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DEPARTMENT OF THE AIR FORCE

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HOLLOMAN AIR FORCE BASE, NEW MEXICO

MAY 10 2004

MEMORANDUM FOR NEW MEXICO ENVIRONMENT DEPARTMENT

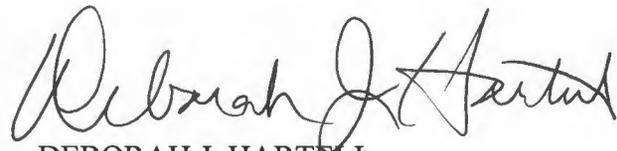
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FROM: 49 CES/CEV
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SUBJECT: Submittal of Third Quarter 2003 Monitoring Report, 20,000- Pound Open Detonation Unit (ODU) and Quality Assurance/Quality Control Report

1. Attached is the Third Quarter 2003 20,000-pound ODU Monitoring Report and the Third Quarter 2003 Monitoring Report Quality Assurance/Quality Control (Atchs 1 and 2, respectively).
2. The monitoring reports contain the results of soil sampling following the detonation events of 21 July 03. These results were 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, please contact Ms. Susan Van Horn or Mr. Darvin St. John at (505) 572-3931.


DEBORAH J. HARTELL
Chief, Environmental Flight

Attachments:

1. Third Quarter 2003 Monitoring Report 20,000-Pound Open Detonation Unit
2. Third Quarter 2003 Monitoring Report Quality Assurance/Quality Control Results

cc w/Atch:

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*Headquarters, Air Combat Command
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Final

*Third Quarter 2003 Monitoring Report
20,000-Pound Open Detonation Unit*

*Holloman Air Force Base,
New Mexico*

April 2004



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

FINAL
THIRD QUARTER 2003 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
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April 2004

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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 third quarter of 2003, Holloman Air Force Base (AFB) performed the 21st 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. No 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 21st quarterly sampling event.

2.0 FIELD OPERATIONS

The third quarter 2003 detonation event occurred on July 21, and sampling was conducted on July 22, 2003. A total of 12 soil samples and 1 field duplicate were collected from 3 different strata within the boundaries of the 20,000-Pound OD Unit. Field and 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 was 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. Third Quarter 2003 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	0.887	13.3	A13
2	0.563	8.4	A8
3	0.171	2.6	A3
4	0.647	9.7	A10

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	0.792	15.1	B15
2	0.478	9.1	B9
3	0.377	7.2	B7
4	0.860	16.3	B16

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	0.660	15.2	C15
2	0.877	20.2	C20
3	0.411	9.5	C9
4	0.319	7.3	C7

The area sampled was based on wind data recorded at the time of the June 26 and July 21, 2003 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



LEGEND

- Sample Locations
- Open Detonation Unit
- Streets and Roads
- Installation Boundary

**20,000-Pound Open Detonation Unit
 July 22, 2003 Sampling Event
 Holloman Air Force Base, New Mexico**

**Figure 2-1
 Sample Locations**



sample locations associated with the July 22, 2003 sampling event. The wind data are presented below:

- June 26, 2003 (10:01)—wind direction 210 degrees/wind speed 10 knots
- July 21, 2003 (13:13)—wind direction 230 degrees/wind speed 5 knots

3.0 ANALYTICAL RESULTS

This section presents an evaluation of the QA/QC data associated with the analytical results for the third quarter 2003 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 (also known as the method reporting 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 third quarter 2003 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 during this monitoring event were reported above (no laboratory qualifier) and below the sample-specific detection limit (J-qualified by the laboratory). The following explosive compounds were detected:

- Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) in one sample below the sample detection limit (OD-SO-B-02)
- Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) in one sample above the sample detection limit (OD-SO-C-04) and one sample below the sample detection limit (OD-SO-C-01)
- 2,4,6-Trinitrotoluene in two samples above the sample detection limit (OD-SO-A-02, OD-SO-A-04) and one sample below the sample detection limit (OD-SO-A-03)
- Nitrobenzene in four samples above the sample detection limit (OD-SO-A-01, OD-SO-A-02, OD-SO-A-03, OD-SO-A-04) and two samples below the sample detection limit (OD-SO-B-03, OD-SO-C-02)
- Nitroglycerine in five samples above the sample detection limit (OD-SO-A-01, OD-SO-A-02, OD-SO-A-03, OD-SO-A-04, OD-SO-B-04) and one sample below the sample detection limit (OD-SO-B-02)

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 third quarter 2003 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

EPA SW-846 Method 6010B (Metals)
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium (total)
Copper
Lead
Nickel
Selenium
Silver
EPA SW-846 Method 7471A
Mercury
EPA SW-846 Method 8330 (Explosives)
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
EPA SW-846 Method 8332 (Nitroamine Explosives)
Nitroglycerine

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 Metals and Explosives

Constituent	Maximum Detected Concentration	Frequency of Detections	Site-Specific Background UTLs ¹
Metals	mg/kg		mg/kg
Antimony	7.9	9/12	7.3
Arsenic	1.9B	12/12	37
Barium	65.5	12/12	84
Beryllium	0.34	12/12	0.40
Cadmium	5.0	12/12	1.0
Chromium	71.5	12/12	6.6
Copper	20.6	12/12	4.8
Lead ²	260	12/12	na
Nickel	31.4	12/12	5.6
Selenium	0.33B	2/12	10.5
Explosives	µg/kg		µg/kg
HMX	540	2/12	NA
Nitrobenzene	1,300	6/12	NA
Nitroglycerine	710,000	6/12	NA
RDX	120J	1/12	NA
2,4,6-Trinitrotoluene	380	3/12	NA

Notes:

- ¹ UTLs are taken from 20,000-Pound Open Detonation Unit Background Study and Quarterly Monitoring Work Plan, Part II—Background Study (Radian, 1997). Bolded values indicate exceedance of the site-specific background UTLs.
- ² A discussion of the lead screening level is included in Section 4.2.
- µg/kg micrograms per kilogram
- mg/kg milligrams per kilogram
- na Background value not available in Background Study (Radian, 1997).
- B Sample value for metal constituent was detected below sample detection limit; therefore, it is an estimated value.
- HMX octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
- J Organic constituent was detected below sample detection limit; therefore, it is an estimated value.
- NA Background values are not applicable to organic constituents; however, these compounds were carried forward to the risk evaluation phase.
- RDX hexahydro-1,3,5-trinitro-1,3,5-triazine
- UTL upper tolerance limit

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 above the sample detection limit (OD-SO-A-02) and in eight samples below the sample detection limit (OD-SO-A-01, OD-SO-A-03, OD-SO-A-04, OD-SO-B-02, OD-SO-B-04, OD-SO-C-01, OD-SO-C-03, OD-SO-C-04)
- Arsenic in 12 samples below the sample detection limit (all sample IDs)
- Barium, chromium, copper, lead, and nickel in all samples above the sample detection limit (all sample IDs)
- Beryllium in 2 samples above the sample detection limit and 10 samples below the sample detection limit (all sample IDs)
- Cadmium in 4 samples above the sample detection limit and 8 samples below the sample detection limit (all sample IDs)
- Selenium in 2 samples below the sample detection limit (OD-SO-A-02, OD-SO-B-03)

The metals analytical results were compared to the site-specific background UTLs listed in the table (Radian, 1997). The maximum detected concentrations of antimony, cadmium, chromium, copper, and nickel exceeded the UTLs. Because no UTL or toxicity values exist for lead, detections of lead were compared to the EPA Region 6 Human Health Medium-Specific Screening Levels (EPA, 2003a). The maximum detected concentrations for metals during the third quarter 2003 monitoring event are presented in Table 3-2.

4.0 EVALUATION OF POTENTIAL RISK

Inorganic constituents that exceeded site-specific background UTLs and all detected organic constituents were evaluated to determine whether the constituent concentrations at the 20,000-Pound OD Unit pose a potential risk to human health. This section describes both 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. Unauthorized entry to the site 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 incidentally 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 during a 1 year period. This is a conservative estimate because the actual number of detonations is approximately 15 per year. The site is routinely inspected on the day after detonation, and therefore it was also assumed that EOD personnel are at the 20,000-Pound OD Unit for 2 days during each detonation. Thus, 40 days per year was used as the exposure frequency in the risk assessment calculations. This estimate of exposure is still very conservative because the personnel are only onsite for a portion of the day of detonation and the day following 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 and exposure factors defined and presented in the Risk Evaluation Calculation Sheet in Appendix B.

Antimony, cadmium, chromium, copper, and nickel exceeded the site-specific background UTLs; therefore, these metals were assessed in the risk evaluation phase (see Table 3-2). The maximum detected concentration of arsenic, barium, beryllium, and selenium did not exceed site-specific background UTLs, so they were not analyzed in the risk evaluation phase. Given that lead does not have a background UTL or toxicity value, it was not quantitatively evaluated in the risk evaluation phase; however, a qualitative discussion is presented in Section 4.2. The explosive compounds HMX, nitrobenzene, nitroglycerine, RDX, and 2,4,6-trinitrotoluene were also detected. There are no background values for these explosive compounds; therefore, they were included in the risk evaluation.

The maximum detected concentrations of antimony, cadmium, chromium, copper, nickel, HMX, nitrobenzene, nitroglycerine, RDX, and 2,4,6-trinitrotoluene (listed in Table 3-2) were used to calculate risk. It was conservatively assumed that personnel are exposed to the maximum

concentration of these constituents 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 that were analyzed in the risk evaluation, as well as the hazard index (sum of the hazard quotients) and the total cancer risk. The hazard index is a conservative estimate because it assumes that the toxic effects of the different chemicals are additive.

The National Contingency Plan (NCP) risk range goal is a cancer risk estimate between 1×10^{-4} and 1×10^{-6} , and a hazard index of less than 1.0 (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 and the hazard index are well below 1.0; the hazard index is 0.004 (see Table 4-1). The total cancer risk for the site (6×10^{-8}) is well below the NCP risk range. The total cancer risk is based on the individual cancer risks for nitroglycerine, RDX, and 2,4,6-trinitrotoluene which are the only constituents classified as oral carcinogens or have carcinogenic toxicity data.

The maximum detection of lead was compared to the EPA Region 6 Human Health Medium-Specific Screening Level (EPA, 2003a) for the industrial worker exposure scenario (1,400 milligrams per kilogram [mg/kg]). Because the maximum detected concentration of 260 mg/kg is considerably less than 1,400 mg/kg, no risk attributed to lead exposure is anticipated at this site.

All constituents meet 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. Lead was below the EPA Region 6 screening level. The calculated site-specific risk estimates for the five detected organic constituents (HMX, nitrobenzene, nitroglycerine, RDX, and 2,4,6-trinitrotoluene) 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. Results of Carcinogenic and Noncarcinogenic Risk Calculations

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) ⁻¹	Oral Slope Factor Source	Hazard Quotient ¹	Cancer Risk
Metals								
Antimony	6.2E-07	4.4E-08	0.0004	IRIS	NA	IRIS	0.0015	NC
Cadmium	3.9E-07	2.8E-08	0.001	IRIS	NR	IRIS	0.00039	NC
Chromium ²	5.6E-06	4.0E-07	0.003	IRIS	NAP ³	IRIS	0.0019	NC
Copper	1.6E-06	1.2E-07	0.037	EPA R6	NAP	IRIS	0.00004	NC
Nickel ⁴	2.5E-06	1.8E-07	0.02	IRIS	NR	IRIS	0.00012	NC
Explosives								
HMX	4.2E-08	3.0E-09	0.05	IRIS	NAP	IRIS	0.0000008	NC
Nitrobenzene	1.0E-07	7.3E-09	0.0005	IRIS	NAP	IRIS	0.0002	NC
Nitroglycerine	5.6E-05	4.0E-06	NA	NA	0.014	NCEA ⁵	NA	5.6E-08
RDX	9.4E-09	6.7E-10	0.003	IRIS	0.11	IRIS	0.000003	7.4E-11
2,4,6-Trinitrotoluene	3.0E-08	2.1E-09	0.0005	IRIS	0.03	IRIS	0.000059	6.4E-11
Total =							0.004	6E-08

Notes:

- ¹ The sum of the hazard quotients is the hazard index.
- ² The toxicity value for hexavalent chromium was conservatively used.
- ³ Hexavalent chromium is noncarcinogenic through oral exposure.
- ⁴ The toxicity value for nickel soluble salts was used.
- ⁵ As reported in EPA Region 3 Risk-Based Concentration Tables, April 2003b.
- 1.0E-03 The designation of 1.0E-03 is equivalent to 1.0 x 10⁻³ or 0.001.
- EPA R6 EPA Region 6. Human Health Medium-Specific Screening Levels, February 2003a.
- HMX octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
- IRIS EPA Integrated Risk Information System. Online. Accessed November 13, 2003c.
- mg/kg/day milligrams per kilogram per day
- NA toxicity data not available
- NAP Not applicable; constituent is a Class "D" carcinogen through oral exposure (not known to be carcinogenic to humans).
- NC Not calculated; constituent is noncarcinogenic through oral exposure, or no toxicity data exist.
- NCEA National Center for Environmental Assessment
- NR Not reported; constituent is under review or is possible carcinogen via oral exposure but limited evidence or toxicity data exists.
- RDX hexahydro-1,3,5-trinitro-1,3,5-triazine
- RfD reference dose

5.0 CONCLUSIONS

The results of comparing the third quarter 2003 monitoring data (21st 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.

2003a. (February). Region 6. Human Health Medium-Specific Screening Levels.

2003b. (April). Region 3. Risk-Based Concentration Tables.

2003c. Integrated Risk Information System. <http://www.epa.gov/iriswebp/iris/index.html>
Accessed November 13, 2003.

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 Data

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Third Quarter 2003
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	7/22/2003	SW6010B	Antimony	B	0.7	mg/kg			
			Arsenic	B	1.1	mg/kg			
			Barium		43.3	mg/kg			
			Beryllium	B	0.15	mg/kg			
			Cadmium		4.5	mg/kg			
			Chromium	N*	71.5	mg/kg	J		
			Copper	*	7	mg/kg			
			Lead	*	9.1	mg/kg			
			Nickel	N*	31.4	mg/kg	J		
			Selenium	U	0.32	mg/kg			
			Silver	U	0.057	mg/kg			
			SW7471A	Mercury	U	0.019	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			
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg			
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg			
			HMX	U	200	ug/kg			
			m-Nitrotoluene	U	200	ug/kg			
			Nitrobenzene		1100	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	UJ		
			SW8332	Nitroglycerine		9500	ug/kg		
		OD-SO-A-02		SW6010B	Antimony		7.9	mg/kg	
					Arsenic	B	0.83	mg/kg	
Barium					49.8	mg/kg			
Beryllium	B				0.16	mg/kg			

EPA Qualifier J = estimated detect based on QC criteria

Page 1 of 12

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

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Third Quarter 2003
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	7/22/2003	SW6010B	Cadmium		0.75	mg/kg		
			Chromium	N*	14.2	mg/kg	J	
			Copper	*	20.6	mg/kg		
			Lead	*	260	mg/kg		
			Nickel	N*	3.3	mg/kg	J	
			Selenium	B	0.33	mg/kg		
			Silver	U	0.056	mg/kg		
			Mercury	U	0.017	mg/kg		
			SW7471A SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
		2,4,6-Trinitrotoluene			380	ug/kg		
		2,4-Dinitrotoluene		U	100	ug/kg		
		2,6-Dinitrotoluene		U	100	ug/kg		
		2-Amino-4,6-Dinitrotoluene		U	100	ug/kg		
		4-Amino-2,6-Dinitrotoluene		U	100	ug/kg		
		HMX		U	200	ug/kg		
		m-Nitrotoluene		U	200	ug/kg		
		Nitrobenzene			1300	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	UJ	
		Nitroglycerine			710000	ug/kg		
		OD-SO-A-03		SW6010B	Antimony	B	0.83	mg/kg
			Arsenic		B	0.9	mg/kg	
			Barium			42.7	mg/kg	
Beryllium	B		0.14		mg/kg			
Cadmium	B		0.31		mg/kg			
Chromium	N*		7.9		mg/kg	J		
Copper	*		6.8		mg/kg	J		
Lead	*		26.7		mg/kg			

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Third Quarter 2003
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	7/22/2003	SW6010B	Nickel	N*	3.8	mg/kg	J		
			Selenium	U	0.3	mg/kg			
			Silver	U	0.054	mg/kg			
				SW7471A	Mercury	U	0.017	mg/kg	
				SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
					1,3-Dinitrobenzene	U	100	ug/kg	
					2,4,6-Trinitrotoluene	J	69	ug/kg	J
					2,4-Dinitrotoluene	U	100	ug/kg	
					2,6-Dinitrotoluene	U	100	ug/kg	
					2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
					4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
					HMX	U	200	ug/kg	
					m-Nitrotoluene	U	200	ug/kg	
					Nitrobenzene		180	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	UJ
				SW8332	Nitroglycerine		7500	ug/kg	
OD-SO-A-03D		SW6010B	Antimony	B	1.1	mg/kg			
			Arsenic	B	1.5	mg/kg			
			Barium		44.6	mg/kg			
			Beryllium	B	0.16	mg/kg			
			Cadmium	B	0.32	mg/kg			
			Chromium	N*	4.7	mg/kg	J		
			Copper	*	34.5	mg/kg	J		
			Lead	*	42	mg/kg			
			Nickel	N*	2.3	mg/kg	J		
			Selenium	U	0.31	mg/kg			
		Silver	U	0.055	mg/kg				
		SW7471A	Mercury	U	0.018	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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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-03D	7/22/2003	SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg				
			1,3-Dinitrobenzene	U	100	ug/kg				
			2,4,6-Trinitrotoluene		160	ug/kg	J			
			2,4-Dinitrotoluene	U	100	ug/kg				
			2,6-Dinitrotoluene	U	100	ug/kg				
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg				
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg				
			HMX	U	200	ug/kg				
			m-Nitrotoluene	U	200	ug/kg				
			Nitrobenzene		180	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	UJ			
		SW8332	Nitroglycerine		11000	ug/kg				
OD-SO-A-04		SW6010B	Antimony	B	1.3	mg/kg				
			Arsenic	B	1.1	mg/kg				
			Barium		47.5	mg/kg				
			Beryllium	B	0.16	mg/kg				
			Cadmium		5	mg/kg				
			Chromium	N*	5.6	mg/kg	J			
			Copper	*	15.3	mg/kg				
			Lead	*	39.6	mg/kg				
			Nickel	N*	2.6	mg/kg	J			
			Selenium	U	0.31	mg/kg				
			Silver	U	0.056	mg/kg				
					SW7471A	Mercury	U	0.019	mg/kg	
					SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
						1,3-Dinitrobenzene	U	100	ug/kg	
						2,4,6-Trinitrotoluene		220	ug/kg	
			2,4-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
Third Quarter 2003
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	7/22/2003	SW8330	2,6-Dinitrotoluene	U	100	ug/kg				
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg				
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg				
			HMX	U	200	ug/kg				
			m-Nitrotoluene	U	200	ug/kg				
			Nitrobenzene		270	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	UJ			
		SW8332	Nitroglycerine		12000	ug/kg				
OD-SO-B-01		SW6010B	Antimony	U	0.19	mg/kg				
			Arsenic	B	0.64	mg/kg				
			Barium		26	mg/kg				
			Beryllium	B	0.067	mg/kg				
			Cadmium	B	0.063	mg/kg				
			Chromium	N*	2.3	mg/kg	J			
			Copper	*	1.9	mg/kg				
			Lead	*	1.7	mg/kg				
			Nickel	N*	1.1	mg/kg	J			
			Selenium	U	0.24	mg/kg				
			Silver	U	0.042	mg/kg				
					SW7471A	Mercury	U	0.021	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	
						2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg				
			HMX	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
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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	7/22/2003	SW8330	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	UJ			
		SW8332	Nitroglycerine	U	7000	ug/kg				
OD-SO-B-02		SW6010B	Antimony	B	1.1	mg/kg				
			Arsenic	B	0.7	mg/kg				
			Barium		29.2	mg/kg				
			Beryllium	B	0.081	mg/kg				
			Cadmium	B	0.14	mg/kg				
			Chromium	N*	7.6	mg/kg	J			
			Copper	*	3.5	mg/kg				
			Lead	*	6.9	mg/kg				
			Nickel	N*	1.3	mg/kg	J			
			Selenium	U	0.33	mg/kg				
			Silver	U	0.059	mg/kg				
					SW7471A	Mercury	U	0.02	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	
						2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
						4-Amino-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
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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	7/22/2003	SW8330	Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	J	120	ug/kg		
			Tetryl	U	200	ug/kg	UJ	
		SW8332	Nitroglycerine	J	2000	ug/kg		
OD-SO-B-03		SW6010B	Antimony	U	0.18	mg/kg		
			Arsenic	B	0.39	mg/kg		
			Barium		26.4	mg/kg		
			Beryllium	B	0.083	mg/kg		
			Cadmium	B	0.068	mg/kg		
			Chromium	N*	2.2	mg/kg	J	
			Copper	*	2.4	mg/kg		
			Lead	*	1.3	mg/kg		
			Nickel	N*	1.3	mg/kg	J	
			Selenium	B	0.22	mg/kg		
			Silver	U	0.038	mg/kg		
			SW7471A	Mercury	U	0.019	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	
				2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
				4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
				HMX	U	200	ug/kg	
				m-Nitrotoluene	U	200	ug/kg	
				Nitrobenzene	J	44	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	UJ
SW8332	Nitroglycerine	U		7400	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
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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	7/22/2003	SW6010B	Antimony	B	0.35	mg/kg		
			Arsenic	B	0.55	mg/kg		
			Barium		25.8	mg/kg		
			Beryllium	B	0.078	mg/kg		
			Cadmium	B	0.075	mg/kg		
			Chromium	N*	2.2	mg/kg	J	
			Copper	*	2.9	mg/kg		
			Lead	*	1.3	mg/kg		
			Nickel	N*	1.2	mg/kg	J	
			Selenium	U	0.21	mg/kg		
			Silver	U	0.038	mg/kg		
			SW7471A	Mercury	U	0.017	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		
		2-Amino-4,6-Dinitrotoluene		U	100	ug/kg		
		4-Amino-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	UJ		
SW8332	Nitroglycerine		43000	ug/kg				
OD-SO-C-01	SW6010B	Antimony	B	0.54	mg/kg			
		Arsenic	B	1.9	mg/kg			
		Barium		65.5	mg/kg			
		Beryllium		0.34	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

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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	7/22/2003	SW6010B	Cadmium	B	0.48	mg/kg			
			Chromium	N*	7.5	mg/kg	J		
			Copper	*	12.4	mg/kg			
			Lead	*	8.3	mg/kg			
			Nickel	N*	5.1	mg/kg	J		
			Selenium	U	0.27	mg/kg			
			Silver	U	0.048	mg/kg			
		SW7471A	Mercury	U	0.017	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				
		2-Amino-4,6-Dinitrotoluene	U	100	ug/kg				
		4-Amino-2,6-Dinitrotoluene	U	100	ug/kg				
		HMX	J	86	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	UJ			
		SW8332	Nitroglycerine	U	5400	ug/kg			
		OD-SO-C-02		SW6010B	Antimony	U	0.21	mg/kg	
					Arsenic	B	1.4	mg/kg	
					Barium		54.3	mg/kg	
Beryllium					0.22	mg/kg			
Cadmium	B				0.32	mg/kg			
Chromium	N*				5	mg/kg	J		
Copper	*				7.1	mg/kg			
Lead	*	4.5	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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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	7/22/2003	SW6010B	Nickel	N*	3.1	mg/kg	J		
			Selenium	U	0.26	mg/kg			
			Silver	U	0.047	mg/kg			
				SW7471A	Mercury	U	0.017	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	
					2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
					4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
					HMX	U	200	ug/kg	
					m-Nitrotoluene	U	200	ug/kg	
					Nitrobenzene	J	59	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	UJ
				SW8332	Nitroglycerine	U	5600	ug/kg	
OD-SO-C-03		SW6010B	Antimony	B	0.42	mg/kg			
			Arsenic	B	0.92	mg/kg			
			Barium		41.6	mg/kg			
			Beryllium	B	0.13	mg/kg			
			Cadmium	B	0.21	mg/kg			
			Chromium	N*	3.5	mg/kg	J		
			Copper	*	4.8	mg/kg			
			Lead	*	3	mg/kg			
			Nickel	N*	2	mg/kg	J		
			Selenium	U	0.27	mg/kg			
				SW7471A	Mercury	U	0.018	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
Third Quarter 2003
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	7/22/2003	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				
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg				
			4-Amino-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	UJ			
					SW8332	Nitroglycerine	U	5900	ug/kg	
			OD-SO-C-04		SW6010B	Antimony	B	0.39	mg/kg	
Arsenic	B	1.8				mg/kg				
Barium		44.1				mg/kg				
Beryllium	B	0.16				mg/kg				
Cadmium		1				mg/kg				
Chromium	N*	31.5				mg/kg	J			
Copper	•	11.8				mg/kg				
Lead	•	5.5				mg/kg				
Nickel	N*	3.6				mg/kg	J			
Selenium	U	0.29				mg/kg				
Silver	U	0.051				mg/kg				
		SW7471A				Mercury	U	0.018	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				

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
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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-04	7/22/2003	SW8330	2,6-Dinitrotoluene	U	100	ug/kg	
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
			HMX		540	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	UJ	
		SW8332	Nitroglycerine	U	5800	ug/kg	

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Third Quarter 2003
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	7/22/2003	SW6010B	Antimony	U	2.6	ug/L	
			Arsenic	U	4.8	ug/L	
			Barium	B	2	ug/L	
			Beryllium	U	0.2	ug/L	
			Cadmium	U	0.3	ug/L	
			Chromium	U	0.8	ug/L	
			Copper	B	1.5	ug/L	
			Lead	U	0.8	ug/L	
			Nickel	U	1.1	ug/L	
			Selenium	U	2.9	ug/L	
		Silver	U	0.7	ug/L		
		SW7470A	Mercury	U	0.1	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	
			2-Amino-4,6-Dinitrotoluene	U	0.26	ug/L	
			4-Amino-2,6-Dinitrotoluene	U	0.26	ug/L	
			4-Nitroaniline		49	%	
			HMX	U	0.52	ug/L	
			m-Nitrotoluene	U	0.52	ug/L	
			Nitrobenzene	U	0.26	ug/L	
			o-Nitrotoluene	U	0.52	ug/L	
			p-Nitrotoluene	U	0.52	ug/L	
			Pentaerythritol Tetranitrate	U	1.3	ug/L	
			RDX	U	0.52	ug/L	
			Tetryl	U	0.52	ug/L	
			SW8332	Nitroglycerine	U	1000	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 ⁶	10 ⁶
Body weight, adult (kg)	70	BW _a
Constituent concentration in soil (mg/kg)	Constituent-specific	C
Cancer risk	Calculated	CR
Oral Slope factor [(mg/kg/d) ⁻¹]	Constituent-specific	CSF _o
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 _a
Oral Reference dose (mg/kg/d)	Constituent-specific	RfD _o
Averaging time carcinogens (d) (70 yrs × 365 days)	25550	AT _c
Averaging time noncarcinogens (d) (5 yrs × 365 days)	1825	AT _n

d = day

kg = kilograms

mg = milligrams

y = year

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

Final

*Third Quarter 2003 Monitoring Report
Quality Assurance/Quality Control
20,000-Pound Open Detonation Unit*

*Holloman Air Force Base,
New Mexico*

April 2004



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

**FINAL
THIRD QUARTER 2003 MONITORING REPORT
QUALITY ASSURANCE/QUALITY CONTROL RESULTS
20,000-POUND OPEN DETONATION UNIT**

Prepared for:

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

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Under Contract No. DACW45-94-D-0003

Delivery Order 40, Work Authorization Directive 1

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

April 2004

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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
TtFW	Tetra Tech FW, Inc.
USAF	United States Air Force

EXECUTIVE SUMMARY

On July 22, 2003, the 21st 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 explosive compounds 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 explosives 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 Tetra Tech FW, Inc. (TtFW) 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 21st 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 21st 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 21st 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 21st 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 metals and explosives for the 21st 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 metals were within the method control limits for all parameters. The LCS recoveries for explosives were within the method control limits with the exception of the recovery for tetryl below the method criteria (nondetect data qualified "UJ"); and the LCS recovery for 4-amino-2,6-dinitrotoluene above the method criteria (detect data qualified "J"). No data required qualification based on the elevated recovery for 4-amino-2,6-dinitrotoluene because there were no sample detections. LCS recoveries indicated the accuracy associated with the analytical data is acceptable to achieve project DQOs. 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 explosives 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 were within the method criteria for all analytes. The MS recoveries for metals were within the method-specific control limits with the exception of chromium and nickel recoveries below the control limit. Sample detections of chromium and nickel were J-qualified, signifying estimated data. MS/MSD sample recoveries indicate minimal 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 were within the method control limits for both methods, indicating a high level of accuracy associated with the explosives data.

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 criteria with the exception of chromium and nickel. Sample detections for these metals were previously J-qualified based on MS recoveries. 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-A-03) was collected for the 21st quarterly sampling event and analyzed for metals and explosives. Detections of explosives and metals above the MRL in the field sample and the corresponding duplicate were within the 50 percent RPD criteria for all compounds with the exception of copper and 2,4,6-trinitrotoluene. The detections for these analytes in the field sample and duplicate were J-qualified, signifying estimated data. 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 explosives for the 21st quarterly sampling event. There were no detections of explosives or metals reported above the MRL in the equipment blank sample. Detections of barium and copper (2.0 and 1.5 micrograms per liter) reported below the MRL did not result in data qualification. Equipment rinse blank data indicated cross-contamination 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 11 percent of the analytical data for the 21st quarterly sampling event was qualified as estimated; however, these data are still usable to achieve the project DQOs. The percent of J- and UJ-qualified data is based on the number of estimated analytical values (38) compared to the total number of analytical field sample values (336) for the event. Review of the QC data associated with the field sample data indicates all analytical data for the 20,000-Pound OD Unit 21st 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 21st 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
Third Quarter 2003
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	7/22/2003	SW6010B	Antimony	B	0.7	mg/kg			
			Arsenic	B	1.1	mg/kg			
			Barium		43.3	mg/kg			
			Beryllium	B	0.15	mg/kg			
			Cadmium		4.5	mg/kg			
			Chromium	N*	71.5	mg/kg	J		
			Copper	*	7	mg/kg			
			Lead	*	9.1	mg/kg			
			Nickel	N*	31.4	mg/kg	J		
			Selenium	U	0.32	mg/kg			
		Silver	U	0.057	mg/kg				
		SW7471A	Mercury	U	0.019	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			
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg			
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg			
			HMX	U	200	ug/kg			
			m-Nitrotoluene	U	200	ug/kg			
			Nitrobenzene		1100	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	UJ		
			SW8332	Nitroglycerine		9500	ug/kg		
		OD-SO-A-02		SW6010B	Antimony		7.9	mg/kg	
					Arsenic	B	0.83	mg/kg	
					Barium		49.8	mg/kg	
					Beryllium	B	0.16	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
Third Quarter 2003
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	7/22/2003	SW6010B	Cadmium		0.75	mg/kg			
			Chromium	N*	14.2	mg/kg	J		
			Copper	*	20.6	mg/kg			
			Lead	*	260	mg/kg			
			Nickel	N*	3.3	mg/kg	J		
			Selenium	B	0.33	mg/kg			
			Silver	U	0.056	mg/kg			
		SW7471A	Mercury	U	0.017	mg/kg			
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg			
		1,3-Dinitrobenzene	U	100	ug/kg				
		2,4,6-Trinitrotoluene		380	ug/kg				
		2,4-Dinitrotoluene	U	100	ug/kg				
		2,6-Dinitrotoluene	U	100	ug/kg				
		2-Amino-4,6-Dinitrotoluene	U	100	ug/kg				
		4-Amino-2,6-Dinitrotoluene	U	100	ug/kg				
		HMX	U	200	ug/kg				
		m-Nitrotoluene	U	200	ug/kg				
		Nitrobenzene		1300	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	UJ			
		SW8332	Nitroglycerine		710000	ug/kg			
		OD-SO-A-03		SW6010B	Antimony	B	0.83	mg/kg	
					Arsenic	B	0.9	mg/kg	
					Barium		42.7	mg/kg	
Beryllium	B				0.14	mg/kg			
Cadmium	B				0.31	mg/kg			
Chromium	N*				7.9	mg/kg	J		
Copper	*				6.8	mg/kg	J		
Lead	*				26.7	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
Third Quarter 2003
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	7/22/2003	SW6010B	Nickel	N*	3.8	mg/kg	J		
			Selenium	U	0.3	mg/kg			
			Silver	U	0.054	mg/kg			
				SW7471A	Mercury	U	0.017	mg/kg	
				SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
					1,3-Dinitrobenzene	U	100	ug/kg	
					2,4,6-Trinitrotoluene	J	69	ug/kg	J
					2,4-Dinitrotoluene	U	100	ug/kg	
					2,6-Dinitrotoluene	U	100	ug/kg	
					2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
					4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
					HMX	U	200	ug/kg	
					m-Nitrotoluene	U	200	ug/kg	
					Nitrobenzene		180	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	UJ
				SW8332	Nitroglycerine		7500	ug/kg	
OD-SO-A-03D		SW6010B	Antimony	B	1.1	mg/kg			
			Arsenic	B	1.5	mg/kg			
			Barium		44.6	mg/kg			
			Beryllium	B	0.16	mg/kg			
			Cadmium	B	0.32	mg/kg			
			Chromium	N*	4.7	mg/kg	J		
			Copper	*	34.5	mg/kg	J		
			Lead	*	42	mg/kg			
			Nickel	N*	2.3	mg/kg	J		
			Selenium	U	0.31	mg/kg			
		Silver	U	0.055	mg/kg				
		SW7471A	Mercury	U	0.018	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
Third Quarter 2003
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-03D	7/22/2003	SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg				
			1,3-Dinitrobenzene	U	100	ug/kg				
			2,4,6-Trinitrotoluene		160	ug/kg	J			
			2,4-Dinitrotoluene	U	100	ug/kg				
			2,6-Dinitrotoluene	U	100	ug/kg				
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg				
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg				
			HMX	U	200	ug/kg				
			m-Nitrotoluene	U	200	ug/kg				
			Nitrobenzene		180	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	UJ			
					SW8332	Nitroglycerine		11000	ug/kg	
OD-SO-A-04		SW6010B	Antimony	B	1.3	mg/kg				
			Arsenic	B	1.1	mg/kg				
			Barium		47.5	mg/kg				
			Beryllium	B	0.16	mg/kg				
			Cadmium		5	mg/kg				
			Chromium	N*	5.6	mg/kg	J			
			Copper	*	15.3	mg/kg				
			Lead	*	39.6	mg/kg				
			Nickel	N*	2.6	mg/kg	J			
			Selenium	U	0.31	mg/kg				
			Silver	U	0.056	mg/kg				
					SW7471A	Mercury	U	0.019	mg/kg	
					SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
			1,3-Dinitrobenzene	U	100	ug/kg				
			2,4,6-Trinitrotoluene		220	ug/kg				
			2,4-Dinitrotoluene	U	100	ug/kg				

EPA Qualifier J = estimated detect based on QC criteria

Page 4 of 12

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

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Third Quarter 2003
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	7/22/2003	SW8330	2,6-Dinitrotoluene	U	100	ug/kg				
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg				
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg				
			HMX	U	200	ug/kg				
			m-Nitrotoluene	U	200	ug/kg				
			Nitrobenzene		270	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	UJ			
				SW8332	Nitroglycerine			12000	ug/kg	
			OD-SO-B-01		SW6010B	Antimony	U	0.19	mg/kg	
Arsenic	B	0.64				mg/kg				
Barium		26				mg/kg				
Beryllium	B	0.067				mg/kg				
Cadmium	B	0.063				mg/kg				
Chromium	N*	2.3				mg/kg	J			
Copper	*	1.9				mg/kg				
Lead	*	1.7				mg/kg				
Nickel	N*	1.1				mg/kg	J			
Selenium	U	0.24				mg/kg				
Silver	U	0.042				mg/kg				
	SW7471A	Mercury				U	0.021	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		
		2-Amino-4,6-Dinitrotoluene				U	100	ug/kg		
		4-Amino-2,6-Dinitrotoluene	U	100	ug/kg					
		HMX	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
Third Quarter 2003
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	7/22/2003	SW8330	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-02		SW8332	Tetryl	U	200	ug/kg	UJ
			Nitroglycerine	U	7000	ug/kg	
		SW6010B	Antimony	B	1.1	mg/kg	
			Arsenic	B	0.7	mg/kg	
			Barium		29.2	mg/kg	
			Beryllium	B	0.081	mg/kg	
			Cadmium	B	0.14	mg/kg	
			Chromium	N*	7.6	mg/kg	J
			Copper	*	3.5	mg/kg	
			Lead	*	6.9	mg/kg	
			Nickel	N*	1.3	mg/kg	J
			Selenium	U	0.33	mg/kg	
			Silver	U	0.059	mg/kg	
SW7471A	Mercury	U	0.02	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		
		2-Amino-4,6-Dinitrotoluene	U	100	ug/kg		
		4-Amino-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

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

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Third Quarter 2003
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	7/22/2003	SW8330	Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	J	120	ug/kg		
			Tetryl	U	200	ug/kg	UJ	
OD-SO-B-03	7/22/2003	SW8332	Nitroglycerine	J	2000	ug/kg		
		SW6010B	Antimony	U	0.18	mg/kg		
			Arsenic	B	0.39	mg/kg		
			Barium		26.4	mg/kg		
			Beryllium	B	0.083	mg/kg		
			Cadmium	B	0.068	mg/kg		
			Chromium	N*	2.2	mg/kg	J	
			Copper	*	2.4	mg/kg		
			Lead	*	1.3	mg/kg		
			Nickel	N*	1.3	mg/kg	J	
			Selenium	B	0.22	mg/kg		
			Silver	U	0.038	mg/kg		
			SW7471A	Mercury	U	0.019	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	
				2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
				4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
		HMX		U	200	ug/kg		
		m-Nitrotoluene		U	200	ug/kg		
		Nitrobenzene		J	44	ug/kg		
		o-Nitrotoluene		U	200	ug/kg		
		p-Nitrotoluene	U	200	ug/kg			
		SW8332	Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
			Tetryl	U	200	ug/kg	UJ	
			Nitroglycerine	U	7400	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
Third Quarter 2003
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	7/22/2003	SW6010B	Antimony	B	0.35	mg/kg			
			Arsenic	B	0.55	mg/kg			
			Barium		25.8	mg/kg			
			Beryllium	B	0.078	mg/kg			
			Cadmium	B	0.075	mg/kg			
			Chromium	N*	2.2	mg/kg	J		
			Copper	*	2.9	mg/kg			
			Lead	*	1.3	mg/kg			
			Nickel	N*	1.2	mg/kg	J		
			Selenium	U	0.21	mg/kg			
		SW7471A	Silver	U	0.038	mg/kg			
			Mercury	U	0.017	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		
				2-Amino-4,6-Dinitrotoluene	U	100	ug/kg		
				4-Amino-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			
			Pentaerythritol Tetranitrate	U	500	ug/kg			
			RDX	U	200	ug/kg			
			Tetryl	U	200	ug/kg	UJ		
			Nitroglycerine		43000	ug/kg			
			OD-SO-C-01	SW6010B	Antimony	B	0.54	mg/kg	
					Arsenic	B	1.9	mg/kg	
Barium					65.5	mg/kg			
Beryllium					0.34	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
Third Quarter 2003
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	7/22/2003	SW6010B	Cadmium	B	0.48	mg/kg		
			Chromium	N*	7.5	mg/kg	J	
			Copper	*	12.4	mg/kg		
			Lead	*	8.3	mg/kg		
			Nickel	N*	5.1	mg/kg	J	
			Selenium	U	0.27	mg/kg		
			Silver	U	0.048	mg/kg		
			SW7471A	Mercury	U	0.017	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	
		2-Amino-4,6-Dinitrotoluene		U	100	ug/kg		
		4-Amino-2,6-Dinitrotoluene		U	100	ug/kg		
		HMX		J	86	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	UJ		
		SW8332	Nitroglycerine	U	5400	ug/kg		
		OD-SO-C-02	SW6010B	Antimony	U	0.21	mg/kg	
				Arsenic	B	1.4	mg/kg	
				Barium		54.3	mg/kg	
Beryllium				0.22	mg/kg			
Cadmium	B			0.32	mg/kg			
Chromium	N*			5	mg/kg	J		
Copper	*			7.1	mg/kg			
Lead	*			4.5	mg/kg			

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Third Quarter 2003
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	7/22/2003	SW6010B	Nickel	N*	3.1	mg/kg	J		
			Selenium	U	0.26	mg/kg			
			Silver	U	0.047	mg/kg			
			SW7471A	Mercury	U	0.017		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			
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg			
		4-Amino-2,6-Dinitrotoluene	U	100	ug/kg				
		HMX	U	200	ug/kg				
		m-Nitrotoluene	U	200	ug/kg				
		Nitrobenzene	J	59	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	UJ			
		SW8332	Nitroglycerine	U	5600		ug/kg		
OD-SO-C-03		SW6010B	Antimony	B	0.42	mg/kg			
			Arsenic	B	0.92	mg/kg			
			Barium		41.6	mg/kg			
			Beryllium	B	0.13	mg/kg			
			Cadmium	B	0.21	mg/kg			
			Chromium	N*	3.5	mg/kg	J		
			Copper	*	4.8	mg/kg			
			Lead	*	3	mg/kg			
			Nickel	N*	2	mg/kg	J		
			Selenium	U	0.27	mg/kg			
Silver	U	0.048	mg/kg						
SW7471A	Mercury	U	0.018	mg/kg					

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Third Quarter 2003
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	7/22/2003	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				
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg				
			4-Amino-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	UJ			
					SW8332	Nitroglycerine	U	5900	ug/kg	
			OD-SO-C-04		SW6010B	Antimony	B	0.39	mg/kg	
Arsenic	B	1.8				mg/kg				
Barium		44.1				mg/kg				
Beryllium	B	0.16				mg/kg				
Cadmium		1				mg/kg				
Chromium	N*	31.5				mg/kg	J			
Copper	*	11.8				mg/kg				
Lead	*	5.5				mg/kg				
Nickel	N*	3.6				mg/kg	J			
Selenium	U	0.29				mg/kg				
Silver	U	0.051				mg/kg				
		SW7471A				Mercury	U	0.018	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				

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
Third Quarter 2003
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-04	7/22/2003	SW8330	2,6-Dinitrotoluene	U	100	ug/kg	
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
			HMX		540	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	UJ
			SW8332	Nitroglycerine	U	5800	ug/kg

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Third Quarter 2003
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	7/22/2003	SW6010B	Antimony	U	2.6	ug/L	
			Arsenic	U	4.8	ug/L	
			Barium	B	2	ug/L	
			Beryllium	U	0.2	ug/L	
			Cadmium	U	0.3	ug/L	
			Chromium	U	0.8	ug/L	
			Copper	B	1.5	ug/L	
			Lead	U	0.8	ug/L	
			Nickel	U	1.1	ug/L	
			Selenium	U	2.9	ug/L	
		Silver	U	0.7	ug/L		
		SW7470A	Mercury	U	0.1	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	
			2-Amino-4,6-Dinitrotoluene	U	0.26	ug/L	
			4-Amino-2,6-Dinitrotoluene	U	0.26	ug/L	
			4-Nitroaniline		49	%	
			HMX	U	0.52	ug/L	
			m-Nitrotoluene	U	0.52	ug/L	
			Nitrobenzene	U	0.26	ug/L	
			o-Nitrotoluene	U	0.52	ug/L	
			p-Nitrotoluene	U	0.52	ug/L	
			Pentaerythritol Tetranitrate	U	1.3	ug/L	
			RDX	U	0.52	ug/L	
			Tetryl	U	0.52	ug/L	
			SW8332	Nitroglycerine	U	1000	ug/L



APPENDIX B
Quality Control Data



Analytical Report For 307162

for

Tetra Tech - FW

Project Manager : Pam Moss

Project Name : Holloman AFB 20000 lb

August 20, 2003

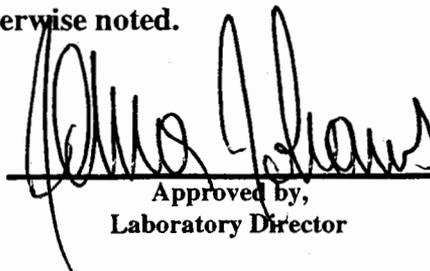
GPL

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 : 84

CASE NARRATIVE

CLIENT: TETRA TECH-FW
PROJECT/SITE: HOLLOMAN AFB 20000 LB
WORK ORDER(S): 307162
REVIEW DATE: 8/21/03

The Case Narrative, Chain of Custody, Sample Receipt Checklist, and the cover page of the Sample Analysis 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 soil and One water samples were received on 07/23/2003. The samples were delivered by Federal Express. 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 Sample Analysis Summary Report. In some chromatographic analyses, manual integration is used instead of automated integration because it produces more accurate results. All manual integrations are denoted on the sample quantitation report as "m". Analysis results and limits for soil are reported on a dry weight basis unless otherwise specified on the report.

Explosives/HPLC

Nitroglycerine by SW8332

1. One water sample was analyzed by direct injection and thirteen soil samples were analyzed for Nitroglycerine using SW846 method 8332.
2. For water matrix spike and matrix spike duplicate analyses was shared with work order # 307148. Percent recovery was within QC limits.
3. For soil samples, matrix spike and duplicate analyses were performed on sample OD-SO-A-01. Percent recovery was within QC limits.
4. Sample OD-SO-A-02 was re-analyzed at a 1:3 dilution due to the presence of the target analyte above the calibration range of the curve. The modified sample ID is OD-SO-A-02DL respectively.
5. A laboratory control sample was extracted and analyzed for both matrices.
6. 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

Explosives by SW8330

1. One water and thirteen soil samples were extracted and analyzed for explosive compounds using SW846 method 8330.
2. For the water sample, matrix spike and matrix duplicate analysis was shared with work order #307148. Percent recovery of two analytes on MS/MSD was outside the QC limit. Percent RPD of three compounds was also out of the limits. All other recoveries were within the limits.
3. For the water sample, laboratory control sample was extracted and analyzed with the sample batch. Percent recovery of four analytes was outside of QC limits. All other recoveries were within QC limits.
4. For the soil samples, matrix spike and matrix spike duplicate analyses were performed on sample OD-SO-A-01. Percent recovery of one compound was below the QC limits on MSD. Percent RPD of one compound was also outside of QC limits. All other recoveries were within QC limits.
5. For the soil samples, laboratory control sample was extracted and analyzed with the sample batch. Percent recovery of two analytes was outside of QC limits. All other recoveries were within QC limits.
6. 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

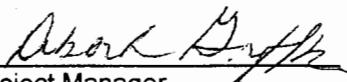
1. One water and thirteen soil samples were extracted and analyzed for PETN using modified SW846 method 8330.
2. For the soil sample, matrix spike and matrix spike duplicate analysis was performed on sample OD-SO-A-01. Percent recoveries were within control limits.
3. No MS/MSD were performed for the water sample, since the sample was field blank.
4. A laboratory control sample was extracted and analyzed along with each of the sample matrix. Percent recoveries were within control limits for both matrixes.
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.

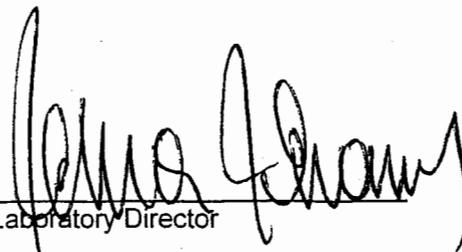
Metals

1. One water and thirteen soil samples were analyzed for antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, and mercury by EPA SW846 methods.
2. The water and soil samples were reported on separate forms.
3. A matrix spike, duplicate, and serial dilutin were performed on the batch water sample 307220-001 for all required ICP analytes. No control limits were applied to the matrix spike for barium due to an insignificant spike addition.

CASE NARRATIVE

4. A matrix spike and duplicate were performed on the batch water sample 307216-005 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. The matrix spike was outside of the control limits for chromium, and nickel; all associated data was flagged with an "N". A post digestion analytical spike addition was insignificant for chromium, and nickel. The duplicate was outside of the control limits for chromium, copper, lead, and nickel; all associated data was flagged with an "**".
6. A matrix spike and duplicate were performed on soil sample OD-SO-C-02 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 with the exceptions of those mentioned above.


Project Manager


Laboratory Director

EXPLOSIVES PACKAGE

GPL Laboratories, LLLP

Surrogate Recovery Summary

Matrix : SOIL

Analytical Method : SW8330

SDG No : 307162

1003

Surrogate	NO2ANIL4
Lower QC Limits	31
Upper QC Limits	129
Sample ID	
BKS61806	90
BLK61806	104
OD-SO-A-01	96
OD-SO-A-01MS	78
OD-SO-A-01MSD	59
OD-SO-A-02	66
OD-SO-A-03	85
OD-SO-A-03D	80
OD-SO-A-04	87
OD-SO-B-01	93
OD-SO-B-02	105
OD-SO-B-03	86
OD-SO-B-04	81
OD-SO-C-01	111
OD-SO-C-02	107
OD-SO-C-03	100
OD-SO-C-04	104

* Value outside of QC Limits

NO2ANIL4 = 4-Nitroaniline

Surrogate Recovery Summary

Matrix : WATER

Analytical Method : SW8330

SDG No : 307162

Surrogate	NO2ANIL4
Lower QC Limits	37
Upper QC Limits	149
Sample ID	
BKS61617	90
BLK61617	106
OD-EB-01	49

* Value outside of QC Limits

NO2ANIL4 = 4-Nitroaniline

MS/MSD RECOVERY

SAMPLE NO

OD-SO-A-01MSD

Lab Name : GPL Laboratories

SDG NO : 307162

Method : SW8330

Lab Code GPL

Lab Sample ID : 307162-001-001-1/1MSD

Matrix : SOIL Analysis Date : 08/12/2003

Compound	Spike Added (ug/kg)		CONCENTRATION (ug/kg)			%RECOVERY		% RPD	RPD Limit	QC Limits
	MS	MSD	Sample	MS	MSD	MS	MSD			
Pentaerythritol Tetranitrate	2000	2000	0	2500	2100	125	105	17	25	77-150

SAMPLE NO

OD-SO-A-01MSD

Lab Name : GPL Laboratories

SDG NO : 307162

Method : SW8330

Lab Code GPL

Lab Sample ID : 307162-001-001-1/1MSD

Matrix : SOIL Analysis Date : 08/15/2003

Compound	Spike Added (ug/kg)		CONCENTRATION (ug/kg)			%RECOVERY		% RPD	RPD Limit	QC Limits
	MS	MSD	Sample	MS	MSD	MS	MSD			
1,3,5-Trinitrobenzene	1500	1500	0	1000	940	67	63	6	25	29-179
1,3-Dinitrobenzene	1500	1500	0	1500	1700	100	113	12	25	83-137
2,4,6-Trinitrotoluene	1500	1500	0	1200	1200	80	80	0	25	71-155
2,4-Dinitrotoluene	1500	1500	0	1400	1500	93	100	7	25	48-108
2,6-Dinitrotoluene	1500	1500	0	1500	1700	100	113	12	25	43-120
2-Amino-4,6-Dinitrotoluene	1500	1500	0	1400	1400	93	93	0	25	57-189
4-Amino-2,6-Dinitrotoluene	1500	1500	0	1700	1600	113	107	5	25	75-129
HMX	3000	3000	0	2800	3000	93	100	7	25	83-125
Nitrobenzene	1500	1500	1100	2500	2000	93	60 *	43 *	25	83-137
RDX	3000	3000	0	3100	3300	103	110	7	25	76-124

Column to be used to flag recovery and RPD Values with an aster

* Values Outside of QC Limits.

RPD 1 Out of 15 Outside Limit

Spike Recovery : 1 Out of 30 outside limit

SAMPLE NO

OD-SO-A-01MSD

Lab Name : GPL Laboratories

SDG NO : 307162

Method : SW8330

Lab Code GPL

Lab Sample ID : 307162-001-001-1/1MSD

Matrix : SOIL Analysis Date : 08/15/2003

Compound	Spike Added (ug/kg)		CONCENTRATION (ug/kg)			%RECOVERY		% RPD	RPD Limit	QC Limits
	MS	MSD	Sample	MS	MSD	MS	MSD			
Tetryl	3000	3000	0	1300	1300	43	43	0	25	16-136
m-Nitrotoluene	3000	3000	0	2600	2900	87	97	11	25	84-132
o-Nitrotoluene	3000	3000	0	2800	3000	93	100	7	25	85-139
p-Nitrotoluene	3000	3000	0	3000	3000	100	100	0	25	31-129

Column to be used to flag recovery and RPD Values with an aster

* Values Outside of QC Limits.

RPD 1 C f 15 Outside Limit
Spike Recovery : 1 Out of 30 outside limit

SAMPLE NO

AS01-1EW08-CM08MSD

 Lab Name : GPL Laboratories

 SDG NO : 307148

 Method : SW8330

 Lab Code GPL

 Lab Sample ID : 307148-001-001-1/6MSD

 Matrix : WATER Analysis Date : 07/31/2003

Compound	Spike Added (ug/L)		CONCENTRATION (ug/L)			%RECOVERY		% RPD	RPD Limit	QC Limits
	MS	MSD	Sample	MS	MSD	MS	MSD			
1,3,5-Trinitrobenzene	3.9	3.9	0	2.7	2.3	69	59	16	25	28-154
1,3-Dinitrobenzene	3.9	3.9	0	4.2	3.8	108	97	11	25	72-126
2,4,6-Trinitrotoluene	3.9	3.9	0	3.9	3.0	100	77	26 *	25	54-150
2,4-Dinitrotoluene	3.9	3.9	0	4.3	3.8	110 *	97 *	13	25	41-95
2,6-Dinitrotoluene	3.9	3.9	0	4.4	3.8	113	97	15	25	25-150
2-Amino-4,6-Dinitrotoluene	3.9	3.9	0	4.4	3.8	113	97	15	25	54-192
4-Amino-2,6-Dinitrotoluene	3.9	3.9	0	6.4	5.3	164 *	136 *	19	25	69-117
HMX	7.8	7.8	0.32	8.7	7.5	107	92	15	25	75-117
Nitrobenzene	3.9	3.9	0	2.8	3.2	72	82	13	25	70-130
RDX	7.8	7.8	0	8.3	8.7	106	112	6	25	67-115
Tetryl	7.8	7.8	0	3.6	3.1	46	40	14	25	19-127
m-Nitrotoluene	7.8	7.8	0	5.6	7.3	72	94	27 *	25	63-135
o-Nitrotoluene	7.8	7.8	0	5.3	7.2	68	92	30 *	25	68-134
p-Nitrotoluene	7.8	7.8	0	6.2	7.1	79	91	14	25	37-149

Column to be used to flag recovery and RPD Values with an aster

* Values Outside of QC Limits.

 RPD 3 Out of 14 Outside Limit

 Spike Recovery : 4 Out of 28 outside limit

LCS SUMMARY

SAMPLE NO
BKS61617

Lab Name : GPL Laboratories
 Lab Code : GPL
 Matrix : WATER
 Method : SW8330

Contract : Holloman AFB 20000 lb
 SDG NO : 307162
 Lab Sample ID : BKS61617
 Analysis Date : 07/31/2003

COMPOUND	SPIKE ADDED (ug/L)	BLANK CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC	QC LIMITS
1,3,5-Trinitrobenzene	3.9	0	2.1	54	39-143
1,3-Dinitrobenzene	3.9	0	3.9	100	77-121
2,4,6-Trinitrotoluene	3.9	0	2.9	74	63-141
2,4-Dinitrotoluene	3.9	0	3.9	100 *	46-90
2,6-Dinitrotoluene	3.9	0	3.7	95	69-175
2-Amino-4,6-Dinitrotoluene	3.9	0	3.8	98	67-180
4-Amino-2,6-Dinitrotoluene	3.9	0	5.2	133 *	74-113
HMX	7.8	0	7.5	96	79-113
Nitrobenzene	3.9	0	3.6	92	75-124
RDX	7.8	0	8.7	112 *	72-111
Tetryl	7.8	0	1.8	23 *	29-117
m-Nitrotoluene	7.8	0	7.1	91	60-122
o-Nitrotoluene	7.8	0	7.5	96	74-128
p-Nitrotoluene	7.8	0	7.8	100	73-123

* Values Outside of QC Limits.

LCS SUMMARY

SAMPLE NO

BKS61806

Lab Name : GPL Laboratories

Contract.

Holloman AFB 20000 lb

Lab Code GPL

SDG NO :

307162

Matrix : SOIL

Lab Sample ID :

BKS61806

Method : SW8330

Analysis Date :

08/14/2003

COMPOUND	SPIKE ADDED (ug/kg)	BLANK CONCENTRATION (ug/kg)	LCS CONCENTRATION (ug/kg)	LCS % REC	QC LIMITS
1,3,5-Trinitrobenzene	1500	0	940	63	42-165
1,3-Dinitrobenzene	1500	0	1800	120	87-132
2,4,6-Trinitrotoluene	1500	0	1200	80	78-147
2,4-Dinitrotoluene	1500	0	1600	107 *	54-103
2,6-Dinitrotoluene	1500	0	1600	107	64-177
2-Amino-4,6-Dinitrotoluene	1500	0	1500	100	69-177
4-Amino-2,6-Dinitrotoluene	1500	0	2100	140 *	80-124
HMX	3000	0	3100	103	87-121
Nitrobenzene	1500	0	1600	107	88-132
RDX	3000	0	3200	107	80-119
Tetryl	3000	0	1000	33	27-125
m-Nitrotoluene	3000	0	3000	100	64-116
o-Nitrotoluene	3000	0	3000	100	90-134
p-Nitrotoluene	3000	0	3200	107	74-143

SAMPLE DATA PACKAGE

NITROGLYCERINE DATA

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

GP Environmental Services, Inc

MS/MSD RECOVERY

SAMPLE NO

OD-SO-A-01MSD

Lab Name : GPL Laboratories

SDG NO : 307162

Method : SW8332

Lab Code GPL

Lab Sample ID : 307162-001-001-1/1MSD

Matrix : SOIL Analysis Date : 08/06/2003

Compound	Spike Added (ug/kg)		CONCENTRATION (ug/kg)			%RECOVERY		% RPD	RPD Limit	QC Limits
	MS	MSD	Sample	MS	MSD	MS	MSD			
Nitroglycerine	61000	61000	9500	66000	67000	93	94	1	25	50-118

Column to be used to flag recovery and RPD Values with an aster

* Values Outside of QC Limits.

RPD 0 Out of 1 Outside Limit

Spike Recovery : 0 Out of 2 outside limit

2003

MS/MSD RECOVERY

SAMPLE NO
AS01-1EW08-CM08MSD

Lab Name : GPL Laboratories

SDG NO : 307148

Method : SW8332

Lab Code GPL

Lab Sample ID : 307148-001-007-1/6MSD

Matrix : WATER Analysis Date : 08/06/2003

Compound	Spike Added (ug/L)		CONCENTRATION (ug/L)			%RECOVERY		% RPD	RPD Limit	QC Limits
	MS	MSD	Sample	MS	MSD	MS	MSD			
Nitroglycerine	10000	10000	0	11000	10000	110	100	10	25	50-125

Column to be used to flag recovery and RPD Values with an aster

Values Outside of QC Limits.

RPD 0 Out of () outside Limit
Spike Recovery () Out of 2 outside limit

2004

LCS SUMMARY

SAMPLE NO

BKS61988

Lab Name : GPL Laboratories
 Lab Code : GPL
 Matrix : WATER
 Method : SW8332

Contract. : Holloman AFB 20000 lb
 SDG NO : 307162
 Lab Sample ID : BKS61988
 Analysis Date : 08/06/2003

COMPOUND	SPIKE ADDED (ug/L)	BLANK CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC	QC LIMITS
Nitroglycerine	10000	0	11000	110	70-120

LCS SUMMARY

SAMPLE NO

BKS61805

Lab Name : GPL Laboratories
 Lab Code : GPL
 Matrix : SOIL
 Method : SW8332

Contract : Holloman AFB 20000 lb
 SDG NO : 307162
 Lab Sample ID : BKS61805
 Analysis Date : 08/06/2003

COMPOUND	SPIKE ADDED (ug/kg)	BLANK CONCENTRATION (ug/kg)	LCS CONCENTRATION (ug/kg)	LCS % REC	QC LIMITS
Nitroglycerine	50000	0	49000	98	60-140

SAMPLE NO
BLK61805

Lab Name :	<u>GPL Laboratories</u>	Client :	<u>Tetra Tech - FW</u>
Lab Code	<u>GPL</u>	SAS NO. :	<u> </u>
Case No.	<u> </u>	SDG NO :	<u>307162</u>
Matrix : (Soil / Water)	<u>SOIL</u>	Lab Sample ID :	<u>BLK61805</u>
Sample Volume :	<u>4</u>	Lab File ID :	<u>LB20497.D</u>
% Moisture:	<u> </u>	Date Received	<u> </u>
Extraction:	<u>EXT_8332</u>	Date Extracte	<u>07/31/2003</u>
Extract Volume	<u>20</u> mL	Date Analyzed	<u>08/06/2003</u>
Injection Volume :	<u>25</u> μ L	Dilution Factor	<u>1</u>
GPC Clean up (Y/N):	<u>N</u> pH: <u> </u>		

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

CAS NO	COMPOUND		Q
55-63-0	Nitroglycerine	5000	U

SAMPLE DATA PACKAGE

PETN DATA

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

GP Environmental Services, Inc

MS/MSD RECOVERY

SAMPLE NO

OD-SO-A-01MSD

Lab Name : GPL Laboratories

SDG NO : 307162

Method : SW8330

Lab Code GPL

Lab Sample ID : 307162-001-001-1/1MSD

Matrix : SOIL Analysis Date : 08/12/2003

Compound	Spike Added (ug/kg)		CONCENTRATION (ug/kg)			%RECOVERY		% RPD	RPD Limit	QC Limits
	MS	MSD	Sample	MS	MSD	MS	MSD			
Pentaerythritol Tetranitrate	2000	2000	0	2500	2100	125	105	17	25	77-150

Column to be used to flag recovery and RPD Values with an aster

Values Outside of QC Limits.

RPD 0 Out of outside Limit
Spike Recover, 2 Out of 2 outside limit

3003

LCS SUMMARY

SAMPLE NO

BKS61807

Lab Name : GPL Laboratories
 Lab Code : GPL
 Matrix : SOIL
 Method : SW8330

Contract : Holloman AFB 20000 lb
 SDG NO : 307162
 Lab Sample ID : BKS61807
 Analysis Date : 08/12/2003

COMPOUND	SPIKE ADDED (ug/kg)	BLANK CONCENTRATION (ug/kg)	LCS CONCENTRATION (ug/kg)	LCS % REC	QC LIMITS
Pentaerythritol Tetranitrate	2000	0	2200	110	50-125

LCS SUMMARY

SAMPLE NO

BKS61618

Lab Name : GPL Laboratories

Contract. Holloman AFB 20000 lb

Lab Code GPL

SDG NO : 307162

Matrix : WATER

Lab Sample ID : BKS61618

Method : SW8330

Analysis Date : 08/12/2003

COMPOUND	SPIKE ADDED (ug/L)	BLANK CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC	QC LIMITS
Pentaerythritol Tetranitrate	5.2	0	5.6	108	50-125

SAMPLE NO
BLK61807

Lab Name :	<u>GPL Laboratories</u>	Client :	<u>Tetra Tech - FW</u>
Lab Code	<u>GPL</u>	SAS NO. :	<u> </u>
Case No.	<u> </u>	SDG NO :	<u>307162</u>
Matrix : (Soil / Water)	<u>SOIL</u>	Lab Sample ID :	<u>BLK61807</u>
Sample Volume :	<u>2</u>	Lab File ID :	<u>LB20600.D</u>
% Moisture:	<u> </u>	Date Received	<u> </u>
Extraction:	<u>EXT_SW8330</u>	Date Extracte	<u>07/30/2003</u>
Extract Volume	<u>20</u> mL	Date Analyzed	<u>08/12/2003</u>
Injection Volume :	<u>100</u> μ L	Dilution Factor	<u>1</u>
GPC Clean up (Y/N):	<u>N</u> pH: <u> </u>		

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

CAS NO	COMPOUND		Q
78-11-5	Pentaerythritol Tetranitrate	500	U

SAMPLE NO

BLK61618

Lab Name :	<u>GPL Laboratories</u>	Client. :	<u>Tetra Tech - FW</u>
Lab Code	<u>GPL</u>	SAS NO. :	<u> </u>
Case No.	<u> </u>	SDG NO :	<u>307162</u>
Matrix : (Soil / Water)	<u>WATER</u>	Lab Sample ID :	<u>BLK61618</u>
Sample Volume :	<u>770</u>	Lab File ID :	<u>LB20582.D</u>
% Moisture:	<u> </u>	Date Received	<u> </u>
Extraction:	<u>EXT_SW8330</u>	Date Extracte	<u>07/28/2003</u>
Extract Volume	<u>20</u> mL	Date Analyzed	<u>08/12/2003</u>
Injection Volume :	<u>100</u> μ L	Dilution Factor	<u>1</u>
GPC Clean up (Y/N):	<u>N</u> pH: <u> </u>		

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

CAS NO	COMPOUND		Q
78-11-5	Pentaerythritol Tetranitrate	1.3	U

METALS PACKAGE

GPL Laboratories, LLLP

GPL - Maryland Laboratory

Metals Data Reporting Form

Preparation Blank Results

SDG: 307162W

Lab Sample ID: BLK61679

Matrix: Water Units: ug/L Prep Date: 8/01/03 Prep Batch: 61679

Weight: 100.00 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	IDL	Report Limit	Conc	Q	DF	Instr	Anal Date	Anal Time
Antimony	206.838	2.6	20.0	2.6	U	1	ICPST	8/01/03	17:58
Arsenic	189.042	4.8	20.0	4.8	U	1	ICPST	8/01/03	17:58
Barium	493.409	0.20	5.0	0.37	B	1	ICPST	8/01/03	17:58
Beryllium	313.042	0.20	2.0	0.20	U	1	ICPST	8/01/03	17:58
Cadmium	226.502	0.30	6.0	0.30	U	1	ICPST	8/01/03	17:58
Chromium	267.716	0.80	5.0	0.80	U	1	ICPST	8/01/03	17:58
Copper	324.753	0.90	10.0	0.90	U	1	ICPST	8/01/03	17:58
Lead	220.353	0.80	10.0	0.80	U	1	ICPST	8/01/03	17:58
Nickel	231.604	1.1	10.0	-1.3	B	1	ICPST	8/01/03	17:58
Selenium	196.026	2.9	20.0	2.9	U	1	ICPST	8/01/03	17:58
Silver	328.068	0.70	3.0	-0.79	B	1	ICPST	8/01/03	17:58

Comments: Color(Before): COLORLESS Color(After): COLORLESS Clarity(Before): CLEAR Clarity(After): CLEAR
 Texture: FINE

GPL - Maryland Laboratory
Metals Data Reporting Form

Preparation Blank Results

SDG: 307162W

Lab Sample ID: BLK61756

Matrix: Water Units: ug/L Prep Date: 8/04/03 Prep Batch: 61756

Weight: 100.00 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	IDL	Report Limit	Conc	O	DF	Instr	Anal Date	Anal Time
Mercury	253.7	0.10	0.20	0.10	U	1	CVAA	8/05/03	11:02

Comments: _____

GPL - Maryland Laboratory

Metals Data Reporting Form

Matrix Spike Sample Results

SDG: 307162W

Spike Sample ID: SP307220-001-001-1/3

Original Sample ID: S 307220-001-001-1/3 Client ID: MW-32

Matrix: Water Units: ug/L Prep Date: 8/01/03 Prep Batch: 61679

Weight: 100.00 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	OS Conc	O	MS Conc	O	Spike Level	% Rec	OS DF	MS DF	Instr	OS Anal Date	OS Anal Time	MS Anal Date	MS Anal Time
Antimony	206.8	2.6	U	52.8		50	105.7	1	1	ICPST	8/01/03	18:14	8/01/03	18:37
Arsenic	189.0	4.8	U	55.6		50	111.2	1	1	ICPST	8/01/03	18:14	8/01/03	18:37
Barium	493.4	6220		6730	NC	500	101.3	1	1	ICPST	8/01/03	18:14	8/01/03	18:37
Beryllium	313.0	0.20	U	25.4		25	101.5	1	1	ICPST	8/01/03	18:14	8/01/03	18:37
Cadmium	226.5	1.2	B	52.7		50	102.8	1	1	ICPST	8/01/03	18:14	8/01/03	18:37
Chromium	267.7	6.7		269		250	104.9	1	1	ICPST	8/01/03	18:14	8/01/03	18:37
Copper	324.8	2.2	B	278		250	110.5	1	1	ICPST	8/01/03	18:14	8/01/03	18:37
Lead	220.4	1.2	B	521		500	103.9	1	1	ICPST	8/01/03	18:14	8/01/03	18:37
Nickel	231.6	9.8	B	269		250	103.8	1	1	ICPST	8/01/03	18:14	8/01/03	18:37
Selenium	196.0	2.9	U	55.6		50	111.1	1	1	ICPST	8/01/03	18:14	8/01/03	18:3
Silver	328.1	0.70	U	53.5		50	107.0	1	1	ICPST	8/01/03	18:14	8/01/03	18:37

Comments: Sample Date: 07/28/03 Sample Time: 06:45 PM Color(Before): COLORLESS Color(After): COLORLESS

Clarity(Before): CLEAR Clarity(After): CLEAR

5.05.0

NC Percent recovery was not calculated

Form 5A Equivalent

* Duplicate analysis RPD was not within limits

E Serial dilution percent difference not within limits

U Result is less than the IDL

GPL - Maryland Laboratory
Metals Data Reporting Form

Matrix Spike Sample Results

SDG: 307162W

Spike Sample ID: SP307216-005-039-1/1

Original Sample ID: S 307216-005-039-1/1 Client ID: SWJOD3

Matrix: Water Units: ug/L Prep Date: 8/04/03 Prep Batch: 61756

Weight: 100.00 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	OS Conc	O	MS Conc	Q	Spike Level	% Rec	OS DF	MS DF	Instr	OS Anal Date	OS Anal Time	MS Anal Date	MS Anal Time
Mercury	253.7	0.10	U	1.0		1	100.0	1	1	CVAA	8/05/03	12:07	8/05/03	12:12

Comments: Sample Date: 07/30/03 Sample Time: 08:35 AM

5.05.0

- NC Percent recovery was not calculated
- * Duplicate analysis RPD was not within limits
- E Serial dilution percent difference not within limits
- U Result is less than the IDL
- B Result is between IDL and RL

Form 5A Equivalent

GPL - Maryland Laboratory

Metals Data Reporting Form

Sample Duplicate RPD Report

SDG: 307162W

Duplicate Sample ID: D 307220-001-001-1/3

Original Sample ID: S 307220-001-001-1/3 Client ID: MW-32

Matrix: Water Units: ug/L Prep Date: 8/01/03 Prep Batch: 61679

Weight: 100.00 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	OS Conc	Q	Dupe Conc	Q	% RPD	OS DF	Dupe DF	Instr	OS Anal Date	OS Anal Time	Dupe Anal Date	Dupe Anal Time
Antimony	206.838	2.6	U	2.6	U		1	1	ICPST	8/01/03	18:14	8/01/03	18:22
Arsenic	189.042	4.8	U	4.8	U		1	1	ICPST	8/01/03	18:14	8/01/03	18:22
Barium	493.409	6220		6270		0.7	1	1	ICPST	8/01/03	18:14	8/01/03	18:22
Beryllium	313.042	0.20	U	0.20	U		1	1	ICPST	8/01/03	18:14	8/01/03	18:22
Cadmium	226.502	1.2	B	1.2	B	4.9	1	1	ICPST	8/01/03	18:14	8/01/03	18:22
Chromium	267.716	6.7		6.8		1.3	1	1	ICPST	8/01/03	18:14	8/01/03	18:22
Copper	324.753	2.2	B	1.8	B	20.2	1	1	ICPST	8/01/03	18:14	8/01/03	18:22
Lead	220.353	1.2	B	1.6	B	28.6	1	1	ICPST	8/01/03	18:14	8/01/03	18:22
Nickel	231.604	9.8	B	8.9	B	9.3	1	1	ICPST	8/01/03	18:14	8/01/03	18:22
Selenium	196.026	2.9	U	2.9	U		1	1	ICPST	8/01/03	18:14	8/01/03	18:22
Silver	328.068	0.70	U	0.70	U		1	1	ICPST	8/01/03	18:14	8/01/03	18:22

GPL - Maryland Laboratory

Metals Data Reporting Form

Sample Duplicate RPD Report

SDG: 307162W

Duplicate Sample ID: D 307216-005-039-1/1

Original Sample ID: S 307216-005-039-1/1 Client ID: SWJOD3

Matrix: Water Units: ug/L Prep Date: 8/04/03 Prep Batch: 61756

Weight: 100.00 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	OS Conc	Q	Dupe Conc	Q	% RPD	OS DF	Dupe DF	Instr	OS Anal Date	OS Anal Time	Dupe Anal Date	Dupe Anal Time
Mercury	253.7	0.10	U	0.10	U		1	1	CVAA	8/05/03	12:07	8/05/03	12:09

GPL - Maryland Laboratory

Metals Data Reporting Form

Laboratory Control Sample Results

SDG: 307162W

Lab Sample ID: BKS61679

Matrix: Water Units: ug/L Prep Date: 8/01/03 Prep Batch: 61679

Weight: 100.00 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	Spike Level	Conc	Percent Recovery	Q	Range	DF	Instr	Anal Date	Anal Time
Antimony	206.838	50.0	53.0	106.0		80- 120	1	ICPST	8/01/03	18:06
Arsenic	189.042	50.0	51.0	102.1		80- 120	1	ICPST	8/01/03	18:06
Barium	493.409	500	527	105.5		80- 120	1	ICPST	8/01/03	18:06
Beryllium	313.042	25.0	26.0	103.8		80- 120	1	ICPST	8/01/03	18:06
Cadmium	226.502	50.0	54.0	108.1		80- 120	1	ICPST	8/01/03	18:06
Chromium	267.716	250	268	107.3		80- 120	1	ICPST	8/01/03	18:06
Copper	324.753	250	267	106.8		80- 120	1	ICPST	8/01/03	18:06
Lead	220.353	500	534	106.8		80- 120	1	ICPST	8/01/03	18:06
Nickel	231.604	250	265	105.9		80- 120	1	ICPST	8/01/03	18:06
Selenium	196.026	50.0	53.4	106.9		80- 120	1	ICPST	8/01/03	18:06
Silver	328.068	50.0	51.5	103.0		80- 120	1	ICPST	8/01/03	18:06

Comments: Color(Before): COLORLESS Color(After): COLORLESS Clarity(Before): CLEAR Clarity(After): CLEAR

GPL - Maryland Laboratory

Metals Data Reporting Form

Laboratory Control Sample Results

SDG: 307162W

Lab Sample ID: BKS61756

Matrix: Water Units: ug/L Prep Date: 8/04/03 Prep Batch: 61756

Weight: 100.00 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	Spike Level	Conc	Percent Recovery	Q	Range	DF	Instr	Anal Date	Anal Time
Mercury	253.7	1.0	1.0	100.0		80- 120	1	CVAA	8/05/03	11:04

Comments: _____

GPL - Maryland Laboratory

Metals Data Reporting Form

Serial Dilution RPD Report

SDG: 307162W

Serial Dilution Sample ID: SE307220-001-001-1/3

Original Sample ID: S 307220-001-001-1/3 Client ID: MW-32

Matrix: Water Units: ug/L Prep Date: 8/01/03 Prep Batch: 61679

Weight: 100.00 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	OS Conc	O	Serial Dilution Conc	O	Percent Diff	OS DF	Ser Dil DF	Instr	OS Anal Date	OS Anal Time	Ser Dil Anal Date	Ser Dil Anal Time
Antimony	206.838	2.6	U	13.0	U		1	5	ICPST	8/01/03	18:14	8/01/03	18:53
Arsenic	189.042	4.8	U	24.0	U		1	5	ICPST	8/01/03	18:14	8/01/03	18:53
Barium	493.409	6220		6180		0.7	1	5	ICPST	8/01/03	18:14	8/01/03	18:53
Beryllium	313.042	0.20	U	1.0	U		1	5	ICPST	8/01/03	18:14	8/01/03	18:53
Cadmium	226.502	1.2	B	1.5	U	100.0	1	5	ICPST	8/01/03	18:14	8/01/03	18:53
Chromium	267.716	6.7		6.7	B	0.1	1	5	ICPST	8/01/03	18:14	8/01/03	18:53
Copper	324.753	2.2	B	4.5	U	100.0	1	5	ICPST	8/01/03	18:14	8/01/03	18:53
Lead	220.353	1.2	B	4.0	U	100.0	1	5	ICPST	8/01/03	18:14	8/01/03	18:53
Nickel	231.604	9.8	B	10.0	B	2.0	1	5	ICPST	8/01/03	18:14	8/01/03	18:53
Selenium	196.026	2.9	U	14.5	U		1	5	ICPST	8/01/03	18:14	8/01/03	18:53
Silver	328.068	0.70	U	3.5	U		1	5	ICPST	8/01/03	18:14	8/01/03	18:53

Comments: Sample Date: 07/28/03 Sample Time: 06:45 PM Color(Before): COLORLESS Color(After): COLORLESS Clarity:

5.05.0

E Serial dilution percent difference not within limits
 U Result is less than the IDL
 B Result is between IDL and RL

Form 9 Equivalent

GPL - Maryland Laboratory

Metals Data Reporting Form

Instrument Detection Limits

SDG: 307162W

Instrument: ICPST

Units: ppb

Element	Wavelength	Reporting Limit	IDL	Date of IDL
Antimony	206.838	20.0	2.6	3/10/03
Arsenic	189.042	20.0	4.8	3/10/03
Barium	493.409	5.0	0.20	3/10/03
Beryllium	313.042	2.0	0.20	3/10/03
Cadmium	226.502	6.0	0.30	3/10/03
Chromium	267.716	5.0	0.80	3/10/03
Copper	324.753	10.0	0.90	3/10/03
Lead	220.353	10.0	0.80	3/10/03
Nickel	231.604	10.0	1.1	3/10/03
Selenium	196.026	20.0	2.9	3/10/03
Silver	328.068	3.0	0.70	3/10/03

GPL - Maryland Laboratory

Metals Data Reporting Form

Instrument Detection Limits

SDG: 307162W

Instrument: CVAA

Units: ppb

Element	Wavelength	Reporting Limit	IDL	Date of IDL
Mercury	253.700	0.2	0.10	2/20/03

GPL - Maryland Laboratory

Metals Data Reporting Form

Preparation Blank Results

SDG: 307162S

Lab Sample ID: BLK61603

Matrix: Soil Units: mg/kg Prep Date: 7/28/03 Prep Batch: 61603

Weight: 1.00 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	IDL	Report Limit	Conc	Q	DF	Instr	Anal Date	Anal Time
Antimony	206.838	0.23	2.0	0.23	U	1	ICPST	8/15/03	1:09
Arsenic	189.042	0.27	2.0	0.27	U	1	ICPST	8/15/03	1:09
Barium	493.409	0.020	0.50	0.26	B	1	ICPST	8/15/03	1:09
Beryllium	313.042	0.010	0.20	-0.017	B	1	ICPST	8/15/03	1:09
Cadmium	226.502	0.030	0.60	0.030	U	1	ICPST	8/15/03	1:09
Chromium	267.716	0.080	0.50	0.098	B	1	ICPST	8/15/03	1:09
Copper	324.753	0.13	1.0	-0.16	B	1	ICPST	8/15/03	1:09
Lead	220.353	0.16	1.0	0.16	U	1	ICPST	8/15/03	1:09
Nickel	231.604	0.15	1.0	-0.56	B	1	ICPST	8/15/03	1:09
Selenium	196.026	0.28	2.0	0.28	U	1	ICPST	8/15/03	1:09
Silver	328.068	0.050	0.30	0.050	U	1	ICPST	8/15/03	1:09
Zinc	213.856	0.25	2.0	0.25	U	1	ICPST	8/15/03	1:09

Comments: Clarity(After): CLEAR Texture: FINE

GPL - Maryland Laboratory

Metals Data Reporting Form

Preparation Blank Results

SDG: 307162S

Lab Sample ID: BLK61683

Matrix: Soil Units: mg/kg Prep Date: 8/01/03 Prep Batch: 61683

Weight: 0.60 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	IDL	Report Limit	Conc	Q	DF	Instr	Anal Date	Anal Time
Mercury	253.7	0.017	0.033	0.017	U	1	CVAA	8/02/03	14:29

Comments: _____

GPL - Maryland Laboratory

Metals Data Reporting Form

Matrix Spike Sample Results

SDG: 307162S

Spike Sample ID: SP307162-001-001-1/1

Original Sample ID: S 307162-001-001-1/1 Client ID: OD-SO-A-01

Matrix: Soil Units: mg/kg Prep Date: 7/28/03 Prep Batch: 61603

Weight: 1.13 Volume: 100 Percent Moisture: 18.30

Element	WL/ Mass	OS Conc	Q	MS Conc	Q	Spike Level	% Rec	OS DF	MS DF	Instr	OS Anal Date	OS Anal Time	MS Anal Date	MS Anal Time
Antimony	206.8	0.70	B	10.0		10.832	85.7	1	1	ICPST	8/15/03	1:24	8/15/03	1:57
Arsenic	189.0	1.1	B	12.1		10.832	101.3	1	1	ICPST	8/15/03	1:24	8/15/03	1:57
Barium	493.4	43.3		163		108.32	110.6	1	1	ICPST	8/15/03	1:24	8/15/03	1:57
Beryllium	313.0	0.15	B	5.6		5.4159	101.2	1	1	ICPST	8/15/03	1:24	8/15/03	1:57
Cadmium	226.5	4.5		16.2		10.832	108.1	1	1	ICPST	8/15/03	1:24	8/15/03	1:57
Chromium	267.7	71.5		70.3	N	54.159	-2.2	1	1	ICPST	8/15/03	1:24	8/15/03	1:57
Copper	324.8	7.0		68.6		54.159	113.8	1	1	ICPST	8/15/03	1:24	8/15/03	1:57
Lead	220.4	9.1		118		108.32	100.2	1	1	ICPST	8/15/03	1:24	8/15/03	1:57
Nickel	231.6	31.4		60.0	N	54.159	52.9	1	1	ICPST	8/15/03	1:24	8/15/03	1:57
niium	196.0	0.32	U	11.0		10.832	101.9	1	1	ICPST	8/15/03	1:24	8/15/03	1:57
ilver	328.1	0.057	U	11.4		10.832	105.2	1	1	ICPST	8/15/03	1:24	8/15/03	1:57
Zinc	213.9	13.0		125		108.32	103.7	1	1	ICPST	8/15/03	1:24	8/15/03	1:57

Comments: Sample Date: 07/22/03 Sample Time: 08:52 AM Color(Before): BROWN Color(After): YELLOW Clarity(After):
CLEAR Texture: FINE

5.05.0

NC Percent recovery was not calculated

Form 5A Equivalent

* Duplicate analysis RPD was not within limits

E Serial dilution percent difference not within limits

U Result is less than the IDL

4083

GPL - Maryland Laboratory

Metals Data Reporting Form

Matrix Spike Sample Results

SDG: 307162S

Spike Sample ID: SP307162-010-010-1/1

Original Sample ID: S 307162-010-010-1/1 Client ID: OD-SO-C-02

Matrix: Soil Units: mg/kg Prep Date: 8/01/03 Prep Batch: 61683

Weight: 0.65 Volume: 100 Percent Moisture: 11.30

Element	WL/ Mass	OS Conc	O	MS Conc	Q	Spike Level	% Rec	OS DF	MS DF	Instr	OS Anal Date	OS Anal Time	MS Anal Date	MS Anal Time
Mercury	253.7	0.017	U	0.46		0.5203	88.3	1	1	CVAA	8/02/03	15:02	8/02/03	15:07

Comments: Sample Date: 07/22/03 Sample Time: 09:20 AM

5.05.0

- NC Percent recovery was not calculated
- * Duplicate analysis RPD was not within limits
- E Serial dilution percent difference not within limits
- U Result is less than the IDL
- B Result is between IDL and RL

Form 5A Equivalent

GPL - Maryland Laboratory

Metals Data Reporting Form

Post Digest Spike Sample Results

SDG: 307162S

Spike Sample ID: PS307162-001-001-1/1

Original Sample ID: S 307162-001-001-1/1 Client ID: OD-SO-A-01

Matrix: Soil Units: mg/kg Prep Date: 7/28/03 Prep Batch: 61603

Weight: 1.07 Volume: 100 Percent Moisture: 18.30

Element	WL/ Mass	OS Conc	O	PDS Conc	O	Spike Level	% Rec	OS DF	PDS DF	Instr	OS Anal Date	OS Anal Time	PDS Anal Date	PDS Anal Time
Chromium	267.7	71.5	N	73.0	NC	2.2878	67.0	1	1	ICPST	8/15/03	1:24	8/15/03	2:05
Nickel	231.6	31.4	N	35.5	NC	4.5757	88.9	1	1	ICPST	8/15/03	1:24	8/15/03	2:05

Comments: Sample Date: 07/22/03 Sample Time: 08:52 AM Color(Before): BROWN Color(After): YELLOW Clarity(After): CLEAR Texture: FINE

GPL - Maryland Laboratory

Metals Data Reporting Form

Sample Duplicate RPD Report

SDG: 307162S

Duplicate Sample ID: D 307162-001-001-1/1

Original Sample ID: S 307162-001-001-1/1 Client ID: OD-SO-A-01

Matrix: Soil Units: mg/kg Prep Date: 7/28/03 Prep Batch: 61603

Weight: 1.09 Volume: 100 Percent Moisture: 18.30

Element	WL/ Mass	OS Conc	Q	Dupe Conc	Q	% RPD	OS DF	Dupe DF	Instr	OS Anal Date	OS Anal Time	Dupe Anal Date	Dupe Anal Time
Antimony	206.838	0.70	B	0.52	B	29.8	1	1	ICPST	8/15/03	1:24	8/15/03	1:32
Arsenic	189.042	1.1	B	0.87	B	22.7	1	1	ICPST	8/15/03	1:24	8/15/03	1:32
Barium	493.409	43.3		42.4		2.1	1	1	ICPST	8/15/03	1:24	8/15/03	1:32
Beryllium	313.042	0.15	B	0.14	B	7.6	1	1	ICPST	8/15/03	1:24	8/15/03	1:32
Cadmium	226.502	4.5		4.7		3.8	1	1	ICPST	8/15/03	1:24	8/15/03	1:32
Chromium	267.716	71.5	N	289	*	120.6	1	1	ICPST	8/15/03	1:24	8/15/03	1:32
Copper	324.753	7.0		9.2	*	26.7	1	1	ICPST	8/15/03	1:24	8/15/03	1:32
Lead	220.353	9.1		11.5	*	23.9	1	1	ICPST	8/15/03	1:24	8/15/03	1:32
Nickel	231.604	31.4	N	136	*	125.0	1	1	ICPST	8/15/03	1:24	8/15/03	1:32
Selenium	196.026	0.32	U	0.31	U		1	1	ICPST	8/15/03	1:24	8/15/03	1:32
Silver	328.068	0.057	U	0.056	U		1	1	ICPST	8/15/03	1:24	8/15/03	1:32
Zinc	213.856	13.0		12.6		3.1	1	1	ICPST	8/15/03	1:24	8/15/03	1:32

GPL - Maryland Laboratory

Metals Data Reporting Form

Sample Duplicate RPD Report

SDG: 307162S

Duplicate Sample ID: D 307162-010-010-1/1

Original Sample ID: S 307162-010-010-1/1 Client ID: OD-SO-C-02

Matrix: Soil Units: mg/kg Prep Date: 8/01/03 Prep Batch: 61683

Weight: 0.64 Volume: 100 Percent Moisture: 11.30

Element	WL/ Mass	OS Conc	Q	Dupe Conc	Q	% RPD	OS DF	Dupe DF	Instr	OS Anal Date	OS Anal Time	Dupe Anal Date	Dupe Anal Time
Mercury	253.7	0.017	U	0.018	U		1	1	CVAA	8/02/03	15:02	8/02/03	15:05

GPL - Maryland Laboratory

Metals Data Reporting Form

Laboratory Control Sample Results

SDG: 307162S

Lab Sample ID: BKS61603

Matrix: Soil Units: mg/kg Prep Date: 7/28/03 Prep Batch: 61603

Weight: 1.00 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	Spike Level	Conc	Percent Recovery	Q	Range	DF	Instr	Anal Date	Anal Time
Antimony	206.838	10.0	10.1	101.0		80- 20	1	ICPST	8/15/03	1:16
Arsenic	189.042	10.0	9.4	93.9		80- 20	1	ICPST	8/15/03	1:16
Barium	493.409	100	106	105.9		80- 20	1	ICPST	8/15/03	1:16
Beryllium	313.042	5.0	5.4	108.9		80- 20	1	ICPST	8/15/03	1:16
Cadmium	226.502	10.0	10.7	106.9		80- 20	1	ICPST	8/15/03	1:16
Chromium	267.716	50.0	54.2	108.3		80- 20	1	ICPST	8/15/03	1:16
Copper	324.753	50.0	54.1	108.2		80- 20	1	ICPST	8/15/03	1:16
Lead	220.353	100	105	104.7		80- 20	1	ICPST	8/15/03	1:16
Nickel	231.604	50.0	53.0	106.1		80- 20	1	ICPST	8/15/03	1:16
Selenium	196.026	10.0	9.4	94.4		80- 20	1	ICPST	8/15/03	1:16
Silver	328.068	10.0	9.8	98.2		80- 20	1	ICPST	8/15/03	1:16
Zinc	213.856	100	105	104.8		80- 20	1	ICPST	8/15/03	1:16

Comments: Clarity(After): CLEAR

GPL - Maryland Laboratory

Metals Data Reporting Form

Laboratory Control Sample Results

SDG: 307162S

Lab Sample ID: BKS61683

Matrix: Soil Units: mg/kg Prep Date: 8/01/03 Prep Batch: 61683

Weight: 0.60 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	Spike Level	Conc	Percent Recovery	Q	Range	DF	Instr	Anal Date	Anal Time
Mercury	253.7	0.50	0.51	101.7		80-120	1	CVAA	8/02/03	14:32

Comments: _____

GPL - Maryland Laboratory

Metals Data Reporting Form

Serial Dilution RPD Report

SDG: 307162S

Serial Dilution Sample ID: SE307162-001-001-1/1

Original Sample ID: S 307162-001-001-1/1 Client ID: OD-SO-A-01

Matrix: Soil Units: mg/kg Prep Date: 7/28/03 Prep Batch: 61603

Weight: 1.07 Volume: 100 Percent Moisture: 18.30

Element	WL/ Mass	OS Conc	O	Serial Dilution Conc	O	Percent Diff	OS DF	Ser Dil DF	Instr	OS Anal Date	OS Anal Time	Ser Dil Anal Date	Ser Dil Anal Time
Antimony	206.838	0.70	B	1.6	B	127.9	1	5	ICPST	8/15/03	1:24	8/15/03	2:13
Arsenic	189.042	1.1	B	1.5	U	100.0	1	5	ICPST	8/15/03	1:24	8/15/03	2:13
Barium	493.409	43.3		43.9		1.2	1	5	ICPST	8/15/03	1:24	8/15/03	2:13
Beryllium	313.042	0.15	B	0.080	B	46.2	1	5	ICPST	8/15/03	1:24	8/15/03	2:13
Cadmium	226.502	4.5		4.8		6.1	1	5	ICPST	8/15/03	1:24	8/15/03	2:13
Chromium	267.716	71.5	N*	74.4		4.1	1	5	ICPST	8/15/03	1:24	8/15/03	2:13
Copper	324.753	7.0	*	6.5		7.5	1	5	ICPST	8/15/03	1:24	8/15/03	2:13
Lead	220.353	9.1	*	9.2		1.0	1	5	ICPST	8/15/03	1:24	8/15/03	2:13
Nickel	231.604	31.4	N*	33.4		6.4	1	5	ICPST	8/15/03	1:24	8/15/03	2:13
Selenium	196.026	0.32	U	1.6	U		1	5	ICPST	8/15/03	1:24	8/15/03	2:13
Silver	328.068	0.057	U	0.29	U		1	5	ICPST	8/15/03	1:24	8/15/03	2:13
Zinc	213.856	13.0		13.0		0.2	1	5	ICPST	8/15/03	1:24	8/15/03	2:13

Comments: Sample Date: 07/22/03 Sample Time: 08:52 AM Color(Before): BROWN Color(After): YELLOW Clarity(After):

5.05.0

E Serial dilution percent difference not within limits
 U Result is less than the IDL
 B Result is between IDL and RL

Form 9 Equivalent

4090

GPL - Maryland Laboratory

Metals Data Reporting Form

Instrument Detection Limits

SDG: 307162S

Instrument: ICPST

Units: ppb

Element	Wavelength	Reporting Limit	IDL	Date of IDL
Antimony	206.838	20.0	2.3	4/03/03
Arsenic	189.042	20.0	2.7	4/03/03
Barium	493.409	5.0	0.20	4/03/03
Beryllium	313.042	2.0	0.10	4/03/03
Cadmium	226.502	6.0	0.30	4/03/03
Chromium	267.716	5.0	0.80	4/03/03
Copper	324.753	10.0	1.3	4/03/03
Lead	220.353	10.0	1.6	4/03/03
Nickel	231.604	10.0	1.5	4/03/03
Selenium	196.026	20.0	2.8	4/03/03
Silver	328.068	3.0	0.50	4/03/03
Zinc	213.856	20.0	2.5	4/03/03

GPL - Maryland Laboratory

Metals Data Reporting Form

Instrument Detection Limits

SDG: 307162S

Instrument: CVAA

Units: ppb

Element	Wavelength	Reporting Limit	IDL	Date of IDL
Mercury	253.700	0.2	0.10	2/14/03