kg					
Lead		6.66			mg/kg					
SW7471A	Nickel				8.11	mg/kg				
	Selenium	U	1.21	mg/kg						
	Silver	U	0.724	mg/kg						
	Mercury	U	0.039	mg/kg						

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-C-01	1/5/01	SW8330	1,3,5-Trinitrobenzene	U	95.2	ug/kg		
			1,3-Dinitrobenzene	U	95.2	ug/kg		
			2,4,6-Trinitrotoluene	U	95.2	ug/kg		
			2,4-Dinitrotoluene	U	95.2	ug/kg		
			2,6-Dinitrotoluene	U	95.2	ug/kg		
			HMX	U	190	ug/kg		
			m-Nitrotoluene	U	190	ug/kg		
			Nitrobenzene	U	95.2	ug/kg		
			o-Nitrotoluene	U	190	ug/kg		
			p-Nitrotoluene	U	190	ug/kg		
			Pentaerythritol Tetranitrate	U	476	ug/kg		
			RDX	U	190	ug/kg		
			Tetryl	U	190	ug/kg		
			SW8332	Nitroglycerine	U	6150	ug/kg	
OD-SO-C-02		CLP_SOLIDS	Percent Solids		80.3	%		
		SW6010B	Antimony	U	0.6	mg/kg		
			Arsenic	U	1.25	mg/kg		
			Barium		58.9	mg/kg		
			Beryllium		0.269	mg/kg		
			Cadmium	B	0.188	mg/kg	J	
			Chromium		4.58	mg/kg		
			Copper		4.82	mg/kg		
			Lead		2.52	mg/kg		
			Nickel		3.16	mg/kg		
			Selenium	U	1.25	mg/kg		
			Silver	U	0.747	mg/kg		
			SW7471A	Mercury	U	0.039	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
2,6-Dinitrotoluene	U	100		ug/kg				

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-C-02	1/5/01	SW8330	HMX	U	200	ug/kg		
			m-Nitrotoluene	U	200	ug/kg		
			Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		
			p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
			Tetryl	U	200	ug/kg		
OD-SO-C-03		SW8332	Nitroglycerine	U	5790	ug/kg		
		CLP_SOLIDS	Percent Solids		77.9	%		
		SW6010B	Antimony	U	0.594	mg/kg		
			Arsenic	U	1.27	mg/kg		
			Barium		29.4	mg/kg		
			Beryllium	B	0.136	mg/kg		
			Cadmium	U	0.762	mg/kg		
			Chromium		2.16	mg/kg		
			Copper		2.25	mg/kg		
			Lead	B	0.679	mg/kg		
			Nickel		1.42	mg/kg		
			Selenium	U	1.27	mg/kg		
			Silver	U	0.762	mg/kg		
			SW7471A	Mercury	U	0.04	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
				2,6-Dinitrotoluene	U	100	ug/kg	
		HMX		U	200	ug/kg		
		m-Nitrotoluene		U	200	ug/kg		
		Nitrobenzene		U	100	ug/kg		
		o-Nitrotoluene		U	200	ug/kg		
		p-Nitrotoluene		U	200	ug/kg		

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-C-03	1/5/01	SW8330	Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
			Tetryl	U	200	ug/kg		
		SW8332	Nitroglycerine	U	6260	ug/kg		
OD-SO-C-04		CLP_SOLIDS	Percent Solids		81.5	%		
		SW6010B	Antimony	B	0.647	mg/kg		
			Arsenic	U	1.18	mg/kg		
			Barium		49	mg/kg		
			Beryllium		0.287	mg/kg		
			Cadmium	B	0.175	mg/kg	J	
			Chromium		4.86	mg/kg		
			Copper		4.1	mg/kg		
			Lead		2.66	mg/kg		
			Nickel		3.26	mg/kg		
			Selenium	U	1.18	mg/kg		
			Silver	U	0.708	mg/kg		
			SW7471A	Mercury	U	0.039	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
		2,4,6-Trinitrotoluene		U	100	ug/kg		
		2,4-Dinitrotoluene		U	100	ug/kg		
		2,6-Dinitrotoluene		U	100	ug/kg		
		HMX		U	200	ug/kg		
		m-Nitrotoluene		U	200	ug/kg		
		Nitrobenzene		U	100	ug/kg		
		o-Nitrotoluene		U	200	ug/kg		
		p-Nitrotoluene		U	200	ug/kg		
		Pentaerythritol Tetranitrate		U	500	ug/kg		
		RDX		U	200	ug/kg		
		Tetryl		U	200	ug/kg		
		SW8332	Nitroglycerine	U	6130	ug/kg		

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Equipment Blank Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	
OD-EB-01	1/5/01	SW6010B	Antimony	U	6	ug/L	
			Arsenic	U	5	ug/L	
			Barium		6.74	ug/L	
			Beryllium	U	1	ug/L	
			Cadmium	U	3	ug/L	
			Chromium	B	3.98	ug/L	
			Copper		16.7	ug/L	
			Lead	B	2.39	ug/L	
			Nickel	B	3.01	ug/L	
			Selenium	U	5	ug/L	
			Silver	B	1.89	ug/L	
			SW7470A	Mercury		1.3	ug/L
			SW8330	1,3,5-Trinitrobenzene	U	0.26	ug/L
		1,3-Dinitrobenzene		U	0.26	ug/L	
		2,4,6-Trinitrotoluene		U	0.26	ug/L	
		2,4-Dinitrotoluene		U	0.26	ug/L	
		2,6-Dinitrotoluene		U	0.26	ug/L	
		HMX		U	0.519	ug/L	
		m-Nitrotoluene		U	0.519	ug/L	
		Nitrobenzene		U	0.26	ug/L	
		o-Nitrotoluene		U	0.519	ug/L	
		p-Nitrotoluene		U	0.519	ug/L	
		RDX		U	0.519	ug/L	
		Tetryl		U	0.519	ug/L	



**APPENDIX B**

**Risk Evaluation Calculation Sheet**

## EOD Exposure Scenario

### Noncarcinogenic Risk:

$$\text{Intake (mg / kg / d)} = \frac{C \cdot EF \cdot ED \cdot \frac{IRS_a}{10^6} \cdot FC}{BW_a \cdot AT_n}$$

$$HQ = \frac{\text{Intake}}{RfD_o}$$

### Carcinogenic Risk:

$$\text{Intake (mg / kg / d)} = \frac{C \cdot EF \cdot ED \cdot \frac{IRS_a}{10^6} \cdot FC}{BW_a \cdot AT_c}$$

$$CR = \text{Intake} \cdot CSF_o$$

Exposure Variables	Value	Symbol
Conversion factor (mg/kg)	10 <sup>6</sup>	10 <sup>6</sup>
Body weight, adult (kg)	70	BW <sub>a</sub>
Constituent concentration in soil (mg/kg)	Constituent-specific	C
Cancer risk	Calculated	CR
Oral Slope factor [(mg/kg/d) <sup>-1</sup> ]	Constituent-specific	CSF <sub>o</sub>
Exposure duration, total (y)	5	ED
Exposure frequency (d/y)	40	EF
Fraction of soil ingested from contaminated area (unitless)	0.5	FC
Hazard quotient	Calculated	HQ
Ingestion rate of soil, adult (mg/d)	100	IRS <sub>a</sub>
Oral Reference dose (mg/kg/d)	Constituent-specific	RfD <sub>o</sub>
Averaging time carcinogens (d) (70 yrs × 365 days)	25550	AT <sub>c</sub>
Averaging time noncarcinogens (d) (5 yrs × 365 days)	1825	AT <sub>n</sub>

d = day

kg = kilograms

mg = milligrams

y = year



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*Headquarters, Air Combat Command  
Langley Air Force Base,  
Virginia*

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*Final*

*Second Quarter 2001 Monitoring Report  
Quality Assurance/Quality Control  
20,000-Pound Open Detonation Unit*

*Holloman Air Force Base,  
New Mexico*

*April 2002*

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*49 CES/CEV  
Holloman Air Force Base,  
New Mexico*

**FINAL  
SECOND QUARTER 2001 MONITORING REPORT  
QUALITY ASSURANCE/QUALITY CONTROL RESULTS  
20,000-POUND OPEN DETONATION UNIT**

Prepared for:

Holloman Air Force Base  
49 CES/CEV  
550 Tabosa Avenue  
Holloman AFB, New Mexico 88330

Prepared by:

Foster Wheeler Environmental Corporation  
143 Union Boulevard, Suite 1010  
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U.S. Army Corps of Engineers  
Omaha District  
Omaha, Nebraska

April 2002

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### APPENDICES

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- B Quality Control Data

## LIST OF ACRONYMS

AFB	Air Force Base
DQO	data quality objective
EPA	United States Environmental Protection Agency
Foster Wheeler	Foster Wheeler Environmental Corporation
GPL	GPL Laboratories, LLLP
LCS	laboratory control sample
MDL	method detection limit
MRL	method reporting limit
MS/MSD	matrix spike/matrix spike duplicate
OD	Open Detonation
QA	quality assurance
QC	quality control
RPD	relative percent difference
TNT	2,4,6-trinitrotoluene
USAF	United States Air Force
µg/L	micrograms per liter

## EXECUTIVE SUMMARY

On April 20, 2001, the 12<sup>th</sup> quarterly sampling event was conducted at the Holloman Air Force Base (AFB) 20,000-Pound Open Detonation (OD) Unit in accordance with the Holloman AFB Open Detonation Treatment Unit Sampling and Analysis Plan, Permit Attachment J (USAF, 1996). Twelve soil samples and one field duplicate sample were collected from three different strata within the boundaries of the 20,000-Pound OD Unit and analyzed for metals and explosives by GPL Laboratories, LLLP (GPL), Gaithersburg, Maryland. Analytical methods for chemical analysis were taken from the latest revision of the United States Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste, SW-846, Third Edition and Updates (EPA, 1986). These methods included:

- Metals—EPA 6010B
- Mercury—EPA 7471A
- Explosives—EPA 8330
- Nitroamine explosives—EPA 8332

Analytical results for the metals and explosive analyses are reported below the method reporting limit (MRL) and above the method detection limit (MDL). Sample concentrations reported below the MRL are identified with a “B” (metals) or a “J” (explosives) in the “Flag” data element field in the quality control (QC) and analytical data presented in Appendices A and B.

The Foster Wheeler Environmental Corporation (Foster Wheeler) project chemist reviewed the field and laboratory QC data associated with the 13 soil samples (includes field duplicate) to determine the usability and defensibility of the 12<sup>th</sup> quarterly event analytical data. Review of the QC data indicated project measurement data were reliable and fulfilled project data quality objectives (DQOs). Sampling and analysis precision and accuracy for the 12<sup>th</sup> quarterly event analytical data were acceptable, and valid conclusions may be drawn from the field sample data.

## 1.0 SUMMARY OF QUALITY ASSURANCE DATA EVALUATION

The laboratory QC samples associated with the 20,000-Pound OD Unit sample analyses include method blanks, laboratory control samples (LCSs), matrix spike/matrix spike duplicate (MS/MSD) samples, and laboratory duplicate samples. The method blanks were used to assess potential contamination in the laboratory, and the other types of laboratory QC samples were used to measure the analytical method precision and accuracy. A field duplicate sample and equipment rinse blank sample were also collected and analyzed to evaluate the precision associated with the field sampling and laboratory analysis and assess potential cross-contamination of equipment during sampling. The results of the laboratory and field QC data analyses are presented in Section 1.0 of this report.

The data review procedures used for the 20,000-Pound OD Unit were performed in accordance with the Holloman AFB Final Work Plan Addendum for 20,000-Pound Open Detonation Unit (Foster Wheeler, 1999) and the EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (EPA, 1994a; 1994b). One hundred percent of the analytical data were reviewed for the following criteria:

- Completeness of data deliverables
- Extraction and analysis holding times
- Method blank data
- LCS recovery
- MS/MSD recovery
- System monitoring compounds
- Laboratory duplicate sample
- Field duplicate sample
- Equipment rinse blank sample
- Overall data assessment and usability

The results of the data validation procedure were documented and are maintained in the project files. A summary of these results is presented in Section 2.0 of this report.

Following the data validation procedure, the appropriate validation qualifiers were appended to the project analytical database in the "EPA Qualifier" data element field. The qualifiers that may be used for the 20,000-Pound OD Unit include J, R, and B:

J—Positive value is considered to be an estimate based on associated QC data.

UJ—Nondetect value is considered to be an estimate based on associated QC data.

R—Value is considered unreliable and is unusable based on associated QC data.

B—Value is associated with method or equipment blank contamination.

Based on the QC sample data, the appropriate data qualifiers were appended to the analytical data results for the 12<sup>th</sup> quarterly sampling event. The QC data indicated the control mechanisms were effective in ensuring measurement data reliability within the expected limits of sampling and analytical error.

### 1.1 DATA DELIVERABLES

Data completeness is evaluated through review of the hardcopy analytical data packages in comparison with the chain-of-custody record and the electronic data file. The deliverables are reviewed for completeness to ensure that all samples submitted to the laboratory for analysis have been reported and documented. From the quality assurance (QA) review of the hardcopy data packages and the electronic data file, all project analytical documentation was determined to be complete. A data deliverable completeness objective of 100 percent was achieved.

### 1.2 HOLDING TIMES

Representativeness of the data is determined through review of sample extraction and analysis holding times in conjunction with review of the blank data in accordance with the EPA analytical method holding time guidelines. All extractions and analyses were performed within the holding time guidelines for the 12<sup>th</sup> quarterly sampling event.

### 1.3 LABORATORY METHOD BLANK SAMPLES

Laboratory method blank samples were analyzed with each batch of field samples collected for each analytical method and evaluated as part of the validation process. No detections were reported above the MRL in the method blank samples for explosives and metals for the 12<sup>th</sup> quarterly sampling event. The representativeness of the data based on method blank data results

was 100 percent for data reported above and below the MRL. Method blank data are presented in Appendix B.

#### 1.4 LABORATORY CONTROL SAMPLES

The LCSs were analyzed with each batch of field samples for each analytical method. The LCS spike recoveries reported at concentrations above or below the method-specific control limits will result in qualification of those analytes in the associated field samples. The LCS data are used in conjunction with the MS/MSD recovery data and the system monitoring compound recoveries (explosives) to determine the accuracy of the analytical data. The LCS recoveries for all metals and explosives were within the method control limits, with the exception of the 2,4,6-trinitrotoluene (TNT) associated with the equipment blank sample batch, which was slightly above the upper control limit. TNT was not detected in the equipment blank sample; therefore, no qualification of the data is required. LCS spike recoveries indicated a high level of accuracy associated with the analytical data. LCS spike recoveries are presented in Appendix B.

#### 1.5 MATRIX SPIKE/MATRIX SPIKE DUPLICATE SAMPLES

Laboratory MS/MSD samples were analyzed at a frequency of one per batch of field samples for the explosive methods and MS samples were analyzed at a frequency of one per batch of field samples for the metals methods. The MS/MSD sample recoveries were evaluated in conjunction with the other batch QC sample recoveries to determine the need for qualification of analytical data. The MS/MSD recoveries for explosives and the MS recoveries for metals were within the method-specific control limits. MS/MSD recoveries indicated no matrix interference associated with the sample analyses. MS/MSD sample recoveries are presented in Appendix B.

#### 1.6 SYSTEM MONITORING COMPOUNDS

System monitoring compounds, also known as surrogate spike compounds, are used for the explosives analyses to monitor the performance of an individual sample during extraction and analysis. Surrogate spike recoveries were evaluated for explosives, EPA methods 8330 and 8332. Surrogate spike recoveries for both methods were within the method control limits.

#### 1.7 LABORATORY DUPLICATE SAMPLE RESULTS

One laboratory duplicate sample was analyzed for each of the metals methods to evaluate analytical method precision. The relative percent difference (RPD) between the duplicate and

the primary sample was calculated and compared to the laboratory-established method control criteria (20 percent). Based on the results of the laboratory duplicate sample, the RPDs for metals were within the 20 percent RPD criteria. The laboratory duplicate sample data indicated a high level of precision associated with the sample analyses.

### 1.8 FIELD DUPLICATE SAMPLE RESULTS

One field duplicate soil sample (OD-SO-B-03) was collected for the 12<sup>th</sup> quarterly sampling event and analyzed for metals and explosives. There were no detections of explosives in the field sample or corresponding duplicate sample. All metals detections above the MRL were within the 50 percent RPD criteria. The field duplicate data indicated a high level of precision associated with the field sampling and laboratory analyses. Field duplicate sample results and field sample data are presented in Appendix A.

### 1.9 EQUIPMENT RINSE BLANK RESULTS

Equipment rinse blank samples are collected to assess cross-contamination of equipment during sampling activities. One equipment rinse blank sample was collected for the 12<sup>th</sup> quarterly sampling event and analyzed for explosives and metals. There were no detections of explosives or metals reported above the MRL in the equipment blank sample. Detections of metals reported below the MRL included copper at 5.3 micrograms per liter ( $\mu\text{g/L}$ ), barium at 2.6  $\mu\text{g/L}$ , and lead at 1.8  $\mu\text{g/L}$ . These low-level detections did not result in qualification of sample data. Equipment rinse blank data indicated cross-contamination of sampling equipment did not occur during sampling activities. Equipment rinse blank data are presented in Appendix A.

### 2.0 DATA ASSESSMENT AND USABILITY

As a result of the data validation procedure, it was determined that no analytical data for the 12<sup>th</sup> quarterly sampling event were qualified. Review of the QC data associated with the field sample data indicates all analytical data for the 20,000-Pound OD Unit 12<sup>th</sup> quarterly sampling event are valid and fulfill project DQOs. Analytical data are usable to determine that operation of the 20,000-Pound OD Unit is not imposing environmental impact to soils above risk-based cleanup levels. A data completeness objective of 100 percent was achieved for the 12<sup>th</sup> quarterly sampling event.

### 3.0 REFERENCES

EPA (United States Environmental Protection Agency)

1986. SW-846, Test Methods for Evaluating Solid Waste, Third Edition and Updates.

1994a. Contract Laboratory Program National Functional Guidelines for Organic Data Review. EPA 540/R-94/012.

1994b. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. EPA 540/R-94/013.

Foster Wheeler (Foster Wheeler Environmental Corporation)

1999. Holloman Air Force Base Final Work Plan Addendum for 20,000-Pound Open Detonation Unit.

USAF (United States Air Force)

1996. Holloman Air Force Base Open Detonation Treatment Unit Permit Attachment J, Sampling and Analysis Plan.

**APPENDIX A**

**Analytical Data**

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>		
OD-SO-A-01	4/20/2001	CLP_SOLIDS	Percent Solids		85.2	%			
		SW6010B	Antimony	U	4.65	mg/kg			
			Arsenic	U	4.65	mg/kg			
			Barium		29.9	mg/kg			
			Beryllium	U	0.465	mg/kg			
			Cadmium	U	0.697	mg/kg			
			Chromium		2.47	mg/kg			
			Copper		2.47	mg/kg			
			Lead	B	1.26	mg/kg			
			Nickel	B	1.49	mg/kg			
			Selenium	U	4.65	mg/kg			
			Silver	U	0.697	mg/kg			
		SW7471A	Mercury	U	0.036	mg/kg			
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg			
			1,3-Dinitrobenzene	U	100	ug/kg			
			2,4,6-Trinitrotoluene	U	100	ug/kg			
			2,4-Dinitrotoluene	U	100	ug/kg			
			2,6-Dinitrotoluene	U	100	ug/kg			
			HMX	U	200	ug/kg			
			m-Nitrotoluene	U	200	ug/kg			
			Nitrobenzene	U	100	ug/kg			
			o-Nitrotoluene	U	200	ug/kg			
			p-Nitrotoluene	U	200	ug/kg			
			Pentaerythritol Tetranitrate	U	500	ug/kg			
		RDX	U	200	ug/kg				
		Tetryl	U	200	ug/kg				
		SW8332	Nitroglycerine	U	5730	ug/kg			
		OD-SO-A-02		CLP_SOLIDS	Percent Solids		87.2	%	
				SW6010B	Antimony	U	4.59	mg/kg	
					Arsenic	U	4.59	mg/kg	
					Barium		28.8	mg/kg	
					Beryllium	U	0.459	mg/kg	

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>		
OD-SO-A-02	4/20/2001	SW6010B	Cadmium	U	0.688	mg/kg			
			Chromium		2.32	mg/kg			
			Copper		2.35	mg/kg			
			Lead	B	1.35	mg/kg			
			Nickel	B	1.36	mg/kg			
			Selenium	U	4.59	mg/kg			
			Silver	U	0.688	mg/kg			
		SW7471A	Mercury	U	0.036	mg/kg			
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg			
		1,3-Dinitrobenzene	U	100	ug/kg				
		2,4,6-Trinitrotoluene	U	100	ug/kg				
		2,4-Dinitrotoluene	U	100	ug/kg				
		2,6-Dinitrotoluene	U	100	ug/kg				
		HMX	U	200	ug/kg				
		m-Nitrotoluene	U	200	ug/kg				
		Nitrobenzene	U	100	ug/kg				
		o-Nitrotoluene	U	200	ug/kg				
		p-Nitrotoluene	U	200	ug/kg				
		Pentaerythritol Tetranitrate	U	500	ug/kg				
		RDX	U	200	ug/kg				
		Tetryl	U	200	ug/kg				
		SW8332	Nitroglycerine	U	5730	ug/kg			
		OD-SO-A-03		CLP_SOLIDS	Percent Solids		84	%	
				SW6010B	Antimony	B	3.6	mg/kg	
				Arsenic	B	2.63	mg/kg		
				Barium		25.7	mg/kg		
				Beryllium	U	0.467	mg/kg		
Cadmium	B			0.341	mg/kg				
Chromium				2.94	mg/kg				
Copper				3.87	mg/kg				
Lead	B			1.21	mg/kg				
Nickel				2.84	mg/kg				

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>		
OD-SO-A-03	4/20/2001	SW6010B	Selenium	U	4.67	mg/kg			
			Silver		1.19	mg/kg			
		SW7471A	Mercury	U	0.036	mg/kg			
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg			
			1,3-Dinitrobenzene	U	100	ug/kg			
			2,4,6-Trinitrotoluene	U	100	ug/kg			
			2,4-Dinitrotoluene	U	100	ug/kg			
			2,6-Dinitrotoluene	U	100	ug/kg			
			HMX	U	200	ug/kg			
			m-Nitrotoluene	U	200	ug/kg			
			Nitrobenzene	U	100	ug/kg			
			o-Nitrotoluene	U	200	ug/kg			
			p-Nitrotoluene	U	200	ug/kg			
			Pentaerythritol Tetranitrate	U	500	ug/kg			
			RDX	U	200	ug/kg			
			Tetryl	U	200	ug/kg			
			SW8332	Nitroglycerine	U	5950	ug/kg		
		OD-SO-A-04		CLP_SOLIDS	Percent Solids		83.9	%	
				SW6010B	Antimony	U	4.72	mg/kg	
					Arsenic	U	4.72	mg/kg	
Barium					24.6	mg/kg			
Beryllium	U				0.472	mg/kg			
Cadmium	U				0.708	mg/kg			
Chromium					2.06	mg/kg			
Copper	B				2.29	mg/kg			
Lead	B				1	mg/kg			
Nickel	B				1.18	mg/kg			
Selenium	U				4.72	mg/kg			
Silver	U				0.708	mg/kg			
SW7471A	Mercury				U	0.039	mg/kg		
SW8330	1,3,5-Trinitrobenzene				U	100	ug/kg		
	1,3-Dinitrobenzene				U	100	ug/kg		

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-A-04	4/20/2001	SW8330	2,4,6-Trinitrotoluene	U	100	ug/kg		
			2,4-Dinitrotoluene	U	100	ug/kg		
			2,6-Dinitrotoluene	U	100	ug/kg		
			HMX	U	200	ug/kg		
			m-Nitrotoluene	U	200	ug/kg		
			Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		
			p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
OD-SO-B-01		SW8332	Nitroglycerine	U	5960	ug/kg		
		CLP_SOLIDS	Percent Solids		79.1	%		
		SW6010B	Antimony	U	4.96	mg/kg		
			Arsenic	U	4.96	mg/kg		
			Barium		29.4	mg/kg		
			Beryllium	U	0.495	mg/kg		
			Cadmium	U	0.743	mg/kg		
			Chromium		2.07	mg/kg		
			Copper		2.7	mg/kg		
			Lead	B	1.17	mg/kg		
Nickel	B		1.34	mg/kg				
OD-SO-B-01		SW8330	Selenium	U	4.96	mg/kg		
			Silver	U	0.743	mg/kg		
			SW7471A	Mercury	U	0.041	mg/kg	
			1,3,5-Trinitrobenzene	U	100	ug/kg		
			1,3-Dinitrobenzene	U	100	ug/kg		
			2,4,6-Trinitrotoluene	U	100	ug/kg		
			2,4-Dinitrotoluene	U	100	ug/kg		
			2,6-Dinitrotoluene	U	100	ug/kg		
			HMX	U	200	ug/kg		
		m-Nitrotoluene	U	200	ug/kg			

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-B-01	4/20/2001	SW8330	Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		
			p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
			Tetryl	U	200	ug/kg		
OD-SO-B-02	4/20/2001	SW8332	Nitroglycerine	U	6320	ug/kg		
		CLP_SOLIDS	Percent Solids		83.8	%		
		SW6010B	Antimony	U	4.68	mg/kg		
			Arsenic	U	4.68	mg/kg		
			Barium		26.9	mg/kg		
			Beryllium	U	0.468	mg/kg		
			Cadmium	U	0.702	mg/kg		
			Chromium		2.29	mg/kg		
			Copper	B	2.09	mg/kg		
			Lead	B	1.11	mg/kg		
			Nickel	B	1.3	mg/kg		
			Selenium	U	4.68	mg/kg		
			Silver	U	0.702	mg/kg		
			SW7471A	Mercury	U	0.034	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
		2,4,6-Trinitrotoluene		U	100	ug/kg		
		2,4-Dinitrotoluene		U	100	ug/kg		
		2,6-Dinitrotoluene		U	100	ug/kg		
		HMX		U	200	ug/kg		
		m-Nitrotoluene		U	200	ug/kg		
		Nitrobenzene		U	100	ug/kg		
		o-Nitrotoluene		U	200	ug/kg		
		p-Nitrotoluene		U	200	ug/kg		
		Pentaerythritol Tetranitrate		U	500	ug/kg		
		RDX		U	200	ug/kg		

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-B-02	4/20/2001	SW8330	Tetryl	U	200	ug/kg		
		SW8332	Nitroglycerine	U	5970	ug/kg		
OD-SO-B-03		CLP_SOLIDS	Percent Solids		78.1	%		
		SW6010B	Antimony	U	5.02	mg/kg		
			Arsenic	U	5.02	mg/kg		
			Barium		50.9	mg/kg		
			Beryllium	U	0.502	mg/kg		
			Cadmium	U	0.754	mg/kg		
			Chromium		5.49	mg/kg		
			Copper		4.77	mg/kg		
			Lead	B	2.5	mg/kg		
			Nickel		3.74	mg/kg		
			Selenium	B	0.737	mg/kg		
			Silver	U	0.754	mg/kg		
			SW7471A	Mercury	U	0.041	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
				2,6-Dinitrotoluene	U	100	ug/kg	
				HMX	U	200	ug/kg	
				m-Nitrotoluene	U	200	ug/kg	
				Nitrobenzene	U	100	ug/kg	
				o-Nitrotoluene	U	200	ug/kg	
				p-Nitrotoluene	U	200	ug/kg	
				Pentaerythritol Tetranitrate	U	500	ug/kg	
				RDX	U	200	ug/kg	
				Tetryl	U	200	ug/kg	
				SW8332	Nitroglycerine	U	6410	ug/kg
OD-SO-B-03D		CLP_SOLIDS	Percent Solids		77.7	%		
		SW6010B	Antimony	U	5.1	mg/kg		
			Arsenic	U	5.1	mg/kg		

EPA Qualifier J = estimated detect based on QC criteria

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>		
OD-SO-B-03D	4/20/2001	SW6010B	Barium		48.3	mg/kg			
			Beryllium	U	0.51	mg/kg			
			Cadmium	U	0.764	mg/kg			
			Chromium		4.68	mg/kg			
			Copper		4.72	mg/kg			
			Lead	B	2.41	mg/kg			
			Nickel		3.41	mg/kg			
			Selenium	U	5.1	mg/kg			
			Silver	U	0.764	mg/kg			
			SW7471A	Mercury	U	0.041	mg/kg		
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg		
				1,3-Dinitrobenzene	U	100	ug/kg		
				2,4,6-Trinitrotoluene	U	100	ug/kg		
				2,4-Dinitrotoluene	U	100	ug/kg		
		2,6-Dinitrotoluene		U	100	ug/kg			
		HMX		U	200	ug/kg			
		m-Nitrotoluene		U	200	ug/kg			
		Nitrobenzene		U	100	ug/kg			
		o-Nitrotoluene		U	200	ug/kg			
		p-Nitrotoluene		U	200	ug/kg			
		Pentaerythritol Tetranitrate		U	500	ug/kg			
		RDX		U	200	ug/kg			
		Tetryl		U	200	ug/kg			
		SW8332	Nitroglycerine	U	6430	ug/kg			
		OD-SO-B-04		CLP_SOLIDS	Percent Solids		89.1	%	
				SW6010B	Antimony	U	4.45	mg/kg	
					Arsenic	U	4.45	mg/kg	
Barium					29.4	mg/kg			
Beryllium	U				0.445	mg/kg			
Cadmium	U				0.667	mg/kg			
Chromium					2.19	mg/kg			
Copper	B				1.91	mg/kg			

EPA Qualifier J = estimated detect based on QC criteria

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-B-04	4/20/2001	SW6010B	Lead	B	1.1	mg/kg		
			Nickel	B	1.15	mg/kg		
			Selenium	U	4.45	mg/kg		
			Silver	U	0.667	mg/kg		
		SW7471A	Mercury	U	0.034	mg/kg		
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg		
			1,3-Dinitrobenzene	U	100	ug/kg		
			2,4,6-Trinitrotoluene	U	100	ug/kg		
			2,4-Dinitrotoluene	U	100	ug/kg		
			2,6-Dinitrotoluene	U	100	ug/kg		
			HMX	U	200	ug/kg		
			m-Nitrotoluene	U	200	ug/kg		
			Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		
			p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
			Tetryl	U	200	ug/kg		
			SW8332	Nitroglycerine	U	5610	ug/kg	
			OD-SO-C-01		CLP_SOLIDS	Percent Solids		85
SW6010B	Antimony				U	4.7	mg/kg	
	Arsenic	U			4.7	mg/kg		
	Barium				41.4	mg/kg		
	Beryllium	U			0.47	mg/kg		
	Cadmium	B			0.203	mg/kg		
	Chromium				4.08	mg/kg		
	Copper				5.33	mg/kg		
	Lead				2.69	mg/kg		
	Nickel				2.92	mg/kg		
	Selenium	B			0.899	mg/kg		
	Silver	U			0.706	mg/kg		
	SW7471A	Mercury			U	0.038	mg/kg	

EPA Qualifier J = estimated detect based on QC criteria

Page 8 of 11

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>		
OD-SO-C-01	4/20/2001	SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg			
			1,3-Dinitrobenzene	U	100	ug/kg			
			2,4,6-Trinitrotoluene	U	100	ug/kg			
			2,4-Dinitrotoluene	U	100	ug/kg			
			2,6-Dinitrotoluene	U	100	ug/kg			
			HMX	U	200	ug/kg			
			m-Nitrotoluene	U	200	ug/kg			
			Nitrobenzene	U	100	ug/kg			
			o-Nitrotoluene	U	200	ug/kg			
			p-Nitrotoluene	U	200	ug/kg			
			Pentaerythritol Tetranitrate	U	500	ug/kg			
			RDX	U	200	ug/kg			
			Tetryl	U	200	ug/kg			
				SW8332	Nitroglycerine	U	5880	ug/kg	
			OD-SO-C-02		CLP_SOLIDS	Percent Solids		87.2	%
SW6010B	Antimony	U			4.5	mg/kg			
	Arsenic	B			1.94	mg/kg			
	Barium				75.5	mg/kg			
	Beryllium	B			0.277	mg/kg			
	Cadmium	B			0.454	mg/kg			
	Chromium				9.79	mg/kg			
	Copper				14.3	mg/kg			
	Lead				11.1	mg/kg			
	Nickel				6.9	mg/kg			
	Selenium	B			0.54	mg/kg			
	Silver	U			0.674	mg/kg			
	SW7471A	Mercury			U	0.036	mg/kg		
	SW8330	1,3,5-Trinitrobenzene			U	100	ug/kg		
		1,3-Dinitrobenzene			U	100	ug/kg		
2,4,6-Trinitrotoluene		U	100	ug/kg					
2,4-Dinitrotoluene		U	100	ug/kg					
2,6-Dinitrotoluene		U	100	ug/kg					

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-C-02	4/20/2001	SW8330	HMX	U	200	ug/kg		
			m-Nitrotoluene	U	200	ug/kg		
			Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		
			p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
			Tetryl	U	200	ug/kg		
OD-SO-C-03	4/20/2001	SW8332	Nitroglycerine	U	5730	ug/kg		
		CLP_SOLIDS	Percent Solids		83.4	%		
		SW6010B	Antimony	U	4.75	mg/kg		
			Arsenic	B	1.35	mg/kg		
			Barium		41.5	mg/kg		
			Beryllium	U	0.475	mg/kg		
			Cadmium	B	0.262	mg/kg		
			Chromium		3.52	mg/kg		
			Copper		5.3	mg/kg		
			Lead		2.46	mg/kg		
			Nickel		2.72	mg/kg		
			Selenium	U	4.75	mg/kg		
			Silver	U	0.712	mg/kg		
			SW7471A	Mercury	U	0.04	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
		2,4,6-Trinitrotoluene		U	100	ug/kg		
		2,4-Dinitrotoluene		U	100	ug/kg		
		2,6-Dinitrotoluene		U	100	ug/kg		
		HMX		U	200	ug/kg		
		m-Nitrotoluene		U	200	ug/kg		
		Nitrobenzene		U	100	ug/kg		
		o-Nitrotoluene		U	200	ug/kg		
		p-Nitrotoluene		U	200	ug/kg		

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-C-03	4/20/2001	SW8330	Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	J	179	ug/kg		
			Tetryl	U	200	ug/kg		
OD-SO-C-04	4/20/2001	SW8332	Nitroglycerine	U	6000	ug/kg		
		CLP_SOLIDS	Percent Solids		87.4	%		
		SW6010B	Antimony	U	4.53	mg/kg		
			Arsenic	U	4.53	mg/kg		
			Barium		59.8	mg/kg		
			Beryllium	B	0.152	mg/kg		
			Cadmium		0.827	mg/kg		
			Chromium		7.42	mg/kg		
			Copper		13.7	mg/kg		
			Lead		8.37	mg/kg		
			Nickel		5.15	mg/kg		
			Selenium	B	0.594	mg/kg		
			Silver	U	0.68	mg/kg		
			SW7471A	Mercury	U	0.035	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
				2,6-Dinitrotoluene	U	100	ug/kg	
				HMX		5970	ug/kg	
				m-Nitrotoluene	U	200	ug/kg	
				Nitrobenzene	U	100	ug/kg	
				o-Nitrotoluene	U	200	ug/kg	
				p-Nitrotoluene	U	200	ug/kg	
				Pentaerythritol Tetranitrate	U	500	ug/kg	
				RDX		20600	ug/kg	
				Tetryl	U	200	ug/kg	
		SW8332	Nitroglycerine	U	5720	ug/kg		

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Equipment Blank Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>
OD-EB-01	4/20/2001	SW6010B	Antimony	U	20	ug/L
			Arsenic	U	20	ug/L
			Barium	B	2.61	ug/L
			Beryllium	U	2	ug/L
			Cadmium	U	3	ug/L
			Chromium	U	5	ug/L
			Copper	B	5.33	ug/L
			Lead	B	1.77	ug/L
			Nickel	U	10	ug/L
			Selenium	U	20	ug/L
		Silver	U	3	ug/L	
		SW7470A	Mercury	U	0.2	ug/L
		SW8330	1,3,5-Trinitrobenzene	U	0.26	ug/L
			1,3-Dinitrobenzene	U	0.26	ug/L
			2,4,6-Trinitrotoluene	U	0.26	ug/L
			2,4-Dinitrotoluene	U	0.26	ug/L
			2,6-Dinitrotoluene	U	0.26	ug/L
			HMX	U	0.519	ug/L
			m-Nitrotoluene	U	0.519	ug/L
			Nitrobenzene	U	0.26	ug/L
			o-Nitrotoluene	U	0.519	ug/L
			p-Nitrotoluene	U	0.519	ug/L
			Pentaerythritol Tetranitrate	U	1.3	ug/L
			RDX	U	0.519	ug/L
		Tetryl	U	0.519	ug/L	
		SW8332	Nitroglycerine	U	2000	ug/L

**APPENDIX B**  
**Quality Control Data**

# Analytical Report For 104180

for

**Foster Wheeler Environmental Corp.**

**Project Manager: Pam Moss**

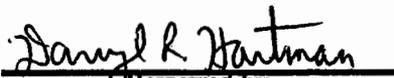
**Project Name : Holliman AFB 20000 lb**

May 21, 2001

***GPL***

***Laboratories***

**GPL Laboratories, LLLP Certifies that the test results meet all requirements of the  
NELAC Standards unless otherwise noted.**

  
Reviewed by,  
Project Manager

  
Approved by,  
Laboratory Director

202 Perry Parkway Gaithersburg, MD 20877 Phone (301) 926-6802 Fax: (301) 840-1209  
www.gplab.com

TOTAL # OF PAGES : 96

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**CASE NARRATIVE**

**CLIENT:** FOSTER WHEELER ENVIRONMENTAL CORP.  
**PROJECT/SITE:** HOLLIMAN AFB 20000LB  
**WORK ORDER(S):** 104180  
**REVIEW DATE:** 5/21/2001

The Case Narrative, Chain of Custody, Sample Receipt Checklist, and the cover page of the Analytical Report, are integral parts of GPL Laboratories' report package. If you did not receive all of these documents, please contact GPL immediately.

**Sample Receipt**

Thirteen soils and one water sample were received on 4/21/2001. The samples were delivered by UPS. The samples were received intact. Sample receipt conditions and temperatures are documented on the Sample Receipt Checklist.

**Sample Analysis**

Samples were prepared and analyzed by GPL using the analytical methodologies indicated on the Analytical Report of Analysis.

**Explosives/HPLC**

1. Thirteen soils and one water were extracted and analyzed for explosive compounds using SW846 method 8330.
2. Matrix spike and matrix spike duplicate analyses for soil were performed on OD-SO-B-03D. All target analyte recoveries were within control limits.
3. Matrix spike and matrix spike duplicate analyses for water were not performed due to insufficient sample volume supplied by the client.
4. Two laboratory control samples for water and one for soil were extracted and analyzed along with the sample batch. Results from the two LCS analyses were reported in both LCS Forms. All target analyte recoveries were within control limits.
5. Surrogate recovery for BLK 11242, BKS1 11242 and BKS2 11242 was above the control limit.
6. Explosive compounds 2,4-DNT and 2,6-DNT co-elute on the primary column and the confirmation column. The mixture of 2,4-DNT and 2,6-DNT in the LCS and MS/MSD samples is quantitated and reported as 2,4-DNT. A peak detected in the retention time window of 2,4-DNT and 2,6-DNT on both columns will be reported as an isomeric pair in samples under the results for 2,4-DNT.
7. Manual integration was performed on some data files, when automatic integration provided by the software was inappropriate. Some forms were "hand" corrected due to software limitations.

**CASE NARRATIVE****8332**

1. Thirteen soil samples were analyzed for Nitroglycerine using SW846 method 8332. One water sample was also analyzed by direct injection.
1. MS/MSD analyses for soil samples were performed on sample OD-SO-B-03D. All recoveries were within control limits.
2. Matrix spike and matrix spike duplicate analyses for water were shared with GPL work order 104173. All target analyte recoveries were within control limits.
8. A laboratory control sample for water was analyzed along with this sample batch. Percent recovery was within control limits.
2. A laboratory control sample was extracted and analyzed along with the soil sample batch. All recoveries were within control limits.
5. Manual integration was performed on some data files, when automatic integration provided by the software was inappropriate. Some forms were "hand" corrected due to software limitations.

**PETN**

1. Thirteen soils and one water were extracted and analyzed for PETN compounds using SW846 method 8330.
2. MS/MSD analyses were performed on sample OD-S0-B-03D for soil. The percent recoveries were within the control limits.
3. Due to insufficient volume supplied by the clients, no MS/MSD analyses were performed for the water sample, instead two LCS were performed. Percent recoveries were within the control limits.
4. A laboratory control standard was also performed for soil samples and the percent recovery was within control limits.
5. Manual integration was performed on some data files, when automatic integration provided by the software was inappropriate. Some forms were "hand" corrected due to software limitations.

**Metals**

1. Thirteen soil samples and one water sample were analyzed for antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, silver, and selenium by ICP; mercury by cold vapor AA; EPA SW846 methods were used.
2. The soil and water samples were reported on separate forms.
3. A matrix spike, duplicate, and serial dilution were performed on the batch water sample 104173-009 for all required ICP analytes. They were within the control limits.

**CASE NARRATIVE**

4. A matrix spike and duplicate were performed on the batch water sample 104172-001 for mercury. They were within the control limits.
5. A matrix spike, duplicate and serial dilution were performed on soil sample OD-SO-A-01 for all required ICP analytes. They were within the control limits.
6. A matrix spike and duplicate were performed on soil sample OD-SO-B-03 for mercury. They were within the control limits.
7. Calibration standards are verified against independent check standards purchased from a commercial vendor of environmental standards.
8. All GPL QA/QC criteria were met.

Donnyl R. Hartman  
Project Manager

Sharon Johnson  
Lab Director

# **SAMPLE DATA PACKAGE**

## **EXPLOSIVE DATA**

**A. QC Summary**

**B. Sample Data**

**C. Standards Data**

**D. Raw QC Data**

***GPL Laboratories, LLLP***

## **A. QC Summary**

- 1. Surrogate Percent Recovery Summary**
- 2. Matrix Spike/Matrix Spike Duplicate Summary**
- 3. Laboratory Control Standard Summary (where applicable)**
- 4. Method Blank Summary**

***GPL Laboratories, LLLP***

Lab Na GPL Laboratories

Contract: \_\_\_\_\_

Lab Code GPL

Case No. \_\_\_\_\_

SAS NO. : \_\_\_\_\_

SDG NO. 104180

Level: (low/me LOW)

EPA SAMPLE NO.	S1 (4NA)	S2 ( )	S3 ( )	S4 ( )	S5 ( )	S6 ( )	S7 ( )	S8 ( )	TOT OUT
1	OD-SO-A-01	99							0
2	OD-SO-A-02	89							0
3	OD-SO-A-03	100							0
4	OD-SO-A-04	97							0
5	OD-SO-B-01	99							0
6	OD-SO-B-02	91							0
7	OD-SO-B-03	100							0
8	OD-SO-B-04	87							0
9	OD-SO-C-01	83							0
10	OD-SO-C-02	90							0
11	OD-SO-C-03	91							0
12	OD-SO-C-04	92							0
13	OD-SO-B-03D	88							0
14	OD-SO-B-03D MS	97							0
15	OD-SO-B-03D MS	100							0
16	BKS11263	100							0
17	BLK11263	96							0

**QC LIMITS**

- S1 (4NA) = 4-Nitroaniline
- S2
- S3
- S4
- S5
- S6
- S7
- S8

- (24 - 140)
- ( - )
- ( - )
- ( - )
- ( - )
- ( - )
- ( - ) (advisory)
- ( - ) (advisory)

- # Column to be used to flag recovery values
- \* Values outside of contract required QC limits
- D Surrogate diluted out

Lab Name: GPL Laboratories

Contract: \_\_\_\_\_

Lab Code GPL

Case No. \_\_\_\_\_

SAS NO. : \_\_\_\_\_

SDG NO. 104180

EPA SAMPLE NO.	S1 (4NA)	S2 ( )	S3 ( )	S4 ( )	S5 ( )	S6 ( )	S7 ( )	S8 ( )	TOT OUT
1 OD-EB-01	43								0
2 BKS2 11242	113								0
3 BKS1 11242	119								0
4 BLK11242	105								0

**QC LIMITS**

S1 (4NA) = 4-Nitroaniline	(24 - 140)	
S2	(-)	
S3	(-)	
S4	(-)	
S5	(-)	
S6	(-)	
S7	(-)	(advisory)
S8	(-)	(advisory)

# Column to be used to flag recovery values

\* Values outside of contract required QC limits

D Surrogate diluted out

3D  
SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: GPL LABORATORIES, LLLP Contract: FOSTER WHEELER ENVIROM

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix Spike - EPA Sample No.: OD-SO-B-03D Level: (low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
HMX	3000	0.0	2600	87	70- 113
1,3,5-TRINITROBENZENE	1500	0.0	1600	107	20- 150
TETRYL	3000	0.0	2300	77	20- 103
2,4,6-TRINITROTOLUENE	1500	0.0	2000	133	46- 150
4-AMINO-2,6-DINITROTOLU	1500	0.0	1500	100	39- 136
4-NITROTOLUENE	3000	0.0	2800	93	70- 114
RDX	3000	0.0	2700	90	70- 124
1,3-DINITROBENZENE	1500	0.0	1500	100	70- 127
NITROBENZENE	1500	0.0	1500	100	70- 120
2-AMINO-4,6-DINITROTOLU	1500	0.0	1900	127	43- 150
2,4-DINITROTOLUENE	3000	0.0	1900	63	56- 100
2-NITROTOLUENE	3000	0.0	2900	97	70- 116
3-NITROTOLUENE	3000	0.0	2900	97	70- 109

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	REC.
HMX	3000	2700	90	3	25	70- 113
1,3,5-TRINITROBENZENE	1500	1600	107	0	25	20- 150
TETRYL	3000	2300	77	0	25	20- 103
2,4,6-TRINITROTOLUENE	1500	2000	133	0	25	46- 150
4-AMINO-2,6-DINITROTOLU	1500	1500	100	0	25	39- 136
4-NITROTOLUENE	3000	2900	97	4	25	70- 114
RDX	3000	2600	87	3	25	70- 124
1,3-DINITROBENZENE	1500	1500	100	0	25	70- 127
NITROBENZENE	1500	1500	100	0	25	70- 120
2-AMINO-4,6-DINITROTOLU	1500	2000	133	5	25	43- 150
2,4-DINITROTOLUENE	3000	1900	63	0	25	56- 100
2-NITROTOLUENE	3000	3000	100	3	25	70- 116

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 0 out of 13 outside limits

Spike Recovery: 0 out of 26 outside limits

COMMENTS:

## SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: GPL LABORATORIES, LLLP Contract: FOSTER WHEELER ENVIROM.  
 Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A  
 Matrix Spike - EPA Sample No.: OD-SO-B-03D Level: (low/med) LOW

3-NITROTOLUENE	3000	2900	97	0	25	70 - 109
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# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 0 out of 0 outside limits

Spike Recovery: 0 out of 0 outside limits

COMMENTS: \_\_\_\_\_

3F  
SOIL LABORATORY CONTROL SPIKE RECOVERY

Lab Name: GPL Laboratories, LLLP

Contract: FOSTER WHEELER ENVIRO

Lab Code: GPLL

GPL Work-order: 102119

EPA Sample No.: NLCS A

GP ID: BKS 11263

COMPOUND	SPIKE ADDED (ug/kg)	LCS CONCENTRATION (ug/kg)	LCS % REC	QC LIMITS
HMX	3000	2599	87	70-114
1,3,5-TNB	1500	1529	102	70-118
TETRYL	3000	1667	56	26-100
TNT	1500	2006	134	70-150
4-AMINO-2,6-DNT	1500	1464	98	60-112
4-NITROTOLUENE	3000	2670	89	70-119
RDX	3000	2734	91	70-118
1,3-DINITROBENZENE	1500	1657	110	70-118
NITROBENZENE	1500	1500	100	70-121
2-AMINO-4,6-DNT	1500	1672	111	69-146
2,4-DNT	3000	2046	68	64-100
2-NITROTOLUENE	3000	2711	90	75-122
3-NITROTOLUENE	3000	2910	97	70-111

\* OUTSIDE QC LIMIT

COMMENTS:

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## WATER LABORATORY CONTROL SPIKE RECOVERY

Lab Name: GPL Laboratories, LLLP

Contract FOSTER WHEELER ENVIROMENTAL CO

Lab Code: GPLL

GPL Work-order: 12041

EPA Sample No.: NLCS B1

GP ID: BKS 11242

COMPOUND	SPIKE ADDED ug/l	LCS CONCENTRATION ug/l	LCS % REC	QC LIMITS
HMX	7.8	7.9	101	70-127
1,3,5-TNB	3.9	4.4	112	20-150
TETRYL	7.8	5.6	72	20-104
TNT	3.9	5.9	151	70-150
4-AMINO-2,6-DNT	3.9	4.4	113	63-121
4-NITROTOLUENE	7.8	10.0	128	57-139
RDX	7.8	8.2	105	70-124
1,3-DINITROBENZENE	3.9	4.4	112	65-141
NITROBENZENE	3.9	4.4	114	71-134
2-AMINO-4,6-DNT	3.9	5.3	137	43-150
2,4-DNT	7.8	6.0	77	53-101
2-NITROTOLUENE	7.8	8.8	112	63-132
3-NITROTOLUENE	7.8	8.7	111	68-133

\* OUTSIDE QC LIMIT

COMMENTS:

3F  
WATER LABORATORY CONTROL SPIKE RECOVERY

Lab Name: GPL Laboratories, LLLP

Contract FOSTER WHEELER ENVIROMENTAL CO

Lab Code: GPLL

GPL Work-order: 12041

EPA Sample No.: NLCS B2

GP ID: BKS 11242

COMPOUND	SPIKE ADDED ug/l	LCS CONCENTRATION ug/l	LCS % REC	QC LIMITS
HMX	7.8	7.4	94	70-127
1,3,5-TNB	3.9	4.1	105	20-150
TETRYL	7.8	5.2	67	20-104
TNT	3.9	5.5	142	70-150
4-AMINO-2,6-DNT	3.9	4.1	106	63-121
4-NITROTOLUENE	7.8	10.1	130	57-139
RDX	7.8	7.7	99	70-124
1,3-DINITROBENZENE	3.9	4.1	104	65-141
NITROBENZENE	3.9	4.1	106	71-134
2-AMINO-4,6-DNT	3.9	4.6	118	43-150
2,4-DNT	7.8	5.6	72	53-101
2-NITROTOLUENE	7.8	8.8	113	63-132
3-NITROTOLUENE	7.8	8.2	105	68-133

\* OUTSIDE QC LIMIT

COMMENTS:

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# **SAMPLE DATA PACKAGE**

## **EXPLOSIVE DATA**

- A. QC Summary**
- B. Sample Data**
- C. Standards Data**
- D. Raw QC Data**

***GPL Laboratories, LLLP***

## **A. QC Summary**

- 1. Surrogate Percent Recovery Summary**
- 2. Matrix Spike/Matrix Spike Duplicate Summary**
- 3. Laboratory Control Standard Summary (where applicable)**
- 4. Method Blank Summary**

***GPL Laboratories, LLLP***

2D  
SOIL SEMIVOLATILE SURROGATE RECOVERY

Lab Name: GPL ENVIRONMENTAL Contract: FOSTER WHEELER ENVIROME  
 Lab Code: GPL Case No.: N/A SAS No.: N/A SDG No.: N/A  
 Level: (low/med) LOW

	Client	S1	TOT
	SAMPLE NO.	#	OUT
01	NBLK A	56	0
02	NLCS A	69	0
03	OD-SO-A-01	75	0
04	OD-SO-A-02	43	0
05	OD-SO-A-03	52	0
06	OD-SO-A-04	39	0
07	OD-SO-B-01	49	0
08	OD-SO-B-02	46	0
09	OD-SO-B-03	59	0
10	OD-SO-B-04	49	0
11	OD-SO-C-01	46	0
12	OD-SO-C-2	52	0
13	OD-SO-C-03	43	0
14	OD-SO-C-04	52	0
15	OD-SO-B-03D	39	0
16	OD-SO-B-03 MS	49	0
17	OD-SO-B-03 MSD	36	0

S1 = 4-Nitroaniline QC LIMITS  
(32-154)

# Column to be used to flag recovery values  
 \* Values outside of contract required QC limits  
 D Surrogate diluted out

## WATER EXPLOSIVES MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: GPL LABORATORY Contract: Foster Wheeler  
 Lab Code: GPL Case No.: N/A SAS No.: N/A SDG No.: N/A  
 Matrix Spike - EPA Sample No.: AS01-1EW16-CM01

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
Nitroglycerine	10000	0.0	11000	110	50- 125

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	REC.
Nitroglycerine	10000	11000	110	0	25	50- 125

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 0 out of 1 outside limits

Spike Recovery: 0 out of 2 outside limits

COMMENTS: \_\_\_\_\_

## SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: GPL ENVIROMENTAL Contract: FOSTER WHEELER ENVIROM  
 Lab Code: GPL Case No.: N/A SAS No.: N/A SDG No.: N/A  
 Matrix Spike - EPA Sample No.: OD-SO-B-03 Level: (low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
Nitroglycerine	64000	0.0	59000	92	70- 118

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	REC.
Nitroglycerine	64000	55000	86	7	25	70- 118

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 0 out of 1 outside limits

Spike Recovery: 0 out of 2 outside limits

COMMENTS: \_\_\_\_\_

## WATER NITROGLYCERIN LABORATORY CONTROL SPIKE RECOVERY

Lab Name: GPL Laboratories, LLLP

Client: FOSTER WHEELER ENVIROME

Lab Code: GPLL

Case No.: N/A

SAS No.: N/A

SDG No.: N/A

EPA Sample No. NLCS A

GP ID: BKS

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC	QC LIMITS
NITROGLYCERIN	10000	11954	120	70-120

COMMENTS:

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3E

SOIL 8332 LABORATORY CONTROL SPIKE RECOVERY

Lab Name: GPL ENVIRONMENTAL

Client: FOSTER WHEELER ENVIROMENTAL

Lab Code: GPL

Case No.: N/A

SAS No.: N/A

SDG No.:

N/A

EPA Sample No.: NLCS B

GP ID: BKS-11265

COMPOUND	SPIKE ADDED (ug/Kg)	LCS CONCENTRATION (ug/Kg)	LCS % REC	QC LIMITS
NITROGLYCERINE	50050	50495	101	70-128

COMMENTS:

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# **SAMPLE DATA PACKAGE**

## **PETN DATA**

- A. QC Summary
- B. Sample Data
- C. Standards Data
- D. Raw QC Data

*GP Environmental Services, Inc*

## **A. QC Summary**

- 1. Surrogate Percent Recovery Summary**
- 2. Matrix Spike/Matrix Spike Duplicate Summary**
- 3. Laboratory Control Standard Summary (where applicable)**
- 4. Method Blank Summary**

***GPL Laboratories, LLLP***

## SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: GP ENVIRONMENTAL SERVICES Contract: Foster Wheeler EnvironmentalLab Code: GP\_ENV Case No.: N/A SAS No.: N/A SDG No.: N/AMatrix Spike - EPA Sample No.: OD-SO-B-03D Level: (low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
PETN	2000	0.0	1500	75	48- 128

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	REC.
PETN	2000	1600	80	6	25	48- 128

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 0 out of 1 outside limits

Spike Recovery: 0 out of 2 outside limits

COMMENTS: \_\_\_\_\_

3E

SOIL PETN LABORATORY CONTROL SPIKE RECOVERY

Lab Name: GPL Laboratories

Client: Foster Wheeler Enviro

Lab Code: GP\_ENV

Case No.: N/A

SAS No.: N/A

SDG No.: N/A

EPA Sample No.: BKSA

GP ID: BKS11263

COMPOUND	SPIKE ADDED (ug/Kg)	LCS CONCENTRATION (ug/Kg)	LCS % REC	QC LIMITS
PETN	2000	2062	103	50-125

COMMENTS:

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WATER PETN LABORATORY CONTROL SPIKE RECOVERY

Lab Name: GP Environmental Services

Client: Foster Wheeler Enviro

Lab Code: GP\_ENV

Case No.: N/A

SAS No.: N/A

SDG No.: N/A

EPA Sample No.: BKSB

GP ID: BKS1-11244

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC	QC LIMITS
PETN	5.19	4.04	78	50-125

COMMENTS:

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WATER PETN LABORATORY CONTROL SPIKE RECOVERY

Lab Name: GP Environmental Services

Client: Foster Wheeler Enviro

Lab Code: GP\_ENV

Case No.: N/A

SAS No.: N/A

SDG No.: N/A

EPA Sample No.: BKSDB

GP ID: BKS2-11244

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC	QC LIMITS
PETN	5.19	4.11	79	50-125

COMMENTS:

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*METALS PACKAGE*

*GPL Laboratories, LLLP*

**TOTAL METALS  
COVER PAGE - INORGANIC ANALYSIS DATA PACKAGE**

Contract:

SDG No.: 104180S

Code:

Case No.:

SAS No.:

SOW No.: SW-846

<u>Sample No.</u>	<u>Lab Sample ID.</u>
OD-SO-A-01	104180-001
OD-SO-A-01D	104180-001D
OD-SO-A-01S	104180-001S
OD-SO-A-02	104180-002
OD-SO-A-03	104180-003
OD-SO-A-04	104180-004
OD-SO-B-01	104180-005
OD-SO-B-02	104180-006
OD-SO-B-03	104180-007
OD-SO-B-03DUP	104180-007DUP
OD-SO-B-03S	104180-007S
OD-SO-B-04	104180-008
OD-SO-C-01	104180-009
OD-SO-C-02	104180-010
OD-SO-C-03	104180-011
OD-SO-C-04	104180-012
OD-SO-B-03D	104180-013

Were ICP interelement corrections applied?

Yes/No YES

Were ICP background corrections applied?

Yes/No YES

If yes-were raw data generated before application of background corrections?

Yes/No NO

Comments:

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I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: Rita Amin

Name: RITA AMIN

Date: 5-21-01

Title: Metals Reporting

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180S

Initial Calibration Source: HIGH PURITY/CPI

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony	400.0	404.45	101.1	1000.0	1007.72	100.8	1018.95	101.9	P
Arsenic	400.0	403.03	100.8	1000.0	996.70	99.7	1007.09	100.7	P
Barium	400.0	399.05	99.8	500.0	491.91	98.4	493.95	98.8	P
Beryllium	40.0	39.94	99.8	50.0	49.85	99.7	49.97	99.9	P
Cadmium	40.0	41.03	102.6	500.0	497.22	99.4	500.67	100.1	P
Chromium	400.0	401.89	100.5	500.0	496.31	99.3	499.23	99.8	P
Copper	400.0	397.27	99.3	500.0	498.22	99.6	507.98	101.6	P
Lead	400.0	404.53	101.1	500.0	497.36	99.5	504.51	100.9	P
Mercury	5.0	47.50	95.0	5.0	51.00	102.0	50.00	100.0	CV
Nickel	400.0	404.84	101.2	500.0	494.17	98.8	496.36	99.3	P
Selenium	400.0	413.38	103.3	1000.0	1003.75	100.4	1014.96	101.5	P
Silver	40.0	40.41	101.0	50.0	50.40	100.8	50.93	101.9	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

4016

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180S

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				1000.0	1020.30	102.0	1035.82	103.6	P
Arsenic				1000.0	1009.59	101.0	1024.12	102.4	P
Barium				500.0	491.15	98.2	497.74	99.5	P
Beryllium				50.0	50.14	100.3	50.70	101.4	P
Cadmium				500.0	502.51	100.5	508.01	101.6	P
Chromium				500.0	499.81	100.0	506.54	101.3	P
Copper				500.0	509.73	101.9	518.20	103.6	P
Lead				500.0	506.57	101.3	510.63	102.1	P
Mercury				5.0	50.80	101.6	50.10	100.2	CV
Nickel				500.0	494.15	98.8	499.73	99.9	P
Selenium				1000.0	1013.54	101.4	1020.74	102.1	P
Silver				50.0	51.16	102.3	51.90	103.8	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

4017

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180S

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration		Continuing Calibration				M	
	True	Found %R(1)	True	Found	%R(1)	Found		%R(1)
Antimony			1000.0	1005.25	100.5	1019.02	101.9	P
Arsenic			1000.0	1001.33	100.1	1005.26	100.5	P
Barium			500.0	483.60	96.7	487.32	97.5	P
Beryllium			50.0	49.45	98.9	49.62	99.2	P
Cadmium			500.0	495.60	99.1	497.45	99.5	P
Chromium			500.0	491.70	98.3	494.81	99.0	P
Copper			500.0	506.48	101.3	512.04	102.4	P
Lead			500.0	498.31	99.7	500.86	100.2	P
Mercury			5.0	50.40	100.8			CV
Nickel			500.0	485.26	97.1	485.78	97.2	P
Selenium			1000.0	998.86	99.9	1007.44	100.7	P
Silver			50.0	50.42	100.8	49.87	99.7	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

4018

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180S

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/EPT *NA5-21*

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				1000.0	999.63	100.0	1090.50	109.1	P
Arsenic				1000.0	979.85	98.0	1063.39	106.3	P
Barium				500.0	471.96	94.4	520.39	104.1	P
Beryllium				50.0	48.50	97.0	52.88	105.8	P
Cadmium				500.0	487.07	97.4	529.71	105.9	P
Chromium				500.0	483.30	96.7	529.23	105.8	P
Copper				500.0	500.94	100.2	552.00	110.4	P
Lead				500.0	493.20	98.6	528.40	105.7	P
Nickel				500.0	473.61	94.7	515.19	103.0	P
Selenium				1000.0	990.39	99.0	1055.60	105.6	P
Silver				50.0	50.64	101.3	54.26	108.5	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

4019

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180S

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/EPH-RA521

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				1000.0	1039.77	104.0	1046.94	104.7	P
Arsenic				1000.0	1013.69	101.4	1016.59	101.7	P
Barium				500.0	489.77	98.0	495.63	99.1	P
Beryllium				50.0	50.18	100.4	50.60	101.2	P
Cadmium				500.0	501.25	100.3	506.01	101.2	P
Chromium				500.0	499.90	100.0	505.31	101.1	P
Copper				500.0	524.56	104.9	530.64	106.1	P
Lead				500.0	507.40	101.5	510.04	102.0	P
Nickel				500.0	482.33	96.5	491.48	98.3	P
Selenium				1000.0	1015.27	101.5	1023.27	102.3	P
Silver				50.0	52.37	104.7	52.50	105.0	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

4020

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180S

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/~~CPI~~ RA 5-21

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				1000.0	1042.23	104.2	1052.59	105.3	P
Arsenic				1000.0	1020.16	102.0	1026.10	102.6	P
Barium				500.0	494.19	98.8	496.53	99.3	P
Beryllium				50.0	50.49	101.0	50.84	101.7	P
Cadmium				500.0	505.71	101.1	510.01	102.0	P
Chromium				500.0	503.26	100.7	508.59	101.7	P
Copper				500.0	530.76	106.2	532.56	106.5	P
Lead				500.0	510.04	102.0	514.30	102.9	P
Nickel				500.0	489.66	97.9	492.47	98.5	P
Selenium				1000.0	1021.98	102.2	1029.95	103.0	P
Silver				50.0	51.75	103.5	53.58	107.2	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

TOTAL METALS

-2B-

CRDL STANDARD FOR AA AND ICP

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 104180S

AA CRDL Standard Source:

ICP CRDL Standard Source: HIGH PURITY

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	Initial			Final	
	True	Found	%R	True	Found	%R	Found	%R
Antimony				120.0	118.51	98.8		
Arsenic				20.0	21.85	109.3		
Barium				400.0	388.86	97.2		
Beryllium				10.0	9.68	96.8		
Cadmium				10.0	9.98	99.8		
Chromium				20.0	19.48	97.4		
Copper				50.0	49.97	99.9		
Lead				6.0	6.34	105.7		
Mercury	0.2	0.18	90.0					
Nickel				80.0	79.67	99.6		
Selenium				10.0	12.61	126.1		
Silver				20.0	19.36	96.8		

4022

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180S

Preparation Blank Matrix (soil/water): SOIL

Preparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank	C	M
			1	C	2	C	3	C			
Antimony	9.5	U	9.5	U	9.5	U	9.5	U	0.950	U	P
Arsenic	5.3	U	5.3	U	5.3	U	5.3	U	-0.544	B	P
Barium	0.4	U	0.4	U	0.4	U	0.4	U	0.099	B	P
Beryllium	0.2	U	0.2	U	0.2	U	-0.2	B	-0.041	B	P
Cadmium	0.5	U	0.5	U	0.5	U	0.5	U	0.050	U	P
Chromium	0.9	U	0.9	U	0.9	U	0.9	U	0.090	U	P
Copper	1.6	U	1.6	U	1.6	U	1.6	U	0.382	B	P
Lead	1.5	U	1.5	U	1.5	U	1.5	U	0.150	U	P
Mercury	0.1	U	0.1	U	0.1	U	0.1	U	0.017	U	CV
Nickel	1.1	U	1.1	U	1.1	U	1.1	U	-0.114	B	P
Selenium	2.4	U	2.4	U	2.4	U	2.4	U	0.240	U	P
Silver	2.3	U	2.3	U	2.3	U	2.3	U	0.230	U	P

4023

SW-846

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180S

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank	C	M
			1	C	2	C	3	C			
Antimony			9.5	U	9.5	U	9.5	U			P
Arsenic			5.3	U	5.3	U	5.3	U			P
Barium			0.4	U	0.4	U	0.4	U			P
Beryllium			-0.3	B	-0.4	B	-0.4	B			P
Cadmium			0.5	U	0.5	U	0.5	U			P
Chromium			0.9	U	0.9	U	0.9	U			P
Copper			1.6	U	1.8	B	1.7	B			P
Lead			1.5	U	1.5	U	1.5	U			P
Mercury			0.1	U	0.1	U					CV
Nickel			1.1	U	1.1	U	1.1	U			P
Selenium			2.4	U	2.4	U	2.4	U			P
Silver			2.3	U	2.3	U	2.3	U			P

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180S

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank	C	M
			1	C	2	C	3	C			
Antimony			9.5	U	9.5	U	9.5	U			P
Arsenic			5.3	U	5.3	U	5.3	U			P
Barium			0.4	U	0.4	U	0.4	U			P
Beryllium			-0.4	B	-0.4	B	-0.5	B			P
Cadmium			0.5	U	0.5	U	0.5	U			P
Chromium			0.9	U	0.9	U	0.9	U			P
Copper			1.6	B	2.2	B	1.9	B			P
Lead			1.5	U	1.5	U	1.5	U			P
Nickel			1.1	U	1.1	U	1.1	U			P
Selenium			3.9	B	2.4	U	2.4	U			P
Silver			2.3	U	2.3	U	2.3	U			P

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180S

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank		M
			1	C	2	C	3	C	C		
Antimony			9.5	U	9.5	U	9.5	U			P
Arsenic			5.3	U	5.3	U	5.3	U			P
Barium			0.4	U	0.4	U	0.4	U			P
Beryllium			-0.5	B	-0.6	B	-0.5	B			P
Cadmium			0.5	U	0.5	U	0.5	U			P
Chromium			0.9	U	1.1	B	0.9	U			P
Copper			1.6	U	2.4	B	1.6	U			P
Lead			1.5	U	1.5	U	1.5	U			P
Nickel			1.1	U	1.1	U	1.1	U			P
Selenium			2.4	U	2.4	U	2.4	U			P
Silver			2.3	U	2.3	U	2.3	U			P

TOTAL METALS

- 4 -

ICP INTERFERENCE CHECK SAMPLE

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180S

ICP ID Number:

TJA61 ICP

ICS Source:

HIGH PURITY

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Antimony		600	3	623.5	103.9			
Arsenic		100	1	99.7	99.7			
Barium		500	1	515.8	103.2			
Beryllium		500	0	514.7	102.9			
Cadmium		1000	2	979.8	98.0			
Chromium		500	-5	490.9	98.2			
Copper		500	1	527.6	105.5			
Lead		50	-2	47.9	95.8			
Nickel		1000	-1	967.6	96.8			
Selenium		50	-2	48.8	97.6			
Silver		200	-1	213.1	106.6			

**TOTAL METALS**  
**-5A-**  
**SPIKE SAMPLE RECOVERY**

SAMPLE NO.

OD-SO-A-01S

Contract:

Lab Code:

Case No.:

SAS

SDG NO.: 104180S

Matrix (soil/water): SOIL

Level (low/med): LOW

% Solids for Sample: 85.2

Concentration Units (ug/L or mg/kg dry weight): **MG/KG**

Analyte	Control Limit %R	Spiked Sample Result (SSR) C	Sample Result (SR) C	Spike Added (SA)	%R	Q	M
Antimony	75 - 125	22.0554	2.2077 U	23.24	94.9		P
Arsenic	75 - 125	22.7373	1.2317 U	23.24	97.8		P
Barium	75 - 125	273.4274	29.8988	232.39	104.8		P
Beryllium	75 - 125	11.3771	0.0465 U	11.62	97.9		P
Cadmium	75 - 125	22.3163	0.1162 U	23.24	96.0		P
Chromium	75 - 125	116.0073	2.4668	116.20	97.7		P
Copper	75 - 125	123.5694	2.4695	116.20	104.2		P
Lead	75 - 125	223.6315	1.2596 B	232.39	95.7		P
Nickel	75 - 125	110.4885	1.4858 B	116.20	93.8		P
Selenium	75 - 125	22.8976	0.5577 U	23.24	98.5		P
Silver	75 - 125	24.5524	0.5345 U	23.24	105.7		P

Comments:

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4028

**TOTAL METALS**  
**-5A-**  
**SPIKE SAMPLE RECOVERY**

SAMPLE NO.

OD-SO-B-03S

Contract:

Lab Code:

Case No.:

SAS

SDG NO.: 104180S

Matrix (soil/water): SOIL

Level (low/med): LOW

% Solids for Sample: 78.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit %R	Spiked Sample Result (SSR) C	Sample Result (SR) C	Spike Added (SA)	%R	Q	M
Mercury	75 - 125	0.6218	0.0204 U	0.63	99.3		CV

Comments:

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4029

TOTAL METALS

-6-

DUPLICATES

SAMPLE NO.

OD-SO-A-01D

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180S

Matrix (soil/water): SOIL

Level (low/med): LOW

% Solids for Sample: 85.2

% Solids for Duplicate: 85.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Antimony		2.2077	U	2.2077	U			P
Arsenic		1.2317	U	1.2317	U			P
Barium		29.8988		30.8854		3.2		P
Beryllium		0.0465	U	0.0465	U			P
Cadmium		0.1162	U	0.1162	U			P
Chromium	1.2	2.4668		2.5976		5.2		P
Copper	2.3	2.4695		2.3243		6.1		P
Lead		1.2596	B	1.5047	B	17.7		P
Nickel		1.4858	B	1.6063	B	7.8		P
Selenium		0.5577	U	0.7119	B	200.0		P
Silver		0.5345	U	0.5345	U			P

TOTAL METALS

-6-

DUPLICATES

SAMPLE NO.

OD-SO-B-03D

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180S

Matrix (soil/water): SOIL

Level (low/med): LOW

% Solids for Sample: 78.1

% Solids for Duplicate: 78.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Mercury		0.0204	U	0.0211	U			CV

4031

TOTAL METALS

-7-

LABORATORY CONTROL SAMPLE

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180S

Solid LCS Source: HIGH PURITY

Aqueous LCS Source:

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Antimony				20.0	19.9		16.0   24.0	99.5
Arsenic				20.0	20.8		16.0   24.0	104.2
Barium				200.0	218.1		160.0   240.0	109.0
Beryllium				10.0	10.9		8.0   12.0	109.4
Cadmium				20.0	22.2		16.0   24.0	110.8
Chromium				100.0	110.0		80.0   120.0	110.0
Copper				100.0	114.5		80.0   120.0	114.5
Lead				200.0	220.5		160.0   240.0	110.2
Mercury				0.5	0.5		0.4   0.6	104.0
Nickel				100.0	107.1		80.0   120.0	107.1
Selenium				20.0	21.5		16.0   24.0	107.3
Silver				20.0	20.7		16.0   24.0	103.7

TOTAL METALS

-9-

ICP SERIAL DILUTIONS

SAMPLE NO.

OD-SO-A-01L

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 1041805

Matrix (soil/water): SOIL

Level (low/med): LOW

Concentration Units: ug/L

Analyte	Initial Sample Result (I)		Serial Dilution Result (S)		% Difference	Q	M
		C		C			
Antimony	9.50	U	47.50	U			P
Arsenic	5.30	U	26.50	U			P
Barium	128.66		129.10		0.3		P
Beryllium	0.20	U	1.00	U			P
Cadmium	0.50	U	2.50	U			P
Chromium	10.61		8.15	B	23.2		P
Copper	10.63		21.75	B	104.6		P
Lead	5.42	B	8.38	B	55.0		P
Nickel	6.39	B	7.34	B	15.0		P
Selenium	2.40	U	15.24	B	100.0		P
Silver	2.30	U	11.50	U			P

TOTAL METALS  
COVER PAGE - INORGANIC ANALYSIS DATA PACKAGE

Contract:

SDG No.: 104180W

Lab Code:

Case No.:

SAS No.:

SOW No.: SW-846

<u>Sample No.</u>	<u>Lab Sample ID.</u>
<u>104172-001</u>	<u>104172-001</u>
<u>104172-001D</u>	<u>104172-001D</u>
<u>104172-001S</u>	<u>104172-001S</u>
<u>104173-009</u>	<u>104173-009</u>
<u>104173-009D</u>	<u>104173-009D</u>
<u>104173-009S</u>	<u>104173-009S</u>
<u>OD-EB-01</u>	<u>104180-014</u>

Were ICP interelement corrections applied?

Yes/No YES

Were ICP background corrections applied?

Yes/No YES

If yes-were raw data generated before application of background corrections?

Yes/No NO

Comments:

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I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: Rita Amin

Name: RITA AMIN

Date: 5-21-01

Title: Metals Reporting

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

OD-EB-01

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180W

Matrix (soil/water): WATER

Lab Sample ID: 104180-014

Level (low/med): LOW

Date Received: 03/21/2001

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	4.5	U		P
7440-38-2	Arsenic	4.1	U		P
7440-39-3	Barium	2.6	B		P
7440-41-7	Beryllium	0.20	U		P
7440-43-9	Cadmium	0.40	U		P
7440-47-3	Chromium	0.90	U		P
7440-50-8	Copper	5.3	B		P
7439-92-1	Lead	1.8	B		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.1	U		P
7782-49-2	Selenium	3.4	U		P
7440-22-4	Silver	1.4	U		P

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180W

Initial Calibration Source: HIGH PURITY/CPI

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony	400.0	400.30	100.1	1000.0	992.01	99.2	994.99	99.5	P
Arsenic	400.0	402.76	100.7	1000.0	999.81	100.0	996.97	99.7	P
Barium	400.0	399.80	99.9	500.0	491.38	98.3	490.83	98.2	P
Beryllium	40.0	40.01	100.0	50.0	49.58	99.2	49.35	98.7	P
Cadmium	40.0	41.03	102.6	500.0	494.20	98.8	491.99	98.4	P
Chromium	400.0	401.62	100.4	500.0	494.00	98.8	492.87	98.6	P
Copper	400.0	396.37	99.1	500.0	495.58	99.1	496.02	99.2	P
Lead	400.0	402.80	100.7	500.0	494.63	98.9	494.97	99.0	P
Mercury	5.0	4.78	95.6	5.0	4.94	98.8	5.04	100.8	CV
Nickel	400.0	402.55	100.6	500.0	493.09	98.6	491.09	98.2	P
Selenium	400.0	407.19	101.8	1000.0	997.54	99.8	993.24	99.3	P
Silver	40.0	40.10	100.3	50.0	48.89	97.8	49.25	98.5	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180W

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				1000.0	1011.31	101.1	1002.54	100.3	P
Arsenic				1000.0	1015.25	101.5	1000.78	100.1	P
Barium				500.0	500.92	100.2	495.93	99.2	P
Beryllium				50.0	50.23	100.5	49.63	99.3	P
Cadmium				500.0	499.92	100.0	493.52	98.7	P
Chromium				500.0	501.47	100.3	495.66	99.1	P
Copper				500.0	506.73	101.3	503.35	100.7	P
Lead				500.0	501.84	100.4	496.70	99.3	P
Mercury				5.0	5.06	101.2	4.96	99.2	CV
Nickel				500.0	498.64	99.7	493.58	98.7	P
Selenium				1000.0	1012.58	101.3	997.31	99.7	P
Silver				50.0	50.85	101.7	50.40	100.8	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180W

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/~~CPT~~ RA5-a1

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				1000.0	1069.05	106.9			P
Arsenic				1000.0	1067.21	106.7			P
Barium				500.0	526.21	105.2			P
Beryllium				50.0	52.81	105.6			P
Cadmium				500.0	527.48	105.5			P
Chromium				500.0	528.36	105.7			P
Copper				500.0	537.43	107.5			P
Lead				500.0	529.31	105.9			P
Nickel				500.0	523.62	104.7			P
Selenium				1000.0	1063.43	106.3			P
Silver				50.0	53.37	106.7			P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

TOTAL METALS

-2B-

CRDL STANDARD FOR AA AND ICP

tract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 104180W

AA CRDL Standard Source:

ICP CRDL Standard Source: HIGH PURITY

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	Initial		Final		
				True	Found	%R	Found	%R
Antimony				120.0	118.07	98.4		
Arsenic				20.0	20.45	102.3		
Barium				400.0	379.29	94.8		
Beryllium				10.0	9.77	97.7		
Cadmium				10.0	9.82	98.2		
Chromium				20.0	18.23	91.2		
Copper				50.0	47.30	94.6		
Lead				6.0	6.37	106.2		
Mercury	0.2	0.23	115.0					
Nickel				80.0	74.84	93.6		
Selenium				10.0	9.40	94.0		
Silver				20.0	19.61	98.1		

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180W

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank		M
		C	1	C	2	C	3	C		C	
Antimony	4.5	U	4.5	U	4.5	U	4.5	U	4.500	U	P
Arsenic	4.1	U	4.1	U	4.1	U	4.1	U	4.100	U	P
Barium	0.4	U	0.4	U	0.4	U	0.4	U	0.400	U	P
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.200	U	P
Cadmium	0.4	U	0.4	U	0.4	U	0.4	U	0.400	U	P
Chromium	0.9	U	0.9	U	-1.0	B	-1.0	B	-1.436	B	P
Copper	4.9	U	4.9	U	4.9	U	4.9	U	4.900	U	P
Lead	1.5	U	1.5	U	1.5	U	1.5	U	1.500	U	P
Mercury	0.1	U	0.1	U	0.1	U	0.1	U	0.100	U	CV
Nickel	-2.8	B	-2.5	B	-4.0	B	-2.6	B	-3.127	B	P
Selenium	3.4	U	3.4	U	3.4	U	3.4	U	3.400	U	P
Silver	1.5	B	1.4	U	1.4	U	1.4	U	1.400	U	P

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180W

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank		M
			1	C	2	C	3	C	C		
Antimony			4.5	U	4.5	U					P
Arsenic			4.1	U	4.1	U					P
Barium			0.4	U	0.4	U					P
Beryllium			0.2	U	0.2	U					P
Cadmium			0.4	U	0.4	U					P
Chromium			0.9	U	0.9	U					P
Copper			4.9	U	4.9	U					P
Lead			1.5	U	1.5	U					P
Mercury			0.1	U							CV
Nickel			-3.5	B	-3.7	B					P
Selenium			3.4	U	3.4	U					P
Silver			1.4	U	1.4	U					P

TOTAL METALS

- 4 -

ICP INTERFERENCE CHECK SAMPLE

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180W

ICP ID Number:

TJA61 ICP

ICS Source:

HIGH PURITY

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Antimony		600	1	600.3	100.1			
Arsenic		100	-1	96.0	96.0			
Barium		500	1	507.9	101.6			
Beryllium		500	1	501.7	100.3			
Cadmium		1000	1	954.6	95.5			
Chromium		500	-6	480.9	96.2			
Copper		500	0	512.8	102.6			
Lead		50	1	47.7	95.4			
Nickel		1000	-4	955.1	95.5			
Selenium		50	-5	41.7	83.4			
Silver		200	-1	207.1	103.6			

**TOTAL METALS**  
**-5A-**  
**SPIKE SAMPLE RECOVERY**

SAMPLE NO.

104172-001S

Contract:

Lab Code:

Case No.:

SAS

SDG NO.: 104180W

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids for Sample: 0.0

Concentration Units (ug/L or mg/kg dry weight):  $\mu\text{G/L}$

Analyte	Control Limit %R	Spiked Sample Result (SSR) C	Sample Result (SR) C	Spike Added (SA)	%R	Q	M
Mercury	75 - 125	1.0500	0.1000   U	1.00	105.0		CV

Comments:

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**TOTAL METALS**  
**-5A-**  
**SPIKE SAMPLE RECOVERY**

SAMPLE NO.

104173-009S

Contract:

Lab Code:

Case No.:

SAS

SDG NO.: 104180W

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids for Sample: 0.0

Concentration Units (ug/L or mg/kg dry weight):  $\mu\text{G/L}$

Analyte	Control Limit %R	Spiked Sample Result (SSR) C	Sample Result (SR) C	Spike Added (SA)	%R	Q	M
Antimony	75 - 125	48.3743	4.5000 U	50.00	96.7		P
Arsenic	75 - 125	52.0075	4.1000 U	50.00	104.0		P
Barium	75 - 125	609.2638	71.4958	500.00	107.6		P
Beryllium	75 - 125	26.3283	0.2000 U	25.00	105.3		P
Cadmium	75 - 125	53.6535	0.4000 U	50.00	107.3		P
Chromium	75 - 125	267.9797	0.9000 U	250.00	107.2		P
Copper	75 - 125	287.0001	18.4999	250.00	107.4		P
Lead	75 - 125	533.9496	1.5000 U	500.00	106.8		P
Nickel	75 - 125	266.2606	1.1000 U	250.00	106.5		P
Selenium	75 - 125	52.0028	3.4000 U	50.00	104.0		P
Silver	75 - 125	54.6297	1.4000 U	50.00	109.3		P

Comments:

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TOTAL METALS

-6-

DUPLICATES

SAMPLE NO.

104172-001D

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180W

Matrix (soil/water): WATER

Level (low/med): LOW

\* Solids for Sample: 0.0

\* Solids for Duplicate:

Concentration Units (ug/L or mg/kg dry weight): µG/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Mercury		0.1000	U	0.1000	U			CV

TOTAL METALS

-6-

DUPLICATES

SAMPLE NO.

104173-009D

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180W

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids for Sample: 0.0

% Solids for Duplicate:

Concentration Units (ug/L or mg/kg dry weight): µG/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Antimony		4.5000	U	4.5000	U			P
Arsenic		4.1000	U	4.1000	U			P
Barium		71.4958		73.8683		3.3		P
Beryllium		0.2000	U	0.2000	U			P
Cadmium		0.4000	U	0.4000	U			P
Chromium		0.9000	U	0.9000	U			P
Copper	10.0	18.4999		19.3152		4.3		P
Lead		1.5000	U	2.2854	B	200.0		P
Nickel		1.1000	U	1.1000	U			P
Selenium		3.4000	U	3.4000	U			P
Silver		1.4000	U	1.4000	U			P

**TOTAL METALS**  
-7-  
**LABORATORY CONTROL SAMPLE**

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180W

Solid LCS Source:

Aqueous LCS Source: HIGH PURITY

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Antimony	50.0	50.73	101.5					
Arsenic	50.0	50.88	101.8					
Barium	500.0	511.20	102.2					
Beryllium	25.0	25.06	100.2					
Cadmium	50.0	51.39	102.8					
Chromium	250.0	253.87	101.5					
Copper	250.0	254.81	101.9					
Lead	500.0	507.88	101.6					
Mercury	1.0	1.01	101.0					
Nickel	250.0	253.04	101.2					
Selenium	50.0	48.76	97.5					
Silver	50.0	51.18	102.4					

TOTAL METALS

-9-

ICP SERIAL DILUTIONS

SAMPLE NO.

104173-009L

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 104180W

Matrix (soil/water): WATER

Level (low/med): LOW

Concentration Units: ug/L

Analyte	Initial Sample Result (I)		Serial Dilution Result (S)		% Difference	Q	M
		C		C			
Antimony	4.50	U	22.50	U			P
Arsenic	4.10	U	20.50	U			P
Barium	71.50		68.98		3.5		P
Beryllium	0.20	U	1.00	U			P
Cadmium	0.40	U	2.00	U			P
Chromium	0.90	U	4.50	U			P
Copper	18.50		24.50	U	100.0		P
Lead	1.50	U	7.50	U			P
Nickel	1.10	U	5.50	U			P
Selenium	3.40	U	17.00	U			P
Silver	1.40	U	7.00	U			P



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*Final*

*Second Quarter 2001 Monitoring Report  
20,000-Pound Open Detonation Unit*

*Holloman Air Force Base,  
New Mexico*

*April 2002*

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*49 CES/CEV  
Holloman Air Force Base,  
New Mexico*

**FINAL  
SECOND QUARTER 2001 MONITORING REPORT  
20,000-POUND OPEN DETONATION UNIT**

Prepared for:

Holloman Air Force Base  
49 CES/CEV  
550 Tabosa Avenue  
Holloman AFB, New Mexico 88330

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U.S. Army Corps of Engineers  
Omaha District  
Omaha, Nebraska

April 2002

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## LIST OF ACRONYMS

AFB	Air Force Base
DQO	data quality objective
EOD	explosive ordnance disposal
EPA	United States Environmental Protection Agency
HMX	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
mg/kg	milligrams per kilogram
NCP	National Contingency Plan
OD	open detonation
QA	quality assurance
QC	quality control
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
USAF	United States Air Force
UTL	upper tolerance limit
Work Plan	Final Work Plan Addendum

## 1.0 INTRODUCTION

During the second quarter of 2001, Holloman Air Force Base (AFB) performed the 12<sup>th</sup> quarterly sampling event at the 20,000-Pound Open Detonation (OD) Unit in accordance with Attachment J of the operating permit Sampling and Analysis Plan (USAF, 1996). Twelve locations were sampled for metals and explosive compounds and the analytical results were compared to the decision criteria outlined on page 33 of Attachment J of the operating permit. None of the sample results exceeded the decision criteria, and therefore, no changes to operations at the 20,000-Pound OD Unit are recommended. The following report summarizes the field operations, analytical results, potential risk, and conclusions from the 12<sup>th</sup> quarterly sampling event.

## 2.0 FIELD OPERATIONS

The second quarter 2001 detonation and sampling events occurred on April 20, 2001. A total of 12 soil samples were collected from 3 different strata within the boundaries of the 20,000-Pound OD Unit. Samples, including quality assurance/quality control (QA/QC) samples, were obtained following the procedures outlined in the Final Work Plan Addendum for the 20,000-Pound Open Detonation Unit (Work Plan) (Foster Wheeler, 1999). Samples were analyzed for metals and explosive compounds as specified in the Work Plan.

During the field operations, the dimensions of each stratum were measured and recorded, and a grid developed based on these measurements. Random sampling locations were determined following the guidelines established in the Work Plan. Sample locations are listed in Table 2-1.

Samples were labeled according to the following number sequence: OD-SO-s-x, where

OD = open detonation

SO = soil

s = stratum (A, B, or C)

x = sequential sample number within each stratum (01, 02, 03, 04)

**Table 2-1. Second Quarter 2001 Sample Locations**

<b>Stratum: A</b> <b>Number of Samples: 4</b> <b>Number of Potential</b> <b>Sampling Locations (n): 16</b> <b>Scale Factor (n-1): 15</b>			
Sample Number	Random Number	Scaled Random Number	Grid-to-Node Sample
1	0.586	8.8	A9
2	0.252	3.8	A4
3	0.785	11.8	A12
4	0.733	11.0	A11

<b>Stratum: B</b> <b>Number of Samples: 4</b> <b>Number of Potential</b> <b>Sampling Locations (n): 20</b> <b>Scale Factor (n-1): 19</b>			
Sample Number	Random Number	Scaled Random Number	Grid-to-Node Sample
1	0.063	1.2	B1
2	0.135	2.6	B3
3	0.603	11.5	B12
4	0.203	3.8	B4

<b>Stratum: C</b> <b>Number of Samples: 4</b> <b>Number of Potential</b> <b>Sampling Locations (n): 24</b> <b>Scale Factor (n-1): 23</b>			
Sample Number	Random Number	Scaled Random Number	Grid-to-Node Sample
1	0.939	21.6	C22
2	0.225	5.2	C5
3	0.386	8.9	C9
4	0.825	19.0	C19

The area sampled was based on wind data recorded at the time of the February 7 (2 events), February 8, March 7, March 23, and April 20, 2001 detonations. The assumption was made that any small particles from the detonation events would settle downwind of the detonation location. Figure 2-1 illustrates the strata layout and the sample locations associated with the April 20, 2001 sampling event. The wind data are presented below:

- February 7, 2001 (12:00 P.M.)—wind direction 220 degrees/wind speed 19 knots
- February 7, 2001 (2:30 P.M.)—wind direction 220 degrees/wind speed 13 knots
- February 8, 2001—wind direction 270 degrees/wind speed 23 knots
- March 7, 2001—wind direction 150 degrees/wind speed 14 knots
- March 23, 2001—wind direction 290 degrees/wind speed 10 knots
- April 20, 2001—wind direction 160 degrees/wind speed 17 knots

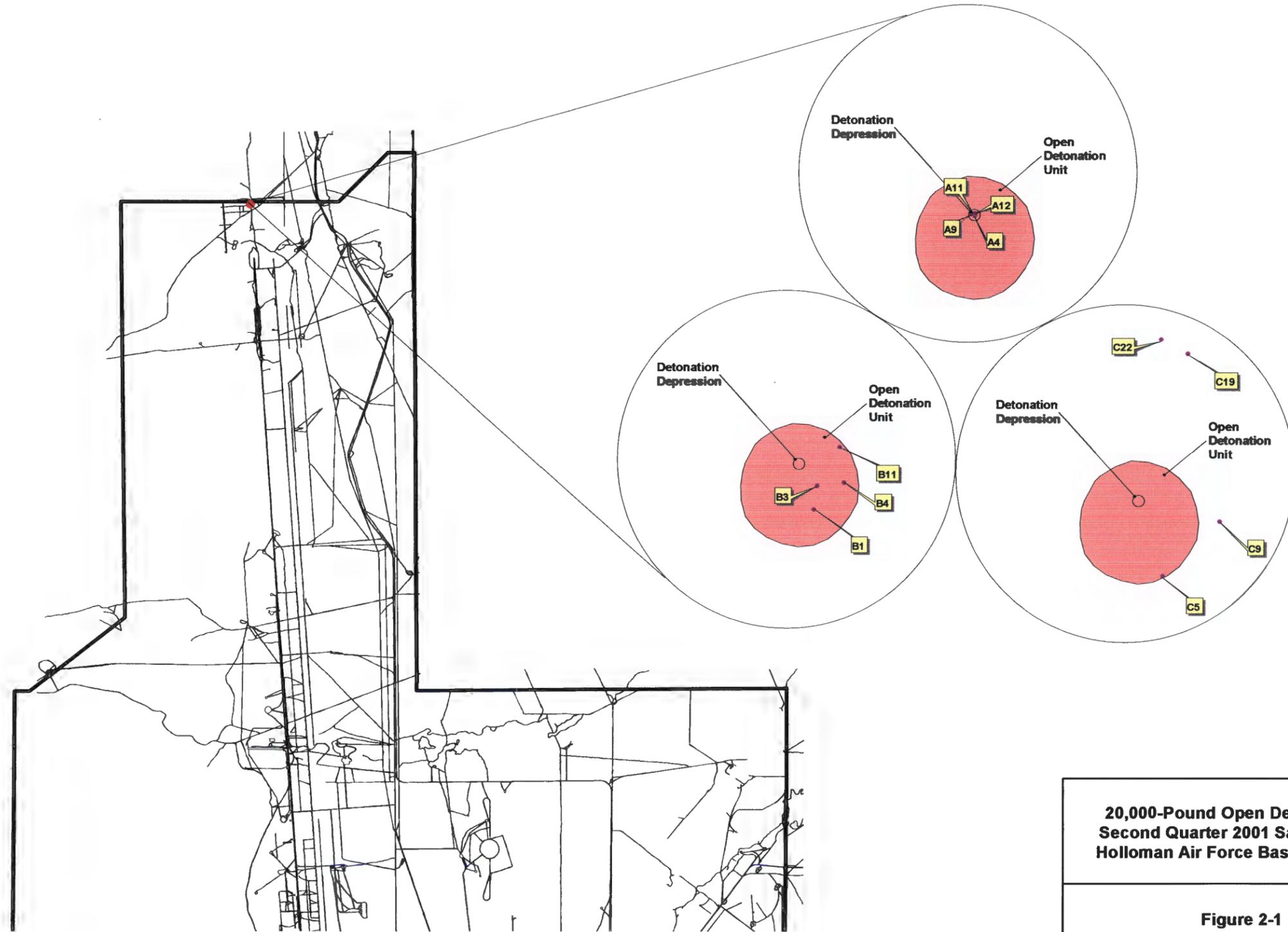
### 3.0 ANALYTICAL RESULTS

This section presents an evaluation of the QA/QC data associated with the analytical results for the second quarter 2001 monitoring event. Analytical methods for chemical analysis were taken from the latest revision of United States Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste, SW-846, Third Edition and Updates (EPA, 1986).

#### 3.1 QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

The QC data were reviewed to determine usability and achievement of project data quality objectives (DQOs). The review focused on laboratory method blanks, matrix and control sample spikes, surrogate recoveries, and holding times. Overall, QC data associated with this sampling event indicate that project measurement data are reliable and fulfill project DQOs.

The explosives data (EPA SW-846 Methods 8330 and 8332) for this monitoring event are reported to the method detection limit. A “J” qualifier signifying an estimated concentration was assigned to concentrations reported below the sample-specific detection limit and above the method detection limit. Explosive compounds that were not detected are reported with a “U” qualifier accompanying the sample detection limit.



**LEGEND**

• **Sample Locations**

■ **Open Detonation Unit**

— **Roads**

— **Boundary**



**20,000-Pound Open Detonation Unit  
Second Quarter 2001 Sampling Event  
Holloman Air Force Base, New Mexico**

**Figure 2-1  
Sample Locations**



**Foster Wheeler Environmental Corporation**

The reported metals results are uncensored; all instrument response measurements are reported as measured concentrations. A "B" qualifier was assigned to reported concentrations that were less than the sample detection limit and indicates that there is less confidence associated with the reported concentration (i.e., estimated quantitation). Metals that were not detected are reported with a "U" qualifier accompanying the sample detection limit.

### 3.2 RESULTS SUMMARY

Soil samples were collected and analyzed for the parameters specified in the operating permit and outlined in Table 3-1. Complete analytical results and the associated chain-of-custody record for the second quarter monitoring event are provided in Appendix A. This section summarizes the analytical results and provides a comparison of the sample results with the site-specific background values.

#### 3.2.1 Explosives Results

Explosive compounds detected for this monitoring event were reported above and below the sample-specific detection limit. Compounds reported below the detection limit were assigned a "J" qualifier. The following explosive compounds were detected:

- Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) in one sample within Stratum C (sample OD-SO-A-04)
- Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) in one sample above the sample detection limit (sample OD-SO-C-04), and in one sample below the sample detection limit (OD-SO-C-03)

Because no site-specific background upper tolerance limits (UTLs) exist for explosives at this site (Radian, 1997), the detected compounds were carried forward to the risk evaluation phase. The maximum detected concentrations of explosive compounds for the second quarter 2001 monitoring event are presented in Table 3-2. The risk evaluation is described in Section 4.0 of this report.

**Table 3-1. Analytical Methods and Parameters**

<b>EPA SW-846 Method 6010B (Metals)</b>
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium (total)
Copper
Lead
Nickel
Selenium
Silver
<b>EPA SW-846 Method 7471A</b>
Mercury
<b>EPA SW-846 Method 8330 (Explosives)</b>
2-Amino-4,6-dinitrotoluene
4-Amino-2,6-dinitrotoluene
1,3,5-Trinitrobenzene
1,3-Dinitrobenzene
2,4,6-Trinitrotoluene
2,4-Dinitrotoluene
2,6-Dinitrotoluene
2-Nitrotoluene
3-Nitrotoluene
4-Nitrotoluene
HMX
Nitrobenzene
RDX
Tetryl
PETN
<b>EPA SW-846 Method 8332 (Nitroamine Explosives)</b>
Nitroglycerin

**Notes:**

EPA	United States Environmental Protection Agency
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
PETN	pentaerythritol tetranitrate
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
Tetryl	methyl-2,4,6-trinitrophenylnitramine

**Table 3-2. Maximum Detected Concentrations, Frequency of Detections, and UTLs for Explosives and Metals**

Constituent	Maximum Detected Concentration	Frequency of Detections	Site-Specific Background UTLs <sup>1</sup>
<b>Metals</b>	<b>mg/kg</b>		<b>mg/kg</b>
Antimony	3.6 B	1/12	7.3
Arsenic	2.63 B	3/12	37
Barium	75.5	12/12	84
Beryllium	0.28 B	2/12	0.4
Cadmium	0.83	5/12	1.0
Chromium	9.79	12/12	6.6
Copper	14.3	12/12	4.8
Lead <sup>2</sup>	11.1	12/12	na
Nickel	6.9	12/12	5.6
Selenium	0.90 B	4/12	10.5
Silver	1.19	1/12	0.7
<b>Explosives</b>	<b>µg/kg</b>		<b>µg/kg</b>
HMX	5,970	1/12	NA
RDX	20,600	2/12	NA

**Notes:**

- <sup>1</sup> UTLs are taken from 20,000-Pound Open Detonation Unit Background Study and Quarterly Monitoring Work Plan, Part II—Background Study (Radian, 1997).
  - <sup>2</sup> A discussion of the lead screening level is included in the text
  - B Estimated concentration reported below the sample detection limit
  - µg/kg micrograms per kilogram
  - mg/kg milligrams per kilogram
  - na Background value not available in Background Study (Radian, 1997)
  - NA Background values not applicable to organic constituents
- Bolded values indicate exceedance of the Site-Specific Background UTLs

3.2.2 Metals Results

Metals detected for this monitoring event were reported above the sample-specific detection limit (no laboratory qualifier) and below the sample-specific detection limit, but above the method detection limit (“B” qualifier). Metals that were not detected were reported at the sample detection limit accompanied by a “U” qualifier, signifying a nondetect value. The following metals were detected:

- Antimony in one sample below the sample detection limit (sample OD-SO-A-03)
- Arsenic in three samples below the sample detection limit (samples OD-SO-A-03, OD-SO-C-02, OD-SO-C-03)
- Barium and chromium in all samples above the sample detection limit (all sample IDs)

- Cadmium in one sample above the sample detection limit and in five samples below the sample detection limit (samples OD-SO-A-03, OD-SO-C-01, -02, -03, -04)
- Copper in nine samples above the sample detection limit and in three samples below the sample detection limit (all sample IDs)
- Lead in four samples above the sample detection limit and in eight samples below the sample detection limit (all sample IDs)
- Nickel in six samples above the sample detection limit and in six samples below the sample detection limit (all sample IDs)
- Selenium in four samples below the sample detection limit (samples OD-SO-B-03, OD-SO-C-01, -02, -04)
- Silver in one sample above the sample detection limit (OD-SO-A-03)

The metals analytical results were compared to the site-specific background UTLs listed in Table 3-2. The maximum detected concentrations for chromium, copper, nickel, and silver exceeded the UTLs. Since no UTL or toxicity values exist for lead, lead detections were compared to the EPA Region 6 Human Health Medium-Specific Screening Levels (EPA, 2000 [November]). The maximum detected concentrations for the second quarter 2001 monitoring event are presented in Table 3-2.

#### 4.0 EVALUATION OF POTENTIAL RISK

Inorganic constituents that exceeded background UTLs and all detected organic constituents were evaluated to determine if the levels present at the site pose a potential risk to human health. This section describes the methodology that was used for this evaluation, as well as the results of the noncarcinogenic and carcinogenic risk evaluations.

##### 4.1 METHODOLOGY

The 20,000-Pound OD Unit is located in an isolated area of Holloman AFB. Access to the area is restricted to authorized explosive ordnance disposal (EOD) personnel working at the site during a detonation, and unauthorized entry is prevented by security fences and continuous surveillance in addition to warning signs. The evaluation of potential risk was based on the amount of soil ingested by the EOD personnel in a realistic, but conservative, exposure scenario. This exposure scenario considered the frequency of detonations, the amount of time spent at the 20,000-Pound OD Unit for each detonation, and the length of time personnel would be assigned to this duty.

It was assumed that a maximum of 20 detonations would be conducted in 1 year. This is a conservative estimate because the actual number of detonations is approximately 15 per year. It was also assumed that EOD personnel are at the 20,000-Pound OD Unit for 2 days during each detonation. Typically, the site is inspected on the day after detonation, and so personnel are at the site 2 days for each detonation. Thus, 40 days per year was used as the exposure frequency in the risk assessment calculations. This estimate of exposure is still a very conservative assumption because the personnel are there for only a portion of each day before and after detonation. It was therefore assumed that only half of the soil that is incidentally ingested during those 40 days is obtained at the site. Finally, the exposure scenario assumed that the same personnel attend every detonation for 5 years. Since only military personnel staff the EOD office, 5 years is a conservative estimate because military personnel are frequently reassigned to different units or duties. The exposure scenario is further defined in the Risk Evaluation Calculation Sheet in Appendix B.

The maximum detected concentrations of antimony, arsenic, barium, beryllium, cadmium, and selenium did not exceed the site-specific background UTLs, so these analytes were not carried forward to the risk evaluation phase (see Table 3-2). Chromium, copper, nickel, and silver exceeded the site-specific background UTLs; therefore, these metals were evaluated in the risk evaluation phase.

The maximum detection of lead, 11.1 milligrams per kilogram (mg/kg), was compared to the EPA Region 6 Human Health Medium-Specific Screening Level (EPA, 2000) value for the industrial worker exposure scenario (2,000 mg/kg), because no background UTL or toxicity values have been established. Because the maximum detection is considerably less than 2,000 mg/kg, no risk attributed to lead exposure is anticipated at this site.

HMX and RDX were the only organic constituents detected and were included in the risk evaluation.

The maximum detected concentrations for chromium, copper, nickel, silver, HMX, and RDX listed in Table 3-2 were used to calculate risk. It was conservatively assumed that personnel are

exposed to this maximum concentration throughout the length of the exposure scenario described above.

#### 4.2 RESULTS OF RISK EVALUATION

Table 4-1 presents the noncancer risk (i.e., hazard quotient) and cancer risk estimates for each of the constituents, as well as the cumulative hazard index (sum of the hazard quotients) and cancer risk. The National Contingency Plan (NCP) risk range goal is a hazard index of less than 1.0 and a cancer risk estimate less than  $1.0 \times 10^{-6}$  (Title 40 of the Code of Federal Regulations, Part 300). Below these levels, no significant adverse effects are anticipated. At the 20,000-Pound OD Unit, all of the hazard quotients are well below 1.0, and the hazard index is 0.0009 (see Table 4-1). The total cancer risk for the site of  $1 \times 10^{-8}$  is well below the NCP goal of  $1.0 \times 10^{-6}$ . The cancer risk is based solely on the cancer risk for RDX, which is the only constituent classified as an oral carcinogen or has carcinogenic toxicity data.

All constituents met the decision criteria specified in Attachment J of the operating permit. All inorganic constituents were either below site-specific background levels or the calculated site-specific risk estimates were well below the NCP goals. The calculated site-specific risk estimates for the two detected organic constituents (HMX and RDX) were also well below the NCP goals. The results of the site-specific risk estimates indicate that no adverse effects are anticipated from exposure during detonation events at the 20,000-Pound OD Unit.

#### 5.0 CONCLUSION

The results of comparing the second quarter 2001 monitoring data (12<sup>th</sup> quarterly event) with the decision criteria specified in Attachment J of the operating permit indicate that the treatment operations at the 20,000-Pound OD Unit are effective. A statistical analysis will be performed on the risk evaluation results from the first eight quarterly monitoring events to determine whether further quarterly monitoring at the 20,000-Pound OD Unit will be recommended.

**Table 4-1. Hazard Index and Cancer Risk**

Constituent	Non-carcinogenic Intake (mg/kg/day)	Carcinogenic Intake (mg/kg/day)	Oral RfD (mg/kg/day)	Oral RfD Source	Oral Slope Factor (mg/kg/day) <sup>1</sup>	Oral Slope Factor Source	Hazard Quotient <sup>1</sup>	Cancer Risk
<b>Metals</b>								
Chromium <sup>2</sup>	7.7E-07	5.5E-08	0.003	IRIS	na	na	0.00026	NC
Copper	1.1E-06	8.0E-08	0.037	HEAST in EPA R6	nap	nap	0.00003	NC
Nickel	5.4E-07	3.9E-08	0.02	IRIS	na	na	0.000027	NC
Silver	9.3E-08	6.7E-09	0.005	IRIS	nap	nap	0.000019	NC
<b>Explosives</b>								
HMX	4.7E-07	3.3E-08	0.05	IRIS	nap	na	0.0000093	NC
RDX	1.6E-06	1.2E-07	0.003	IRIS	0.11	IRIS	0.00054	1.3E-08
Total =							0.0009	1 E-08

**Notes:**

- <sup>1</sup> The sum of the hazard quotients is the hazard index.
- <sup>2</sup> The toxicity value for hexavalent chromium was conservatively used.

1.0E-03 The designation of 1.0E-03 is equivalent to  $1.0 \times 10^{-3}$  or 0.001.  
 EPA R6 EPA Region 6. Human Health Medium-Specific Screening Levels. Last updated November 15, 2000.  
 HEAST EPA Health Effects Assessment Summary Tables (EPA, 1997).  
 IRIS EPA Integrated Risk Information System. Online. October 17, 2001.  
 mg/kg/day milligrams per kilogram per day  
 na carcinogenic data not available  
 nap Not applicable, constituent is a Class "D" carcinogen (not known to be carcinogenic to humans).  
 NC Not calculated; constituent is non-carcinogenic or no carcinogenic toxicity data exists.  
 RfD reference dose

## 6.0 REFERENCES

EPA (United States Environmental Protection Agency)

1986 SW-846, Test Methods for Evaluating Solid Waste, Third Edition and Updates.

1997 Health Effects Assessment Summary Tables.

2000 (November). Region 6. Human Health Medium-Specific Screening Levels.

2001 (July). Integrated Risk Information System. On-line.

Foster Wheeler (Foster Wheeler Environmental Corporation)

1999 (January). Final Work Plan Addendum for the 20,000-Pound Open Detonation Unit, Holloman Air Force Base, New Mexico.

Radian (Radian Corporation)

1997 (December). 20,000-Pound Open Detonation Unit Background Study and Quarterly Monitoring Work Plan. Part II—Background Study, Holloman Air Force Base, New Mexico.

USAF (United States Air Force)

1996. Holloman Air Force Base Open Detonation Treatment Unit Permit Attachment J, Sampling and Analysis Plan.

**APPENDIX A**  
**Analytical Results**

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>
OD-SO-A-01	4/20/2001	CLP_SOLIDS	Percent Solids		85.2	%	
		SW6010B	Antimony	U	4.65	mg/kg	
			Arsenic	U	4.65	mg/kg	
			Barium		29.9	mg/kg	
			Beryllium	U	0.465	mg/kg	
			Cadmium	U	0.697	mg/kg	
			Chromium		2.47	mg/kg	
			Copper		2.47	mg/kg	
			Lead	B	1.26	mg/kg	
			Nickel	B	1.49	mg/kg	
			Selenium	U	4.65	mg/kg	
			Silver	U	0.697	mg/kg	
		SW7471A	Mercury	U	0.036	mg/kg	
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
			1,3-Dinitrobenzene	U	100	ug/kg	
			2,4,6-Trinitrotoluene	U	100	ug/kg	
			2,4-Dinitrotoluene	U	100	ug/kg	
			2,6-Dinitrotoluene	U	100	ug/kg	
			HMX	U	200	ug/kg	
			m-Nitrotoluene	U	200	ug/kg	
			Nitrobenzene	U	100	ug/kg	
			o-Nitrotoluene	U	200	ug/kg	
			p-Nitrotoluene	U	200	ug/kg	
			Pentaerythritol Tetranitrate	U	500	ug/kg	
			RDX	U	200	ug/kg	
			Tetryl	U	200	ug/kg	
		SW8332	Nitroglycerine	U	5730	ug/kg	
OD-SO-A-02		CLP_SOLIDS	Percent Solids		87.2	%	
		SW6010B	Antimony	U	4.59	mg/kg	
			Arsenic	U	4.59	mg/kg	
			Barium		28.8	mg/kg	
			Beryllium	U	0.459	mg/kg	

EPA Qualifier J = estimated detect based on QC criteria

Page 1 of 11

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-A-02	4/20/2001	SW6010B	Cadmium	U	0.688	mg/kg		
			Chromium		2.32	mg/kg		
			Copper		2.35	mg/kg		
			Lead	B	1.35	mg/kg		
			Nickel	B	1.36	mg/kg		
			Selenium	U	4.59	mg/kg		
			Silver	U	0.688	mg/kg		
		SW7471A	Mercury	U	0.036	mg/kg		
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg		
			1,3-Dinitrobenzene	U	100	ug/kg		
			2,4,6-Trinitrotoluene	U	100	ug/kg		
			2,4-Dinitrotoluene	U	100	ug/kg		
			2,6-Dinitrotoluene	U	100	ug/kg		
			HMX	U	200	ug/kg		
			m-Nitrotoluene	U	200	ug/kg		
			Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		
			p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
			Tetryl	U	200	ug/kg		
			SW8332	Nitroglycerine	U	5730	ug/kg	
			OD-SO-A-03		CLP_SOLIDS	Percent Solids		84
SW6010B	Antimony				B	3.6	mg/kg	
	Arsenic	B			2.63	mg/kg		
	Barium				25.7	mg/kg		
	Beryllium	U			0.467	mg/kg		
	Cadmium	B			0.341	mg/kg		
	Chromium				2.94	mg/kg		
	Copper				3.87	mg/kg		
	Lead	B			1.21	mg/kg		
	Nickel				2.84	mg/kg		

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>			
OD-SO-A-03	4/20/2001	SW6010B	Selenium	U	4.67	mg/kg				
			Silver		1.19	mg/kg				
		SW7471A	Mercury	U	0.036	mg/kg				
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg				
			1,3-Dinitrobenzene	U	100	ug/kg				
			2,4,6-Trinitrotoluene	U	100	ug/kg				
			2,4-Dinitrotoluene	U	100	ug/kg				
			2,6-Dinitrotoluene	U	100	ug/kg				
			HMX	U	200	ug/kg				
			m-Nitrotoluene	U	200	ug/kg				
			Nitrobenzene	U	100	ug/kg				
			o-Nitrotoluene	U	200	ug/kg				
			p-Nitrotoluene	U	200	ug/kg				
			Pentaerythritol Tetranitrate	U	500	ug/kg				
			RDX	U	200	ug/kg				
			Tetryl	U	200	ug/kg				
			SW8332	Nitroglycerine	U	5950	ug/kg			
			OD-SO-A-04		CLP_SOLIDS	Percent Solids		83.9	%	
					SW6010B	Antimony	U	4.72	mg/kg	
Arsenic	U					4.72	mg/kg			
Barium		24.6				mg/kg				
Beryllium	U	0.472				mg/kg				
Cadmium	U	0.708				mg/kg				
Chromium		2.06				mg/kg				
Copper	B	2.29				mg/kg				
Lead	B	1				mg/kg				
Nickel	B	1.18				mg/kg				
Selenium	U	4.72				mg/kg				
Silver	U	0.708				mg/kg				
SW7471A	Mercury	U				0.039	mg/kg			
SW8330	1,3,5-Trinitrobenzene	U				100	ug/kg			
	1,3-Dinitrobenzene	U				100	ug/kg			

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-A-04	4/20/2001	SW8330	2,4,6-Trinitrotoluene	U	100	ug/kg		
			2,4-Dinitrotoluene	U	100	ug/kg		
			2,6-Dinitrotoluene	U	100	ug/kg		
			HMX	U	200	ug/kg		
			m-Nitrotoluene	U	200	ug/kg		
			Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		
			p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
			Tetryl	U	200	ug/kg		
			SW8332	Nitroglycerine	U	5960	ug/kg	
			OD-SO-B-01		CLP_SOLIDS	Percent Solids		79.1
SW6010B	Antimony	U			4.96	mg/kg		
	Arsenic	U			4.96	mg/kg		
	Barium				29.4	mg/kg		
	Beryllium	U			0.495	mg/kg		
	Cadmium	U			0.743	mg/kg		
	Chromium				2.07	mg/kg		
	Copper				2.7	mg/kg		
	Lead	B			1.17	mg/kg		
	Nickel	B			1.34	mg/kg		
	Selenium	U			4.96	mg/kg		
	Silver	U			0.743	mg/kg		
	SW7471A	Mercury			U	0.041	mg/kg	
	SW8330	1,3,5-Trinitrobenzene			U	100	ug/kg	
		1,3-Dinitrobenzene			U	100	ug/kg	
		2,4,6-Trinitrotoluene			U	100	ug/kg	
		2,4-Dinitrotoluene			U	100	ug/kg	
2,6-Dinitrotoluene		U	100	ug/kg				
HMX	U	200	ug/kg					
m-Nitrotoluene	U	200	ug/kg					

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>
OD-SO-B-01	4/20/2001	SW8330	Nitrobenzene	U	100	ug/kg	
			o-Nitrotoluene	U	200	ug/kg	
			p-Nitrotoluene	U	200	ug/kg	
			Pentaerythritol Tetranitrate	U	500	ug/kg	
			RDX	U	200	ug/kg	
			Tetryl	U	200	ug/kg	
			SW8332	Nitroglycerine	U	6320	ug/kg
OD-SO-B-02		CLP_SOLIDS	Percent Solids		83.8	%	
		SW6010B	Antimony	U	4.68	mg/kg	
			Arsenic	U	4.68	mg/kg	
			Barium		26.9	mg/kg	
			Beryllium	U	0.468	mg/kg	
			Cadmium	U	0.702	mg/kg	
			Chromium		2.29	mg/kg	
			Copper	B	2.09	mg/kg	
			Lead	B	1.11	mg/kg	
			Nickel	B	1.3	mg/kg	
			Selenium	U	4.68	mg/kg	
			Silver	U	0.702	mg/kg	
			SW7471A	Mercury	U	0.034	mg/kg
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
			1,3-Dinitrobenzene	U	100	ug/kg	
			2,4,6-Trinitrotoluene	U	100	ug/kg	
			2,4-Dinitrotoluene	U	100	ug/kg	
			2,6-Dinitrotoluene	U	100	ug/kg	
			HMX	U	200	ug/kg	
			m-Nitrotoluene	U	200	ug/kg	
			Nitrobenzene	U	100	ug/kg	
			o-Nitrotoluene	U	200	ug/kg	
			p-Nitrotoluene	U	200	ug/kg	
Pentaerythritol Tetranitrate	U		500	ug/kg			
RDX	U	200	ug/kg				

EPA Qualifier J = estimated detect based on QC criteria

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>
OD-SO-B-02	4/20/2001	SW8330	Tetryl	U	200	ug/kg	
		SW8332	Nitroglycerine	U	5970	ug/kg	
OD-SO-B-03		CLP_SOLIDS	Percent Solids		78.1	%	
		SW6010B	Antimony	U	5.02	mg/kg	
			Arsenic	U	5.02	mg/kg	
			Barium		50.9	mg/kg	
			Beryllium	U	0.502	mg/kg	
			Cadmium	U	0.754	mg/kg	
			Chromium		5.49	mg/kg	
			Copper		4.77	mg/kg	
			Lead	B	2.5	mg/kg	
			Nickel		3.74	mg/kg	
			Selenium	B	0.737	mg/kg	
			Silver	U	0.754	mg/kg	
		SW7471A	Mercury	U	0.041	mg/kg	
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
			1,3-Dinitrobenzene	U	100	ug/kg	
			2,4,6-Trinitrotoluene	U	100	ug/kg	
			2,4-Dinitrotoluene	U	100	ug/kg	
			2,6-Dinitrotoluene	U	100	ug/kg	
			HMX	U	200	ug/kg	
			m-Nitrotoluene	U	200	ug/kg	
			Nitrobenzene	U	100	ug/kg	
			o-Nitrotoluene	U	200	ug/kg	
			p-Nitrotoluene	U	200	ug/kg	
			Pentaerythritol Tetranitrate	U	500	ug/kg	
			RDX	U	200	ug/kg	
			Tetryl	U	200	ug/kg	
		SW8332	Nitroglycerine	U	6410	ug/kg	
OD-SO-B-03D		CLP_SOLIDS	Percent Solids		77.7	%	
		SW6010B	Antimony	U	5.1	mg/kg	
			Arsenic	U	5.1	mg/kg	

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
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Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>		
OD-SO-B-03D	4/20/2001	SW6010B	Barium		48.3	mg/kg			
			Beryllium	U	0.51	mg/kg			
			Cadmium	U	0.764	mg/kg			
			Chromium		4.68	mg/kg			
			Copper		4.72	mg/kg			
			Lead	B	2.41	mg/kg			
			Nickel		3.41	mg/kg			
			Selenium	U	5.1	mg/kg			
			Silver	U	0.764	mg/kg			
			SW7471A	Mercury	U	0.041	mg/kg		
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg		
				1,3-Dinitrobenzene	U	100	ug/kg		
				2,4,6-Trinitrotoluene	U	100	ug/kg		
		2,4-Dinitrotoluene		U	100	ug/kg			
		2,6-Dinitrotoluene		U	100	ug/kg			
		HMX		U	200	ug/kg			
		m-Nitrotoluene		U	200	ug/kg			
		Nitrobenzene		U	100	ug/kg			
		o-Nitrotoluene		U	200	ug/kg			
		p-Nitrotoluene		U	200	ug/kg			
		Pentaerythritol Tetranitrate		U	500	ug/kg			
		RDX		U	200	ug/kg			
		Tetryl		U	200	ug/kg			
		SW8332		Nitroglycerine	U	6430	ug/kg		
		OD-SO-B-04		CLP_SOLIDS	Percent Solids		89.1	%	
				SW6010B	Antimony	U	4.45	mg/kg	
					Arsenic	U	4.45	mg/kg	
Barium					29.4	mg/kg			
Beryllium	U				0.445	mg/kg			
Cadmium	U				0.667	mg/kg			
Chromium					2.19	mg/kg			
Copper	B				1.91	mg/kg			

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>			
OD-SO-B-04	4/20/2001	SW6010B	Lead	B	1.1	mg/kg				
			Nickel	B	1.15	mg/kg				
			Selenium	U	4.45	mg/kg				
			Silver	U	0.667	mg/kg				
				SW7471A	Mercury	U	0.034	mg/kg		
				SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg		
			1,3-Dinitrobenzene		U	100	ug/kg			
			2,4,6-Trinitrotoluene		U	100	ug/kg			
			2,4-Dinitrotoluene		U	100	ug/kg			
			2,6-Dinitrotoluene		U	100	ug/kg			
			HMX		U	200	ug/kg			
			m-Nitrotoluene		U	200	ug/kg			
			Nitrobenzene		U	100	ug/kg			
			o-Nitrotoluene		U	200	ug/kg			
			p-Nitrotoluene		U	200	ug/kg			
			Pentaerythritol Tetranitrate		U	500	ug/kg			
			RDX		U	200	ug/kg			
			Tetryl		U	200	ug/kg			
					SW8332	Nitroglycerine	U	5610	ug/kg	
		OD-SO-C-01			CLP_SOLIDS	Percent Solids		85	%	
SW6010B	Antimony				U	4.7	mg/kg			
	Arsenic			U	4.7	mg/kg				
	Barium				41.4	mg/kg				
	Beryllium			U	0.47	mg/kg				
	Cadmium			B	0.203	mg/kg				
	Chromium				4.08	mg/kg				
	Copper				5.33	mg/kg				
	Lead				2.69	mg/kg				
	Nickel				2.92	mg/kg				
	Selenium			B	0.899	mg/kg				
	Silver			U	0.706	mg/kg				
				SW7471A	Mercury	U	0.038	mg/kg		

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>			
OD-SO-C-01	4/20/2001	SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg				
			1,3-Dinitrobenzene	U	100	ug/kg				
			2,4,6-Trinitrotoluene	U	100	ug/kg				
			2,4-Dinitrotoluene	U	100	ug/kg				
			2,6-Dinitrotoluene	U	100	ug/kg				
			HMX	U	200	ug/kg				
			m-Nitrotoluene	U	200	ug/kg				
			Nitrobenzene	U	100	ug/kg				
			o-Nitrotoluene	U	200	ug/kg				
			p-Nitrotoluene	U	200	ug/kg				
			Pentaerythritol Tetranitrate	U	500	ug/kg				
			RDX	U	200	ug/kg				
			Tetryl	U	200	ug/kg				
					SW8332	Nitroglycerine	U	5880	ug/kg	
OD-SO-C-02		CLP_SOLIDS	Percent Solids		87.2	%				
		SW6010B	Antimony	U	4.5	mg/kg				
			Arsenic	B	1.94	mg/kg				
			Barium		75.5	mg/kg				
			Beryllium	B	0.277	mg/kg				
			Cadmium	B	0.454	mg/kg				
			Chromium		9.79	mg/kg				
			Copper		14.3	mg/kg				
			Lead		11.1	mg/kg				
			Nickel		6.9	mg/kg				
			Selenium	B	0.54	mg/kg				
			Silver	U	0.674	mg/kg				
					SW7471A	Mercury	U	0.036	mg/kg	
					SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene		U	100	ug/kg		
				2,4,6-Trinitrotoluene		U	100	ug/kg		
				2,4-Dinitrotoluene		U	100	ug/kg		
	2,6-Dinitrotoluene	U	100	ug/kg						

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-C-02	4/20/2001	SW8330	HMX	U	200	ug/kg		
			m-Nitrotoluene	U	200	ug/kg		
			Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		
			p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
			Tetryl	U	200	ug/kg		
OD-SO-C-03		SW8332	Nitroglycerine	U	5730	ug/kg		
		CLP_SOLIDS	Percent Solids		83.4	%		
		SW6010B	Antimony	U	4.75	mg/kg		
			Arsenic	B	1.35	mg/kg		
			Barium		41.5	mg/kg		
			Beryllium	U	0.475	mg/kg		
			Cadmium	B	0.262	mg/kg		
			Chromium		3.52	mg/kg		
			Copper		5.3	mg/kg		
			Lead		2.46	mg/kg		
			Nickel		2.72	mg/kg		
			Selenium	U	4.75	mg/kg		
			Silver	U	0.712	mg/kg		
			SW7471A	Mercury	U	0.04	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
		2,4,6-Trinitrotoluene		U	100	ug/kg		
		2,4-Dinitrotoluene		U	100	ug/kg		
		2,6-Dinitrotoluene		U	100	ug/kg		
		HMX		U	200	ug/kg		
		m-Nitrotoluene		U	200	ug/kg		
		Nitrobenzene		U	100	ug/kg		
		o-Nitrotoluene		U	200	ug/kg		
		p-Nitrotoluene	U	200	ug/kg			

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-C-03	4/20/2001	SW8330	Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	J	179	ug/kg		
			Tetryl	U	200	ug/kg		
OD-SO-C-04	4/20/2001	SW8332	Nitroglycerine	U	6000	ug/kg		
		CLP_SOLIDS	Percent Solids		87.4	%		
		SW6010B	Antimony	U	4.53	mg/kg		
			Arsenic	U	4.53	mg/kg		
			Barium		59.8	mg/kg		
			Beryllium	B	0.152	mg/kg		
			Cadmium		0.827	mg/kg		
			Chromium		7.42	mg/kg		
			Copper		13.7	mg/kg		
			Lead		8.37	mg/kg		
			Nickel		5.15	mg/kg		
			Selenium	B	0.594	mg/kg		
			Silver	U	0.68	mg/kg		
			SW7471A	Mercury	U	0.035	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
				2,6-Dinitrotoluene	U	100	ug/kg	
				HMX		5970	ug/kg	
				m-Nitrotoluene	U	200	ug/kg	
				Nitrobenzene	U	100	ug/kg	
				o-Nitrotoluene	U	200	ug/kg	
				p-Nitrotoluene	U	200	ug/kg	
				Pentaerythritol Tetranitrate	U	500	ug/kg	
				RDX		20600	ug/kg	
				Tetryl	U	200	ug/kg	
		SW8332	Nitroglycerine	U	5720	ug/kg		

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
Second Quarter 2001  
Equipment Blank Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	
OD-EB-01	4/20/2001	SW6010B	Antimony	U	20	ug/L	
			Arsenic	U	20	ug/L	
			Barium	B	2.61	ug/L	
			Beryllium	U	2	ug/L	
			Cadmium	U	3	ug/L	
			Chromium	U	5	ug/L	
			Copper	B	5.33	ug/L	
			Lead	B	1.77	ug/L	
			Nickel	U	10	ug/L	
			Selenium	U	20	ug/L	
			Silver	U	3	ug/L	
			SW7470A	Mercury	U	0.2	ug/L
		SW8330	1,3,5-Trinitrobenzene	U	0.26	ug/L	
			1,3-Dinitrobenzene	U	0.26	ug/L	
			2,4,6-Trinitrotoluene	U	0.26	ug/L	
			2,4-Dinitrotoluene	U	0.26	ug/L	
			2,6-Dinitrotoluene	U	0.26	ug/L	
			HMX	U	0.519	ug/L	
			m-Nitrotoluene	U	0.519	ug/L	
			Nitrobenzene	U	0.26	ug/L	
			o-Nitrotoluene	U	0.519	ug/L	
			p-Nitrotoluene	U	0.519	ug/L	
			Pentaerythritol Tetranitrate	U	1.3	ug/L	
			RDX	U	0.519	ug/L	
			Tetryl	U	0.519	ug/L	
			SW8332	Nitroglycerine	U	2000	ug/L



**APPENDIX B**

**Risk Evaluation Calculation Sheet**

## EOD Exposure Scenario

### Noncarcinogenic Risk:

$$Intake (mg / kg / d) = \frac{C \cdot EF \cdot ED \cdot \frac{IRS_a}{10^6} \cdot FC}{BW_a \cdot AT_n}$$

$$HQ = \frac{Intake}{RfD_o}$$

### Carcinogenic Risk:

$$Intake (mg / kg / d) = \frac{C \cdot EF \cdot ED \cdot \frac{IRS_a}{10^6} \cdot FC}{BW_a \cdot AT_c}$$

$$CR = Intake \cdot CSF_o$$

Exposure Variables	Value	Symbol
Conversion factor (mg/kg)	10 <sup>6</sup>	10 <sup>6</sup>
Body weight, adult (kg)	70	BW <sub>a</sub>
Constituent concentration in soil (mg/kg)	Constituent-specific	C
Cancer risk	Calculated	CR
Oral Slope factor [(mg/kg/d) <sup>-1</sup> ]	Constituent-specific	CSF <sub>o</sub>
Exposure duration, total (y)	5	ED
Exposure frequency (d/y)	40	EF
Fraction of soil ingested from contaminated area (unitless)	0.5	FC
Hazard quotient	Calculated	HQ
Ingestion rate of soil, adult (mg/d)	100	IRS <sub>a</sub>
Oral Reference dose (mg/kg/d)	Constituent-specific	RfD <sub>o</sub>
Averaging time carcinogens (d) (70 yrs × 365 days)	25550	AT <sub>c</sub>
Averaging time noncarcinogens (d) (5 yrs × 365 days)	1825	AT <sub>n</sub>

d = day

kg = kilograms

mg = milligrams

y = year



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Virginia*

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*Final*

*First Quarter 2001 Monitoring Report  
Quality Assurance/Quality Control  
20,000-Pound Open Detonation Unit*

*Holloman Air Force Base,  
New Mexico*

*April 2002*

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*49 CES/CEV  
Holloman Air Force Base,  
New Mexico*

**FINAL  
FIRST QUARTER 2001 MONITORING REPORT  
QUALITY ASSURANCE/QUALITY CONTROL RESULTS  
20,000-POUND OPEN DETONATION UNIT**

Prepared for:

Holloman Air Force Base  
49 CES/CEV  
550 Tabosa Avenue  
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Prepared by:

Foster Wheeler Environmental Corporation  
143 Union Boulevard, Suite 1010  
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Under Contract No. DACW45-94-D-0003

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U.S. Army Corps of Engineers  
Omaha District  
Omaha, Nebraska

April 2002

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### APPENDICES

- A Analytical Data
- B Quality Control Data

## LIST OF ACRONYMS

AFB	Air Force Base
DQO	data quality objective
EPA	United States Environmental Protection Agency
Foster Wheeler	Foster Wheeler Environmental Corporation
GPL	GPL Laboratories, LLLP
LCS	laboratory control sample
MDL	method detection limit
MRL	method reporting limit
MS/MSD	matrix spike/matrix spike duplicate
OD	Open Detonation
QA	quality assurance
QC	quality control
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RPD	relative percent difference
USAF	United States Air Force
$\mu\text{g}/\text{kg}$	micrograms per kilogram
$\mu\text{g}/\text{L}$	micrograms per liter

## EXECUTIVE SUMMARY

On January 5, 2001, the 11<sup>th</sup> quarterly sampling event was conducted at the Holloman Air Force Base (AFB) 20,000-Pound Open Detonation (OD) Unit in accordance with the Holloman AFB Open Detonation Treatment Unit Sampling and Analysis Plan, Permit Attachment J (USAF, 1996). Twelve soil samples and one field duplicate sample were collected from three different strata within the boundaries of the 20,000-Pound OD Unit and analyzed for metals and explosives by GPL Laboratories, LLLP (GPL), Gaithersburg, Maryland. Analytical methods for chemical analysis were taken from the latest revision of the United States Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste, SW-846, Third Edition and Updates (EPA, 1986). These methods included:

- Metals—EPA 6010B
- Mercury—EPA 7471A
- Explosives—EPA 8330
- Nitroamine explosives—EPA 8332

Analytical results for the metals and explosive analyses are reported below the method reporting limit (MRL) and above the method detection limit (MDL). Sample concentrations reported below the MRL are identified with a “B” (metals) or a “J” (explosives) in the “Flag” data element field in the quality control (QC) and analytical data presented in Appendices A and B.

The Foster Wheeler Environmental Corporation (Foster Wheeler) project chemist reviewed the field and laboratory QC data associated with the 13 soil samples (includes field duplicate) to determine the usability and defensibility of the 11<sup>th</sup> quarterly event analytical data. Review of the QC data indicated project measurement data were reliable and fulfilled project data quality objectives (DQOs). Sampling and analysis precision and accuracy for the 11<sup>th</sup> quarterly event analytical data were acceptable, and valid conclusions may be drawn from the field sample data.

## 1.0 SUMMARY OF QUALITY ASSURANCE DATA EVALUATION

The laboratory QC samples associated with the 20,000-Pound OD Unit sample analyses include method blanks, laboratory control samples (LCSs), matrix spike/matrix spike duplicate (MS/MSD) samples, and laboratory duplicate samples. The method blanks were used to assess potential contamination in the laboratory, and the other types of laboratory QC samples were used to measure the analytical method precision and accuracy. A field duplicate sample and equipment rinse blank sample were also collected and analyzed to evaluate the precision associated with the field sampling and laboratory analysis and assess potential cross-contamination of equipment during sampling. The results of the laboratory and field QC data analyses are presented in Section 1.0 of this report.

The data review procedures used for the 20,000-Pound OD Unit were performed in accordance with the Holloman AFB Final Work Plan Addendum for 20,000-Pound Open Detonation Unit (Foster Wheeler, 1999) and the EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (EPA, 1994a; 1994b). One hundred percent of the analytical data were reviewed for the following criteria:

- Completeness of data deliverables
- Extraction and analysis holding times
- Method blank data
- LCS recovery
- MS/MSD recovery
- System monitoring compounds
- Laboratory duplicate sample
- Field duplicate sample
- Equipment rinse blank sample
- Overall data assessment and usability

The results of the data validation procedure were documented and are maintained in the project files. A summary of these results is presented in Section 2.0 of this report.

Following the data validation procedure, the appropriate validation qualifiers were appended to the project analytical database in the "EPA Qualifier" data element field. The qualifiers that may be used for the 20,000-Pound OD Unit include J, UJ, R, and B:

J—Positive value is considered to be an estimate based on associated QC data.

UJ—Nondetect value is considered to be an estimate based on associated QC data.

R—Value is considered unreliable and is unusable based on associated QC data.

B—Value is associated with method or equipment blank contamination.

Based on the QC sample data, the appropriate data qualifiers were appended to the analytical data results for the 11<sup>th</sup> quarterly sampling event. The QC data indicated the control mechanisms were effective in ensuring measurement data reliability within the expected limits of sampling and analytical error.

### 1.1 DATA DELIVERABLES

Data completeness is evaluated through review of the hardcopy analytical data packages in comparison with the chain-of-custody record and the electronic data file. The deliverables are reviewed for completeness to ensure that all samples submitted to the laboratory for analysis have been reported and documented. From the quality assurance (QA) review of the hardcopy data packages and the electronic data file, all project analytical documentation was determined to be complete. A data deliverable completeness objective of 100 percent was achieved.

### 1.2 HOLDING TIMES

Representativeness of the data is determined through review of sample extraction and analysis holding times in conjunction with review of the blank data in accordance with the EPA analytical method holding time guidelines. All extraction and analysis were performed within the holding time guidelines for the 11<sup>th</sup> quarterly sampling event.

### 1.3 LABORATORY METHOD BLANK SAMPLES

Laboratory method blank samples were analyzed with each batch of field samples collected for each analytical method and evaluated as part of the validation process. No detections were reported above the MRL in the method blank samples for explosives and metals for the 11<sup>th</sup> quarterly sampling event. The representativeness of the data based on method blank data results

was 100 percent for data reported above and below the MRL. Method blank data are presented in Appendix B.

#### 1.4 LABORATORY CONTROL SAMPLES

The LCSs were analyzed with each batch of field samples for each analytical method. The LCS spike recoveries reported at concentrations above or below the method-specific control limits will result in qualification of those analytes in the associated field samples. The LCS data are used in conjunction with the MS/MSD recovery data and the system monitoring compound recoveries (explosives) to determine the accuracy of the analytical data. The LCS recoveries for all metals and explosives were within the method control limits. LCS spike recoveries indicate a high level of accuracy associated with the analytical data. LCS spike recoveries are presented in Appendix B.

#### 1.5 MATRIX SPIKE/MATRIX SPIKE DUPLICATE SAMPLES

Laboratory MS/MSD samples were analyzed at a frequency of one per batch of field samples for each analytical method. The MS/MSD sample recoveries were evaluated in conjunction with the other batch QC sample recoveries to determine the need for qualification of analytical data. The MS/MSD recoveries for metals and explosives were within the method-specific control limits indicating no matrix interference associated with the sample analyses. MS/MSD sample recoveries are presented in Appendix B.

#### 1.6 SYSTEM MONITORING COMPOUNDS

System monitoring compounds, also known as surrogate spike compounds, are used for the explosives analyses to monitor the performance of an individual sample during extraction and analysis. Surrogate spike recoveries were evaluated for explosives, EPA methods 8330 and 8332. Surrogate spike recoveries for both methods were within the method control limits.

#### 1.7 LABORATORY DUPLICATE SAMPLE RESULTS

One laboratory duplicate sample was analyzed for each of the metals methods to evaluate analytical method precision. The relative percent difference (RPD) between the duplicate and the primary sample was calculated and compared to the laboratory-established method control criteria (20 percent). Based on the results of the laboratory duplicate sample, the RPDs for metals were within the 20 percent RPD criteria with the exception of cadmium (116.5 percent).

Sample detections for cadmium were J-qualified, signifying estimated data. The laboratory duplicate sample data indicated a high level of precision associated with the sample analyses.

#### 1.8 FIELD DUPLICATE SAMPLE RESULTS

One field duplicate sample (OD-SO-A-02) was collected for the 11<sup>th</sup> quarterly sampling event and analyzed for metals and explosives. All metals detections above the MRL were within the 50 percent RPD criteria with the exception of nickel. One explosive compound, hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), was detected in field sample OD-SO-A-02 at a concentration of 260 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ), but was not detected in the duplicate sample. The field duplicate sample data indicate an acceptable level of precision is associated with the field sampling and laboratory analyses. Field duplicate sample results and field sample data are presented in Appendix A.

#### 1.9 EQUIPMENT RINSE BLANK RESULTS

Equipment rinse blank samples are collected to assess cross-contamination of equipment during sampling activities. One equipment rinse blank sample was collected for the 11<sup>th</sup> quarterly sampling event and analyzed for metals only. The sample could not be analyzed for explosives because GPL inadvertently preserved the sample with nitric acid. Detections of copper, barium, and mercury were reported above the MRL at 16.7, 6.74, and 1.3 micrograms per liter ( $\mu\text{g}/\text{L}$ ), respectively. Detections of chromium (3.98  $\mu\text{g}/\text{L}$ ), lead (2.39  $\mu\text{g}/\text{L}$ ), nickel (3.01  $\mu\text{g}/\text{L}$ ), and silver (1.89  $\mu\text{g}/\text{L}$ ) were reported below the MRL. These low-level detections did not result in qualification of sample data, and mercury was not detected in any of the field samples. Equipment rinse blank data indicate cross-contamination of sampling equipment did not occur during sampling activities. Equipment rinse blank data are presented in Appendix A.

## 2.0 DATA ASSESSMENT AND USABILITY

As a result of the data validation procedure, it was determined that 3 percent of the analytical data for the 11<sup>th</sup> quarterly sampling event were qualified as estimated; however, these data are still usable to achieve the project DQOs. The percent of J-qualified data is based on the number of estimated analytical values (9) compared to the total number of analytical field sample data values (312) for the event. Analytical data were J-qualified based on the following validation criteria:

- Laboratory duplicate sample RPD above the 20 percent criteria—9 detects for cadmium

No sample results were B-qualified, signifying method or equipment blank contamination. Review of the QC data associated with the field sample data indicates all analytical data for the 20,000-Pound OD Unit 11<sup>th</sup> quarterly sampling event are valid and fulfill project DQOs. Based on the data validation procedure, 9 data results were J-qualified (estimated data) but are still usable to determine that operation of the 20,000-Pound OD Unit is not imposing environmental impact to soils above risk-based cleanup levels. A data completeness objective of 100 percent was achieved for the 11<sup>th</sup> quarterly sampling event.

### 3.0 REFERENCES

EPA (United States Environmental Protection Agency)

1986. SW-846, Test Methods for Evaluating Solid Waste, Third Edition and Updates.

1994a. Contract Laboratory Program National Functional Guidelines for Organic Data Review. EPA 540/R-94/012.

1994b. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. EPA 540/R-94/013.

Foster Wheeler (Foster Wheeler Environmental Corporation)

1999. Holloman Air Force Base Final Work Plan Addendum for 20,000-Pound Open Detonation Unit.

USAF (United States Air Force)

1996. Holloman Air Force Base Open Detonation Treatment Unit Permit Attachment J, Sampling and Analysis Plan.

## **APPENDIX A**

### **Analytical Data**

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-A-01	1/5/2001	CLP_SOLIDS	Percent Solids		79.6	%		
		SW6010B	Antimony	U	0.594	mg/kg		
			Arsenic	U	1.24	mg/kg		
			Barium		35.6	mg/kg		
			Beryllium	B	0.191	mg/kg		
			Cadmium		4.44	mg/kg	J	
			Chromium		3.49	mg/kg		
			Copper		4.64	mg/kg		
			Lead		2.17	mg/kg		
			Nickel		2.35	mg/kg		
			Selenium	U	1.24	mg/kg		
			Silver	U	0.746	mg/kg		
			SW7471A	Mercury	U	0.039	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	95.2	ug/kg	
				1,3-Dinitrobenzene	U	95.2	ug/kg	
		2,4,6-Trinitrotoluene		U	95.2	ug/kg		
		2,4-Dinitrotoluene		U	95.2	ug/kg		
		2,6-Dinitrotoluene		U	95.2	ug/kg		
		HMX		U	190	ug/kg		
		m-Nitrotoluene		U	190	ug/kg		
		Nitrobenzene		U	95.2	ug/kg		
		o-Nitrotoluene		U	190	ug/kg		
		p-Nitrotoluene		U	190	ug/kg		
		Pentaerythritol Tetranitrate		U	476	ug/kg		
		RDX			378	ug/kg		
		Tetryl		U	190	ug/kg		
		SW8332	Nitroglycerine	U	6280	ug/kg		
OD-SO-A-02		CLP_SOLIDS	Percent Solids		80	%		
		SW6010B	Antimony	U	0.594	mg/kg		
			Arsenic	U	1.24	mg/kg		
			Barium		36.4	mg/kg		
			Beryllium	B	0.184	mg/kg		

EPA Qualifier J = estimated detect based on QC criteria

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>
OD-SO-A-02	1/5/2001	SW6010B	Cadmium	B	0.379	mg/kg	J
			Chromium		3.83	mg/kg	
			Copper		4.76	mg/kg	
			Lead		2.09	mg/kg	
			Nickel		22.9	mg/kg	
			Selenium	U	1.24	mg/kg	
		SW7471A	Silver	U	0.743	mg/kg	
			Mercury	U	0.04	mg/kg	
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
			1,3-Dinitrobenzene	U	100	ug/kg	
			2,4,6-Trinitrotoluene	U	100	ug/kg	
			2,4-Dinitrotoluene	U	100	ug/kg	
			2,6-Dinitrotoluene	U	100	ug/kg	
			HMX	U	200	ug/kg	
			m-Nitrotoluene	U	200	ug/kg	
			Nitrobenzene	U	100	ug/kg	
			o-Nitrotoluene	U	200	ug/kg	
			p-Nitrotoluene	U	200	ug/kg	
			Pentaerythritol Tetranitrate	U	500	ug/kg	
			RDX		260	ug/kg	
			Tetryl	U	200	ug/kg	
			SW8332	Nitroglycerine	U	6250	
		OD-SO-A-02D		CLP_SOLIDS	Percent Solids		
SW6010B	Antimony			U	0.594	mg/kg	
	Arsenic			U	1.23	mg/kg	
	Barium				37.5	mg/kg	
	Beryllium			B	0.204	mg/kg	
	Cadmium			B	0.369	mg/kg	J
	Chromium				3.77	mg/kg	
	Copper				4.73	mg/kg	
	Lead				2.32	mg/kg	
	Nickel				2.32	mg/kg	

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>		
OD-SO-A-02D	1/5/2001	SW6010B	Selenium	U	1.23	mg/kg			
			Silver	U	0.74	mg/kg			
		SW7471A	Mercury	U	0.04	mg/kg			
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg		
		1,3-Dinitrobenzene		U	100	ug/kg			
		2,4,6-Trinitrotoluene		U	100	ug/kg			
		2,4-Dinitrotoluene		U	100	ug/kg			
		2,6-Dinitrotoluene		U	100	ug/kg			
		HMX		U	200	ug/kg			
		m-Nitrotoluene		U	200	ug/kg			
		Nitrobenzene		U	100	ug/kg			
		o-Nitrotoluene		U	200	ug/kg			
		p-Nitrotoluene		U	200	ug/kg			
		Pentaerythritol Tetranitrate	U	500	ug/kg				
		RDX	U	200	ug/kg				
		Tetryl	U	200	ug/kg				
		SW8332	Nitroglycerine	U	6230	ug/kg			
		OD-SO-A-03		CLP_SOLIDS	Percent Solids		79.5	%	
				SW6010B	Antimony	U	0.588	mg/kg	
					Arsenic	U	1.23	mg/kg	
Barium					37.7	mg/kg			
Beryllium	B				0.205	mg/kg			
Cadmium	B				0.33	mg/kg	J		
Chromium					3.74	mg/kg			
Copper					5.32	mg/kg			
Lead					2.86	mg/kg			
Nickel					2.64	mg/kg			
Selenium	U				1.23	mg/kg			
Silver	U			0.74	mg/kg				
SW7471A	Mercury			U	0.039	mg/kg			
SW8330	1,3,5-Trinitrobenzene	U	95.2	ug/kg					
	1,3-Dinitrobenzene	U	95.2	ug/kg					

EPA Qualifier J = estimated detect based on QC criteria

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-A-03	1/5/2001	SW8330	2,4,6-Trinitrotoluene	U	95.2	ug/kg		
			2,4-Dinitrotoluene	U	95.2	ug/kg		
			2,6-Dinitrotoluene	U	95.2	ug/kg		
			HMX	U	190	ug/kg		
			m-Nitrotoluene	U	190	ug/kg		
			Nitrobenzene	U	95.2	ug/kg		
			o-Nitrotoluene	U	190	ug/kg		
			p-Nitrotoluene	U	190	ug/kg		
			Pentaerythritol Tetranitrate	U	476	ug/kg		
			RDX		254	ug/kg		
			Tetryl	U	190	ug/kg		
		SW8332	Nitroglycerine	U	6290	ug/kg		
OD-SO-A-04		CLP_SOLIDS	Percent Solids		80	%		
		SW6010B	Antimony	U	0.594	mg/kg		
			Arsenic	U	1.24	mg/kg		
			Barium		33.3	mg/kg		
			Beryllium	B	0.164	mg/kg		
			Cadmium	B	0.589	mg/kg	J	
			Chromium		3.13	mg/kg		
			Copper		4.11	mg/kg		
			Lead		2.07	mg/kg		
			Nickel		2.27	mg/kg		
			Selenium	U	1.24	mg/kg		
			Silver	U	0.742	mg/kg		
			SW7471A	Mercury	U	0.039	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
	2,6-Dinitrotoluene	U		100	ug/kg			
		HMX	U	200	ug/kg			
		m-Nitrotoluene	U	200	ug/kg			

EPA Qualifier J = estimated detect based on QC criteria

Page 4 of 11

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-A-04	1/5/2001	SW8330	Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		
			p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX		356	ug/kg		
			Tetryl	U	200	ug/kg		
OD-SO-B-01	1/5/2001	SW8332	Nitroglycerine		37000	ug/kg		
		CLP_SOLIDS	Percent Solids		81.7	%		
		SW6010B	Antimony	U	0.594	mg/kg		
			Arsenic	U	1.21	mg/kg		
			Barium		34.3	mg/kg		
			Beryllium	B	0.178	mg/kg		
			Cadmium	B	0.269	mg/kg	J	
			Chromium		3.1	mg/kg		
			Copper		3	mg/kg		
			Lead		1.7	mg/kg		
			Nickel		1.98	mg/kg		
			Selenium	U	1.21	mg/kg		
			Silver	U	0.727	mg/kg		
			SW7471A	Mercury	U	0.037	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
				2,6-Dinitrotoluene	U	100	ug/kg	
				HMX	U	200	ug/kg	
				m-Nitrotoluene	U	200	ug/kg	
		Nitrobenzene		U	100	ug/kg		
		o-Nitrotoluene		U	200	ug/kg		
		p-Nitrotoluene		U	200	ug/kg		
		Pentaerythritol Tetranitrate	U	500	ug/kg			
		RDX	J	181	ug/kg			

EPA Qualifier J = estimated detect based on QC criteria

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-B-01	1/5/2001	SW8330	Tetryl	U	200	ug/kg		
		SW8332	Nitroglycerine	U	6120	ug/kg		
OD-SO-B-02	1/5/2001	CLP_SOLIDS	Percent Solids		79.3	%		
		SW6010B	Antimony	U	0.594	mg/kg		
			Arsenic	U	1.25	mg/kg		
			Barium		31.7	mg/kg		
			Beryllium	B	0.17	mg/kg		
			Cadmium	U	0.75	mg/kg		
			Chromium		2.88	mg/kg		
			Copper		2.64	mg/kg		
			Lead		1.09	mg/kg		
			Nickel		1.91	mg/kg		
			Selenium	U	1.25	mg/kg		
			Silver	U	0.75	mg/kg		
			SW7471A	Mercury	U	0.04	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	90.9	ug/kg	
				1,3-Dinitrobenzene	U	90.9	ug/kg	
				2,4,6-Trinitrotoluene	U	90.9	ug/kg	
				2,4-Dinitrotoluene	U	90.9	ug/kg	
				2,6-Dinitrotoluene	U	90.9	ug/kg	
				HMX	U	182	ug/kg	
				m-Nitrotoluene	U	182	ug/kg	
				Nitrobenzene	U	90.9	ug/kg	
				o-Nitrotoluene	U	182	ug/kg	
				p-Nitrotoluene	U	182	ug/kg	
				Pentaerythritol Tetranitrate	U	455	ug/kg	
				RDX	U	182	ug/kg	
				Tetryl	U	182	ug/kg	
				SW8332	Nitroglycerine	U	6150	ug/kg
OD-SO-B-03	1/5/2001	CLP_SOLIDS	Percent Solids		76.7	%		
		SW6010B	Antimony	U	0.594	mg/kg		
			Arsenic	U	1.29	mg/kg		

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>
OD-SO-B-03	1/5/2001	SW6010B	Barium		37.6	mg/kg	
			Beryllium	B	0.232	mg/kg	
			Cadmium	U	0.775	mg/kg	
			Chromium		3.82	mg/kg	
			Copper		3.02	mg/kg	
			Lead		1.88	mg/kg	
			Nickel		2.54	mg/kg	
			Selenium	U	1.29	mg/kg	
			Silver	U	0.775	mg/kg	
			SW7471A	Mercury	U	0.041	mg/kg
		SW8330	1,3,5-Trinitrobenzene	U	90.9	ug/kg	
			1,3-Dinitrobenzene	U	90.9	ug/kg	
			2,4,6-Trinitrotoluene	U	90.9	ug/kg	
			2,4-Dinitrotoluene	U	90.9	ug/kg	
			2,6-Dinitrotoluene	U	90.9	ug/kg	
			HMX	U	182	ug/kg	
			m-Nitrotoluene	U	182	ug/kg	
			Nitrobenzene	U	90.9	ug/kg	
			o-Nitrotoluene	U	182	ug/kg	
			p-Nitrotoluene	U	182	ug/kg	
			Pentaerythritol Tetranitrate	U	455	ug/kg	
			RDX	U	182	ug/kg	
			Tetryl	U	182	ug/kg	
SW8332	Nitroglycerine	U	6520	ug/kg			
OD-SO-B-04		CLP_SOLIDS	Percent Solids		80.6	%	
		SW6010B	Antimony	U	0.594	mg/kg	
			Arsenic	U	1.23	mg/kg	
			Barium		34.7	mg/kg	
			Beryllium	B	0.174	mg/kg	
			Cadmium	B	0.361	mg/kg	J
			Chromium		3.33	mg/kg	
			Copper		4.94	mg/kg	

EPA Qualifier J = estimated detect based on QC criteria

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-B-04	1/5/2001	SW6010B	Lead		2.12	mg/kg		
			Nickel		2.45	mg/kg		
			Selenium	U	1.23	mg/kg		
			Silver	U	0.737	mg/kg		
		SW7471A	Mercury	U	0.04	mg/kg		
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg		
		1,3-Dinitrobenzene	U	100	ug/kg			
		2,4,6-Trinitrotoluene	U	100	ug/kg			
		2,4-Dinitrotoluene	U	100	ug/kg			
		2,6-Dinitrotoluene	U	100	ug/kg			
		HMX	U	200	ug/kg			
		m-Nitrotoluene	U	200	ug/kg			
		Nitrobenzene	U	100	ug/kg			
		o-Nitrotoluene	U	200	ug/kg			
		p-Nitrotoluene	U	200	ug/kg			
		Pentaerythritol Tetranitrate	U	500	ug/kg			
		RDX		236	ug/kg			
		Tetryl	U	200	ug/kg			
		SW8332	Nitroglycerine	U	5910	ug/kg		
		OD-SO-C-01		CLP_SOLIDS	Percent Solids		81.3	%
SW6010B	Antimony			U	0.588	mg/kg		
	Arsenic				1.88	mg/kg		
	Barium				92.1	mg/kg		
	Beryllium				0.662	mg/kg		
	Cadmium			B	0.306	mg/kg	J	
	Chromium				11.6	mg/kg		
	Copper				9.9	mg/kg		
	Lead				6.66	mg/kg		
	Nickel				8.11	mg/kg		
	Selenium			U	1.21	mg/kg		
	Silver			U	0.724	mg/kg		
	SW7471A			Mercury	U	0.039	mg/kg	

EPA Qualifier J = estimated detect based on QC criteria

Page 8 of 11

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-C-01	1/5/2001	SW8330	1,3,5-Trinitrobenzene	U	95.2	ug/kg		
			1,3-Dinitrobenzene	U	95.2	ug/kg		
			2,4,6-Trinitrotoluene	U	95.2	ug/kg		
			2,4-Dinitrotoluene	U	95.2	ug/kg		
			2,6-Dinitrotoluene	U	95.2	ug/kg		
			HMX	U	190	ug/kg		
			m-Nitrotoluene	U	190	ug/kg		
			Nitrobenzene	U	95.2	ug/kg		
			o-Nitrotoluene	U	190	ug/kg		
			p-Nitrotoluene	U	190	ug/kg		
			Pentaerythritol Tetranitrate	U	476	ug/kg		
			RDX	U	190	ug/kg		
			Tetryl	U	190	ug/kg		
				SW8332	Nitroglycerine	U	6150	ug/kg
OD-SO-C-02		CLP_SOLIDS	Percent Solids		80.3	%		
		SW6010B	Antimony	U	0.6	mg/kg		
			Arsenic	U	1.25	mg/kg		
			Barium		58.9	mg/kg		
			Beryllium		0.269	mg/kg		
			Cadmium	B	0.188	mg/kg	J	
			Chromium		4.58	mg/kg		
			Copper		4.82	mg/kg		
			Lead		2.52	mg/kg		
			Nickel		3.16	mg/kg		
			Selenium	U	1.25	mg/kg		
			Silver	U	0.747	mg/kg		
			SW7471A	Mercury	U	0.039	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
1,3-Dinitrobenzene	U	100		ug/kg				
2,4,6-Trinitrotoluene	U	100		ug/kg				
2,4-Dinitrotoluene	U	100		ug/kg				
2,6-Dinitrotoluene	U	100		ug/kg				

EPA Qualifier J = estimated detect based on QC criteria

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>		
OD-SO-C-02	1/5/2001	SW8330	HMX	U	200	ug/kg			
			m-Nitrotoluene	U	200	ug/kg			
			Nitrobenzene	U	100	ug/kg			
			o-Nitrotoluene	U	200	ug/kg			
			p-Nitrotoluene	U	200	ug/kg			
			Pentaerythritol Tetranitrate	U	500	ug/kg			
			RDX	U	200	ug/kg			
			Tetryl	U	200	ug/kg			
					SW8332	Nitroglycerine	U	5790	ug/kg
OD-SO-C-03		CLP_SOLIDS	Percent Solids		77.9	%			
		SW6010B	Antimony	U	0.594	mg/kg			
			Arsenic	U	1.27	mg/kg			
			Barium		29.4	mg/kg			
			Beryllium	B	0.136	mg/kg			
			Cadmium	U	0.762	mg/kg			
			Chromium		2.16	mg/kg			
			Copper		2.25	mg/kg			
			Lead	B	0.679	mg/kg			
			Nickel		1.42	mg/kg			
			Selenium	U	1.27	mg/kg			
			Silver	U	0.762	mg/kg			
			SW7471A	Mercury	U	0.04	mg/kg		
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg		
				1,3-Dinitrobenzene	U	100	ug/kg		
				2,4,6-Trinitrotoluene	U	100	ug/kg		
				2,4-Dinitrotoluene	U	100	ug/kg		
				2,6-Dinitrotoluene	U	100	ug/kg		
				HMX	U	200	ug/kg		
				m-Nitrotoluene	U	200	ug/kg		
		Nitrobenzene	U	100	ug/kg				
		o-Nitrotoluene	U	200	ug/kg				
		p-Nitrotoluene	U	200	ug/kg				

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-C-03	1/5/2001	SW8330	Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
			Tetryl	U	200	ug/kg		
OD-SO-C-04	1/5/2001	SW8332	Nitroglycerine	U	6260	ug/kg		
		CLP_SOLIDS	Percent Solids		81.5	%		
		SW6010B	Antimony	B	0.647	mg/kg		
			Arsenic	U	1.18	mg/kg		
			Barium		49	mg/kg		
			Beryllium		0.287	mg/kg		
			Cadmium	B	0.175	mg/kg	J	
			Chromium		4.86	mg/kg		
			Copper		4.1	mg/kg		
			Lead		2.66	mg/kg		
			Nickel		3.26	mg/kg		
			Selenium	U	1.18	mg/kg		
			Silver	U	0.708	mg/kg		
			SW7471A	Mercury	U	0.039	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
				2,6-Dinitrotoluene	U	100	ug/kg	
				HMX	U	200	ug/kg	
				m-Nitrotoluene	U	200	ug/kg	
				Nitrobenzene	U	100	ug/kg	
				o-Nitrotoluene	U	200	ug/kg	
				p-Nitrotoluene	U	200	ug/kg	
				Pentaerythritol Tetranitrate	U	500	ug/kg	
				RDX	U	200	ug/kg	
				Tetryl	U	200	ug/kg	
		SW8332	Nitroglycerine	U	6130	ug/kg		

EPA Qualifier J = estimated detect based on QC criteria

EPA Qualifier UJ = estimated non-detect based on QC criteria

Holloman Air Force Base  
20,000-Pound Open Detonation Unit  
First Quarter 2001  
Equipment Blank Results

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<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>
OD-EB-01	1/5/2001	SW6010B	Antimony	U	6	ug/L
			Arsenic	U	5	ug/L
			Barium		6.74	ug/L
			Beryllium	U	1	ug/L
			Cadmium	U	3	ug/L
			Chromium	B	3.98	ug/L
			Copper		16.7	ug/L
			Lead	B	2.39	ug/L
			Nickel	B	3.01	ug/L
			Selenium	U	5	ug/L
			Silver	B	1.89	ug/L
		SW7470A	Mercury		1.3	ug/L

## **APPENDIX B**

### **Quality Control Data**

# Analytical Report For 101038

for

**Foster Wheeler Environmental Corp.**

**Project Manager: Pam Moss**

**Project Name : Holliman AFB 20000 lb**

**January 30, 2001**

***GPL***

***Laboratories***

*Darryl R. Hartman*  
Reviewed by,  
Project Manager

*Pam Moss*  
Approved by,  
Laboratory Director

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**TOTAL # OF PAGES : 90**

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**CASE NARRATIVE**

**CLIENT:** FOSTER WHEELER ENVIRONMENTAL CORP.  
**PROJECT/SITE:** HOLLOMAN AFB 20K BURN  
**WORK ORDER(S):** 101038  
**REVIEW DATE:** 01/30/2001

The Case Narrative, Chain of Custody, Sample Receipt Checklist, and the cover page of the Analytical Report, are integral parts of GPL Laboratories' report package. If you did not receive all of these documents, please contact GPL immediately.

**Sample Receipt**

Thirteen soils and one water were received on 01/06/2001. The samples were delivered by UPS. The samples were received intact. Sample receipt conditions and temperatures are documented on the Sample Receipt Checklist. The Metals sample for OD-EB-01 was received unpreserved and was preserved by the Lab. The water sample for explosives analyses was accidentally preserved also by the Lab, and therefore, no results are being reported for these analyses.

**Sample Analysis**

Samples were prepared and analyzed by GPL using the analytical methodologies indicated on the Analytical Report of Analysis.

**Explosives/HPLC**

1. Thirteen soils were extracted and analyzed for explosive compounds using SW846 method 8330.
2. Matrix spike and matrix spike duplicate analyses were performed on sample OD-SO-A-02D for soil sample batch. All target analyte recoveries were within control limits.
3. One laboratory control sample was extracted and analyzed with the sample batch. Percent recovery of 2,4-DNT in NLCS B was slightly below the control limit. All target analyte recoveries were within control limits.
4. Explosive compounds 2,4-DNT and 2,6-DNT co-elute on the primary column and the confirmation column. The mixture of 2,4-DNT and 2,6-DNT in the LCS and MS/MSD samples is quantitated and reported as 2,4-DNT. A peak detected in the retention time window of 2,4-DNT and 2,6-DNT on both columns will be reported as an isomeric pair in samples under the results for 2,4-DNT.
5. Manual integration was performed on some data files, when automatic integration provided by the software was inappropriate. Some forms were "hand" corrected due to software limitations.

## CASE NARRATIVE

### 8332

1. Thirteen soil samples were analyzed for Nitroglycerine using SW846 method 8332.
2. MS/MSD analyses for soil sample were performed on sample OD-SO-A-02D. All recoveries were within control limits.
3. A laboratory control sample was extracted and analyzed along with the soil sample batch. Percent recovery was within control limits.
4. Manual integration was performed on some data files, when automatic integration provided by the software was inappropriate. Some forms were "hand" corrected due to software limitations.

### PETN

1. Thirteen soil samples were also extracted and analyzed for PETN by modified method 8330.
2. Matrix spike and matrix spike duplicate analyses were performed on sample OD-SO-A-02D. All recoveries were within control limits.
3. A laboratory control sample was extracted and analyzed along with the sample batch. Percent recovery was within control limits.
4. Manual integration was performed on some data files, when automatic integration provided by the software was inappropriate. Some forms were "hand" corrected due to software limitations.

### Metals

1. Thirteen soil samples and one water sample were analyzed for antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, silver, and selenium by ICP; mercury by cold vapor AA; EPA SW846 methods were used.
2. The soil and water samples were reported on separate forms.
3. The continuing calibration blank #6 was slightly high for antimony in the ICP run 010115. All of the samples reported from this run are surrounded by CCB's that are within the control limits.
4. A matrix spike, duplicate, and serial dilution were performed on the batch water sample 101026-001 for all required ICP analytes. They were within the control limits.
5. A matrix spike and duplicate were performed on the batch water sample 101047-009 for mercury. They were within the control limits.

## CASE NARRATIVE

6. A matrix spike and duplicate were performed on soil sample OD-SO-A-01 for all required analytes. A serial dilution was also performed for the ICP analytes. The duplicate was outside of the control limits for cadmium; all associated data was flagged with an "\*\*\*".
7. Calibration standards are verified against independent check standards purchased from a commercial vendor of environmental standards.
8. All GPL QA/QC criteria were met with the exception of that mentioned above.

*Darryl R. Hartman*

Project Manager

*James J. Lehman*

Lab Director

## **A. QC Summary**

- 1. Surrogate Percent Recovery Summary**
- 2. Matrix Spike/Matrix Spike Duplicate Summary**
- 3. Laboratory Control Standard Summary (where applicable)**
- 4. Method Blank Summary**

***GPL Laboratories, LLLP***

2D  
SOIL SEMIVOLATILE SURROGATE RECOVERY

Lab Name: GPL LABORATORIES, LLLP Contract: FOSTER WHEELER ENVIROME  
Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A  
Level: (low/med) LOW

	Client SAMPLE NO.	S1 #	TOT OUT
01	NBLK B	68	0
02	NLCS B	77	0
03	OD-SO-A-01	100	0
04	OD-SO-A-02	95	0
05	OD-SO-A-03	95	0
06	OD-SO-A-04	92	0
07	OD-SO-B-01	99	0
08	OD-SO-B-02	99	0
09	OD-SO-B-03	98	0
10	OD-SO-B-04	79	0
11	OD-SO-C-01	94	0
12	OD-SO-C-02	93	0
13	OD-SO-C-03	80	0
14	OD-SO-C-04	96	0
15	OD-SO-A-02D	100	0
16	OD-SO-A-02D MS	85	0
17	OD-SO-A-02D MS	89	0

S1 = 4-NITROANILINE QC LIMITS (24-140)

# Column to be used to flag recovery values  
\* Values outside of contract required QC limits  
D Surrogate diluted out

3D  
SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: GPL LABORATORIES, LLLP Contract: FOSTER WHEELER ENVIROM  
 Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A  
 Matrix Spike - EPA Sample No.: OD-SO-A-02D Level: (low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
HMX	3000	0.0	2700	90	70- 113
1,3,5-TRINITROBENZENE	1500	0.0	1500	100	20- 150
TETRYL	3000	0.0	2700	90	20- 103
2,4,6-TRINITROTOLUENE	1500	0.0	1700	113	46- 150
4-AMINO-2,6-DINITROTOLU	1500	0.0	1400	93	39- 136
4-NITROTOLUENE	3000	0.0	2800	93	70- 114
RDX	3000	0.0	2900	97	70- 124
1,3-DINITROBENZENE	1500	0.0	1500	100	70- 127
NITROBENZENE	1500	0.0	1500	100	70- 120
2-AMINO-4,6-DINITROTOLU	1500	0.0	2000	133	43- 150
2,4-DINITROTOLUENE	3000	0.0	1900	63	56- 100
2-NITROTOLUENE	3000	0.0	2900	97	70- 116
3-NITROTOLUENE	3000	0.0	2900	97	70- 109

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS	
					RPD	REC.
HMX	3000	2800	93	3	25	70- 113
1,3,5-TRINITROBENZENE	1500	1500	100	0	25	20- 150
TETRYL	3000	2700	90	0	25	20- 103
2,4,6-TRINITROTOLUENE	1500	1700	113	0	25	46- 150
4-AMINO-2,6-DINITROTOLU	1500	1400	93	0	25	39- 136
4-NITROTOLUENE	3000	2900	97	4	25	70- 114
RDX	3000	3100	103	6	25	70- 124
1,3-DINITROBENZENE	1500	1500	100	0	25	70- 127
NITROBENZENE	1500	1500	100	0	25	70- 120
2-AMINO-4,6-DINITROTOLU	1500	2000	133	0	25	43- 150
2,4-DINITROTOLUENE	3000	1900	63	0	25	56- 100
2-NITROTOLUENE	3000	3000	100	3	25	70- 116

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 0 out of 13 outside limits

Spike Recovery: 0 out of 26 outside limits

COMMENTS:

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## SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: GPL LABORATORIES, LLLP Contract: FOSTER WHEELER ENVIROM  
 Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A  
 Matrix Spike - EPA Sample No.: OD-SO-A-02D Level: (low/med) LOW

3-NITROTOLUENE	3000	2900	97	0	25	70- 109
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# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 0 out of 0 outside limits

Spike Recovery: 0 out of 0 outside limits

COMMENTS:

\_\_\_\_\_

\_\_\_\_\_

3F  
SOIL LABORATORY CONTROL SPIKE RECOVERY

Lab Name: GPL Laboratories, LLLP

Contract: FOSTER WHEELER ENVIRO

Lab Code: GPLL

Case No. N/A

SAS No. N/A

SDG No. N/A

EPA Sample No.: NLCS B

GP ID: NBLK 8970 MS

COMPOUND	SPIKE ADDED (ug/kg)	LCS CONCENTRATION (ug/kg)	LCS % REC	QC LIMITS
HMX	3000	2684	89	70-114
1,3,5-TNB	1500	1421	95	70-118
TETRYL	3000	1595	53	26-100
TNT	1500	1521	101	70-150
4-AMINO-2,6-DNT	1500	1416	94	60-112
4-NITROTOLUENE	3000	2799	93	70-119
RDX	3000	2413	80	70-118
1,3-DINITROBENZENE	1500	1338	89	70-118
NITROBENZENE	1500	1464	98	70-121
2-AMINO-4,6-DNT	1500	1933	129	69-146
2,4-DNT	3000	1839	61	64-100
2-NITROTOLUENE	3000	2914	97	75-122
3-NITROTOLUENE	3000	2741	91	70-111

\* OUTSIDE QC LIMIT

COMMENTS:

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001009

4B  
SEMIVOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

NBLK B

Lab Name: GPL LABORATORIES, LLLP Contract: FOSTER WHE  
 Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A  
 Lab File ID: LCA4797.D Lab Sample ID: BLK 8970  
 Instrument ID: LCA Date Extracted: 01/11/01  
 Matrix: (soil/water) SOIL Date Analyzed: 01/25/01  
 Level: (low/med) LOW Time Analyzed: 20:07

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	Client SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	NLCS B	BKS 8970	LCA4798.D	01/25/01
02	OD-SO-A-01	101038-001	LCA4825.D	01/26/01
03	OD-SO-A-02	101038-002	LCA4826.D	01/26/01
04	OD-SO-A-04	101038-004	LCA4829.D	01/26/01
05	OD-SO-B-01	101038-005	LCA4830.D	01/26/01
06	OD-SO-B-02	101038-006	LCA4831.D	01/26/01
07	OD-SO-B-03	101038-007	LCA4832.D	01/26/01
08	OD-SO-B-04	101038-008	LCA4833.D	01/26/01
09	OD-SO-C-01	101038-009	LCA4836.D	01/26/01
10	OD-SO-C-02	101038-010	LCA4837.D	01/26/01
11	OD-SO-C-03	101038-011	LCA4839.D	01/26/01
12	OD-SO-C-04	101038-012	LCA4840.D	01/26/01
13	OD-SO-A-02D	101038-013	LCA4841.D	01/26/01
14	OD-SO-A-02D MS	101038-013 MS	LCA4842.D	01/26/01
15	OD-SO-A-02D MSD	101038-013 MSD	LCA4843.D	01/26/01

COMMENTS:

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4B  
SEMIVOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

NBLK A

Lab Name: GPL LABORATORIES, LLLP Contract: FOSTER WHE  
Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A  
Lab File ID: LCA4793.D Lab Sample ID: BLK 8958  
Instrument ID: LCA Date Extracted: 01/11/01  
Matrix: (soil/water) WATER Date Analyzed: 01/25/01  
Level: (low/med) LOW Time Analyzed: 18:10

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	Client SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	NLCS A1	BKS1 8958	LCA4794.D	01/25/01
02	NLCS A2	BKS2 8958	LCA4795.D	01/25/01
03	OD-EB-01	101038-014	LCA4796.D	01/25/01

COMMENTS:

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## **A. QC Summary**

- 1. Surrogate Percent Recovery Summary**
- 2. Matrix Spike/Matrix Spike Duplicate Summary**
- 3. Laboratory Control Standard Summary (where applicable)**
- 4. Method Blank Summary**

***GPL Laboratories, LLLP***

2D  
SOIL SEMIVOLATILE SURROGATE RECOVERY

Lab Name: GPL ENVIROMENTAL Contract: FOSTER WHEELER ENVIROME

Lab Code: GPL Case No.: N/A SAS No.: N/A SDG No.: N/A

Level: (low/med) LOW

	Client SAMPLE NO.	S1 #	TOT OUT
01	NLCS B	62	0
02	OD-SO-A-01	75	0
03	OD-SO-A-02	59	0
04	OD-SO-A-03	85	0
05	OD-SO-A-04	66	0
06	OD-SO-B-01	85	0
07	OD-SO-B-02	89	0
08	OD-SO-B-03	85	0
09	OD-SO-B-04	85	0
10	OD-SO-C-01	79	0
11	OD-SO-C-02	85	0
12	OD-SO-C-03	79	0
13	OD-SO-C-04	82	0
14	OD-SO-A-02D	82	0
15	OD-SO-A-02D MS	85	0
16	OD-SO-A-02D MS	72	0
17	NBLK B	82	0

S1 = 4-Nitroaniline

QC LIMITS  
(32-154)

# Column to be used to flag recovery values  
\* Values outside of contract required QC limits  
D Surrogate diluted out

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3D  
SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: GPL ENVIROMENTAL Contract: FOSTER WHEELER ENVIROM  
 Lab Code: GPL Case No.: N/A SAS No.: N/A SDG No.: N/A  
 Matrix Spike - EPA Sample No.: OD-SO-A-02D Level: (low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
Nitroglycerine	31000	0.0	28000	90	70- 118

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD REC.	
Nitroglycerine	31000	23000	74	20	25	70- 118

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 0 out of 1 outside limits

Spike Recovery: 0 out of 2 outside limits

COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_

3E

SOIL 8332 LABORATORY CONTROL SPIKE RECOVERY

Lab Name: GPL ENVIRONMENTAL

Client: FOSTER WHEELER ENVIROMENTAL

Lab Code: GPL

Case No.: N/A

SAS No.: N/A

SDG No.:

N/A

EPA Sample No.: NLCS B

GP ID: BKS- 8971

COMPOUND	SPIKE ADDED (ug/Kg)	LCS CONCENTRATION (ug/Kg)	LCS % REC	QC LIMITS
NITROGLYCERINE	25000	25610	102	70-128

COMMENTS:

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4B  
SEMIVOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

NBLK B

Lab Name: GPL ENVIROMENTAL Contract: FOSTER WHE

Lab Code: GPL Case No.: N/A SAS No.: N/A SDG No.: N/A

Lab File ID: LCC3553.D Lab Sample ID: BLK 8971

Instrument ID: LCC Date Extracted: 01/12/01

Matrix: (soil/water) SOIL Date Analyzed: 01/24/01

Level: (low/med) LOW Time Analyzed: 10:27

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	Client SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	NLCS B	BKS 8971	LCC3527.D	01/22/01
02	OD-SO-A-01	101038-001	LCC3528.D	01/22/01
03	OD-SO-A-02	101038-002	LCC3529.D	01/22/01
04	OD-SO-A-03	101038-003	LCC3530.D	01/22/01
05	OD-SO-A-04	101038-004	LCC3531.D	01/22/01
06	OD-SO-B-01	101038-005	LCC3532.D	01/22/01
07	OD-SO-B-02	101038-006	LCC3533.D	01/22/01
08	OD-SO-B-03	101038-007	LCC3534.D	01/22/01
09	OD-SO-B-04	101038-008	LCC3535.D	01/22/01
10	OD-SO-C-01	101038-009	LCC3537.D	01/22/01
11	OD-SO-C-02	101038-010	LCC3538.D	01/22/01
12	OD-SO-C-03	101038-011	LCC3539.D	01/22/01
13	OD-SO-C-04	101038-012	LCC3540.D	01/22/01
14	OD-SO-A-02D	101038-013	LCC3541.D	01/22/01
15	OD-SO-A-02D MS	101038-013 MS	LCC3542.D	01/22/01
16	OD-SO-A-02D MSD	101038-013 MSD	LCC3543.D	01/22/01

COMMENTS:

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4B  
EXPLOSIVES METHOD BLANK SUMMARY

EPA SAMPLE NO.

NBLK A

Lab Name: GPL LABORATORY Contract: FOSTER WHE  
 Lab Code: GPL Case No.: N/A SAS No.: N/A SDG No.: N/A  
 Lab File ID: LCC3545.D Lab Sample ID: BKS  
 Instrument ID: LCD Date Extracted: \_\_\_\_\_  
 Matrix: (soil/water) WATER Date Analyzed: 01/22/01  
 Level: (low/med) LOW Time Analyzed: 19:03

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

Client Sample NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01 NLCS A	BLK	LCC3544.D	01/22/01
02 OD-EB-01	101038-014	LCC3547.D	01/22/01
03 OD-EB-01 MS	101038-014 MS	LCC3548.D	01/22/01
04 OD-EB-01 MSD	101038-014 MSD	LCC3549.D	01/22/01

COMMENTS:

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## **A. QC Summary**

- 1. Matrix Spike/ Matrix Spike Duplicate Summary**
- 2. Laboratory Control Standard Summary (where applicable)**
- 3. Method Blank Summary**

***GPL Laboratories, LLLP***

003002

3D  
SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: GP ENVIRONMENTAL SERVICES Contract: Foster Wheeler Environmental C  
 Lab Code: GP\_ENV Case No.: N/A SAS No.: N/A SDG No.: N/A  
 Matrix Spike - EPA Sample No.: OD-SO-A-02D Level: (low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
PETN	2000	0.0	2400	120	48- 128

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	REC.
PETN	2000	2200	110	9	25	48- 128

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 0 out of 1 outside limits

Spike Recovery: 0 out of 2 outside limits

COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_

SOIL PETN LABORATORY CONTROL SPIKE RECOVERY

Lab Name: GPL Laboratories

Client: FosterWheeler Env. C

Lab Code: GP\_ENV

Case No.: N/A

SAS No.: N/A

SDG No.: N/A

EPA Sample No.: NLCSA

GP ID: BKS8969

COMPOUND	SPIKE ADDED (ug/Kg)	LCS CONCENTRATION (ug/Kg)	LCS % REC	QC LIMITS
PETN	2000	2109	105	50-125

COMMENTS:

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4B  
SEMIVOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

BLKA

Lab Name: GP ENVIRONMENTAL SERVICES Contract: Foster Wheeler  
 Lab Code: GP\_ENV Case No.: N/A SAS No.: N/A SDG No.: N/A  
 Lab File ID: LCB8104.D Lab Sample ID: BLK-8969 RI  
 Instrument ID: LCB Date Extracted: 01/11/01  
 Matrix: (soil/water) SOIL Date Analyzed: 01/26/01  
 Level: (low/med) LOW Time Analyzed: 10:48

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	Client SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	BKS	BKS-8969 RI	LCB8105.D	01/26/01
02	OD-SO-A-01	101038-001RI	LCB8106.D	01/26/01
03	OD-SO-A-02	101038-002 RI	LCB8107.D	01/26/01
04	OD-SO-A-03	101038-003 RI	LCB8108.D	01/26/01
05	OD-SO-A-04	101038-004 RI	LCB8109.D	01/26/01
06	OD-SO-B-02	101038-006 RI	LCB8111.D	01/26/01
07	OD-SO-B-03	101038-007 RI	LCB8112.D	01/26/01
08	OD-SO-B-04	101038-008 RI	LCB8115.D	01/26/01
09	OD-SO-C-01	101038-009 RI	LCB8116.D	01/26/01
10	OD-SO-C-02	101038-010	LCB8117.D	01/26/01
11	OD-SO-C-03	101038-011	LCB8118.D	01/26/01
12	OD-SO-C-04	101038-012	LCB8119.D	01/26/01
13	OD-SO-A-02D	101038-013	LCB8120.D	01/26/01
14	OD-SO-A-02D MS	101038-013 MS	LCB8121.D	01/26/01
15	OD-SO-A-02D MSD	101038-013 MSD	LCB8122.D	01/26/01
16	OD-SO-B-01	101038-005 RI	LCB8124.D	01/26/01

COMMENTS:

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TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

Initial Calibration Source: HIGH PURITY/CPI

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony	400.0	407.97	102.0	500.0	509.75	101.9	507.80	101.6	P
Arsenic	400.0	407.50	101.9	500.0	507.46	101.5	498.53	99.7	P
Barium	400.0	406.10	101.5	500.0	508.09	101.6	498.99	99.8	P
Beryllium	40.0	41.06	102.7	50.0	50.82	101.6	50.02	100.0	P
Cadmium	40.0	40.68	101.7	500.0	493.00	98.6	485.97	97.2	P
Chromium	400.0	406.09	101.5	500.0	502.23	100.4	495.53	99.1	P
Copper	400.0	403.30	100.8	500.0	510.83	102.2	502.01	100.4	P
Lead	400.0	410.45	102.6	500.0	501.82	100.4	499.83	100.0	P
Mercury	5.0	52.80	105.6	5.0	50.80	101.6	51.50	103.0	CV
Nickel	400.0	406.15	101.5	500.0	496.89	99.4	491.85	98.4	P
Selenium	400.0	414.92	103.7	500.0	512.74	102.5	504.40	100.9	P
Silver	40.0	40.88	102.2	50.0	51.61	103.2	50.49	101.0	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

4016

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	523.46	104.7	514.52	102.9	P
Arsenic				500.0	513.34	102.7	511.97	102.4	P
Barium				500.0	510.84	102.2	508.91	101.8	P
Beryllium				50.0	51.94	103.9	51.67	103.3	P
Cadmium				500.0	502.31	100.5	498.20	99.6	P
Chromium				500.0	511.42	102.3	507.54	101.5	P
Copper				500.0	517.11	103.4	515.56	103.1	P
Lead				500.0	512.10	102.4	513.13	102.6	P
Mercury				5.0	51.20	102.4			CV
Nickel				500.0	506.82	101.4	502.00	100.4	P
Selenium				500.0	517.69	103.5	517.98	103.6	P
Silver				50.0	52.33	104.7	51.45	102.9	P

4017

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

**TOTAL METALS**

-2A-

**INITIAL AND CONTINUING CALIBRATION VERIFICATION**

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	526.13	105.2	514.05	102.8	P
Arsenic				500.0	515.00	103.0	508.55	101.7	P
Barium				500.0	517.41	103.5	509.36	101.9	P
Beryllium				50.0	52.43	104.9	51.72	103.4	P
Cadmium				500.0	503.31	100.7	492.63	98.5	P
Chromium				500.0	514.04	102.8	506.07	101.2	P
Copper				500.0	524.00	104.8	517.37	103.5	P
Lead				500.0	517.14	103.4	513.29	102.7	P
Nickel				500.0	506.40	101.3	498.22	99.6	P
Selenium				500.0	523.47	104.7	518.77	103.8	P
Silver				50.0	51.75	103.5	51.51	103.0	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

401c

**TOTAL METALS**

-2A-

**INITIAL AND CONTINUING CALIBRATION VERIFICATION**

tract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	514.28	102.9	521.44	104.3	P
Arsenic				500.0	507.63	101.5	512.76	102.6	P
Barium				500.0	505.44	101.1	515.67	103.1	P
Beryllium				50.0	51.40	102.8	52.36	104.7	P
Cadmium				500.0	491.10	98.2	500.07	100.0	P
Chromium				500.0	503.58	100.7	512.45	102.5	P
Copper				500.0	513.36	102.7	521.68	104.3	P
Lead				500.0	510.58	102.1	517.77	103.6	P
Nickel				500.0	495.09	99.0	502.89	100.6	P
Selenium				500.0	516.05	103.2	521.83	104.4	P
Silver				50.0	51.92	103.8	52.27	104.5	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

## TOTAL METALS

-2A-

## INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					M
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Antimony				500.0	510.70	102.1	513.09	102.6	P
Arsenic				500.0	497.03	99.4	496.40	99.3	P
Barium				500.0	502.54	100.5	506.37	101.3	P
Beryllium				50.0	51.07	102.1	51.59	103.2	P
Cadmium				500.0	484.30	96.9	483.66	96.7	P
Chromium				500.0	498.73	99.7	502.33	100.5	P
Copper				500.0	511.41	102.3	518.20	103.6	P
Lead				500.0	501.82	100.4	505.83	101.2	P
Nickel				500.0	488.76	97.8	488.98	97.8	P
Selenium				500.0	500.95	100.2	507.32	101.5	P
Silver				50.0	51.27	102.5	51.24	102.5	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

4020

**TOTAL METALS**

-2A-

**INITIAL AND CONTINUING CALIBRATION VERIFICATION**

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	508.71	101.7	510.56	102.1	P
Arsenic				500.0	498.94	99.8	500.76	100.2	P
Barium				500.0	508.65	101.7	510.82	102.2	P
Beryllium				50.0	52.07	104.1	52.06	104.1	P
Cadmium				500.0	487.94	97.6	488.64	97.7	P
Chromium				500.0	507.00	101.4	507.14	101.4	P
Copper				500.0	522.31	104.5	522.21	104.4	P
Lead				500.0	513.76	102.8	512.31	102.5	P
Nickel				500.0	491.80	98.4	494.47	98.9	P
Selenium				500.0	515.08	103.0	509.60	101.9	P
Silver				50.0	52.08	104.2	51.24	102.5	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

**4021**

**TOTAL METALS**

-2A-

**INITIAL AND CONTINUING CALIBRATION VERIFICATION**

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	498.95	99.8	508.69	101.7	P
Arsenic				500.0	488.33	97.7	495.77	99.2	P
Barium				500.0	496.65	99.3	507.39	101.5	P
Beryllium				50.0	51.16	102.3	52.22	104.4	P
Cadmium				500.0	476.30	95.3	485.57	97.1	P
Chromium				500.0	497.23	99.4	507.10	101.4	P
Copper				500.0	511.87	102.4	524.44	104.9	P
Lead				500.0	502.25	100.4	513.74	102.7	P
Nickel				500.0	480.83	96.2	488.22	97.6	P
Selenium				500.0	502.93	100.6	516.62	103.3	P
Silver				50.0	50.51	101.0	51.42	102.8	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code: Case No.: SAS No.: SDG NO.: 101038S

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	514.34	102.9	519.41	103.9	P
Arsenic				500.0	501.84	100.4	507.02	101.4	P
Barium				500.0	509.87	102.0	506.08	101.2	P
Beryllium				50.0	52.72	105.4	53.30	106.6	P
Cadmium				500.0	488.97	97.8	491.92	98.4	P
Chromium				500.0	511.16	102.2	512.68	102.5	P
Copper				500.0	528.02	105.6	530.70	106.1	P
Lead				500.0	521.68	104.3	523.93	104.8	P
Nickel				500.0	493.70	98.7	495.30	99.1	P
Selenium				500.0	523.05	104.6	523.62	104.7	P
Silver				50.0	52.30	104.6	52.77	105.5	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

4023

**TOTAL METALS**

**-2A-**

**INITIAL AND CONTINUING CALIBRATION VERIFICATION**

**Contract:**

**Lab Code:**

**Case No.:**

**SAS No.:**

**SDG NO.:** 101038S

**Initial Calibration Source:**

**Continuing Calibration Source:** HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	522.58	104.5			P
Arsenic				500.0	508.92	101.8			P
Barium				500.0	506.78	101.4			P
Beryllium				50.0	53.58	107.2			P
Cadmium				500.0	492.51	98.5			P
Chromium				500.0	513.40	102.7			P
Copper				500.0	534.00	106.8			P
Lead				500.0	528.91	105.8			P
Nickel				500.0	495.89	99.2			P
Selenium				500.0	530.41	106.1			P
Silver				50.0	52.18	104.4			P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

**TOTAL METALS**

-2B-

**CRDL STANDARD FOR AA AND ICP**

tract:

Code:

Case No.:

SAS No.:

SDG No.: 101038S

AA CRDL Standard Source:

ICP CRDL Standard Source: HIGH PURITY

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	Initial			Final	
				True	Found	%R	Found	%R
Antimony				120.0	126.86	105.7		
Arsenic				20.0	19.14	95.7		
Barium				400.0	402.28	100.6		
Beryllium				10.0	10.24	102.4		
Cadmium				10.0	10.36	103.6		
Chromium				20.0	20.33	101.7		
Copper				50.0	51.32	102.6		
Lead				6.0	5.58	93.0		
Mercury	0.2	0.18	90.0					
Nickel				80.0	81.17	101.5		
Selenium				10.0	11.40	114.0		
Silver				20.0	21.26	106.3		

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

Preparation Blank Matrix (soil/water): SOIL

Preparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank		M
			1	C	2	C	3	C	C		
Antimony	2.7	U	3.9	B	2.7	U	2.7	U	0.270	U	P
Arsenic	4.0	U	4.0	U	4.0	U	4.0	U	0.400	U	P
Barium	0.5	U	0.5	U	0.5	U	0.5	U	0.050	U	P
Beryllium	0.1	U	0.1	U	0.1	U	0.1	U	0.010	U	P
Cadmium	0.4	U	0.4	U	0.4	U	0.4	U	0.040	U	P
Chromium	0.6	U	0.6	U	0.6	U	0.6	U	0.068	B	P
Copper	1.0	U	1.0	U	1.0	U	1.0	U	0.100	U	P
Lead	1.3	U	1.3	U	1.3	U	1.3	U	0.130	U	P
Mercury	0.1	U	0.1	U	0.1	U	0.1	U	0.017	U	CV
Nickel	1.0	U	1.0	U	1.0	U	1.0	U	-0.101	B	P
Selenium	3.3	U	3.3	U	3.3	U	3.3	U	0.330	U	P
Silver	1.8	U	1.8	U	1.8	U	1.8	U	0.180	U	P

004026

## TOTAL METALS

-3-

## BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038SPreparation Blank Matrix (soil/water): WATERPreparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank		M
			1	C	2	C	3	C	C		
Antimony			4.2	B	2.7	U	8.5				P
Arsenic			4.0	U	4.0	U	4.0	U			P
Barium			0.5	U	0.5	U	0.5	U			P
Beryllium			0.1	U	0.1	U	0.1	U			P
Cadmium			0.4	U	0.4	U	0.4	U			P
Chromium			0.6	U	0.6	U	0.6	U			P
Copper			1.0	U	1.0	U	1.0	U			P
Lead			1.3	U	1.3	U	1.3	U			P
Nickel			1.0	U	1.0	U	1.0	U			P
Selenium			3.3	U	3.3	U	3.3	U			P
Silver			1.8	U	1.8	U	1.8	B			P

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank		M
			1	C	2	C	3	C	C		
Antimony			2.7	U	2.7	U	2.7	U			P
Arsenic			4.0	U	4.0	U	4.0	U			P
Barium			0.5	U	0.5	U	0.5	U			P
Beryllium			0.1	U	0.1	U	0.1	U			P
Cadmium			0.4	U	0.4	U	0.4	U			P
Chromium			0.6	U	0.6	U	0.6	U			P
Copper			1.0	U	1.0	U	1.0	U			P
Lead			1.3	U	1.3	U	1.3	B			P
Nickel			1.0	U	1.0	U	1.0	U			P
Selenium			3.3	U	3.3	U	3.3	U			P
Silver			1.8	U	1.8	U	1.8	U			P

**TOTAL METALS**

-3-

**BLANKS**

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank	C	M
			1	C	2	C	3	C			
Antimony			2.7	U	2.7	U	2.7	U			P
Arsenic			-4.3	B	-4.4	B	4.0	U			P
Barium			0.5	U	0.5	U	0.5	U			P
Beryllium			0.1	U	0.1	U	0.1	U			P
Cadmium			0.4	U	0.4	U	0.4	U			P
Chromium			0.6	U	0.6	U	0.6	U			P
Copper			1.0	U	1.0	U	1.4	B			P
Lead			1.3	U	1.3	B	1.3	U			P
Nickel			1.0	U	1.0	U	1.0	U			P
Selenium			3.3	U	3.3	U	3.3	U			P
Silver			1.8	U	1.8	U	1.8	U			P

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank	C	M
			1	C	2	C	3	C			
Antimony			2.7	U	4.6	B	2.7	U			P
Arsenic			4.0	U	4.0	U	4.0	U			P
Barium			0.5	U	0.5	U	0.5	U			P
Beryllium			0.1	U	0.1	U	0.1	U			P
Cadmium			0.4	U	0.4	U	0.4	U			P
Chromium			0.6	U	0.6	U	0.6	U			P
Copper			1.3	B	1.0	U	1.2	B			P
Lead			1.3	U	1.3	U	1.3	U			P
Nickel			1.0	U	1.0	U	1.0	U			P
Selenium			3.3	U	3.3	U	3.3	U			P
Silver			1.8	U	1.8	U	1.8	U			P

**TOTAL METALS**

-3-

**BLANKS**

tract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank	C	M
			1	C	2	C	3	C			
Antimony			2.7	U	2.7	U					P
Arsenic			4.0	U	4.0	U					P
Barium			0.5	U	0.5	U					P
Beryllium			0.1	U	0.1	U					P
Cadmium			0.4	U	0.4	U					P
Chromium			0.6	U	0.6	U					P
Copper			1.5	B	1.9	B					P
Lead			1.6	B	1.3	U					P
Nickel			1.0	U	1.0	U					P
Selenium			3.3	U	3.3	U					P
Silver			1.8	U	1.8	U					P

**TOTAL METALS**

- 4 -

**ICP INTERFERENCE CHECK SAMPLE**

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

ICP ID Number: TJA61 ICP

ICS Source: HIGH PURITY

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Antimony		600	4	628.3	104.7			
Arsenic		100	5	98.4	98.4			
Barium		500	1	518.8	103.8			
Beryllium		500	0	500.5	100.1			
Cadmium		1000	0	960.5	96.1			
Chromium		500	1	496.5	99.3			
Copper		500	1	526.7	105.3			
Lead		50	-1	47.8	95.6			
Nickel		1000	2	971.3	97.1			
Selenium		50	-7	45.8	91.5			
Silver		200	1	212.5	106.2			

**TOTAL METALS**  
**-5A-**  
**SPIKE SAMPLE RECOVERY**

SAMPLE NO.

OD-SO-A-01S

Contract:

Lab Code:

Case No.:

SAS

SDG NO.: 101038S

Matrix (soil/water): SOIL

Level (low/med): LOW

% Solids for Sample: 79.6

Concentration Units (ug/L or mg/kg dry weight): **MG/KG**

Analyte	Control Limit %R	Spiked Sample Result (SSR) C	Sample Result (SR) C	Spike Added (SA)	%R	Q	M
Antimony	75 - 125	22.9080	0.6713 U	23.47	97.6		P
Arsenic	75 - 125	23.2247	0.9946 U	23.47	99.0		P
Barium	75 - 125	286.0879	35.5540	234.70	106.7		P
Beryllium	75 - 125	12.6389	0.1910 B	11.74	106.1		P
Cadmium	75 - 125	22.1553	4.4386	23.47	75.5		P
Chromium	75 - 125	117.3416	3.4905	117.35	97.0		P
Copper	75 - 125	125.0362	4.6430	117.35	102.6		P
Lead	75 - 125	228.0340	2.1676	234.70	96.2		P
Mercury	75 - 125	0.6506	0.0196 U	0.59	109.7		CV
Nickel	75 - 125	110.9418	2.3489	117.35	92.5		P
Selenium	75 - 125	22.0979	0.8205 U	23.47	94.2		P
Silver	75 - 125	23.0283	0.4476 U	23.47	98.1		P

Comments:

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TOTAL METALS

-6-

DUPLICATES

SAMPLE NO.

OD-SO-A-01D

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

Matrix (soil/water): SOIL

Level (low/med): LOW

% Solids for Sample: 79.6

% Solids for Duplicate: 79.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Antimony		0.6713	U	0.6648	U			P
Arsenic		0.9946	U	0.9848	U			P
Barium		35.5540		37.4155		5.1		P
Beryllium		0.1910	B	0.1942	B	1.7		P
Cadmium	0.7	4.4386		1.1709		116.5	*	P
Chromium	1.2	3.4905		3.6486		4.4		P
Copper	1.2	4.6430		5.0816		9.0		P
Lead	0.7	2.1676		2.1638		0.2		P
Mercury		0.0196	U	0.0197	U			CV
Nickel	1.2	2.3489		2.4111		2.6		P
Selenium		0.8205	U	0.8125	U			P
Silver		0.4476	U	0.4432	U			P

TOTAL METALS

-7-

LABORATORY CONTROL SAMPLE

Abstract:

Lab Code: Case No.: SAS No.: SDG NO.: 101038S

Solid LCS Source: HIGH PURITY

Aqueous LCS Source: \_\_\_\_\_

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Antimony				20.0	19.3		16.0   24.0	96.4
Arsenic				20.0	18.2		16.0   24.0	91.0
Barium				200.0	193.7		160.0   240.0	96.8
Beryllium				10.0	10.6		8.0   12.0	105.9
Cadmium				20.0	18.9		16.0   24.0	94.5
Chromium				100.0	97.6		80.0   120.0	97.5
Copper				100.0	99.7		80.0   120.0	99.7
Lead				200.0	196.6		160.0   240.0	98.3
Mercury				0.5	0.5		0.4   0.6	106.0
Nickel				100.0	94.5		80.0   120.0	94.5
Selenium				20.0	18.8		16.0   24.0	94.0
Silver				20.0	18.9		16.0   24.0	94.4

TOTAL METALS

-9-

ICP SERIAL DILUTIONS

SAMPLE NO.

OD-SO-A-01L

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038S

Matrix (soil/water): SOIL

Level (low/med): LOW

Concentration Units: ug/L

Analyte	Initial Sample Result (I)		Serial Dilution Result (S)		% Difference	Q	M
		C		C			
Antimony	2.70	U	13.50	U			P
Arsenic	4.00	U	20.00	U			P
Barium	142.99		146.21		2.3		P
Beryllium	0.77	B	0.68	B	11.0		P
Cadmium	17.85		18.83		5.5		P
Chromium	14.04		16.37	B	16.6		P
Copper	18.67		25.00	B	33.8		P
Lead	8.72		7.25	B	16.8		P
Nickel	9.45		9.96	B	5.4		P
Selenium	3.30	U	16.50	U			P
Silver	1.80	U	9.00	U			P

004036

## TOTAL METALS

-2A-

## INITIAL AND CONTINUING CALIBRATION VERIFICATION

Abstract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Initial Calibration Source: HIGH PURITY/CPI

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					M
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Antimony	400.0	407.97	102.0	500.0	509.75	101.9	507.80	101.6	P
Arsenic	400.0	407.50	101.9	500.0	507.46	101.5	498.53	99.7	P
Barium	400.0	406.10	101.5	500.0	508.09	101.6	498.99	99.8	P
Beryllium	40.0	41.06	102.7	50.0	50.82	101.6	50.02	100.0	P
Cadmium	40.0	40.68	101.7	500.0	493.00	98.6	485.97	97.2	P
Chromium	400.0	406.09	101.5	500.0	502.23	100.4	495.53	99.1	P
Copper	400.0	403.30	100.8	500.0	510.83	102.2	502.01	100.4	P
Lead	400.0	410.45	102.6	500.0	501.82	100.4	499.83	100.0	P
Mercury	5.0	5.09	101.8	5.0	4.84	96.8	4.86	97.2	CV
Nickel	400.0	406.15	101.5	500.0	496.89	99.4	491.85	98.4	P
Selenium	400.0	414.92	103.7	500.0	512.74	102.5	504.40	100.9	P
Silver	40.0	40.88	102.2	50.0	51.61	103.2	50.49	101.0	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

004053

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	523.46	104.7	514.52	102.9	P
Arsenic				500.0	513.34	102.7	511.97	102.4	P
Barium				500.0	510.84	102.2	508.91	101.8	P
Beryllium				50.0	51.94	103.9	51.67	103.3	P
Cadmium				500.0	502.31	100.5	498.20	99.6	P
Chromium				500.0	511.42	102.3	507.54	101.5	P
Copper				500.0	517.11	103.4	515.56	103.1	P
Lead				500.0	512.10	102.4	513.13	102.6	P
Nickel				500.0	506.82	101.4	502.00	100.4	P
Selenium				500.0	517.69	103.5	517.98	103.6	P
Silver				50.0	52.33	104.7	51.45	102.9	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

004054

**TOTAL METALS**

-2A-

**INITIAL AND CONTINUING CALIBRATION VERIFICATION**

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	526.13	105.2	514.05	102.8	P
Arsenic				500.0	515.00	103.0	508.55	101.7	P
Barium				500.0	517.41	103.5	509.36	101.9	P
Beryllium				50.0	52.43	104.9	51.72	103.4	P
Cadmium				500.0	503.31	100.7	492.63	98.5	P
Chromium				500.0	514.04	102.8	506.07	101.2	P
Copper				500.0	524.00	104.8	517.37	103.5	P
Lead				500.0	517.14	103.4	513.29	102.7	P
Nickel				500.0	506.40	101.3	498.22	99.6	P
Selenium				500.0	523.47	104.7	518.77	103.8	P
Silver				50.0	51.75	103.5	51.51	103.0	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

004055

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	514.28	102.9	521.44	104.3	P
Arsenic				500.0	507.63	101.5	512.76	102.6	P
Barium				500.0	505.44	101.1	515.67	103.1	P
Beryllium				50.0	51.40	102.8	52.36	104.7	P
Cadmium				500.0	491.10	98.2	500.07	100.0	P
Chromium				500.0	503.58	100.7	512.45	102.5	P
Copper				500.0	513.36	102.7	521.68	104.3	P
Lead				500.0	510.58	102.1	517.77	103.6	P
Nickel				500.0	495.09	99.0	502.89	100.6	P
Selenium				500.0	516.05	103.2	521.83	104.4	P
Silver				50.0	51.92	103.8	52.27	104.5	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

00405

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	510.70	102.1	513.09	102.6	P
Arsenic				500.0	497.03	99.4	496.40	99.3	P
Barium				500.0	502.54	100.5	506.37	101.3	P
Beryllium				50.0	51.07	102.1	51.59	103.2	P
Cadmium				500.0	484.30	96.9	483.66	96.7	P
Chromium				500.0	498.73	99.7	502.33	100.5	P
Copper				500.0	511.41	102.3	518.20	103.6	P
Lead				500.0	501.82	100.4	505.83	101.2	P
Nickel				500.0	488.76	97.8	488.98	97.8	P
Selenium				500.0	500.95	100.2	507.32	101.5	P
Silver				50.0	51.27	102.5	51.24	102.5	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

004057

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	508.71	101.7	510.56	102.1	P
Arsenic				500.0	498.94	99.8	500.76	100.2	P
Barium				500.0	508.65	101.7	510.82	102.2	P
Beryllium				50.0	52.07	104.1	52.06	104.1	P
Cadmium				500.0	487.94	97.6	488.64	97.7	P
Chromium				500.0	507.00	101.4	507.14	101.4	P
Copper				500.0	522.31	104.5	522.21	104.4	P
Lead				500.0	513.76	102.8	512.31	102.5	P
Nickel				500.0	491.80	98.4	494.47	98.9	P
Selenium				500.0	515.08	103.0	509.60	101.9	P
Silver				50.0	52.08	104.2	51.24	102.5	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

004050

**TOTAL METALS**

-2A-

**INITIAL AND CONTINUING CALIBRATION VERIFICATION**

tract:

Lab Code:                      Case No.:                      SAS No.:                      SDG NO.: 101038W

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	498.95	99.8	508.69	101.7	P
Arsenic				500.0	488.33	97.7	495.77	99.2	P
Barium				500.0	496.65	99.3	507.39	101.5	P
Beryllium				50.0	51.16	102.3	52.22	104.4	P
Cadmium				500.0	476.30	95.3	485.57	97.1	P
Chromium				500.0	497.23	99.4	507.10	101.4	P
Copper				500.0	511.87	102.4	524.44	104.9	P
Lead				500.0	502.25	100.4	513.74	102.7	P
Nickel				500.0	480.83	96.2	488.22	97.6	P
Selenium				500.0	502.93	100.6	516.62	103.3	P
Silver				50.0	50.51	101.0	51.42	102.8	P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

004059

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	514.34	102.9	519.41	103.9	P
Arsenic				500.0	501.84	100.4	507.02	101.4	P
Barium				500.0	509.87	102.0	506.08	101.2	P
Beryllium				50.0	52.72	105.4	53.30	106.6	P
Cadmium				500.0	488.97	97.8	491.92	98.4	P
Chromium				500.0	511.16	102.2	512.68	102.5	P
Copper				500.0	528.02	105.6	530.70	106.1	P
Lead				500.0	521.68	104.3	523.93	104.8	P
Nickel				500.0	493.70	98.7	495.30	99.1	P
Selenium				500.0	523.05	104.6	523.62	104.7	P
Silver				50.0	52.30	104.6	52.77	105.5	P

00406

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

TOTAL METALS

-2A-

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Initial Calibration Source:

Continuing Calibration Source: HIGH PURITY/CPI

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M	
	True	Found	%R(1)	True	Found	%R(1)	Found		%R(1)
Antimony				500.0	522.58	104.5			P
Arsenic				500.0	508.92	101.8			P
Barium				500.0	506.78	101.4			P
Beryllium				50.0	53.58	107.2			P
Cadmium				500.0	492.51	98.5			P
Chromium				500.0	513.40	102.7			P
Copper				500.0	534.00	106.8			P
Lead				500.0	528.91	105.8			P
Nickel				500.0	495.89	99.2			P
Selenium				500.0	530.41	106.1			P
Silver				50.0	52.18	104.4			P

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

004061

TOTAL METALS

-2B-

CRDL STANDARD FOR AA AND ICP

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 101038W

AA CRDL Standard Source:

ICP CRDL Standard Source: HIGH PURITY

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	Initial		Final		
				True	Found	%R	Found	%R
Antimony				120.0	126.86	105.7		
Arsenic				20.0	19.14	95.7		
Barium				400.0	402.28	100.6		
Beryllium				10.0	10.24	102.4		
Cadmium				10.0	10.36	103.6		
Chromium				20.0	20.33	101.7		
Copper				50.0	51.32	102.6		
Lead				6.0	5.58	93.0		
Mercury	0.2	0.19	95.0					
Nickel				80.0	81.17	101.5		
Selenium				10.0	11.40	114.0		
Silver				20.0	21.26	106.3		

004062

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank		M
			1	C	2	C	3	C	C		
Antimony	3.7	U	3.9	B	3.7	U	3.7	U	3.700	U	P
Arsenic	3.2	U	3.2	U	3.2	U	-3.7	B	-4.404	B	P
Barium	0.6	U	0.6	U	0.6	U	0.6	U	0.600	U	P
Beryllium	0.1	U	0.1	U	0.1	U	0.1	U	0.100	U	P
Cadmium	0.4	U	0.4	U	0.4	U	0.4	U	0.400	U	P
Chromium	0.8	U	0.8	U	0.8	U	0.8	U	1.008	B	P
Copper	1.2	U	1.2	U	1.2	U	1.2	U	2.762	B	P
Lead	1.5	U	1.5	U	1.5	U	1.5	U	1.500	U	P
Mercury	0.1	U	0.1	U	0.1	U			0.100	U	CV
Nickel	2.0	U	2.0	U	2.0	U	2.0	U	2.000	U	P
Selenium	2.3	U	2.3	U	2.4	B	2.3	U	2.300	U	P
Silver	0.7	U	0.7	U	0.7	U	0.7	U	0.700	U	P

004063

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	Continuing Calibration Blank (ug/L)						Preparation Blank	C	M
		1	C	2	C	3	C			
Antimony		4.2	B	3.7	U	8.5			P	
Arsenic		3.2	U	3.2	U	3.2	U		P	
Barium		0.6	U	0.6	U	0.6	U		P	
Beryllium		0.1	U	0.1	U	0.1	U		P	
Cadmium		0.4	U	0.4	U	0.4	U		P	
Chromium		0.8	U	0.8	U	0.8	U		P	
Copper		1.2	U	1.2	U	1.2	U		P	
Lead		1.5	U	1.5	U	1.5	U		P	
Nickel		2.0	U	2.0	U	2.0	U		P	
Selenium		2.3	U	2.3	U	2.3	U		P	
Silver		0.7	U	-1.0	B	1.8	B		P	

004064

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank		M
			1	C	2	C	3	C	C		
Antimony			3.7	U	3.7	U	3.7	U			P
Arsenic			3.2	U	3.2	U	3.2	U			P
Barium			0.6	U	0.6	U	0.6	U			P
Beryllium			0.1	U	0.1	U	0.1	U			P
Cadmium			0.4	U	0.4	U	0.4	U			P
Chromium			0.8	U	0.8	U	0.8	U			P
Copper			1.2	U	1.2	U	1.2	U			P
Lead			1.5	U	1.5	U	1.5	U			P
Nickel			2.0	U	2.0	U	2.0	U			P
Selenium			2.3	U	2.3	U	-2.3	B			P
Silver			0.7	U	1.4	B	0.7	U			P

004065

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank	C	M
			1	C	2	C	3	C			
Antimony			3.7	U	3.7	U	3.7	U			P
Arsenic			-4.3	B	-4.4	B	3.2	U			P
Barium			0.6	U	0.6	U	0.6	U			P
Beryllium			0.1	U	0.1	U	0.1	U			P
Cadmium			0.4	U	0.4	U	0.4	U			P
Chromium			0.8	U	0.8	U	0.8	U			P
Copper			1.2	U	1.2	U	1.4	B			P
Lead			1.5	U	1.5	U	1.5	U			P
Nickel			2.0	U	2.0	U	2.0	U			P
Selenium			2.3	U	2.3	U	2.3	U			P
Silver			0.7	B	0.7	U	0.7	U			P

004066

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank	C	M
			1	C	2	C	3	C			
Antimony			3.7	U	4.6	B	3.7	U			P
Arsenic			-3.3	B	3.2	U	3.2	U			P
Barium			0.6	U	0.6	U	0.6	U			P
Beryllium			0.1	U	0.1	U	0.1	U			P
Cadmium			0.4	U	0.4	U	0.4	U			P
Chromium			0.8	U	0.8	U	0.8	U			P
Copper			1.3	B	1.2	U	1.2	B			P
Lead			1.5	U	1.5	U	1.5	U			P
Nickel			2.0	U	2.0	U	2.0	U			P
Selenium			2.3	U	2.3	U	2.3	U			P
Silver			0.7	U	1.4	B	1.0	B			P

004067

TOTAL METALS

-3-

BLANKS

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank	C	M
			1	C	2	C	3	C			
Antimony			3.7	U	3.7	U					P
Arsenic			-3.8	B	-3.9	B					P
Barium			0.6	U	0.6	U					P
Beryllium			0.1	U	0.1	U					P
Cadmium			0.4	U	0.4	U					P
Chromium			0.8	U	0.8	U					P
Copper			1.5	B	1.9	B					P
Lead			1.6	B	1.5	U					P
Nickel			2.0	U	2.0	U					P
Selenium			2.3	U	2.3	U					P
Silver			0.8	B	0.7	U					P

004068

TOTAL METALS

- 4 -

ICP INTERFERENCE CHECK SAMPLE

tract:

Lab Code: Case No.: SAS No.: SDG NO.: 101038W

ICP ID Number: TJA61 ICP ICS Source: HIGH PURITY

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Antimony		600	4	628.3	104.7			
Arsenic		100	5	98.4	98.4			
Barium		500	1	518.8	103.8			
Beryllium		500	0	500.5	100.1			
Cadmium		1000	0	960.5	96.1			
Chromium		500	1	496.5	99.3			
Copper		500	1	526.7	105.3			
Lead		50	-1	47.8	95.6			
Nickel		1000	2	971.3	97.1			
Selenium		50	-7	45.8	91.5			
Silver		200	1	212.5	106.2			

004069

**TOTAL METALS**  
**-5A-**  
**SPIKE SAMPLE RECOVERY**

SAMPLE NO.

E19-SB01-03-424S

Contract:

Lab Code:

Case No.:

SAS

SDG NO.: 101038W

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids for Sample: 0.0

Concentration Units (ug/L or mg/kg dry weight):  $\mu\text{G/L}$

Analyte	Control Limit %R	Spiked Sample Result (SSR) C	Sample Result (SR) C	Spike Added (SA)	%R	Q	M
Antimony	75 - 125	553.8717	37.0000 U	500.00	110.8		P
Arsenic	75 - 125	448.6849	32.0000 U	500.00	89.7		P
Barium	75 - 125	5319.8096	286.5017	5000.00	100.7		P
Beryllium	75 - 125	279.5403	1.0000 U	250.00	111.8		P
Cadmium	75 - 125	508.7850	4.0000 U	500.00	101.8		P
Chromium	75 - 125	2595.2142	8.0000 U	2500.00	103.8		P
Copper	75 - 125	2635.7065	31.0849 B	2500.00	104.2		P
Lead	75 - 125	5396.4575	15.0000 U	5000.00	107.9		P
Nickel	75 - 125	2530.2191	20.0000 U	2500.00	101.2		P
Selenium	75 - 125	518.6396	23.0000 U	500.00	103.7		P
Silver	75 - 125	500.6275	11.0527 B	500.00	97.9		P

Comments:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

004070

**TOTAL METALS**  
**-5A-**  
**SPIKE SAMPLE RECOVERY**

SAMPLE NO.

101047-009S

Contract:

Lab Code:

Case No.:

SAS

SDG NO.: 101038W

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids for Sample: 0.0

Concentration Units (ug/L or mg/kg dry weight):  $\mu\text{G/L}$

Analyte	Control Limit %R	Spiked Sample Result (SSR) C	Sample Result (SR) C	Spike Added (SA)	%R	Q	M
Mercury	75 - 125	1.0500	0.1000 U	1.00	105.0		CV

Comments:

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\_\_\_\_\_

004071

TOTAL METALS

-6-

DUPLICATES

SAMPLE NO.

101047-009D

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids for Sample: 0.0

% Solids for Duplicate:

Concentration Units (ug/L or mg/kg dry weight): µG/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Mercury		0.1000	U	0.1000	U			CV

004072

**TOTAL METALS**

-6-

**DUPLICATES**

SAMPLE NO.

E19-SB01-03-424D

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids for Sample: 0.0

% Solids for Duplicate:

Concentration Units (ug/L or mg/kg dry weight): µG/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Antimony		37.0000	U	37.0000	U			P
Arsenic		32.0000	U	32.0000	U			P
Barium		286.5017		278.6366		2.8		P
Beryllium		1.0000	U	1.0000	U			P
Cadmium		4.0000	U	4.0000	U			P
Chromium		8.0000	U	10.1606	B	200.0		P
Copper		31.0849	B	26.2016	B	17.0		P
Lead	30.0	15.0000	U	31.8149		200.0		P
Nickel		20.0000	U	23.6797	B	200.0		P
Selenium		23.0000	U	23.0000	U			P
Silver		11.0527	B	17.9157	B	47.4		P

004073

**TOTAL METALS**  
-7-  
**LABORATORY CONTROL SAMPLE**

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Solid LCS Source:

Aqueous LCS Source: HIGH PURITY

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Antimony	50.0	50.26	100.5					
Arsenic	50.0	46.75	93.5					
Barium	500.0	488.26	97.7					
Beryllium	25.0	26.99	108.0					
Cadmium	50.0	49.18	98.4					
Chromium	250.0	250.28	100.1					
Copper	250.0	253.63	101.5					
Lead	500.0	515.52	103.1					
Mercury	1.0	1.02	102.0					
Nickel	250.0	243.59	97.4					
Selenium	50.0	47.67	95.3					
Silver	50.0	50.06	100.1					

004074

**TOTAL METALS**

-9-

**ICP SERIAL DILUTIONS**

SAMPLE NO.

E19-SB01-03-424L

Contract:

Lab Code:

Case No.:

SAS No.:

SDG NO.: 101038W

Matrix (soil/water): WATER

Level (low/med): LOW

Concentration Units: ug/L

Analyte	Initial Sample Result (I)		Serial Dilution Result (S)		% Difference	Q	M
		C		C			
Antimony	3.70	U	18.50	U			P
Arsenic	3.20	U	16.00	U			P
Barium	28.65		27.50		4.0		P
Beryllium	0.10	U	0.50	U			P
Cadmium	0.40	U	2.00	U			P
Chromium	0.80	U	4.00	U			P
Copper	3.11	B	7.42	B	137.9		P
Lead	1.50	U	7.50	U			P
Nickel	2.00	U	10.00	U			P
Selenium	2.30	U	11.50	U			P
Silver	1.11	B	3.50	U	100.0		P

004075